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Erika Fundelius, Taryn Wade, Audrey Robbins, Sen Wang, M. Addie
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Erika Fundelius, MA¹, Taryn Wade, PhD¹, Audrey Robbins, PhD¹, Sen Wang, MA¹, M. Addie McConomy, MA¹, and Keisey Fumero, PhD¹

Abstract: The article demonstrates how to use the multimodal and multisensory representation principle of Universal Design for Learning (UDL) to increase access to storybook reading for diverse groups of preschoolers with extensive support needs (ESN). Storybook reading is an essential part of instruction in early childhood education. Utilizing UDL-inspired book boxes, children of all ability levels can partake in the activity in a meaningful manner. Multimodal representation, such as use of tangible or abstract items (e.g.: photos, miniatures, real items) or sensory experiences (e.g.: essential oils, food items, braille, physical movement) allow children to engage with stories in an enhanced manner. Book boxes can assist in developing concepts related to social emotional growth, social skills, functional living skills, environmental concepts, and vocabulary presented in books.

Keywords: Universal Design for Learning (UDL), multiple disabilities, extensive support needs, early childhood, literacy, multimodal representation

“ THIS ARTICLE WILL DESCRIBE HOW TO USE UNIVERSAL DESIGN FOR LEARNING (UDL) PRINCIPLES TO ENRICH STORYBOOK READING FOR A DIVERSE GROUP OF PRESCHOOL STUDENTS WITH ESN TO ENSURE ALL STUDENTS IN THE CLASSROOM HAVE MEANINGFUL ACCESS TO LITERACY EXPERIENCES. TEACHING CHILDREN WITH ESN REQUIRES STRATEGIC ADAPTATION OF MATERIALS TO CAPITALIZE ON STUDENTS’ STRENGTHS. THESE STUDENTS OFTEN HAVE STRONG SENSORY PREFERENCES THAT CAN BE MET BY INCLUDING MATERIALS TO STIMULATE A VARIETY OF SENSORY PATHWAYS.”

Ms. Mia and Mr. Rob are co-teachers in a preschool inclusion classroom. The children have a wide range of strengths and needs. Storybook reading is part of the daily routine which creates opportunities for the teachers to incorporate curriculum content and other skills in the context of shared book reading. Ms. Mia suggests they find ways to make the books in the next unit more accessible for the children in the classroom. Jessie has a visual impairment, and it can be difficult for her to distinguish pictures on a crowded picture book page. Zane is a child who has multiple disabilities and learns best when multiple sensory channels are stimulated. Albert has developmental delays, and his home language is Spanish. He uses limited speech in school and his co-teachers are unsure how this will impact his literacy development. Ava, a child with language delays, benefits from repeated exposure to vocabulary words within the context of storybook reading to improve her performance in literacy and mathematics. Ms. Mia and Mr. Rob decide to use the multimodal representation of Universal Design for Learning (UDL) framework as

a guide to meet all the children's needs. They create **book boxes-kits with a book and materials-** to provide enriching literacy experiences addressing many different developmentally appropriate topics related to social skills, mathematics, and alphabet knowledge. They collect resources that will provide auditory (e.g., sound makers), tactile (e.g.: three dimensional objects), and olfactory (e.g., scented oils) access as well as language-based and physical representations of concepts to support learning. They include adapted printed text by adding braille labels and use photos of real objects to facilitate language development.

Storybook reading in inclusive preschool classroom is an essential part of daily instruction that frequently occurs in the context of circle time. Teachers use stories to provide models for activities and to share the joy of reading. Research in emergent literacy demonstrates that from birth to 6 years old children gain the skills needed to successfully learn to read (Brown, 2014; Shanahan & Lonigan, 2010). Exposure to books at an early age teaches book concepts and print awareness. Literary tools such as alliteration and rhyming introduce foundational concepts of phonological and metalinguistics awareness and teach children that letters and symbols have meaning (alphabet knowledge; Shanahan & Lonigan, 2010). Careful consideration of how printed materials are presented in the classroom facilitates growth in language, in social skills, and in academics. However, approaching instruction using only standardized curriculum and activities may create learning barriers for students with and without extensive support needs (Towson et al., 2017).

Kurth and colleagues (2019) define students with extensive support needs (ESN) as those who have ongoing and pervasive support needs and have a diagnosis of autism, intellectual disability, or multiple disabilities. ESN often include students who have sensory impairments (i.e., blind, low vision, deaf, deafblind). This article will describe how to use Universal Design for Learning (UDL) principles to enrich storybook reading for a diverse group of preschool students with ESN to ensure all students in the classroom have meaningful access to literacy experiences. Teaching children with ESN requires strategic adaptation of materials to capitalize on students' strengths. These students often have strong sensory preferences that can be met by including materials to stimulate a variety of sensory pathways. From selecting motivating topics and materials, to providing scaffolded response modes and meaningful consequences, implementation of a UDL approach can accommodate the needs of all students in a classroom, including those with disabilities (Toews et al., 2021).

Although UDL approaches have made materials more accessible to special education students, these strategies support all students. It is a framework that provides high-quality instruction in an inclusive environment by improving all students' access to materials in multiple mediums (Brillante & Nemeth, 2017; Evmenova, 2018). The principles of UDL include providing multiple means of (a) representations of information (*What* of learning), (b) actions and expressions of learning tasks

(*How* of learning), and (c) engagement in learning (*Why* of learning; CAST, 2018). This article illustrates simple ways to increase accessibility by designing multisensory learning activities using the principles of UDL by creating book boxes around a storybook for reading in a preschool classroom.

Literacy-Based Activities in Preschool

Storybook reading is an essential part of everyday routines in preschool programs, early intervention practices, and in the home (Coogler et al., 2021; Gaudreau et al., 2020). Research in early reading supports early experiences with books as a foundation for later academic success. As a result, many organizations such as Dolly Parton's Imagination Library and Seedlings (braille) provide free books to families. However, simply having access to storybooks does not capitalize on all the benefits that can be derived from book exposure for preschool children.

Storytime in educational settings often stops with giving children a quick peek into the illustrations, whereas shared book reading is more interactive and can enhance engagement between the adult and child (Towson et al., 2021). Teachers can use the UDL framework in instructional planning to increase student benefits by combining listening to the written word with active engagement with the story (Chen & Dote-Kwan, 2021; Gauvreau et al., 2021). The UDL approach accommodates diverse needs and preferences, improving the accessibility of presented material. For example, children who are learning English in school but understand concepts in their native language may struggle with understanding some ideas presented in books. Students with visual impairments who do not have visual access to the pictures that represent the concepts in the story may also struggle (Allman & Lewis, 2014; Chen & Dote-Kwan, 2021; Dalton & Brand, 2012). Using the UDL framework, teachers can bridge book concepts with the words and build children's comprehension and vocabulary development while sharing in the pleasure of book reading supported by interactive and multisensory scaffolds.

Using Book Boxes to Provide Multiple Means of Representation and Engagement

Experts in the reading, communication, and special education fields have called for more research on evidence-based practices for teaching all aspects of literacy for students with ESN, including phonemic awareness, phonics, fluency, vocabulary, and comprehension (Hudson & Test, 2011; Spooner & Browder, 2015). Existing research indicates students with ESN can participate meaningfully in storybook reading and benefit from many of the same instructional approaches as typically developing learners (Browder et al., 2008; Toews et al., 2021). The use of the UDL framework increases opportunities and decreases barriers by providing multiple means of representation, action and expression, and opportunities for meaningful engagement (Browder et al., 2008; Horn et al., 2019).

Book boxes are an instructional strategy, which is aligned with the multimodal representation principle of the UDL framework. Book boxes are a common strategy utilized by teachers of students with visual impairments (TVIs). This strategy can be expanded to a broader population of students. Book boxes offer a way to connect UDL's (a) *what of learning* such as concepts, words, actions, with the (b) *how of learning*, by using literacy activities through reading, vocabulary development, and sensory supports (e.g., tactile books, concrete objects, sounds), and (c) *engagement in learning* through physical manipulation of objects to a routine book reading experience. Items and ideas for a story are proactively gathered into one physical or digital book box.

Accommodations for a child with visual impairments might begin with large print versions of books, braille overlays, or tactile illustrations in a personal copy of the book. However, the use of real or abstract tactile items to represent concepts is most effective in relaying meaning (Allman & Lewis, 2014). TVIs often preteach concepts across contexts (e.g., farm concepts for a field trip) to lay a foundation for students with visual impairments. To support understanding of story concepts, they use physical materials as a part of an anticipatory activity during story-based lessons for students with ESN (Chen & Dote-Kwan, 2021; Hudson & Test, 2011). Book boxes are intended to support all students' understanding of the concepts presented in stories, such as the feeling of air blown by a fan when reading *The Wind Blew* by Pat Hutchinson. Using multiple exposures and multiple means of representation supports students across ability levels, including those with ESN (Browder et al., 2006).

In school settings, themes that align with seasons and holidays are often used as instructional opportunities through thematic units. *The Vegetable Alphabet Book* (Table 1) illustrates how using multimodal representations can improve accessibility while aligning with curricular expectations. This book may be used as a foundation before a farm visit, planting a garden, or germinate a seedling. Teachers should support the connection to real foods while supporting literacy. Students can touch, smell, and taste a variety of vegetables described by the book. Students may be introduced to the more abstract versions of artificial vegetables presented in classroom kitchens, stores, or dramatic play areas. To build a book box for an individual story, teachers can store materials representing concepts and stimulating senses in any box available (e.g., plastic shoebox). Alternatively, creating a filing system where each book has a list of items (Table 2) representing concepts, using multimodal and multisensory options to be collected before the lesson, will promote ease of planning, and may be used by peer or substitute teachers.

Ms. Mia is working on a book box to present before visiting the apple farm where the children will be able to pick and taste a variety of apples. She chooses the book by Jill Esbaum: Apples for Everyone. As the book uses photos of actual apples, it teaches characteristics of apples with the most real representation possible. She also uses the plastic apples from their harvest celebration materials. For children to learn the "appleness" of an

apple, they need to experience the apple completely. To teach the attributes of an apple, including shape, size, weight, color, taste, and smell, she will use real apples. At the farm, the children will build on the book concepts when they experience the fruit, the trees, leaves, water, and space needed to produce delicious, healthy fruit.

Using the multimodal representation to plan reading activities for preschool students may provide students a more inclusive environment (Cunconan-Lahr & Stife, 2007; Stockall et al., 2012) and meaningful way to connect to books and embrace the joy of reading. Verbalization and repetition aid learning new words and help build concepts that are not visually available (Allman & Lewis, 2014). The book *The Gingerbread Man* (Table 1) illustrates how a book box may enhance engagement and expression for all students in the preschool classroom, including students with ESN. This book uses repetition as a literary device that helps students of all abilities be highly engaged. To allow individual engagement, teachers can offer opportunities to activate a speech-generating device for repeated phrases, such as "Run, run as fast as you can." The needs of children with ESN are some of the most complex, when accommodated, exemplify the value of the UDL approach. Strategic adaptation of materials capitalizes on students' strengths. Building book boxes that offer multiple means of representations alongside sensory experiences offer a path to multifaceted experiences for all students in a classroom.

Mr. Rob and Ms. Mia plan their unit on "The Gingerbread Man" to include a baking lesson (independent living skills) with a recipe card to take home. The students measure ingredients (numbers, weight, tactile sense) and take turns (social skills) completing the baking steps (following directions). Mr. Rob will use essential oils (olfactory) to remind students of the gingerbread smell they experienced during baking, each time they interact with the story book.

Considerations for Students With Sensory Impairments

Children with ESN who have sensory impairments (those who are visually impaired, blind, Deaf, or Deafblind) often have an incomplete experience of stories, as teachers lack knowledge on improving accessibility. A person's understanding of concepts (mental ideas about the world; Allman & Lewis, 2014) grows out of life experiences and gives meaning to the world (Miles & McLetchie, 2008). Children with sensory impairments struggle with concept development, not necessarily because they lack cognitive skills, but because they lack sensory access. Incidental learning (i.e., learning by sight through observation) begins at birth and it accounts for nearly 85% of overall learning experiences that support concepts (Allman & Lewis, 2014). While children with typical vision observe the context of the world around them, children with vision loss miss out on a significant amount of information. Offering concrete objects and multiple opportunities for experiential learning can help students build a solid conceptual understanding. Furthermore, students with sensory impairments learn best using part to whole learning. As the name indicates, children need to learn

Table 1. Sensory Impairments and Extensive Support Needs (ESN).

Disability	Sensory impairments	Extensive support needs
Target skills	Concept & vocabulary development	Participation, Language, & Literacy development
Book title	<i>The Vegetable Alphabet Book</i> by Jerry Pallotta	<i>Gingerbread Man</i> by Jim Aylesworth
Auditory (hearing)	YouTube video of book read out loud	animal sounds, large button with repeating phases
Tactile (touch)	Real fruits and vegetables, realistic models, raised lines of illustrations of main ideas of the book, braille version	Gingerbread man, dolls for the characters, artifacts of cooking (measuring tools, spoon, bowl, cutter), raised lines of main ideas of the book, braille version
Olfactory (smell)	Fruits and vegetables, dried spices, essential oils	Gingerbread essential oil
Visual (sight)	Braille, CCTV for large print, Photos of vegetables with name, large print version	Photos of student with cookies, photos of teacher cooking, Large print version
Gustatory (taste)	Real fruits and vegetables, foods & baked goods	Gingerbread cookies
Independent living	Cooking, cutting, using utensils, doing dishes	Making/ eating cookies
Career education	Chefs, bakers, farmers, grocery store clerk	Chefs, bakers, farmers, grocery store clerk
Academics	Literacy: vocabulary, book concepts Math & Geometry: one-to-one correspondence, weight, shape, length, width, girth Biology & earth sciences: animal husbandry, soil properties, water cycle Chemistry: cooking	Literacy: vocabulary, book concepts Math & Geometry: one to one correspondence, subitizing, measuring, weight, shape, size Art: ginger scented activities (playdough or paint) Drama: reenactments (props in center or outdoor play) Anatomy: felt gingerbread man body parts Physical education: fitness, health to be running and be fast

the parts accessible to them first and then put the parts together to learn the whole concept. By teaching parts, then explicitly explaining how the parts make a whole, students build a mental image of a scene (Allman & Lewis, 2014).

For students with sensory impairments, pictures with braille labels (e.g., vegetable names) should be added to the classroom, supporting accessibility for all students. Real objects should be introduced first, allowing students to learn the idea of representation (a foundational concept). Conceptual knowledge of farm animals will likely be skewed if a child has only held a small plastic pig or horse, while opportunities to experience real animals supports development of authentic understanding.

Students with typically developing senses have access to the visual attributes of animals while children with sensory losses need concrete experiences to build their conceptual libraries. The UDL principle of multimodal representation, combining actions and expressions with active engagement in learning experiences, is necessary for children with sensory impairments.

Mr. Rob was brainstorming how to introduce the students to the concept of one-to-one correspondence in a fun way. Their classroom has the traditional counting bears, but he wanted to embed this numeracy activity within one of their story-based lessons. He decided to use the Ten Wiggly, Wiggly Caterpillars by Tiger Tale, because his students love bugs. Mr. Rob remembered

Table 2. Recommendations for Multisensory Experiences.

Sensory channel	General examples	Specific examples
Olfactory (Smell)	Aromatics	Offer a cotton ball scented with a drop of essential oil in a small container with a hole (e.g., an empty prescription bottle).
Tactile (Touch)	Exploration of textures with tactile cues (raised-line illustrations, tabs for page turning, photo frame bumpers to raise pages, tangible symbols)	Offer real objects, when possible, with a variety of textures. Outline the images of a coloring book with white glue or puff paint. (e.g., Storybox Ideas from Norma Drissel; https://www.pathstoliteracy.org/storybox-ideas-norma-drissel)
Auditory (Sound)	Speech-generating device (SGD), recorded read-aloud	Record a favorite adult voice reading a word or passage.
Visual (Sight)	Increase contrast	Thickly outline illustrations using a Sharpie, provide optimal -direct- lighting. (e.g.: Smith (n.d.) Experience Stories for Functionally Blind Pre-reader; https://www.tsbvi.edu/independent-living-skills/64-graphics/1735-experience-stories-for-functionally-blind-pre-readers-1)
Gustatory (Taste)	Edible representations of story concepts	Offer a ginger cookie snack, vegetables, edible flowers

that repetition supports memory skills, and that physical movement can create more engagement. He gave each student with 10 toy caterpillars and an egg carton with 10 cups to provide a tactile and contextualized counting experience.

Considerations for Students With ESN Who Have Language Delays

Book boxes can help children with ESN who have language delays, as well as those children in inclusive classrooms who may be at risk of language delays. These students may have difficulty learning new words or naming objects; expressing thoughts, feelings, or needs; and understanding others (Gurganus, 2017; Saeed et al., 2018). They may demonstrate difficulties in understanding literal and inferential language, including showing what they know and building new knowledge (van Kleeck, 2008). In addition, students with or at risk of language delays may have difficulty following simple directions or recalling number words zero to ten (Gurganus, 2017). Language development helps students navigate their environment, communicate, socialize, and build foundational reading skills. While preschool mathematics and reading are language-based, students with or at risk for language delays enter preschool with less developed language skills (McLeod et al., 2019; Nelson et al., 2020) and may struggle to keep up with their peers. Teachers and caregivers can use literacy-based activities such as shared book reading or story time to support language skill development of all students in the preschool classroom.

There are routine opportunities to embed interactive engagement between teachers and students beyond teacher as storyteller and student as listener (Purpura et al., 2017). To promote engagement, storybooks may include colorful illustrations or have tactile pages. An example is the *Ten Little Ladybugs* (Table 3), which has raised plastic ladybugs on each page. The simple story of the 10 ladybugs can teach math concepts, including one-to-one correspondence (e.g., counting each ladybug in a set once and using one number name for each item), subitizing (e.g., recognizing and naming the number in a small set of ladybugs on the table instantly without counting), or cardinality (e.g., counting ladybugs in a set and knowing the last number counted is the number of items in that set; Baroody et al., 2019; Clements & Sarama, 2019). The book box may have toy bugs or other real-life or abstract representations of the illustrations in the book (e.g., animals, plastic flowers). The class might grow an ant farm, butterfly garden, or a garden to attract bugs for observation and discussion. Interactions around the book may include use of mathematical vocabulary using the illustrations as visual support, physical movement around the classroom, school yard, or home to find real-world examples (e.g., bugs in the garden), and using the sense of smell (e.g., flowers) or hearing (e.g., wind) to engage with the story.

Mr. Rob and Ms. Mia want to engage Albert in their story time in a more meaningful way. Mr. Rob speaks Spanish, and they are paring English words with Albert's native Spanish (e.g.: orange/

Table 3. DLL & Language Delay.

Disability	DLL	Language delay
Target skills	Vocabulary & language development	Concept & language development, communication skills
Book title	<i>Thank you, Mr. Panda/Gracias, Sr. Panda</i> by Steve Antony	<i>Ten Little Ladybugs</i> by Melanie Gerth
Auditory (hearing)	YouTube video of book read out loud.	Real-world sounds of the animals in the story.
Tactile (touch)	Boxes with gift items, animal characters, raised lines of main ideas of the book, braille version	Ladybug and animals from story, raised lines of illustrations of main ideas of the book, braille version
Olfactory (smell)	Party candles	Flowers, fish, honey
Visual (sight)	Boxes with gift items, animal characters, pictures of real animals with words in both languages, large print version	Ant farm, butterfly grow kit, real-world photos of the bugs & insects, animals, photos with words, large print version Cortical Visual Impairment version of book
Gustatory (taste)	Cupcake (party/gift)	N/A (edible chocolate covered ants?)
Independent Living Skills	shopping for gifts, traveling to the store, money skills, budgeting, organizing	Rote counting money skills
Career education	zoologist, party planner, personal shopper, retail	biologist, farmer, veterinarian, entomologists
Academics	Literacy: vocabulary, book concepts, English Math: operations, one to one correspondence Geography: map skills to get to the store Physics: speed and time	Literacy: vocabulary, book concepts Math & Geometry: one-to-one correspondence, subitizing Art: colors Biology & earth sciences: animal husbandry, food cycle

Note. DLL = Dual language learners.

naranja). They have used a song or a rhyme from “*The Bilingual Book of Rhymes, Songs, Stories and Fingerplays*” by Shiller and Lara-Alecio to help support his engagement and participation, and to introduce his culture to all children in the class. Materials in the book box provide physical representations of the words and help Albert connect the concepts with the words in both languages.

Considerations for Students With ESN Who Are Dual Language Learners

UDL is not constricted to one single language; it can be applied across several orthographies. Given that the goal of UDL framework is to meet the diverse needs of all students in any classroom, consideration should also be given to the needs of dual language learners (DLLs). The Head Start: Early Childhood

Learning & Knowledge Center (2019) defines DLL students as children who are learning English while they are developing their first language, prior to entering kindergarten. Nearly 30% of the preschool-age population in the United States are DLLs who are often labeled at risk of low reading achievement because of their language status (Zimmerman et al., 2008). Furthermore, children from culturally and linguistically diverse backgrounds may be inappropriately assigned to special education classrooms with a diagnosed disability or with an “at risk” consideration (Artiles & Ortiz, 2002; Guñan & Cheatham, 2018).

Research has shown that when we incorporate the student’s home language, it has the potential to support several language and literacy goals (Ortiz & Fránquiz, 2019). Interactive book reading has been shown to support the effectiveness of developing and maintaining a student’s home language

(Dickinson et al., 2007). Furthermore, using reading, concepts, and language in both languages can be expanded (Dixon et al., 2012). It is reasonable to expect that teachers do not speak a second language to accommodate every student's needs. However, parents can assist with identifying target vocabulary words in the student's home language that align with English vocabulary while also building positive working relationships between home and school. Teachers might invite parents who speak other languages to read stories and expose students to other languages and cultures. For example, there are nearly 500 versions of the fairy tale *Cinderella* (American Library Association, 2017). The use of this story would allow for cross-cultural comprehension of concepts as the premise of the story is identical.

Creating a bilingual book box, with support from parents or bilingual staff members, can demonstrate cultural sensitivity while also embracing the student's language and literacy development. Alternatively, the use of bilingual books such as Steve Antony's *Thank you, Mr. Panda* (Table 2) can help in creating developmentally appropriate language and literacy opportunities (Guñan & Cheatham, 2018). Offering the student, a stuffed panda, a photo of the animal, and labeling it in their home language, English, print, and braille encourages the student to make mental connections between the words and their meanings. In addition, recorded animal sounds can encourage vocalization. Using book boxes provides opportunities to offer multiple representations of items, concepts, and words in students' home language and may promote DLLs literacy and language development.

Conclusion

All learners can benefit from multisensory instruction and inclusive instructional methodologies leading to improved early literacy development. UDL is a researched and supported framework that focuses on goals, methods, materials, and assessments to ensure all students—including those with ESN—have access to entire instructional experiences.

The use of book boxes that are prepared with careful consideration of the UDL principles can successfully accommodate student learning. Attention to multiple means of representation, engagement, and action and expression throughout lesson planning can elevate the benefits of instructions and provide well-rounded concept development for all students in a preschool classroom.

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Author Biographies

Erika Fundelius is a doctoral candidate at Florida State University. She earned her bachelors and masters at San Francisco State University in K-5 and special education. She has worked in special education for over two decades, most recently as a credentialed teacher of students with visual impairments, and currently works as a certified orientation and mobility instructor. Her dissertation research focuses on vision specialists' understanding of self-determination in quality-of-life outcomes for students with visual disabilities.

Taryn Wade has graduated from Florida State University with her doctoral degree in a focus in special education. She is a school psychologist and board-certified behavior analyst. She earned her bachelor's from the University of South Carolina and her master's and education specialist degrees from Florida State University. Her dissertation research focused on teaching math vocabulary in the context of a shared reading routine to preschool children at risk for language delays.

Audrey Robbins has graduated Florida State University with her doctoral degree. She earned her bachelors and masters at the University of Florida and spent over 20 years teaching. Her specializations include early intervention and researching

communication interventions for children with multiple significant disabilities.

Sen Wang is a doctoral candidate attending Florida State University. She earned her bachelor's in Child, Youth, and Family Studies and master's in Reading Education, and Philosophy, and spent over ten years teaching. Her specializations include early literacy education, especially in vocabulary and knowledge development.

M. Addie McConomy is a doctoral candidate in Special Education at Florida State University. Prior to enrolling in this program, she worked as a classroom teacher and district

professional development trainer for 9 years. Addie earned her B.S. from the University of South Florida in Special Education and is a National Board-Certified teacher. Addie is supported by Project RAISE (Research-based Academic Interventions for Students with Extensive Support Needs). Her area of research interest teacher retention and the implementation fidelity of high-leverage and evidence-based practices in classroom settings.

Keisey Fumero is a English-Spanish Bilingual Speech-Language Pathologist and a earned her doctorate at Florida State University. Her research interests include bilingual language and literacy development and intervention with a focus on family centered services.