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Multimodal Communication Support for Word Recognition and Literacy in Children With Language Delays

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**Multimodal Communication Support for Word Recognition and Literacy in Children With
Language Delays**

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Abstract

As the definition of being literate transforms from being able to read and write to being able to decipher a variety of mediums (e.g., music, text emojis, and more!), it is necessary that curriculum is adapted to reflect these changes. This paper discusses 11 preschoolers aged 4 to 6 years with language delays and their ability to recognize one-syllable words. Two different interventions assessed word recognition. One intervention paired gestures with five words. The second intervention had participants create self-interpreted drawings for each of the remaining five words. To determine whether or not gestures and drawing were effective literacy strategies, participants' word recognition scores pre and post intervention were analyzed. Assessments featured a visual field of three printed words and analyzed participants' printed word recognition by asking them to point to the orally presented word. The correct responses connected to gestures versus drawing were compared. This study was inspired by the Stage to Page program, a collaboration between Ballet Vero Beach, The Learning Alliance, and the School District of Indian River County that worked to connect the art of dance and literacy in elementary-aged students (The Learning Alliance, 2021, 0:00). The program aimed to combat illiteracy and reach the community's goal of 90% of students reading at grade-level by the end of third grade. Curriculum combined dance and literacy, ended in a culminating post-performance workshop, and identified that integrating the arts is a unique way to provide students access to text and support other areas of learning, such as literacy and reading.

Acknowledgements

Mackenzie would like to thank Dr. Suzanne Reading for her counseling and expert knowledge during the development, fulfillment, and examination of this project. In addition, Mackenzie would like to thank M.S. CCC-SLP Ashley Helpingstine for her willingness to collaborate with both the student researcher and Dr. Reading on implementing this project into the Butler Early Language and Literacy (BELL) program schedule and facilitating communication between parents and researchers. Combining interests of both dance and literacy into a tangible study would not have been possible without the guidance of both of these professionals.

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Multimodal Communication Support for Word Recognition and Literacy in Children With

Language Delays

       Preschool programs for children with language delays may focus on developing early literacy skills. The ability to recognize and decode print strengthens reading comprehension and supports vocabulary growth (Landi, 2010) so that children can make sense of their education and the world around them. Traditional forms of literacy in the school system, however, have neglected the arts as a modality for expressing knowledge of text. Due to the small amount of pre-existing research surrounding movement-based activities, it is important to evaluate how gestures can kinesthetically depict print and encourage literacy. Since children learn through imitation beginning at an early age, communicative gestures have the power to aid preschoolers' literacy skills as they transition to grade school. Hanna (2008) denoted dance as a form of literacy because it has both vocabulary and grammar through locomotion and gestures that logically sequence in the same way that text does. Therefore, gestures have the power to help the recently learned words remain relevant in the child's mind through embodied knowledge. In the same way that dance utilizes the body to tell a story to an audience, this research study aimed to employ useful insight into how the multimodal intervention of gestures can empower children with language delays in their means of self-expression and support them in their ability to read.

       Despite reservations about gestures inhibiting the oral expression of language, previous work has revealed that gestures facilitate the development and use of both receptive (what is understood) and expressive (what is communicated) language (Singleton & Saks, 2015). Capone and McGregor's (2005) work additionally reinforced that gestures contribute a richer semantic representation leading to stronger neural connections and minimized word retrieval errors. Leonard et al. (2016) summarized the overarching goal of this research, that involving

multimodal communication support can contribute to children's ability to create connections between different concepts and experiences.

The purpose of the current study was to test how the implementation of pairing gestures with select consonant-vowel-consonant (CVC) words positively affected early literacy skills and word recognition in preschoolers with language delays. This paper examines the effect of gestures and drawing on one-syllable CVC word recognition in preschoolers with language delays. Previous research has revealed that iconic co-speech gestures provide children with a richer learning experience than only using pictures as a scaffold (McGregor, 2009), and this gesture-supported word learning can be applied to multiple contexts outside of the classroom. It is the hope of this research study that when children with language delays involve their body in the self-performance of gestures, they will be able to consolidate the words better for later retrieval (McGregor, 2009) in a whole word approach. Therefore, the student researcher hypothesized that the posttest would reveal stronger word recognition performance for the words associated with the experimental condition of gesture instruction as compared to the words associated with the control condition of creating self-interpreted drawings.

Leonard et al. (2016) discussed qualitative research findings from a 3-week dance artist-in-residence program at a United States elementary school with the purpose of evaluating how using dance as a primary mode of inquiry and expression impacted students' ability to make meaning of both themselves and curricular concepts. The three main themes that emerged were artistic autonomy, embodied knowledge, and multimodality. Artistic autonomy found that implying meaning through gestures empowered students' literacy skills by allowing them to personify their expression. Embodied knowledge meant that students were able to make sense of complex biological processes learned in the classroom by relating the experience to themselves

through the form of integrated dance movement. Third, the theme of multimodality translates to the ability to intersect knowledge by involving other modes of communication, such as physical and tactile constructions of learning. Leonard et al. (2016) concluded that dance is a form of literacy, and being literate in the 21st century means providing students the opportunity to use multimodal practices beyond the traditional forms of literacy (reading, speaking, writing, listening) so that they can create connections between different concepts and experiences.

Gestures, while abstract, are powerful in that they aid children in their overall word learning (Rowe et al., 2008) and retrieval by strengthening the semantic representation of objects. As children begin to learn new words, they must sort through the sudden increase in knowledge to not only retrieve the word, but also rely on an even richer knowledge base to accurately name the word. Capone and McGregor (2005) conducted a study to test the hypothesis that depth of semantic representation, or how well the meaning of a medium is described, influences toddlers' word retrieval. Capone and McGregor's work found that less support for word retrieval was needed for the gesture-based conditions than the control condition of no semantic cue. In addition, gestures contributed a richer semantic representation through provision of distinct knowledge related to the target word, which led to stronger neural connections and minimized word retrieval errors. Therefore, the conclusions of Capone and McGregor's study are relevant to this research study as they strengthen the proposed hypothesis that gestures indeed aid children in conceptualizing words, and thus support early literacy.

In addition, incorporation of the arts has the power to engage the population of limited English proficient students in kindergarten through second grade that may not have otherwise received the level of language attention needed to reach English proficiency. Brouillette (2012) found that the arts utilizes nonverbal communication which in turn encourages the use of oral

communication. Implementing the arts into curriculum contributed to student motivation and boosted language development as evidenced by increased attendance and greater academic achievement scores on the California English Language Development Test (CELDT) after 2 years in the program as compared to the control group who did not have any exposure to the San Diego Teaching Artist Program. As a whole, Brouillette (2012) concluded that maximum literacy learning, vocabulary growth, and oral language are supported by implementing the arts into curriculum.

Even more so, adopting multimodal practices can assist in the ability to be emotionally literate, or the skill to discern and communicate one's feelings. A qualitative study conducted by Vulcan (2021) explored how involving the body in therapy with children on the autism spectrum can assist in addressing the emotional and relational complications, such as lack of empathy, difficulty with emotion regulation, and absence of social communication skills that the neuro-developmental condition presents. The main themes that emerged from the study are the relevance of the body in therapy encounters, the difficulties children on the spectrum have in sharing subjective experience with others, and the potential effectiveness of adopting body movement in therapy. These themes reiterate that adopting an embodied approach in therapy with children on the spectrum leads to greater receptiveness of inner emotions which results in strengthened communicative and relational skills. Involving the body through implementation of gestures then, not only has the power to support word recognition, but also improve overall quality of life.

Since the current study deals with preschool-aged participants, the Flack and Horst (2018) two-part study provided further insight into how word learning during shared storybook reading is supported by gestures that direct attention to relevant information without significantly

increasing the time taken to read the story. Key findings from this study were that too much extraneous information or multiple illustrations can hinder word learning, and gestures improve word learning as compared to reading without a guiding gesture. Children utilize pictures to make sense of new words and beyond that, gestures can act as further support to promote better generalization of abstract concepts. This research study provides additional justification that gestures can make all the difference in preliterate children because they narrow the field of attention and reduce the overall cognitive load present when learning new words.

The research in this review demonstrates the relevance of engaging with language and concepts in multiple ways. This particular investigation expanded on current research by adopting a multimodal approach and including a population with language delay. Furthermore, gestures not only predict early success in word learning, but early deficits in gestural learning are indicative of language delay in the early stages of language learning (Rowe et al., 2008). In modifying curricular content, children will be exposed to literacy in a more complex manner that goes beyond what traditional methodologies can cover. Pairing literacy with motion through the form of gestures paves the way for more confident oral expression of language, cements a foundation for early literacy skills, assists in early identification of language delay, and encourages the continuation of arts learning in later years.

Learning Outcomes

The learning outcomes for those engaging with this research are as follows:

1. Recognize the importance of early literacy intervention

2. Describe gestures and drawing as multimodal methods to strengthen early literacy skills

3. Compare the effectiveness of gestures versus drawing in eliciting a correct word recognition response for one-syllable consonant-vowel-consonant (CVC) words

Method

Recruitment

This study tested word recognition for preschoolers with language delays. Participants were enrolled in the Butler Early Language and Literacy (BELL) program, a clinical opportunity for undergraduates in the Speech, Language, and Hearing Sciences (SLHS) major. An infographic about the researcher and an informed consent form were distributed by the program director, Ashley Helpingstine, to parents for review. The informed consent form relayed that all students enrolled in the preschool would participate in the group gestures and drawing a picture intervention activities. This was the case because the main goal of the BELL program is to teach language and early literacy skills to prepare preschoolers with language delays for success upon entering kindergarten. Thus, one way to make literacy intervention more engaging is through incorporation of multimodal methods (gestures, drawing) to encourage communication, strengthen word recognition, and empower an overall love for literacy. Parents were informed that their child's participation in the assessment portion of the study was voluntary without penalty and that no reference would be made orally or written to link a child to a particular set of word recognition scores in later presentation. Prior to beginning this study, approval was obtained from Butler's Institutional Review Board (IRB).
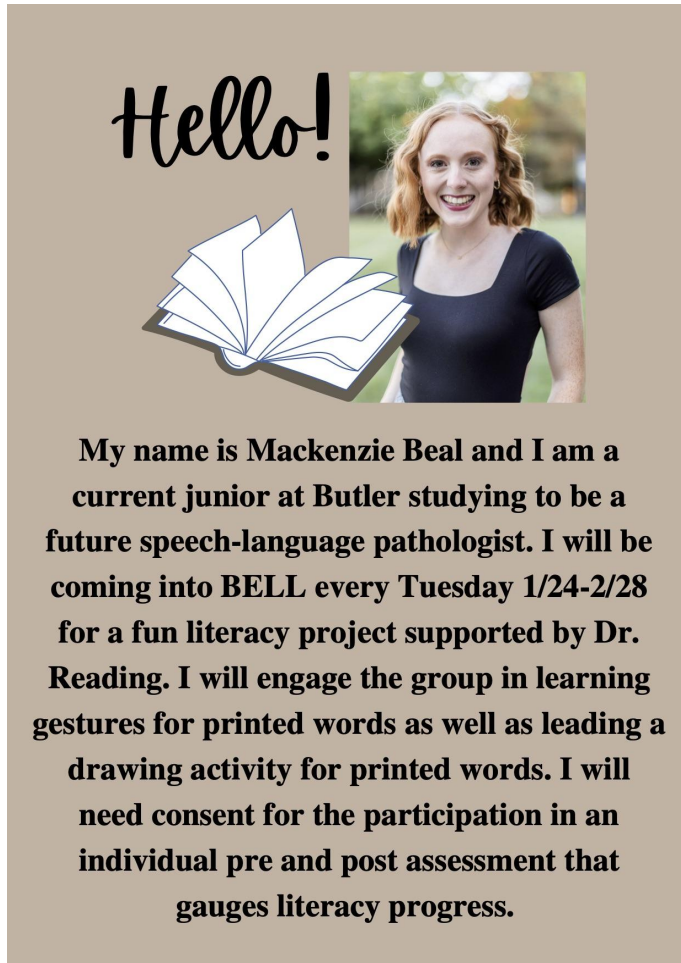
Figure 1: This image depicts the student researcher infographic that was sent to the enrolled BELL students' parents.

Participants

Consent was acquired from all parents to have their child participate in the separate individualized word recognition assessment portion of the study. This study utilized 11 children with language delays enrolled in the BELL program. Participants' ages ranged from 4 to 6 years and years of experience in the program varied. If one of the four group intervention sessions between the pre and posttest was missed, this, along with the format of the session (gestures intervention first, drawing intervention second; drawing intervention first, gestures intervention second) was noted in data analysis as G-D or D-G.

Stimuli Selection

The 10 one-syllable CVC words utilized in this study (house, cut, nap, hid, call, box, sad, star, bug, sun) were selected on the basis of considering the population's current level of understanding and providing variety in CVC from a production and written standpoint. Feedback was taken from the speech-language pathologist and director of the BELL program in order to determine what words may not be as commonly known to the children from previous program lessons and what words would be easily paired with an iconic gesture (a gesture that closely represents the meaning of the speech it is paired with). In addition, Indiana's Early Learning Development Framework was taken into consideration when choosing the stimuli listed above and constructing the methodology of this study (Indiana Department of Education, 2014). The English/Language Arts piece of Indiana's Early Learning Development Framework rests on three foundations: communication process, early reading, and early writing. These foundations served as guidance for what was developmentally appropriate and reiterated the importance of this study in relation to continued research in early literacy. Moreover, the framework relayed that preschoolers must be able to use complex gestures to communicate, demonstrate letter-sound correspondence, understand print carries meaning, and interact with stories in great detail. Working to improve literacy and word recognition through the support of gestures sets participants up for success so that they are prepared to be successful in learning to read in kindergarten and future grades (Indiana Department of Education, 2014).

Pretest

To set a baseline for participant word recognition capability, the participants with consents were pulled individually during the allotted free play time during the start of the BELL day to be tested. No positive reinforcement was given during the assessment so that results

accurately depicted starting word recognition capability. The student researcher set up in the closed off testing room which featured a small table, a chair for the participant, and a chair adjacent to the participant for the student researcher. The pre and post assessment format featured all 10 words (house, cut, nap, hid, call, box, sad, star, bug, sun) and was administered on an electronic device (student researcher's Macbook) so that both print (Arial, bolded, 60pt) and protocol was standardized.

To test printed word recognition for each of the 10 chosen words, participants were presented with a visual field of three printed words and asked to identify the printed word that corresponded to what the researcher orally presented. One word in each field started with the same consonant as the correct response. In order for children to be able to correctly identify print, they would need to have an understanding that different sounds make up words. Moreover, choosing to have one word be phonemically close to the stimulus forced participants to become aware of how sounds in words work and thus strengthen early literacy. A correct word recognition response in assessments was defined as the participant correctly pointing to the stimulus amongst the visual field of three. In accordance with Flack and Horst's (2018) findings, the test also included a warmup stage where the researcher modeled recognition via pointing for two training items before testing the 10 selected words. In addition, participants were guided during the training items to actually touch the researcher's screen so that the word chosen was clear to the researcher during assessment. The student researcher was conscious to hide her clipboard and assessment sheet so that participants could not see their accuracy.

nap   ham   nut

Figure 2: This image depicts the electronic presentation of the word recognition assessment. Participants were presented with a visual field of three printed words to choose from in the 10 trials, full-screen on the researchers' laptop. Font was standardized between both intervention sessions and pre and posttest assessment as Arial, bolded, 60pt.

Literacy Research Assessment

BELL Student Name:

Date:

Examiner Name:

The assessment will include two training items and ten tested words that will be presented in a visual field of three printed words. No positive reinforcement for pointing to the correct orally presented word will be given during the tested items. The correct response will be indicated by bolded print. The examiner will circle each student's response and include a score out of ten at the bottom.

Training items:
- **hot**   dog   hop

- fin   fun   **tug**

Tested items:
1) **nap**   ham   nut

2) mat   sip   **star**

3) **house**   hat   mud

4) yes   hen   **hid**

5) sub   top   **sun**

6) can   **cut**   lot

7) web   **call**   cap

8) **bug**   bag   pet

9) bat   jug   **box**

10) fin   **sad**   sat

Number of correct responses: _____/10

Figure 3: This image depicts the score sheet developed to test preschoolers' total word recognition pre and post four group student researcher-led intervention sessions. The correct response for each of the 10 words tested was indicated in bold print.

Research Assessment Script
"You're doing fine," "Keep at it/going," "Remember lets point, point to the word I say"

Training:
Here are three words *sweeping gesture*

I will say one of these words

Point to the word I say

Training item 1 point to hot This is the word hot

Point to hot

Training ONLY: Good job, let's try another one

We are going to do the same thing now, let's go

Here are three words *sweeping gesture*

I will say one of these words

Point to the word I say

Training item 2 point to tug This is the word tug

Point to tug

Great job! Let's keep going…

Test:

Next one, point to _____

Nap
Star
House
Hid
Sun
Cut
Call
Bug
Box
Sad

Figure 4: This image depicts the script referenced by the student researcher during individual word recognition pre and post assessment with each participant. This script ensured consistency in administration and no positive reinforcement.

<u>Group Intervention Model</u>

Since the goal of the BELL program is to teach language and early literacy skills, all children in the program were exposed to both the experimental condition of gestures and the control condition of drawing a self-interpreted picture. The student researcher visited the BELL program to lead four scheduled group intervention sessions (1/31/23; 2/7/23; 2/14/23; 2/21/23) that lasted around 20 minutes. All participants were seated at tables in a U shape that made viewing the projector screen and student researcher at the front of the room easy from all angles. The pattern of intervention administration went as follows: gesture intervention first, drawing intervention second; drawing intervention first, gesture intervention second; gesture intervention first, drawing intervention second; drawing intervention first, gesture intervention second.

Figure 5: This image depicts the student researcher and the setup in BELL that the participants viewed for the four student researcher-led group intervention sessions.

star

Figure 6: This image illustrates the presentation of the 10 words learned during the four group intervention sessions. Participants were shown all 10 words (five associated with gestures, five associated with drawing a picture) on the projector screen, one at a time. Font was standardized between intervention sessions and assessment as Arial, bolded, 60pt.

<u>Gesture Intervention</u>

The experimental condition of gestures was paired with half of the 10 total words which resulted in gestures covering: bug, cut, nap, hid, and call. It was the goal of the gesture intervention to pair CVC words with dance-like movements involving the body that would semantically represent the individual word. For instance, for the word bug, the student researcher held out both hands in front of her chin and wiggled her fingers to mimic a creepy, crawly bug. Then, for the word cut, the researcher held out her index and middle finger to create an imaginary pair of scissors and opened and closed her fingers. Each of the five words was listed on an individual PowerPoint slide in standardized print (Arial, bolded, 60pt) that was projected full-screen on a projector screen at the front of the room. For administration of this intervention, the student researcher followed the script of saying, "this is the word ___" and pointing to the word on the screen, saying "let's do ___" and showcasing the gesture, saying "show me ___" and showcasing the gesture a second time, and saying "good work on ___" and showcasing the gesture a third time. The gesture portion of the group session allowed children the opportunity to

learn to replicate the gestures along with the student researcher in hopes of establishing both agency in their learning and greater reinforcement of concepts post the four visits to the program.

Figure 7: This image depicts the student researcher and participants making the gesture for bug during the gesture portion of the student researcher-led group intervention session. All participants' faces were blurred for privacy reasons.

<u>Drawing Intervention</u>

The control condition of drawing a picture covered the remaining five words: star, box, sad, house, sun. Each of the five words was listed on an individual PowerPoint slide in standardized print (Arial, bolded, 60pt) that was projected full-screen on a projector screen. The researcher followed a script in line with the gesture intervention administration. The student researcher stated, "this is the word ___" and pointed to the word on the screen, said "let's draw ___," said "can you draw ___," and said "good work on ___." To complete this task, participants were provided with a sheet of printer paper (8.5 x 11 inches) for each of the five words that was labeled with student name, word depicted, and date in the top left corner to prevent confusion in

later data analysis. Participants were also given the same drawing instrument (dark blue crayon) from the BELL resource room with which they could draw a self-interpreted picture for each of the five printed words within a 45-second time limit. The sound chosen for the timer that went off after each of the five words was the "twinkle" sound from the student researcher's I-phone since it is softer and less frightening than the other sound options Apple provides. The student researcher collected the drawings after each of the words, so that each participant ended with a total of five drawings post every intervention session. The student researcher encouraged participation through utilizing an engaging tone and reinforced participants to "try their best" when drawing. It is interesting to note that some participants had more literal and picturesque depictions of the word, so future research considerations may further evaluate the accuracy of participants' self-interpreted drawings and the correlation between their word recognition scores for the five words associated with the drawing condition.
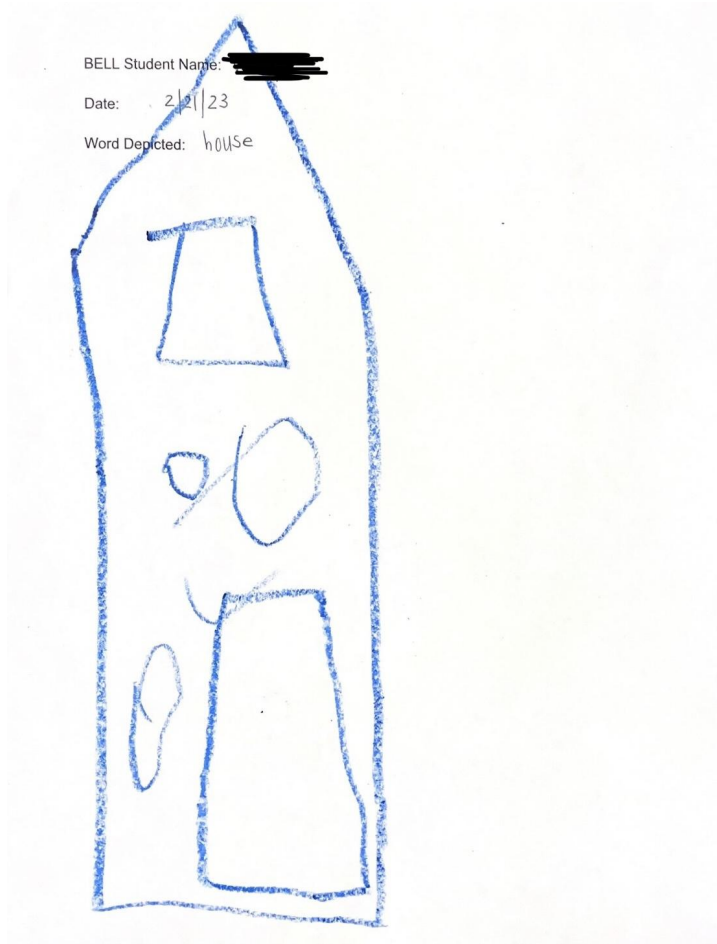

Figure 8: This image depicts the student researcher pointing to the printed word box and participants creating a self-interpreted drawing for the word box during the drawing portion of the student researcher-led group intervention session.

BELL Student Name: ▬▬▬

Date: 2/21/23

Word Depicted: house
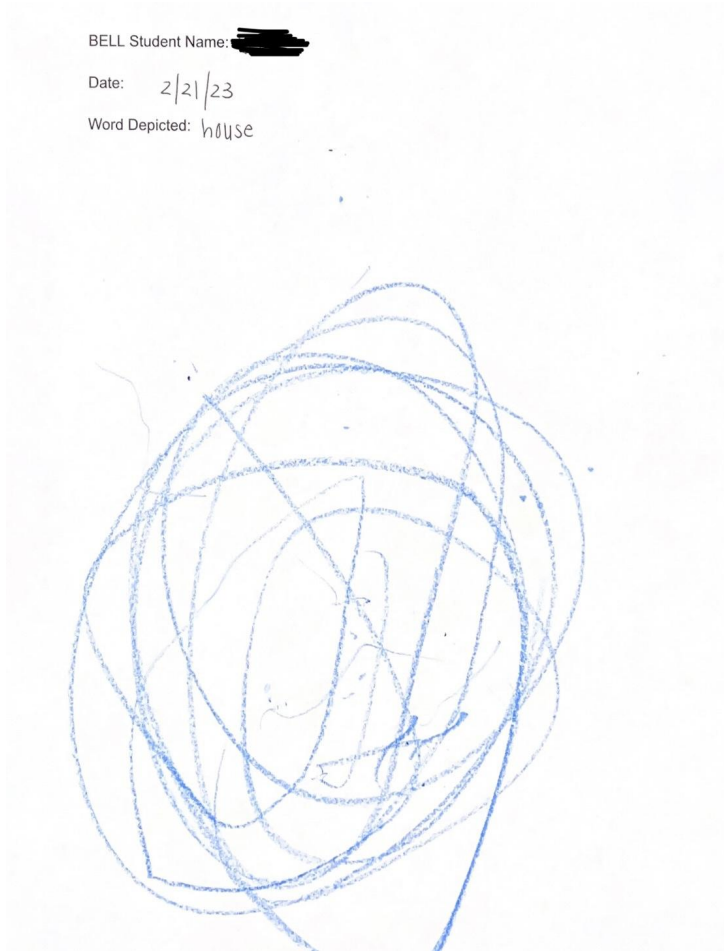
Figure 9: This image depicts a less literal interpretation of the word house by student 10 on the

last group intervention session date; 2/21/23.

BELL Student Name:

Date: 2|21|23

Word Depicted: house

Figure 10: This image depicts a more literal interpretation of the word house by student 1 on the last group intervention session date; 2/21/23.
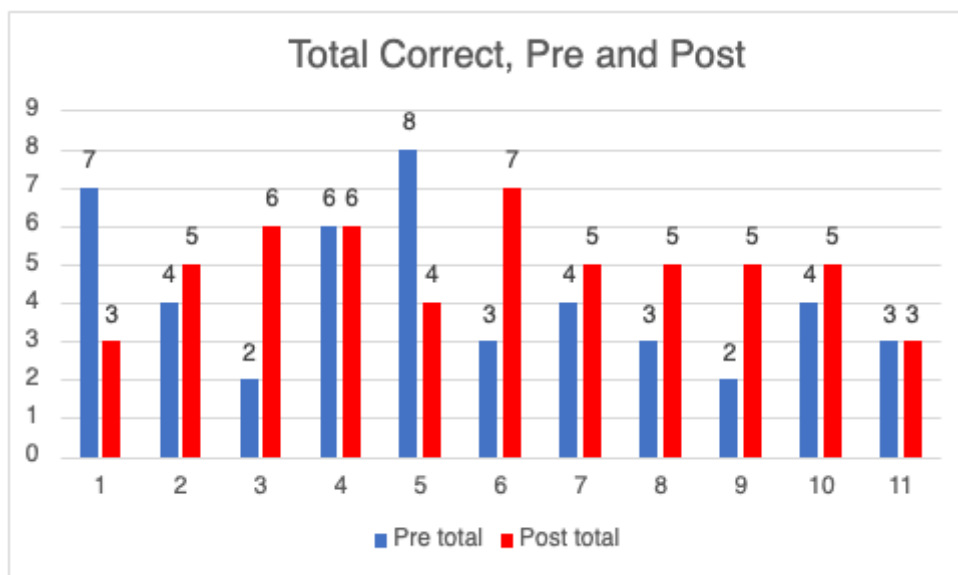
Posttest

Following the four student researcher-led intervention sessions, the participants with consents were again pulled individually during the allotted free play time to be tested. No positive reinforcement was given during the assessment so that results accurately depicted ending word recognition capability. The posttest followed the same format as the pretest and gauged participants' word recognition scores for all 10 words, and evaluated if there was any difference between the five words affiliated with the gesture intervention as compared to the five words affiliated with the drawing a picture intervention.

Results

For data analysis, using the pre and posttest assessment forms, each of the 10 words were scored either 1 = correct or 0 = incorrect for both pre and posttest. Then, for the participant drawings, the first drawing was deemed the pretest and the fourth drawing was deemed the posttest. If a student missed the first or last of the four intervention sessions, the pretest was their first collected drawing and the posttest was their last collected drawing regardless of date. Seven out of the 11 participants missed at least one session. The student researcher and faculty advisor scored the drawings on a scale of 1-3 with 1= unrecognizable, 2 = somewhat recognizable, and 3 = easily recognizable as depicting the word. A one-tailed and type 1 t-test was run (paired comparison). The data was then visually presented as a bar graph, see figure 11. As evidenced below, 7 out of the 11 participants improved in their overall word recognition for the 10 words from pretest to posttest, 2 out of the 11 participants got worse in their overall word recognition from pretest to posttest, and 2 out of the 11 participants stayed the same in their overall word recognition from pretest to posttest. The t-test revealed no significant difference between the groups, $t(109) = .13$, $p > .05$ To show a significant difference between pre and posttest, the p-value has to be equal to or smaller than .05. Figures 12 and 13 depict the relationships between pre- and post-scores for gestures and drawing. Again, the t-tests revealed no significant differences between pre- and post for gestures, $t(54) = .42$ and for drawing, $t(54) = .08$. However, the t-test for drawing was close to significance at $t(54) = .08$. Although there was no significance with the total word recognition correct out of 10 total words from pre and posttest, it is encouraging that following both interventions, a large number of participants showed overall word recognition improvement.

When comparing interventions, figure 12 reveals that 5 out of the 11 participants improved word recognition for the five gesture affiliated words (bug, cut, nap, hid, and call) and figure 13 reveals that 7 out of the 11 participants improved word recognition for the five words affiliated with drawing a picture (star, box, sad, house, sun). This was surprising and hypothesized to be the case because the three repetitions of performing the gesture ended up being shorter than the 45-seconds allotted to drawing a picture. Even more so, although the target word was on the projector screen for all 10 words, each of the five drawing sheets had the target word printed in front of the child as they drew. Thus, having the word explicitly listed on a material the child was using could have skewed their recognition of the five words affiliated with the drawing intervention.

Figure 11: This bar graph depicts the total correct out of the 10 chosen words for all participants (numbered individually 1-11) pre and posttest. The blue bar graphs indicate participants' pretest score, and the red bar graphs indicate participants' posttest score.
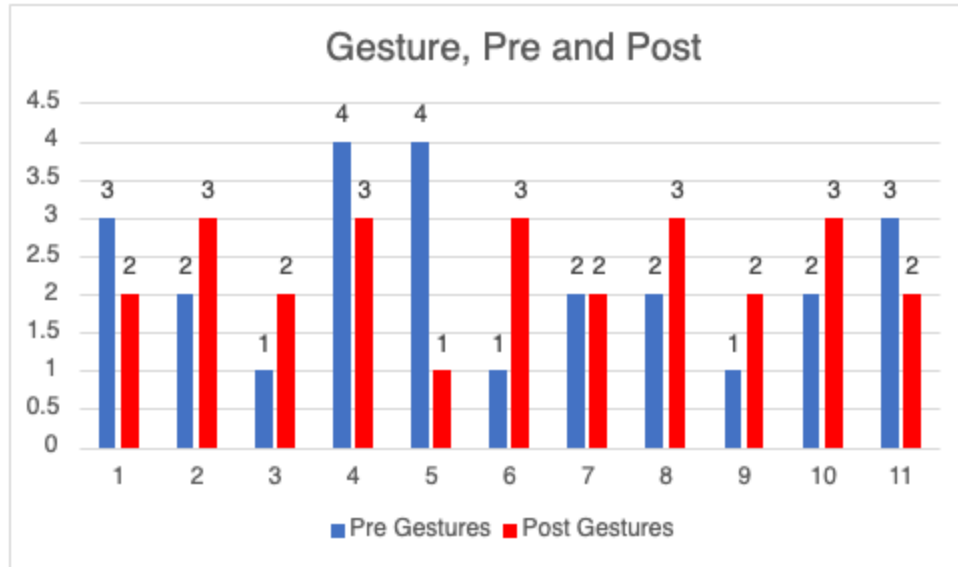
Figure 12: This bar graph depicts the total correct out of five for the words affiliated with the gesture intervention (bug, cut, nap, hid, and call) for all participants (numbered individually 1-11) pre and posttest. The blue bar graphs indicate participants' pretest score, and the red bar graphs indicate participants' posttest score.
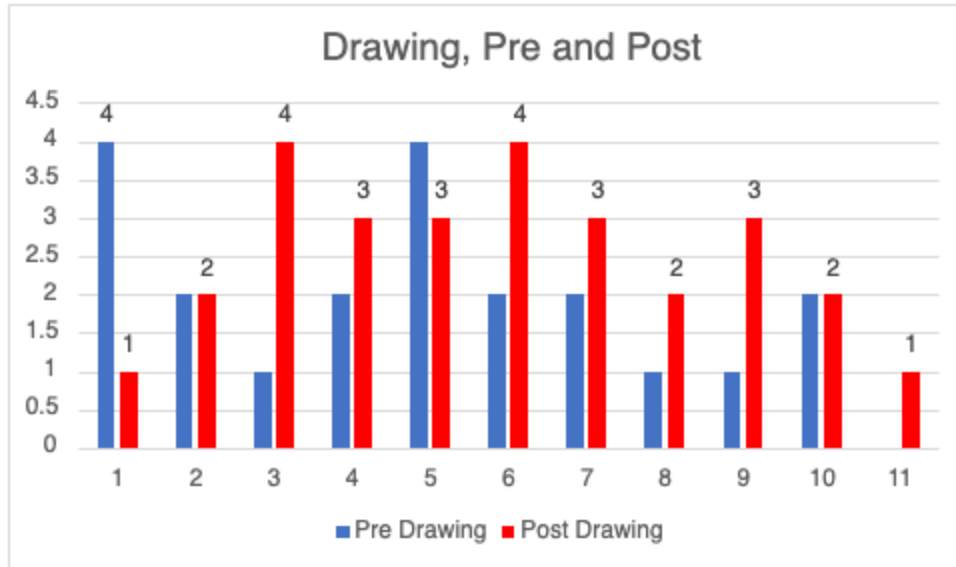
Figure 13: This bar graph depicts the total correct out of five for the words affiliated with the drawing intervention (star, box, sad, house, sun) for all participants (numbered individually 1-11) pre and posttest. The blue bar graphs indicate participants' pretest score, and the red bar graphs indicate participants' posttest score.

Discussion

As a whole, this study revealed the importance of fostering strong literacy skills in the next generation as illiteracy is a global issue, especially in the instance of children with language delays. This study aimed to contribute to advocacy for adopting a broadened perspective that recognizes the value in multimodalities to enhance literacy and increase connections between curricular concepts through a dynamic and arts integration focused lens. Thus, it is important to recognize that literacy is liberating and establishes a key foundation for understanding the world at large.

Although students 1 and 5 cannot be excluded from data presentation ethically, they are outliers in terms of direction of change from pre-to-post-intervention and it is thought provoking to analyze what the data would present as without their scores. If the two outliers were to be

excluded, the total word recognition correct from the pretest to the posttest for the nine remaining participants is significant, at $t(89) = .004$, p < .05, the gesture intervention words correct out of five from pretest to posttest is still not significant, $t(44) = .128$, p > .05, and the drawing a picture intervention words correct out of five from pretest to posttest is significant, $t(44) = .005$, p < .05. Opposite of what the student researcher proposed, drawing was found to be more effective overall in increasing word recognition rather than paired gestures. This is thought to be the case because drawing is a more tangible and less fleeting representation in the same way that print in books does not disappear. Both conditions involved physical embodiment to explore how words can leap to life through the arts.

Shortcomings in the research were that the drawing intervention sheets listed in print each of the five words and could have contributed to the participants' recognition of the word. It is also difficult to choose stimuli that are unfamiliar which could contribute to the participants' overall scores and knowledge coming into assessment. To continue, utilizing a population that was limited in size presented the potential for type two error, and in the future results could be improved with a larger sample size. Since all participants have some form of language delay, measuring printed word recognition was chosen versus measuring oral production to ensure more accurate results. Future studies, however, could evaluate gestures' impact on literacy from a more phonic-based approach. Findings suggest that approaching instruction of word recognition and vocabulary cannot be limited to one mode of expression.

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