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COLLTS: A Promising Interactive Read-Aloud Intervention for Three-Year-Old Dual-Language Learners

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Abstract
The goal of this pilot study was to test a bilingual interactive read-aloud intervention designed to develop the oral language proficiency of three-year-old dual language learners (DLLs). The eight-week intervention—Cultivating Oral Language and Literacy Talent in Students (COLLTS)—was aligned with the Head Start Early Learning Outcomes Framework and consisted of evidence-based instructional methods; resources for teachers and students that supported teachers in enacting these methods; professional development related to the methods and resources; and family literacy activities. Control teachers were given the same books as the treatment teachers to read to their students but were not provided with all of the professional development and any of the other COLLTS resources. The study was implemented in 22 classrooms in seven Head Start centers in a large city in the southern United States. Data were collected to assess students' language outcomes, teacher fidelity, and family participation. Findings indicated gains on a short receptive measure of instructed vocabulary, but no significant differences between treatment and control DLLs on that measure. Findings also indicated significantly greater gains for treatment DLLs compared with control DLLs in semantic knowledge measured by oral narrative retellings coded using language sample analysis; high levels of parent involvement and family satisfaction; and significantly greater gains in student's vocabulary knowledge for more engaged treatment families.

Keywords Dual language learners · Bilingual · Interactive read-aloud · Intervention · Preschool

Introduction

A large share of students in the United States are young dual language learners (DLLs), defined as children ages 8 years and younger from homes where at least one parent speaks another language. Between 2000 and 2017, the young DLL population had grown by 24% and made up nearly one-third of all young students in the United States (Park et al., 2017).

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The Importance of Developing Young DLLs' Oral Language Proficiency

Eligible students in the current study were dual language learners who were three-years-old at the start of the school year. This study focusses on developing oral language proficiency in young DLL's because oral language proficiency plays in an important role these children's literacy development (Dickinson & Porche, 2011). As an example, a study that examined the relationship between oral language proficiency and literacy in four-year-old Spanish-speaking DLLs found that the absolute level of language proficiency in each language (Spanish and English) was meaningfully associated with both the level and rate of growth in early literacy skills in that language (Lonigan et al., 2018). Other studies have found similar relationships across grades. For example, English oral language proficiency in prekindergarten DLLs was one of the strongest predictors of English word reading in Grade 1, along with English letter knowledge (Language and Reading Research Consortium et al., 2019). In another longitudinal study there was a significant relationship between

kindergarten English productive oral vocabulary and third-grade English literacy (Kieffer, 2012).

Attributes of Instructional Programs Predictive of Positive Language and Literacy Outcomes for Young DLLs

Our intervention—an interactive read-aloud program designed to develop the oral language proficiency of three-year-old dual language learners (DLLs) had both English and Spanish versions to accommodate different classroom contexts and consisted of instructional methods that included explicit teacher attention to vocabulary; opportunities for teacher and student interactions during reading and writing about texts; linguistic and visual supports to clarify core content; and culturally responsive practices. Teachers were provided with robust professional development and parents and caregivers were given resources to support children's language development. In the following paragraphs we describe the research support for these attributes.

Findings from multiple studies that focus on language-focused interventions for young ELs (e.g., Larson et al, 2019; Nelson et al., 2011; Vadasy et al., 2015) indicated that explicit attention to vocabulary was associated with gains in language development. Techniques included oral presentations of child- friendly definitions supported with pictures, examples, and teacher child interactions focused on word meanings during book reading.

Research has also found that particular kinds of interactions around text are effective in enhancing DLLs' language and literacy outcomes in English as well as in other second languages (Guiberson & Ferris, 2019; Larsen et al., 2019). The cited studies involved an adult reading a book to a child or small group of children using specific, structured, techniques that included talking about the story, asking comprehension and recall questions about the story; pointing out illustrations; having children make predictions about the story and retelling the story.

Both the quality and quantity of interactions that occur between adults and children influence young children's language and literacy development (Cabell et al., 2015; Hammer et al., 2014). Quality interactions are characterized by "semantically contingent utterances between two or more speakers that comprise multiple turns on the same topic" (Cabell et al., 2015, p. 81). Elicitations and extensions help engender these high-quality interactions. Elicitation methods include teacher questioning and requests for additional information. Extensions build on children's talk by providing more information or explanations related to the same topic and maintaining children's contributions in conversation.

Research also indicates that visual and linguistic supports used during reading enhance DLLs' listening comprehension and engagement when learning occurs in their second language (National Academies of Science, Engineering, and Medicine, 2017). Examples of visual supports include using gestures, pictures, realia, and multimedia. Examples of linguistic supports include: modeling language and tasks; elaborating on children's comments; recasting incorrect production; and providing additional exposure to words, concepts, and skills.

Cultural responsiveness is another attribute of effective instruction for young DLLs (Guibesron & Ferris, 2019; Larsen et al., 2019). An example of cultural responsiveness is cross-linguistic referencing in which children's first language is used to support development in their second language. Culturally responsive interventions also "incorporate the values, beliefs, practices, experiences, and materials relevant to the cultural backgrounds of the individuals receiving the intervention" (Larsen et al., 2019, p. 2).

Professional development to support teachers in enacting these practices is also crucial. Access to teachers with more experience, training in evidence-based instructional practices, and cultural competence can make a significant difference in DLLs' developmental outcomes in English and Spanish (Castro et al., 2017; Jacoby & Lesaux, 2017; Justice et al., 2008). For example, direct training and coaching designed to elicit and extend children's talk increased teacher–child engagement in multi-turn conversations, child-initiated conversations, and teacher's strategy use (Cabell et al., 2015).

Active home literacy activities such as adult–child exchanges about shared events and book reading support children's language growth (Lewis et al., 2016; Reese & Newcombe, 2007).

Findings from recent studies also indicate that the frequency of home literacy activities such as book-reading in English (Lewis et al., 2016) and in Spanish (Wood et al., 2018a, b) are positively related to oral language measures in the respective languages.

Aims of the Present Study

The goal of the present study was to pilot an interactive read-aloud intervention, Cultivating Oral Language and Literacy Talent in Students (COLLTS), that fosters oral language development in young DLLs through the kinds of evidence-based instructional methods, professional development, and family engagement activities described in the introduction. The following research questions guided the study: (1) What is the impact of COLLTs on the fidelity of implementation for treatment teachers and on the general quality of teacher language and literacy instruction for both treatment and control teachers; (2) What is the cumulative impact of the methods used in COLLTS' on DLLs' oral-language development; and (3) What is the relationship between COLLTS

family literacy activity completion rates and student's oral language development.

Method

Setting

The study took place in a large city in the southern United States. Seven Head Start centers associated with three agencies that provided a variety of services to families were recruited to participate. All classrooms at each center were involved in the study, either as treatment or control classrooms.

Sample

Classrooms, Students, and Families

In one of the agencies, three early childhood centers were assigned to the treatment condition and a fourth center with a similar number of classrooms was assigned to the control condition. At the other four participating centers (in the two remaining agencies), randomization occurred within each center with teachers assigned to treatment and control conditions.

Consent forms were sent home with all eligible students in participating classrooms. Eligible students were those from homes where a language other than English was spoken at home and who were 3 years-old at the start of the school year. Within each classroom, a random sample of six eligible students with consent forms was selected to participate. If the class had fewer than six eligible students, then all eligible students participated.

In all, a total 124 students participated in the study; 63 in the treatment group and 61 in the control group. Of these, 118 were assessed both prior to and immediately following the intervention. Six students were unavailable either pre- and/or post-intervention due to extended absences. All analyses focus on the 118 students (60 treatment and 58 control) with both pre- and post-assessment data.

The average age (at the start of the school year) of participating students was 3.5 years (SD = 0.37). In the treatment group, 54 students (90%) were instructed primarily in English and six (10%) in Spanish. In the control group, 38 students (66%) were instructed primarily in English and 20 (34%) in Spanish.

On a home survey completed by an adult family member in the student's household (primarily the mother), the majority of respondents reported speaking either all or mostly Spanish or both English and Spanish to the child (treatment = 83%; control = 87%). A smaller percentage of families spoke some Spanish but mostly English (treatment = 13%; control = 13% and a few spoke a language other than Spanish or English at home (2% treatment; 0% control). Similarly, a majority of respondents reported reading to their child either mostly in Spanish or in a combination of Spanish or English (treatment = 71%; control = 84%) with a smaller percent reading mostly in English to their children (treatment = 23%; control = 16).

Teachers

Twenty-two teachers participated in the study (12 treatment; 10 control). At the beginning of the intervention participating teachers were given surveys to complete by the research team. The teacher survey collected information about teachers' ethnicity/race, training, and experience. Ninety-five percent of the teachers were female; 41% were African American, 50% Latinx, 4.5% White, and 4.5% other race/ethnicity. Over half of the teachers (64%) held a BA/BS or higher; 32% an AA or some college; and 4% a high school diploma (or GED). Seventy-seven percent of the teachers held an early childhood education certification while the remaining 23% were certified in elementary and/or bilingual education, and English as a second language. On average, teachers reported significant experience teaching DLLs (treatment—15.9 years; Control = 12.21 years).

Intervention

Overview

COLLTS is an interactive read-aloud intervention for three-year old DLLs. COLLTS was implemented in treatment classrooms daily during the teacher's regularly scheduled read-aloud time (approximately 30–40 min each day) over the course of 8 weeks. Control teachers were provided with the same books as teachers in the treatment condition and were asked to read these story books to their students using their current techniques during their regularly scheduled read-aloud times and during the same weeks as treatment teachers.

In the following sections we first describe the COLLTS resources and then turn to the methods that characterized COLLTS. The resources and methods were aligned with research findings described in the introduction that highlight the importance of explicit attention to vocabulary, encouraging quality teacher–child interactions around text; providing visual and linguistic supports; using culturally responsive teaching practices and resources; providing robust professional development, and engaging parent/caregiver involvement in children's language development. COLLTS was implemented in Spanish or English, depending on the language of instruction in each of the classrooms.

COLLTS Resources

Each COLLTS unit used in treatment classrooms included a children's book, a teacher guide, vocabulary picture cards, a writing handout and family language development activities. See the online resources for examples of these activities.

There were eight parallel English and Spanish units with the first six units centered around a different children's book while units seven and eight consisted of activities to reinforce the skills and vocabulary targeted during the first six units. Each unit was composed of five thirty-minute lessons, with one lesson taught each day. Lessons 1–4 in each unit involved vocabulary and interactive-read-aloud activities, while lesson 5 focused on shared writing.

The books used were purposefully selected for literary and informational quality, text type (narrative or informational), and appeal to young children. Many of the books were multicultural with main characters and settings that represented different cultures, including the cultures of participating students. Besides the books, each COLLTs curricular unit included a teacher guide to support pre-reading, the interactive read-aloud, and post-reading instruction; picture cards for previewing word meanings; a writing handout; and a bilingual family literacy take-home activity that offered opportunities for families to support children's learning through engaging language-development activities aligned with each unit. Examples of the resources can be found in the electronic supplementary file.

COLLTS Methods to Support DLLs

As noted, the methods used in the intervention were consistent with research cited in the introduction. First, there was explicit attention to vocabulary. Teachers used COLLTs picture cards to teach three kinds of vocabulary words—key words, topic words, and bonus words. Key words were super-ordinates or words whose semantic fields are broad (e.g., vehicle, mammal) or are more conceptually complex (e.g., create and cooperate). Topic words had more specific meanings (e.g., airplane, bus). Bonus words indexed concepts (e.g., plant growth cycle) or linguistic structures (e.g., plurals) relevant to the objectives of the lesson. Each picture card illustrated a word's meaning on the front of the card and provided directions on the back of the card that guided teacher–student interactions related to the word's meaning. Online Resource 1 displays a key word card and a topic word card.

The meanings of many words and phrases were also taught in the context of interactive reading through defining words and phrases in context (e.g., The book says that the bus goes all around the town. This means that the bus goes to many different places in the town.). Teachers also developed student's language through hands-on activities (e.g., sorting objects of various shapes and naming the shapes and colors).

The main activity during the read-alouds were teacher–child interactions related to the story books to foster comprehension and language development. The teacher guides provided teacher prompts and anticipated student responses to support these exchanges. The exchanges consisted of teachers posing two types of questions drawn from Bloom's Taxonomy (Anderson & Krathwohl, 2001); questions that asked students to recognize and recall information explicitly mentioned in the text (Bloom Level 1 remembering questions) and questions that required students to interpret, exemplify, classify, summarize, compare, explain, and infer information (Bloom Level 2, understanding questions). All questions were designed to promote conceptual development appropriate for three-year-old students. Each reading activity ended with a read-aloud closure, where teachers asked students questions that helped them recap key information from the day's reading, infer meaning from the text, and/or make predictions about what will happen next. Online Resource 2 displays a section of an interactive read-aloud. Shared writing activities also provided opportunities for teacher student interactions. Online Resource 3 displays an interactive writing activity and describes the methods used.

Third, throughout, visual supports were used that included picture cards, teacher gestures, realia, and multimedia. Linguistic supports were also extensively used including teachers defining words and phrases in context (e.g., David saw a beautiful tree on his way to school. Beautiful means very pretty) and modeling expected responses to clarify instructions and expectations. Response frames in the teacher guides helped teachers model how to take a short child response and expand it into a complete sentence (e.g., *Question*: Then what did David do? *Expected Response*: David got some crayons and made the tree brown).

Fourth, cultural responsiveness was considered from the outset. Books were chosen because they had both English and Spanish versions and because the characters and settings represented diverse cultures. Teachers capitalized on EL's first language knowledge and skills through cross-linguistic referencing. That is, if students were instructed in their second language, teachers accepted responses in student's first language, translated the response into their second language and moved on to the next interaction.

The COLLTS professional development consisted of two parts. The first part for both treatment and control teachers focused on best practices for developing oral language proficiency and foundational literacy skills in three-year-old preschool DLLs. The second part familiarized treatment teachers with the COLLTS curricular units and instructional methods and provided teachers with opportunities to practice implementing COLLTS lessons and receive feedback. Additionally, during the intervention, project staff observed

Table 1 Quality of instruction

Skill	Treatment Mean	Control Mean	F	P
Pacing	2.13	1.00	22.77	< .001
1 = teacher exceeds allotted time by 5 min or more; 2 = teacher exceeds allotted time by 1–4 min; and 3 = teacher completes most lesson in allotted time				
Classroom Management	1.46	1.30	0.63	0.440
1 = teacher has trouble managing more than 2 misbehaving students; 2 = teacher has trouble managing 1 or 2 misbehaving students; and 3 = teacher manages most students successfully and redirects students who are misbehaving				
Encouragement	1.63	1.20	5.38	0.031
1 = teacher rarely encourages students to participate; 2 = teacher encourages students to participate sometimes; 3 = teacher encourages students to participate most of the time				
Responsiveness	1.67	1.25	5.75	0.026
1 = teacher rarely responds to and builds on students' comments; 2 = teacher responds to and builds on students' comments sometimes; 3-teacher responds to and builds on students' comments most of the time				
Modeling	1.83	1.20	24.77	< .001
1 = teacher rarely models; 2 = teacher models sometimes; 3 = teacher models most of the time				

treatment teachers implementing COLLTS lessons on a biweekly basis. Following each observation, they provided feedback to teachers on the fidelity and quality of implementation and suggestions for improvement.

Each of the first six COLLTS units had accompanying family activities aligned with the theme of each book to be completed at home. Each treatment group family was provided a packet of activities, numbered and dated to align with in-class unit instruction. Activities were completed in the family's strongest language (English or Spanish). Online Resource 4 displays a family literacy activity associated with the book David's Drawing (Falwell, 2002). In the activity parents take children for a walk in the neighborhood; identify a beautiful tree; and talk about what makes the tree beautiful.

Measures

The primary measures assessed fidelity of COLTTS implementation, quality of teacher instructional practices, student's functional language use and vocabulary knowledge, and family satisfaction with the home literacy activities and degree to which families completed these activities. All student measures were administered in students' language of instruction and for the oral narrative retelling, students were allowed to respond in English and/or Spanish. The student measures were administered individually in a quiet school setting.

Fidelity and General Quality of Instruction

For fidelity of COLLTS implementation (treatment teachers only) and general quality of instruction (treatment and control teachers), a research assistant familiar with COLLTS methods and resources was trained to use the measures by the principal investigator. Teachers were observed during the second and sixth week of the intervention.

The fidelity protocol consisted of a 10-item checklist for each activity applicable to the lesson (i.e., word of the day, book introduction, warm-ups, interactive read-aloud, read-aloud closure, content connections, language connections, foundational skills and/or writing). Each attribute was rated on a three-point scale: 1 = did not implement; 2 = implemented some of the activity; and 3 = implemented all of the activity.

General quality of teaching was coded for pacing, classroom management, encouragement, responsiveness, and modeling. Each attribute was rated on a 3-point scale. See Table 1 for definitions of these attributes and results.

Functional Language Use

An oral narrative retelling measure was used to assess each student's typical and functional language use. At both pre- and post-test, each student was told a standardized story aligned with the wordless picture book *Frog, Where Are You?* (Mayer, 1969) or Rana, Dónde Estás. Examiners read the story narrative aloud, pausing every two pages to ask each student questions about what had been read, and every five pages to ask a question that required the student to retell that portion of the story. The examiner then showed the student a storyboard displaying 10 pictures from the book that carried the story line and asked the student to retell the story in his/her own words. Online Resource 5 displays a section of the oral retelling narrative measure.

The process was audiotaped from start to finish. Audio files were transcribed and analyzed in accordance with Systematic Analysis of Language Transcripts (SALT) transcription conventions by bilingual staff from SALT Services who were trained in SALT transcription methods (Miller et al., 2015). For the purposes of the current study, analyses focused on the retell portion of the assessment. The variables of interest were: volubility and linguistic fluency indexed by total utterances[1]; syntax/morphology knowledge indexed by mean length of utterance in words[2]; and semantic knowledge indexed by both the total number of words[3] and by the number of different words.[4]

Curriculum-based Vocabulary

A twenty-item curriculum-based measures, the COLLTS Academic Vocabulary Assessment (CAVA) was used to assess student's receptive vocabulary knowledge before and after the intervention. The CAVA consisted of a stratified random sample of words taught in each COLLTS unit. Ten items assessed knowledge of topic words and ten items assessed key word knowledge. To administer the assessment, research assistants showed each child a set of four pictures and asked them to point to the picture that represented the spoken word. The pictures were visually similar in format to those used in the curriculum, but no pictures from the actual curriculum were used. Each item was scored as correct or incorrect.

COLLTS Family Literacy Logs

Parents were asked to complete a log indicating how much of each family literacy activity they completed and how much they and their child liked the activity. Activity completion was rated on a three-point scale including: 1 = completed; 0.5 = completed some but not all; and 0 = did not complete. Parent and child questions regarding how much they liked the activity were rated on a three-point emoji scale with 0 = frown face; 0.5 = neutral face and 1 = happy face. Treatment teachers reviewed assessment materials with parents prior to their distribution, and all logs were returned to teachers at the close of the intervention.

[1] Total utterances are the total number of verbal utterances.

[2] Mean length of utterance in words is the ratio of the number of main body words to the number of utterances Main body words are all the words in an utterance that are not in mazes or comments.

[3] Total number of words are all words located outside of mazes.

[4] Number of different words are determined by unique free morphemes. Free morphemes are ED and ING in the following example: PLAY, PLAY/ED, and PLAY/ING. These three words would be treated as a one-word root ("PLAY") occurring 3 times.

Results

Question 1: Teacher Fidelity and Quality of Instruction

Question 1a focuses on the level of treatment teacher fidelity of implementation. Research question 1b focuses on general teacher instructional quality during read-aloud time.

Fidelity of COLLTS Implementation

Fidelity of implementation scores for each treatment teacher were calculated by averaging scores across activities (i.e., preparation, vocabulary instruction, shared reading, content connections, foundational skills, and writing) and then averaging across the two observation time points. The average level of implementation across teachers was 2.73. Seven of the twelve teachers received overall ratings of 2.75 or above, with the remaining five teachers falling between 2.02 and 2.67. Results demonstrate that most teachers implemented many or all of the activities with fidelity.

Quality of Instruction (Treatment and Control Teachers)

Research question 1b examined differences in general quality of treatment and control teachers' instruction during interactive reading. Quality of instruction was rated on a three-point scale. Means and results of one-way analyses of variance (ANOVAs) examining differences between treatment and control teachers are presented in Table 1. Significant differences were found for pacing, encouragement, responsiveness, and modeling in favor of treatment teachers indicating the quality of treatment teacher instruction was rated higher, on average, for all variables except classroom management.

A general linear model (GLM) using years of teaching experience predicting quality of instruction (for treatment teachers only) indicated there wasn't a relationship between these variables ($F = 1.46$, $p = 26$). However, the sample size was very small and there might be different findings with a larger sample of teachers.

Question 2: Impact of COLLTS Resources and Methods on Student's Oral Language Development

Research question 2 examines the cumulative impact of COLLTs instructional methods, resources and professional development on typical and functional language use and curriculum-based vocabulary knowledge.

Table 2 Model results for functional language (oral story retelling)

	Effect	Num DF	Den DF	F Value	Pr < F
Total Utterances	Age	1	70	0.06	0.8105
	Agency	2	70	1.08	0.3462
	Group	1	70	0.12	0.7250
	Time	1	70	0.04	0.8394
	Group*Time	1	70	6.84	0.0109
Mean Length of Utterance	Age	1	70	9.24	0.0033
	Agency	2	70	0.81	0.4491
	Group	1	70	0.75	0.3899
	Time	1	70	4.57	0.0360
	Group*Time	1	70	0.00	0.9588
Number of Different Words	Age	1	70	8.28	0.0053
	Agency	2	70	0.35	0.7071
	Group	1	70	0.13	0.7166
	Time	1	70	1.20	0.2772
	Group*Time	1	70	6.78	0.0112
All Words	Age	1	70	2.24	0.1390
	Agency	2	70	0.29	0.7525
	Group	1	70	0.16	0.6883
	Time	1	70	0.84	0.3636
	Group*Time	1	70	7.00	0.0101

Typical and Functional Language Use

To examine the impact of COLLTS resources and methods on student's oral language development, analyses of child language samples were conducted using three-level, mixed-model ANOVA (time within child within teacher) with random intercepts at the child and teacher levels. Performance models used time (pre-/post-test) and group (treatment/control) as primary predictors. All models controlled for student's age and agency associated with the early learning center. Total Utterances (TU), Mean Length of Utterances (MLU), Number of Different Words (NDW) and All Words (AW) were analyzed separately.

As seen in Table 2, analyses indicate significant group by time interactions for total utterances ($F = 6.84$, $p \leq 0.0033$), number of different words ($F = 6.78$, $p \leq 0.0112$), and all words ($F = 7.00$, $p \leq 0.0101$), but not for mean length of utterance ($F = 4.57$, $p \leq 0.9588$). These results indicate that from pre-test to post-test, treatment students made significantly greater gains than students in the control group in the total number of verbal utterances, number of different words, and number of total words, all indicators of semantic knowledge. Syntax (mean length of utterances) did not improve over time for either group.

Curriculum-Based Vocabulary (CAVA)

Analyses of curriculum-based vocabulary performance used four-level mixed-model ANOVA (item within time, within child, within teacher) with random intercepts at the item, child, and teacher levels. Model predictors included time (pre-/post-test) and group status (treatment/control), and all models controlled for child age and educational agency. Analyses were conducted separately for topic words and key words.

Model results for the CAVA presented in Table 3 indicate no significant differences between treatment and control students in gains in knowledge of topic or key words as a function of group (group*time interactions). Main effects for group indicate that treatment students performed at higher levels than control students at post-test on topic words ($F = 6.93$, $p \leq 0.0086$) but not key words ($F = 1.59$, $p \leq 0.2077$) and that all students, on average, showed significant gains over time in knowledge of both topic words and key words (Topic Words: $F = 8.89$, $p \leq 0.0029$; Key Words: $F = 32.66$, $p \leq 0.0001$).

Language of Instruction by Treatment Interaction Effects

For both functional language (oral narrative retelling measure) and curriculum-based knowledge, (CAVA), while the number of students instructed in Spanish was small, all models described in the preceding paragraphs were re-run to determine if there were a language of instruction by treatment interaction effect. Results showed no significant treatment versus control group effects as a function of language of instruction for any language outcomes.

Table 3 Model results for the COLLTS curriculum based vocabulary (CAVA)

	Effect	Num DF	Den DF	F Value	Pr < F
Topic Words	Age	1	2267	11.07	0.0009
	Agency	2	2267	3.67	0.0256
	Time	1	2267	8.89	0.0029
	Group	1	2267	6.93	0.0086
	Group*Time	1	2267	0.00	0.9796
Key Words	Age	1	2267	5.30	0.0214
	Agency	2	2267	4.22	0.0148
	Time	1	2267	32.66	< .0001
	Group	1	2267	1.59	0.2077
	Group*Time	1	2267	0.16	0.6903

Relationship Between Family Literacy Activity Completion Rates and Students' Oral Language Development

Question 3 examined the relationship between COLLTS family literacy activity completion and a student's oral language development. In the process of answering this question, we also assessed how much families liked the activities. Family (parent and child) ratings of how many activities were completed and much they liked the activities were coded and averaged across the six units. Of the 60 treatment families, 41 returned at least one activity log. On average, 4.7 activities were completed by families at home, and families reported liking the activities they completed (mean = 0.98).

To examine the relationship between implementation of COLTTS family activities and student's growth in oral language proficiency, we fit generalized linear mixed models for CAVA topic and key word outcomes separately. Models had random intercepts at the child and teacher level and examined the effects of time (pre-/post-test) and number of family activities completed, controlling for age and educational agency. Gains in key word vocabulary were significantly different in favor of families that engaged in COLLTS family activities ($F(1,1147) = 4.57$, $p = 0.033$). Students with high family activity completion rates tended to score lower on CAVA at pretest (~ 32% correct), compared with those whose families did not complete these activities at home (~ 39% correct). At posttest, there were no significant differences as a function of family activity completion rates. This means that students with high completion rates made gains of ~ 16%, while students completing no home activities made gains of ~ 9%.

Discussion

Summary of Findings

The findings from this study are consistent with findings from recent syntheses of language-focused interventions for culturally and linguistically diverse young students (e.g., Larson et al., 2019; NASEM, 2017) described in the introduction that indicate methods that include evidence-based instructional strategies, resources, professional development and aligned family language and literacy activities show promise for improving DLLs' oral language skills.

Oral Language Proficiency Outcomes

Although findings on the curriculum-based measures of vocabulary did not show significant differences in growth between students in treatment and control groups, the narrative oral retelling measure indicated that students in the treatment condition had significantly greater increases in three lexical domains—the number of total utterances, total number of words, and number of different words relative to control students. These domains assess the diversity of the student's vocabulary and are developmentally sensitive measures of narrative productivity for Spanish–English bilingual students (Golberg et al., 2008; Heilmann et al., 2010; Ucceli & Paez, 2007) and positively related to the bilingual reading achievement of DLLs (Miller et al., 2006). A recent study found that the number of different words (NDW) accounted for the majority of unique variance in kindergarten and first-grade DLLs' performance on standardized English vocabulary measures (Wood et al., 2018a; b).

Of special interest is that while the number of students instructed in Spanish was comparatively small, there were no significant differences in outcomes on the oral narrative retelling measure between treatment students instructed in English and treatment students instructed in Spanish. While the power is low, findings indicate the intervention was effective delivered in Spanish as well as in English.

Family Language and Literacy Outcomes

Gains in key word knowledge were significantly different in favor of treatment families that engaged in home language and literacy activities compared to treatment families that did not engage in these activities. Of note is that key words are those that are more conceptually complex (e.g., *neighborhood*, *vehicles)* and less easily acquired by DLLs absent instruction.

Study Strengths and Contributions

Young DLLs are enrolled in 87% of all Head Start Programs (Loewenberg, 2019). Given the number of DLLs in preschool programs and the importance of student's oral language proficiency for school success, there is an increased interest and need for methods and resources that are effective in developing their oral language proficiency (Guiberson & Ferris, 2019; Larson et al., 2019; Ríos & Castillón, 2018). While there is an increased interest and need for information about promising practices for this age-group, there are very few intervention studies conducted with DLLs as young as 3.5 years old at the start of the school year (National Academies of Sciences, Engineering and Medicine, 2017).

This study provides evidence that a pilot intervention available in English and Spanish, that uses evidence-based instructional methods, professional development and family engagement activities can have a positive impact on the volume and quality of three-year-old DLLs' oral language development in both Spanish and English.

Ease of Integration into a Variety of Settings

COLLTS can be used in a variety of program models because it consists of parallel units in English and Spanish. It can be used in two-way dual language programs in which English learners and English proficient students are both learning in two languages; one-way dual language programs in which one group of students (either DLLs or English proficient students) is learning two languages, or English-only programs in which DLLs are learning only or mostly in English.

COLLTS can be easily integrated into ongoing programming because teachers are used to spending dedicated time reading aloud to students; all resources are provided for implementation; and professional development can be easily integrated into school programming in that it takes 4 hours initially followed by 30-min bi-weekly observations and mentoring.

Use of Authentic Measures of Child Language Adapted for DLLs

A major contribution of the study was the validation of a measure of authentic child language that could be used in future studies with very young dual language learners. To assess DLL's oral language most intervention studies have relied heavily on standardized language assessments. While beneficial for understanding a child's level of ability relative to their peers and the broader population, these assessments are criticized for their limited ecological validity and inability to identify more specific, or subtle, language differences (Hewitt et al., 2005). The oral retelling measure used in this study has advantages that include its ability to measure linguistic components of language (i.e., vocabulary, syntax, semantics, and pragmatics). It can be used with children of various ages including very young children (Miller et al., 2015) and can be used with students who cannot decode (Snow et al., 1995). Finally, it is less biased than norm-referenced tasks, especially for emergent English learners (Gagarina et al., 2015; Miller & Iglesias, 2010; Reese et al., 2012).

Study Limitations and Future Directions

The original intent of the study was randomization of teachers to treatment and control conditions within each center. However, after initial enrollment and immediately before the intervention was to begin, one agency requested that a center be assigned to the control condition while the other two centers be assigned to the treatment condition. The study compensated for this lack of assignment in part by examining growth over time and considering levels of implementation and quality of implementation. At the other four participating centers (in the two remaining agencies), randomization occurred within each center as planned.

There are limitations to the current study that also suggest future directions. The study was very short in duration. A future study might implement the intervention for a longer period to determine whether this might have led to improvements in student's morpho-syntactical ability as measured by the oral retelling assessment.

Vocabulary growth was measured in part through a curriculum-based measure modelled after the Peabody Picture Vocabulary Test, which has shown strong reliability (e.g., $\alpha > 0.85$ for PPVT) for students as young as 2 years, 6 months. Even though topic words were randomly selected for assessment, DLLs in both the treatment and control groups were almost at ceiling for four of the ten topic words at pretest, suggesting that the topic words selected for instruction could have been more challenging. Data also indicate that all students had difficulty with several of the key word items, possibly because the images used for the distractors were too similar to those used for the target words. Future research might include more than 10 items per construct and explore the use of images for conceptually complex words that differ more substantially from each other.

While the current study results indicated no intervention effects on vocabulary acquisition as a function of cognate status, all students, including control students, performed better on topic words that were cognates than those that were not. This suggests that when developing curriculum-based measures, the cognate status of vocabulary might be considered because it might make items differentially easier for DLLs, even those as young as three-years-old. Additionally, given the findings related to the effect of cognate status on

vocabulary acquisition, future studies might more formally assess how young children's Spanish proficiency impacts acquisition of vocabulary in English.

In future research, other attributes of oral language such as number of verbs per utterance might be assessed. Additionally, the macrostructure of student's narrative retells might be coded to assess such attributes such as ability to name and describe story context, characters, major events, and their resolution (Heilmann et al, 2010).

Theory and research suggest the volume and quality of teacher–child interactions influence student's early language development (Cabell et al., 2015) and provide insight into the variables that positively impact language development (Guiberson & Ferris, 2019). As such, it would be useful to collect data related to the volume and quality of teacher-student interactions not only during the intervention but also prior to the intervention and following the intervention to determine if the intervention improved the way in which teachers interacted with students when using intervention resources as well as afterwards when these resources were not available to them.

Finally, this was a pilot study, and the sample size made it only possible to examine the cumulative effect of the methods, resources, and professional development on student outcomes. A study with a larger sample size might be able to investigate mediators and moderators of the relationship between specific methods and resources and student outcomes.

Supplementary Information The online version contains supplementary material available at https://doi.org/10.1007/s10643-023-01447-1.

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