Impact of a Culturally Responsive Professional Development Program in Assistive Technology for Latinx Teachers

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Abstract

Very few studies have examined how to culturally and linguistically (CL) adapt professional development (PD) programs in assistive technology (AT) for Latinx teachers serving young children with disabilities. The purposes of this article are (a) to present an iterative design of a CL-adapted PD program, (b) to examine the impact of this program on teachers' use of AT practices to support young children with disabilities in early childhood classrooms, and (c) to evaluate the usefulness of program adaptations through the lens of bilingual Latinx practitioners. The Ecological Validity Model (EVM) was used as a framework for both the development and assessment of the program's CL adaptations. Quantitative results indicated significant changes in teachers' AT use pre- to post-intervention, while qualitative findings revealed the program's alignment with the *language*, *persons*, *metaphors*, and *context* dimensions of the EVM. In addition, three themes provided rich descriptions of the program's responsiveness to practitioners and classrooms. This study supports the CL adaptation of AT interventions as an equitable practice, supporting young children across a range of disabilities, cultures, and contexts while empowering the diverse practitioners who serve them.

According to the Individuals With Disabilities Education Act (IDEA, 2004), assistive technology (AT) encompasses any tool or service to increase, maintain, or improve the functional capabilities of children with disabilities, which the multidisciplinary team must consider during the development of the child's Individual Education Plan (IEP). The legislation further mandates that teachers implement AT practices in early childhood care and education (ECCE) programs to

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facilitate access to the curriculum for young children with disabilities alongside their peers without disabilities. As described by Tower (2004), AT may serve as a "great equalizer" for persons with disabilities across domains, a means for all children to access activities across their environments. Furthermore, research has supported that AT can help provide the foundation for several aspects of early childhood development, including emergent literacy skills (Burne et al., 2011).

Despite the equitable intent of the special education legislative provisions and demonstrated successful outcomes, studies have reported underutilization of AT (Bouck, 2016; Quinn et al., 2009). Although literature has demonstrated that AT can facilitate children's access to learning and developmental skills, there is an existing divide between research and practice. Disparities and limitations in professional development (PD) and/or training in AT among teachers and staff have been reported as a hindrance to AT implementation (Erickson, 2017; Lohmann et al., 2019; McLeskey et al., 2017; Parette et al., 2010; Tondeur et al., 2017). Contributing further to this gap is an inconsistent understanding of the range of social, developmental, and learning skills that can be supported by AT, especially in inclusive preschool environments (Tamakloe & Agbenyega, 2017). Overall, there is a misinterpretation and lack of clarity about what AT is and how or why it is used (Burne et al., 2011; Okolo & Dietrich, 2014). The lack of accessibility further thwarts implementation of appropriate AT resources and services. A statewide survey conducted by Okolo and Dietrich (2014) among 1,143 education personnel cited the limits in AT knowledge, access, and funding as the top three barriers to AT implementation. Disparities in AT resources and services may be further magnified for (a) students with disability categories requiring greater or specialized supports, (b) communities in which school resources are compromised, and (c) culturally and linguistically diverse (CLD) populations of students and the teachers who serve them (Bouck, 2016; Browder et al., 2012).

A Role for AT

Research has demonstrated how AT tools and strategies can enhance a child's engagement in early learning experiences by providing a means to better access materials, increase participation in classroom activities, build language skills, and create opportunities for social interaction (Light & McNaughton, 2012; Simpson & Oh, 2013). These skills are essential for supporting young children with disabilities in their learning environments across a range of functions, including communication, learning, independence, and play. AT can range from simple, non-electronic items such as visual schedules and adapted books to more dynamic, electronic tools such as voice output communication devices and tablets with early learning applications (Simpson & Oh, 2013). Studies have also reported how AT supports the literacy skill development in early childhood that sets the foundations for kindergarten readiness (Erickson, 2017; Lohmann et al., 2019; McLeskey et al., 2017). This is evidenced in a systematic review of the literature by Burne et al. (2011), who reported findings from several studies using both qualitative and quantitative methods demonstrating the connection between AT knowledge, use, and overall improvement in emergent literacy skills. Examples of emergent skills supported by AT included letter recognition, communication, and children's engagement in literacy-promoting activities (Burne et al., 2011).

Culturally and Linguistically Responsive Interventions

In considering the effectiveness of evidence-based interventions, Klingner and Edwards (2006) presented the question, "What works, with whom, by whom and in what contexts?" (p. 110). Although AT increases access to the curriculum and promotes the development and early literacy skills of young children with disabilities, the child's needs must be the central focus of the intervention (Jones et al., 2020). The Student Environment Task Tool (SETT) framework, for

example, developed by Zabala (1996), which provides essential guidelines for AT interventions, emphasizes consideration of *student*, *the child's environment*, *the task* for which AT is to be used, and the appropriate *tool*, as key determinants of AT appropriateness for the child. However, as Ripat and Woodgate (2011) noted in their literature review, while much of the focus has been on individual AT use, this does not occur outside of an individual's sociocultural ecology, adding:

> where the physical and social aspects of a child's environment influence the use of a device. The cultural environment deserves equal consideration, as it will inevitably shape perceived meaning and subsequent use of a particular device. (p. 87)

Considering the ecological and population validity of interventions has been an often overlooked but necessary step in research, particularly in developing interventions and practices that are culturally and linguistically relevant. Culturally relevant practices may be broadly described by approaches that reflect the home language, cultural heritage, and representation of diverse backgrounds in curricula, books, and instructional materials (Larson et al., 2020). Decades of research studies have supported the need for educational interventions that both reflect the culture and language of students being served rather than a generic and culturally subtractive model (Clewell & Villegas, 1998; Gay, 2002; Ladson-Billings, 2009). However, research studies on interventions have demonstrated that even when interventions meet the criteria for being considered evidence-based, they often continue to be decontextualized, exclusive, or misaligned with the ideals, concerns, values, and disability perspectives among CLD children's families and communities that they are designed to serve (Klingner & Edwards, 2006; McCord & Soto, 2004; Parette & Brotherson, 2004; Weintraub & Wilcox, 2006). Research has supported that this lack of attention to issues of cultural relevance has been a contributor to AT underuse or abandonment (Binger et al., 2008; Mertala, 2019; Parette et al., 2010; Ripat & Woodgate, 2011). One such example is the ethnographic study by McCord and Soto (2004) on Mexican American children using augmentative and alternative communication (AAC) devices, where a family did not perceive the device's language to represent their style of communication, leading to device abandonment. Research has also demonstrated that cultural beliefs and practices around AT in early childhood special education are but one dimension of addressing the AT needs of the CLD populations, as sociocontextual considerations and perceptions of disability also play a significant role (Ripat & Woodgate, 2011).

Empowering Latinx Teachers With AT

While many studies have emphasized the value of considering the cultural and linguistic needs of students receiving AT interventions, little attention has been given to the cultural and linguistic needs of the CLD practitioners who are delivering them in early childhood settings. A significant role for Latinx educators has been evidenced through scholarship, as they may share rich cultural connections with the children in their classrooms (we utilize the term Latinx to broadly describe the wide range of racial, ethnic, cultural, and linguistic identities represented in the literature, as well as our study participants, while acknowledging additional conventions are used as well, such as Latino/a or Hispanic). While studies have connected this cultural congruence to higher expectations and greater support for students from CLD backgrounds, it has also been shown to positively impact all students (Gay, 2002; Ladson-Billings, 2009). Latinx teachers also serve as important liaisons between school and home contexts, engaging families who may experience linguistic and cultural dissonance from schools (Sakash & Chou, 2007). In their review of the literature of perspectives on AAC among CLD students and families, Kulkarni and Parmer (2017) emphasized the importance of garnering input from CLD students and their families for determining the most appropriate AT, adding, "successful supports for multicultural

and multilingual students with complex communication needs require both collaboration between families, students, and professionals and comprehensive assessments, especially if the student is a non-native speaker of English" (p. 171).

Despite these documented strengths, special education literature has described several challenges for CLD teachers in early childhood classrooms. Studies have described how these teachers are often placed within urban school settings with limited resources (Mason-Williams, et al., 2020; Tyler et al., 2004). Furthermore, teachers may not be fully certified in early childhood special education, though they teach students with disabilities with varying or multiple support needs (Mason-Williams et al., 2020; Tyler et al., 2004). PD support may help fill in some of these gaps; studies have revealed the lack of access to PD in these settings has had a negative impact on acquiring the knowledge and skills to implement AT appropriately (Parette et al., 2010; Tondeur et al., 2017). Research has also described how AT knowledge does not always translate into appropriate technology use (Satterfield, 2016; Tondeur et al., 2017). Short-term PD activities, which are often the standard method of adult learning for teachers, have little effect on actually transforming teacher practices (Dunst et al., 2015). In summary, although Latinx teachers often have the skills to broker the educational environments for students and their families, their opportunities and resources for AT training may be constrained by several structural and resource barriers.

Research is yet another tremendous area of disparity when it comes to supporting Latinx teachers. Attention to perspectives from different cultural groups (e.g., race, ethnicity, language) is critical to the successful implementation of AT; yet the majority of the research centers on White, middle-class practitioner's lens (Kulkarni & Parmar, 2017; Parette et al., 2010; Ripat & Woodgate, 2011). A research review by Larson and colleagues (2020) revealed that language-focused interventions adapted to address Latinx parents and children's cultural and linguistic needs positively affected parent and child outcomes, further supporting how culturally relevant practices lead to improved outcomes for CLD children and their caregivers. However, a limitation of the analysis was that only 22% of the studies ($n = 9$) included CLD teachers in ECCE settings. In addition, of the 40 studies included in the review, only one focused on AT interventions, which focused on training parents to implement AT, but not teachers (Binger et al., 2008). In a subsequent study investigating the impact of an AT instructional program to train education assistants (EAs), all three EAs successfully learned how to use the AT intervention to support young children with disabilities from CLD backgrounds (Binger et al., 2008). The study included cultural adaptation strategies to engage children (e.g., selecting books based on their cultural heritage and interests). Still, it did not address the specific cultural considerations to support the diversity of the EAs (African American and Latinx). Although results from the two studies are promising, further research is needed to understand how to develop AT interventions that are culturally and linguistically responsive while also supporting Latinx teachers' adoption of AT practices in ECCE programs.

While literature has supported the effectiveness of AT for early childhood, it has also underscored the need for interventions to be ecologically-, practitioner-, and community-responsive. To date, there are few studies that focus specifically on the AT practices among Latinx teachers. As such, our goal was to construct a culturally and linguistically responsive PD program designed to improve Latinx teachers' AT practices to support young children with disabilities in ECCE classrooms. This article discusses the iterative development and assessment of the culturally and linguistically responsive features of our program and its delivery. Specifically, this study examined the following research questions:

Research Question 1: How did teachers' AT practices change across the intervention?
Research Question 2: How did language preference impact teachers' AT use and practices?

Research Question 3: Which cultural adaptation strategies did participants perceive as most impactful to the program?

Research Question 4: What information was gleaned from the discussions with practitioners to modify the program's approach and design?

This study utilized both quantitative and qualitative methods to answer the research questions. For the questions asked through quantitative measures, we hypothesized that teachers' AT practices would increase after participation in the program and that there would be no differences in AT use and practices based on teachers' language preferences.

Method

Step Up AT for Early Literacy (Step Up AT) was a 5-year project funded by the U.S. Department of Education Office of Special Education Programs (OSEP) to iteratively develop a culturally and linguistically responsive, practice-based PD program for teachers serving children with disabilities, 3 to 5 years of age in ECCE programs in South Florida. The program aimed to embed AT into teachers' instructional practices to promote early literacy skills among young children with disabilities. The Step Up AT program was a collaboration between a University Center for Excellence in Developmental Disabilities (UCEDD) and a statewide AT Program. Step Up AT extended beyond traditional PD practices by integrating (a) self-guided online learning modules for teachers and parents in English and Spanish, (b) access to AT devices through a partnership with a statewide AT program, and (c) training via in-person and virtual coaching (Natale et al., 2020).

Population and Community Context

The Step Up AT program was developed within CLD communities where approximately 50% of the overall population identify as Latinx from the Caribbean, and Central and Latin America; 24% Black with African American, Haitian, or other Caribbean ethnicities; and 58% of the population spoke a language other than English in the home (U.S. Census Bureau, 2019). It should be noted that these communities were largely under-resourced, which scholars have connected to gaps in opportunities (Ladson-Billings, 2007). For example, recent state kindergarten readiness tests indicated that approximately 64% of children who resided in these communities were assessed as "kindergarten ready" which was comparatively lower than children living in more affluent areas, which have rates closer to 80% (Office of Early Learning, 2019).

Participants

Five preschools across a range of ECCE settings participated in the first 3 years of the project, including community-based Head Start, voluntary prekindergarten (VPK) programs, and specialized early childhood classrooms. Across all five schools, 15 inclusion classrooms and seven specialized classrooms for children with disabilities participated in the program. Participants included 22 lead teachers and 36 teacher assistants. Lead teachers were 100% female, 73% were Latinx, and 64% were born outside the United States; approximately 50% of lead teachers preferred Spanish as their primary language, while the other 50% preferred English. The teacher assistants were 100% female, 75% Latinx, and 81% were born outside the United States; approximately 58% of teacher assistants preferred Spanish as a primary language, 39% preferred English, and 3% American Sign Language (ASL). About half of all lead teachers held a bachelor's degree, and teacher assistants' education levels varied.

Among the children enrolled in the program, inclusion criteria included the following: (a) being 3 to 5 years of age, (b) having a delay or disability as documented by a current IEP, and (c) Spanish or English identified as the primary language spoken in the home. Although these were not formal dual-language programs, many of the students were emergent bilinguals, with the teaching staff fluctuating back and forth between Spanish and English in a practice known as translanguaging. This has been commended as a pedagogical practice as a means of sustaining children's home language, while also encouraging them to use their full linguistic repertoire (García, 2009).

The curriculum's intended design supported a broad range of abilities found in inclusive classrooms. To this point, the children's disabilities included autism spectrum disorders, physical disabilities, developmental delays, chronic medical conditions, hearing impairments, intellectual disabilities, speech or language impairments, visual impairments, and dual-sensory impairments, with most children having speech and language delays. In total, 113 children participated in the intervention schools, where 68.3% were male, 48.2% White, 31.1% Black or African American, and 20.7% Multiracial or Other. The ethnicity of the children was identified as 55.8% Latinx and 8.6% Haitian. It should be noted that these descriptors for race and ethnicity are self-reported and are not necessarily exclusive categories. For example, many individuals in this region may identify as White Latinx.

Iterative Development of the Step Up AT Toolkit

During the first 3 years of the project, we developed a Step Up AT toolkit to reflect six key AT concepts aligned with the Division of Early Childhood (DEC) Recommended Practices (RP) in environmental adaptations and instructional supports for children with disabilities (DEC, 2014; Natale et al., 2020). We partnered with our state AT program to design the Step Up AT toolkit, which included an online learning module system, evidence-based coaching, and a curated inventory of devices for the AT lending library (www.stepupat.org). The toolkit included six online learning modules for teachers and accompanying demonstration guides and resources. Module topics focused on developing teachers' knowledge and practices in (a) identifying each child's needs for AT to promote access to and participation in early literacy experiences (DEC RP E4), (b) modifying and adapting the child's environment to encourage each child's access to and engagement in literacy experiences (DEC RP E3), and (c) planning for and providing AT supports and adaptations (DEC RP INS4) (DEC, 2014; Natale et al., 2020).

The AT instructional strategies were selected to support a broad range of needs for children with diverse abilities, which included students needing communication and AAC supports and those requiring behavioral support strategies, such as visual schedules. Coaches, along with the teachers, first assessed AT needs according to the SETT framework (Zabala, 1996) to determine the individualized needs of children and optimal classroom arrangements to inform the tools required for the specific tasks or goals, aligned with their IEP. Step Up AT incorporated a range of no-tech, low-tech, and digital technology tools such as adapted seating, visual supports, communication devices, tablets with literacy applications, materials for adapting books, and writing aids. In addition, the toolkit included low-tech AT options accessible for schools and families with limited resources and tools independent of electronic screens, given the "screen-time" concern for young children (National Association for the Education of Young Children & the Fred Rogers Early Learning & Children's Media at Saint Vincent College [NAEYC], 2012).

Finally, the PD toolkit included evidence-based coaching strategies with demonstrated efficacy in early childhood settings to facilitate teachers' in-class practice of AT (Barkley et al., 2005; Moir, 2018). Step Up AT coaches were selected for their previous special education training and experience as well as their dual fluency in both English and Spanish, a way to further ensure the language accessibility of the program. After viewing an online module, teachers and

teacher assistants met with AT coaches as a classroom unit for in-person and virtual coaching sessions. During the sessions, the AT coach introduced, modeled, provided opportunities for practice, and engaged teachers in self-reflection to address teachers' needs in the classroom and specific goals dictated by the children's IEPs (Rush & Shelden, 2020).

Using a Culturally Responsive Framework

As the rationale for designing responsive interventions for CLD populations has been described in the literature, it is of great importance to utilize tools that can validate and assess those interventions (Crowder & Broome, 2012). The Ecological Validity Model (EVM) developed by Bernal and colleagues (1995) was created to test the appropriateness of interventions for Latinx and other CLD populations across eight dimensions, which include *language*, *persons*, *metaphors*, *content*, *concepts*, *goals*, *methods*, and *context*. An extensive review of this framework's use was employed by Crowder and Broome (2012) across 12 intervention studies on asthma interventions designed for populations described as African American. Findings underscored the importance of considering cultural aspects from the development to the analysis phase of an intervention. Acknowledging the iterative nature of our program design, we also sought to use this EVM framework to assess how our intervention by process and outcome aligned with the cultural adaptations (Bernal et al., 1995).

In this particular iteration of the Step Up AT toolkit, we aimed to create a bilingual program in English and Spanish that would serve the primary and preferred languages of the teachers, teacher assistants, students, and their families. In terms of *persons*, the coaches, who were Latinx, shared the cultural and linguistic identity of the teachers, teacher aides, and more than half of the students in the participating ECCE programs. Finally, the *context* was a dimension that was critical to the development of the program's toolkit and coaching delivery. Our program served as a source of AT PD while also providing AT resources and hands-on coaching for community-based preschools that may have limited to no access to the district-level AT resources and support personnel. A more detailed application of these dimensions to the Step Up AT program is described in Table 1.

Measures

The quantitative and qualitative data collection procedures included all consenting teachers and children from the five ECCE programs in Years 1 through 3, at the beginning and end of each academic year. We used a multimethod, multi-informant approach to collect the data, which promises a more valid and reliable assessment of constructs (Schifferdecker & Reed, 2009). We provide a brief description of the measures below.

Implementation fidelity measures. During the intervention, we collected data from fidelity measures to evaluate the implementation of Step Up AT among teachers and coaches. The first is the AT Use Observation Checklist, a classroom observation tool that was developed to collect data on how teachers used AT tools and strategies during their early literacy instruction. This checklist used a 3-point Likert-type scale to capture the use of 14 AT categories, including communication devices, adapted writing and reading tools, switch toys, iPad© applications, adapted seating, and more. During each 90-min classroom observation, this observation checklist recorded how many times (a) AT was available in the classroom environment (score = 0), (b) the teacher used AT during instruction (score = 1), and (c) the teacher supported a child's use of AT (score = 2). A teacher scored along a scale, from 0 to 28 points.

Early on in the development of the Step Up AT toolkit, all instructional tools and lesson plans were standardized to ensure consistency across classrooms. Teachers were required to watch the

Table 1. EVM Framework and Application to Step Up AT.

EVM dimensions	Application to Step Up AT
Language—Culturally appropriate and relevant; more than a simple word translation	– All materials, modules, and assessment measures were available in Spanish and English Step Up AT coaches were fully bilingual, adapting to the language preferences of the staff, children, and families
Persons—The relationship dynamic and the influence of variables that exist between the "therapist" and client; these can be shared or differing characteristics	– Step Up AT coaches were former teachers who identified as Latinx women sharing cultural identity with the client population while engaging in cultural brokering with stakeholders
Metaphors—Objects, symbols, and concepts that relate to the client's culture	– Graphics and use of terminology were representative of the cultural, racial, and ethnic diversity of the school, community, and regional context
Content—Cultural knowledge, values, customs, and traditions	– This was not explicit in our study; we aim to collaborate more with participants to develop culturally responsive content in the future
Concepts—Relates to the way in which theoretical models are in alignment with cultural constructs of the client population	– Although this was not established in the initial development of Step Up AT, it was closely aligned with the EVM framework
Goals—Creating shared goals based on the values, customs, and traditions of the client population	– Creating shared goals was an essential component, reflective of teacher and IEP goals but was not reflective of culture
Methods—The consideration of cultural values in the actual procedures and methods of delivering the treatment	– This was not well established; we aim to better engage personnel and family in the design though participatory action in future iterations
Context—Consideration of social, economic, political contexts of the client population and how the treatment is supportive and mindful of these factors	– Focus group feedback illuminated contextual considerations, which include limited resources and PD support

Note. EVM = Ecological Validity Model; AT = assistive technology; IEP = Individual Education Plan; PD = professional development.

online modules, complete the activities from the workbook, as well as demonstrate engagement and understanding during the coaching sessions. As such, a second measure, the Teacher Fidelity Form, was completed by the AT coach after every coaching session. This form consisted of a 10-item yes or no checklist to rate teachers' level of participation and track their progress, with scores ranging from 1 to 10. The criteria for teachers to meet fidelity on this form was 80%; if unmet, AT coaches would provide feedback and additional coaching sessions for teachers until this goal was reached. AT coaches also utilized the Action Summary Form to ensure communication of expectations to the teachers within and after regular debriefing meetings.

A third form used, which was complimentary to the Teacher Fidelity Form, was the Teacher Adherence to Treatment Survey, a self-report measure adapted from Kasari and colleagues (2010) completed by the teachers at the end of each coaching cycle. This form recorded teachers' assessment of their own participation in the PD activities, implementation of AT, and any challenges they encountered. In addition, this form served as a short-answer qualitative representation of which AT strategy and tool teachers used, how it was used in the classroom setting, and any benefit they observed in student behavior as a result of the AT used.

As a final measure, coaches completed the Coaching Fidelity Form, to evaluate their own adherence to the coaching protocol while also ensuring consistency of the program

implementation. Twenty percent of the coaching sessions were observed randomly by the clinical manager. To meet the criteria for fidelity, at least 80% of the coaching session fidelity checklist items needed to be successfully completed. If this was not met, coaches were required to repeat the session and/or receive needed professional support from the clinical manager. Regular debriefing sessions between coaches and clinical managers also were points for providing feedback and assessments.

Teacher focus groups. At the end of each academic year, we invited teachers to participate in focus groups to gather feedback on their impressions of the Step Up AT toolkit components. As a result, nine focus groups were conducted which engaged both teachers and teacher assistants who participated in Step Up AT in a guided discussion on topics related to the aspects of the program that were most useful, barriers in their use of the materials, feedback on the program's ability to respond to stakeholders' cultural and linguistic needs, and future recommendations.

Data Analysis

We implemented both quantitative and qualitative analytical approaches to assess the Step Up AT program which employed multiple data sources to triangulate results (Schifferdecker & Reed, 2009; Shenton, 2004). The quantitative analysis focused on data from Year 2 and 3 data using Statistical Package for the Social Sciences, Version 25 (SPSS, IBM Corp, 2017). To examine Research Question 1, a repeated-measures analysis of variance (ANOVA) using the AT Use Observation Checklist examined the extent to which AT use changed from pre- to post-intervention. We also collected teachers' self-report adherence forms to determine how teachers used AT in their classrooms in between coaching. For Research Question 2, we conducted a repeated-measures ANOVA and paired-samples *t* tests to examine the extent to which a teacher's preferred language was relevant to changing teachers' behaviors in using AT in the classroom. In both models, we included the teacher covariate of cohort year.

To examine Research Question 3, we employed qualitative methods to explore participants' experiences of the culturally and linguistically adapted program (Bernal et al., 1995). The nine focus groups were conducted with 29 teachers and teacher assistants across Years 1 to 3, which were recorded and transcribed verbatim. Both deductive and inductive methods of coding and analysis were used. First, the eight dimensions of the EVM framework served as deductive or a priori conceptual categories of analysis, into which open codes were sorted (Bernal et al., 1995). The second method of analysis was inductive, using grounded theory methodology to identify emergent themes from the data (Strauss & Corbin, 1997). This method was chosen to ensure that our analysis remained grounded in the data and not in the framework, while also illuminating any additional insights not captured by the deductive process. Field memos from the classroom observations and open-ended data from teacher adherence forms were also used to triangulate our findings (Schifferdecker & Reed, 2009). A codebook was also developed for further refinement among team members, which includes an experienced qualitative researcher. As a measure of credibility, a key criterion for establishing trustworthiness in qualitative methods, frequent peer debriefing sessions took place to ensure team congruence in interpretation of data (Shenton, 2004).

Results

AT Use Increases Pre- to Post-Step Up AT Intervention

Using a repeated-measures ANOVA, we explored the Step Up AT program's main effect among a majority of Latinx teachers on changes in AT use from pre- to post-intervention. There were

significant increases for teachers' AT use. $F(1, 29) = 23.55$, $p < .001$. We conducted follow-up descriptive analyses to examine the observed type and frequency of AT used by teachers. There were gains across all types of AT use by teachers, most notably in the use of communication devices, which changed from 11.1% pre-intervention to 64.5% post-intervention ($p < .001$). The use of adapted books and adapted writing tools grew from 16.7% and 13.9% to 41.9% and 58.1%, respectively ($p < .001$). Based on teachers' adherence forms after each coaching cycle, teachers often reported using communication devices, tablets with learning applications, communication boards, visual supports, and adapted writing tools or strategies.

Language Preference Did Not Impact Post-Intervention AT Use

A repeated-measures ANOVA examined how the change in observed teacher AT use in the classroom differed between teachers reporting English versus Spanish as their preferred language. No significant interaction was found between teachers' AT use and teachers' preferred language: $F(1, 28) = 0.628$, $p = .435$, $= .457$. We conducted a follow-up paired-samples t test to compare teacher AT use changes from pre- to post-intervention for teachers that preferred English and Spanish. There was a significant change in teachers' AT use from pre-intervention ($M = 6.79$, $SD = 5.94$) to post-intervention ($M = 19.05$, $SD = 7.19$) for teachers whose preferred language was English—$t(18) = 16.212$, $p < .001$. There was also a significant change in teachers' AT use from pre-intervention ($M = 6.83$, $SD = 6.45$) to post-intervention ($M = 18.50$, $SD = 6.77$) for teachers whose preferred language was Spanish; $t(11) = 12.102$, $p < .001$.

Results suggested that, overall, both teachers whose language preference was Spanish and those whose language preference was English made significant gains in their use of AT practices. These findings support the validity of adaptations that promote language accessibility.

Qualitative Findings

Deductively analyzing the data from focus groups among teachers according to the EVM dimensions demonstrated in Table 1 showed the greatest salience among four of the eight EVM dimensions—*language*, *persons*, *metaphors*, and *context*. With regard to *language*, the teachers valued the opportunity to engage with materials in their preferred language, noting the benefit for themselves as participants as well as the families of children attending their schools. Teachers described these as promoting accessibility, while also being responsive to their cultural identity and linguistic preferences:

> The coach, she handled both of the languages and that she could say the concepts to us in English and in Spanish and for us, that was excellent. I think it's very important especially in Miami that we're all Latino and the Spanish is very heavy and even though we speak English, and we try to operate things in English, we obviously feel more comfortable speaking in Spanish.

Teachers shared the importance of "the option to view the videos in Spanish or English." In addition, these respondents valued the dual-language options of the online modules, assessment learning materials, and bilingual coaching.

A second dimension with salience, *persons*, represented the value of having a Spanish-speaking coach who they described as "local," "open," "accessible," and "like a coworker." Teachers and teacher assistants not only appreciated the ability to share language and cultural identity but also valued the coaches' ability to communicate with parents of the children in their classrooms. In particular, teachers commented about how valuable this aspect of the program was for brokering relationships with families.

Participants also valued the use of materials and symbols in which the culture and identity of the students and community were represented, which aligned with the *metaphors* dimension.

Teachers noted how the photos in the online modules, as well as the materials, featured persons from diverse backgrounds. One teacher recalled how one of the coaches used language and symbols that reflected a child's Mexican heritage, which enhanced his engagement in the activity:

> When she worked with the kids, she tried to identify the children with their culture. For example, we had this kid that was in the program that sometimes would be very rebellious to do the activities . . . and she would say things like, I think that you're mad. Why? Let's do something like what do you like? Do you like *bombones*? and the kid would kind of be in shock that she knew something from his Mexican culture . . . asking himself like, "Oh how does she know that I call it *bombon*?"

Of all the eight dimensions of the EVM framework, teachers' reflections had the most profound alignment with the *context* dimension. Teachers described, for example, limited AT resources in the school and classroom, without access to the switch toys or sharing AT devices. Teachers appreciated being able to borrow these resources from the program's lending library, expressing how they would have liked to extend use beyond the intervention.

Through inductive analysis of the focus group data, three overarching themes emerged: *Empowering Teachers*, *Responding to Children's Needs*, and *Sustainability and Future.* These themes spoke to the teachers' perceptions of the program, its cultural and linguistic adaptations, and their recommendations for improvement.

Empowering teachers. In this first theme, practitioners shared how the setting and demands of the classroom often caused teachers to feel overwhelmed, leading to high teacher turnover. An administrator described how learning AT may be challenging for a teacher who is perhaps new as compared with one who has "foundational" knowledge, underscoring the difference between having some minimal understanding of AT and its implementation:

> I think you'd be surprised how many staff we get are like, "Oh yeah, pictures with the book," but they don't ever actually do it. And they go in with a book and they're just reading the book. So, I think that the problem is like people see and they're like, "Oh yeah, that's easy," but they don't do it in the classroom . . . So part of it is like the follow through of like creating that system and keeping, making it consistent. Like this is now how I tell stories. I tell stories with the pictures and the boards and the manipulatives and like all of that, like this is the standard.

Teachers mentioned how the Step Up AT program supported their own practice by training the teacher assistants, who helped them meet the needs of the classroom, while carrying out implementation:

> Sometimes the assistants don't know a lot, so I think that you involving the assistants in the program and teaching them how to do it as, as well as us was really good because a lot of times the teacher is the sole person like doing the teaching. So, having them be more hands-on and you know, learning alongside of us and just having it come from a different person besides us.

Teachers also reflected upon how they were impacted by the anticipated linguistic barriers, expecting an "English-only" program to help them learn new AT skills. They found the coaches to be not only be empathetic but also responsive to their linguistic needs:

> At the beginning I said that if it was all in English . . . the coach started to explain everything in English at the beginning and I left the classroom and started to cry . . . then I talked to the coach and explained they all talked fast, and then they all helped me and started to speak slower. In addition, the coach started to do everything in English and in Spanish. I was able to finish it due to teamwork and the coach.

The personal support offered by coaches was frequently praised by the teachers, mainly because of their flexibility, willingness to offer their time, and hands-on support in learning and implementing AT. For example, one teacher shared,

> And the best part is this lady [coach's name]; I tried the tools, the materials, the things for shared reading, all the devices that we've had. That is not the same from the other programs we have had— record this video, evaluate, do a survey and another day, return the video.

Another shared a similar sentiment reflecting the quality of coaching received: "she was doing great with us; she supported us in the classroom."

Responding to children's needs. The second theme, *Responding to Children's Needs*, described how the program helped the teachers respond to the AT needs across a range of diverse learners, including children's disability support needs and cultural identities. An administrator described how new teachers often enter the school believing they are differentiating instruction, yet not truly incorporating strategies that meet the range of learner needs within the classroom. However, in response to the AT program and its resources, they were able to "think outside of the box" and see the children "light up" adding,

> And being able to borrow those . . . seeing the kids engage with them and actually like participate, even if it's just touching it and getting a smile like was huge . . . I'm getting goosebumps. It was huge for me . . . some of these kids I've had already, this is my second year with them . . . you get nothing out of them for like the longest time . . . and then you see them actually like smile for something. I'm going to cry.

In addition to promoting children's access and engagement, the bilingual aspects of the program and the ability of the coaches to switch back and forth between English and Spanish language were also supportive of the children's identity and culture, modeling this for the teachers to follow:

> That it was in Spanish, English, and that there were kids from many cultures. That one could speak their own language I mean many of the time it is always English. If you have to speak to a particular child in Spanish, you could do it because the program was in Spanish.

Teachers shared just how instrumental the coaches were in supporting the cultural and linguistic needs of the children in the classroom while demonstrating AT. Not only did this encourage teachers to make linguistic connections with the children, but it also promoted children's engagement, as one teacher noted, "She would use words to grab the kid's attention and [as] they would work, the kid would open himself or herself to the activity, and in that aspect, I think it's very important." Another teacher emphasized how her coach was not only supportive to their own language preferences but how important this was to be able to facilitate communication with parents of children with IEPs, adding, "I think that it was ideal the lady that trained us, [coach's name], was very accessible, with the language, especially with the mom of the child with IEP."

Sustainability and future. This theme described the teachers' recommendations for the program and how they saw the AT program as being sustainable at their school site and in the future. Once again, teachers advocated on behalf of the children in the classroom and their families, as they recommended extending the linguistic accessibility of Step Up AT materials and resources to support Haitian Creole speakers:

> We have parents who are, are English speaking, we have parents that are Hispanic and we also have parents that are Creole . . . one of my Creole parents was like really into the AT and she wanted more

> stuff in Creole, since that's our population at our school . . . if you could provide information in Creole, that would be great.

Even though classroom populations change, teachers emphasized how important it was to be able to give parents access to critical information in their home language, especially for parents of children experiencing challenges in communication.

Another recommendation that teachers had for the program was being able to differentiate resources for each classroom, recognizing how the needs for each child within each classroom differed. As such, the utility of the modules should be individualized for each teacher, as noted by one of the teachers:

> Instead of just saying everybody's getting the same kit and "Here you go," you know, look at the population of the class and be like, "Okay, well, you know, this class is going to benefit more on one-cells, or two-cells, or more switch toys. And then this class can use the adaptive mouse and the keyboard and you know, the Go Talk 9."

Teachers also noted how the resources should also represent a range of cultures, as one teacher noted, "Another thing that I can suggest is to put more inclusive stories, stories in Spanish on the iPad. That would be fantastic."

Discussion

This study examined the development of a culturally and linguistically adapted PD toolkit and its impact on the AT practices on Latinx early childhood teachers and teacher assistants working with children with disabilities. As hypothesized, we found that teachers' overall use of AT significantly increased following the intervention, without disparity among participants based on language preference. In the case of this program, positive changes in AT instructional practices may have been enhanced by incorporating culturally and linguistically responsive strategies for intervention adoption to promote equity, accessibility, and confidence.

We used the EVM framework to inform the development of the Step Up AT toolkit in the delivery of the intervention to improve teachers' AT practices as well as to assess its cultural and linguistic responsiveness. During this process, we implemented the PD resource in a range of ECCE programs where teachers had received very little prior training in AT. According to the teachers' responses, the four EVM domains that were most salient in the qualitative analysis were *language*, *metaphors*, *persons*, and *context*. Bernal et al. described *language* as the "carrier of the culture" (as cited in Crowder & Broome, 2012, p. 2012). Indeed, the Latinx teachers in our study saw their own culture reflected and sustained by our bilingual materials and resources, yet they also perceived the program to support the culture and language of the children and their families. Our intervention also reflected the *persons* aspect of the interventions, demonstrating what research has supported as the value of cultural and linguistic congruence among our program's participants, including teachers and teacher assistants, the children and families they serve, and coaches. However, as Crowder and Broome (2012) described, it is not enough to share a racial or ethnic heritage with participants, as these are only single dimensions of culture. These researchers added, "Socioeconomic differences also shape understanding . . . acknowledgement of those similarities and differences should be a part of the discussion during the design/development stage of an intervention" (p. 1018). As such, our program was intentional about addressing the *context* dimension, considering the resource and accessibility challenges that would otherwise restrict AT uptake. Finally, the *metaphor* dimension reflected the linguistic and cultural responsiveness of the program to the children in the classroom, whose teachers believed they had their cultural and linguistic background recognized and valued.

The thematic findings of the qualitative analysis uncovered the specific and nuanced ways that the program supported teachers in their AT use. Having AT devices included in the toolkit addressed some of the contextual and resource barriers that existed for the schools and classrooms. Participants expressed the significance of the program's delivery in both languages, noting "we're all Latino" and "we're obviously more comfortable in Spanish," which promoted their access and engagement in the program. Teachers were tasked with meeting the needs of multiple children in their classroom, while also experiencing resource limitations. Therefore, because the program facilitated teacher assistants to receive the AT training alongside them, teachers felt supported, knowing they did not have to implement AT on their own. Teachers expressed how receiving the tools to provide both disability and linguistic supports promoted accessibility and equity in their practice. Finally, the most notable aspect of the program was the relationship with the coaches, who built trusted relationships with teachers and teacher assistants. A powerful reflection was shared by the teacher assistant, who described her feelings of intimidation by the program's initial delivery in English. This reflection illuminates how programs might disenfranchise Latinx teachers, albeit unintentionally. However, the coach's responsiveness and support provided her with the needed assurances to continue in the program.

As other studies have shown, developing culturally adapted interventions has been identified as a critical need in teachers' adoption of technology in ECCE programs (Binger et al., 2008; Parette et al., 2010; Ripat & Woodgate, 2011). This study echoed the research in descriptions of context and resource barriers that impede AT overall while also speaking in specific ways to the structural challenges faced by bilingual Latinx special educators, with limited access to PD supports. As nearly 56% of the staff preferred the Spanish language, this emphasizes the need for administrators and researchers to ensure that programs consider the practitioners' perspectives and preferences (Mertala, 2019). To our knowledge, this is one of the first studies to focus on the AT practices of Latinx teachers in ECCE settings. The results from this initial study will begin to build the evidence base to better support AT for CLD teachers of children with disabilities. Furthermore, given that the education outcomes of dual-language learners are positively impacted by CLD teachers, supporting a dual-language teacher with bilingual PD may be considered as a best practice (Garrity et al., 2018).

Strengths

This study was valuable in that the addition of preferred language provided insight into how a population of Latinx teachers received the intervention. For the qualitative methods employed in this study, Latinx teachers served as key informants to the adaptations while uncovering deeper concepts centered around equity and access. Credibility was supported though the frequent debriefing among members of the research team and peer scrutiny from interprofessional and community advisors, who guided the study (Crowder & Broome, 2012; Shenton, 2004).

Limitations

One of the limitations of this study is the small sample size of teachers and teacher assistants, as this was a pilot program with few participating sites. Furthermore, our intervention's adaptations were focused on the Latinx community, which may or may not be transferable to other CLD populations in South Florida, such as Haitian, Black, and Afro-Caribbean populations. As suggested by our informants, one of our next adaptations could be to expand our resources and materials and explore which culturally adaptive strategies might be useful for responding to the needs of the other populations within our region. Given the value of focus groups for informing the iterations for AT in the literature (Parette et al., 2003) as well as in this study, we plan to engage our participants in more aspects of the design, including their recommendations for more culturally based

materials and content. An additional mention is how we could have brought greater distinction to the heterogeneity within this community, considering the range of ethnicities in the region that identify as Latinx, such as Cuban, Mexican, Venezuelan, and others (Aponte, 2009).

Future Directions

Although this study focused on the AT practices of Latinx teachers, implications for practice drive further support for developing culturally responsive approaches to empower teachers from other CLD backgrounds. This research becomes crucial as we expand evidence-based, culturally relevant interventions to promote access for children with disabilities or delays in early learning environments. Another important future research direction would be to explore the impact of AT practices on child AT use, connecting this with their developmental and early literacy skills, a noted gap in the literature. However, as demonstrated through this study, there is also a need for further research on "how interventions might differentially affect students from diverse backgrounds" (Klingner & Edwards, 2006, p. 111).

With the recent challenges across the nation with children's access to special education services due to COVID-19, there is an unprecedented need to provide additional resources to teachers supporting young children with and without disabilities across contexts, including remote learning environments. As a result, there has been a technology and AT boom, with new approaches to learning and integrating innovative technological advances (e.g., telepresence robots, bug-in-the-ear coaching, and on-demand videos) to access "anytime anywhere" learning (Ottley et al., 2014).

Adoption of technologies, however, should never fail to consider the needs of all stakeholders, including practitioners. Professionals and researchers must not stop at the discovery of evidence-based practices, because increasing teachers' access to AT, in and of itself, does not fulfill the promise of improved outcomes for young children with disabilities. With the significant number of children from CLD backgrounds served under IDEA, bilingual, CLD early childhood educators in the workforce should not only be provided with professional learning opportunities to incorporate AT interventions to support diverse students, but it should also be ensured that students' and teachers' cultures and languages are infused into AT interventions. As a number of traditional interventions are designed and implemented through a decontextualized, White and middle-class lens that may not be applicable to CLD students and communities, intentional efforts should be made to bolster the professional practice of CLD teachers of children with disabilities in ECCE. Empowering CLD educators who serve an essential role as cultural and linguistic brokers for students and families not only enhances AT implementation, but it may also be a means of promoting equity, as they bring cultural and linguistic richness, value, and expertise to the profession. Using the EVM framework is one way to streamline interventions to enhance ECCE programs' capacity with CLD teachers. High-quality AT supports require attention to the delivery methods, which embed cultural and linguistic supports while removing barriers to accessibility (Nores & Fernandez, 2018). Developing effective leadership roles among teacher and teacher aides is key for designing interventions that are responsive to multilingual, multicultural, and cross-disability needs of classrooms. Therefore, PD to support AT integration should be thought of as equitable for everyone in the classroom. While it can serve as a means of promoting accessibility for children with disabilities, it can also empower the very practitioners who support their learning and development.

Declaration of Conflicting Interests

Funding

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