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Original Research

Accounting for the unaccounted: Examining linguistic diversity in the classroom and the communicative experiences of dual language learners in the United States

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Abstract: A communication-rich early learning environment is essential for the linguistic and social development of preschool children. However, there is limited information about what happens to their communicative experiences when they are in classes composed of preschoolers who are simultaneously learning more than one language (i.e., dual language learners or DLLs). Employing a 60-min time sampling technique per classroom, the present study examines verbal/nonverbal behaviors in intergroup contexts (i.e., DLL/non-DLL status) and explores how linguistic diversity in the classroom can promote or hinder communicative experiences of both DLLs and non-DLLs. Results from 33 racially and ethnically diverse classes of 263 preschoolers revealed that in classes with greater linguistic diversity, both DLLs and non-DLLs displayed less positive affect in general, and teachers displayed less attunement to both DLLs and non-DLLS, albeit in different ways. Moreover, in more linguistically diverse classrooms, DLLs displayed less engagement in classroom activities than did non-DLLs, and non-DLLs were observed to interact less with DLLs than with non-DLLs. Directions for future research to capture a broader, holistic view of children's communicative experiences in the classroom are discussed, as are implications for improving classroom interactions and the broader early childhood education policy landscape.

Keywords: Dual language learners; Superdiversity; Time sampling; Microaggressions; Verbal and nonverbal communication

Introduction

Since 1970, the rate of immigration in the United States (US) has tripled (Budiman, 2020), bringing along with it an ethnically and linguistically diverse group of immigrants. The linguistic diversity in the population is reflected in the children served in early care and education. Nearly one in three (32%) young children in the US are considered dual language learners (DLLs)—0-8-year-olds who belong to a home where a language other than English is spoken as the primary language (Park et al., 2017). Recognizing this growing trend, the US Departments of Health and Human Services and Education (2016) in their joint policy statement have called for supporting the linguistic and holistic development of young DLLs.

To support the holistic development of young DLLs, there is a need to better understand how to best meet the needs of this diverse population. Superdiversity is a term to describe

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the increasing within-group variation among immigrant and ethnic minority groups: they speak different languages and identify with many races and ethnicities with varying migration histories (Park et al., 2018). Although a little over half of DLLs in the US are currently of Hispanic/Latine origin (63%) (Zong & Batalova, 2015), there is a growing number of non-Hispanic/Latine DLLs. For instance, Asian Americans are projected to be largest immigrant group by 2055, surpassing Hispanics (Budiman & Ruiz, 2021). Compared to Hispanic/Latine DLLs who share a common language, the majority of whom use variations of Spanish, Asian American DLLs speak a variety of distinct languages (e.g., Chinese, Vietnamese, Tagalog, Hindi, Korean) that may be infrequently spoken (e.g., Arabic, Nepali, S' gaw, Karen), and have different alphabets and writing systems. To better address the language and learning needs of DLLs, superdiversity within DLLs—particularly linguistic diversity—warrants further investigation.

Facilitating the language development of DLLs

Teachers' language responsiveness is often thought of as following the child's lead" or caregivers acknowledging and using a child's interest or talk to continue a conversation (Giromaletto & Weitzman, 2002). Language responsiveness can be in the forms of communication-facilitating behaviors (or behaviors that promote a child's engagement during conversations) like encouraging a child to talk and asking open-ended questions. It can also include language developing behaviors (or behaviors that provide children with advance linguistic models), such as responding to what children say in a more grammatically correct or semantically complex form (Giromaletto & Weitzman, 2002; Piasta et al., 2012). Prior research has shown that teachers who more frequently use communication-facilitating behaviors in preschool classrooms have been associated with vocabulary growth (Cabell et al., 2015; Justice, Jiang & Strasser, 2018).

Because the human brain can process multiple languages simultaneously (Werker & Byers-Heilein, 2008), it has been hypothesized that speaking two or more languages regularly from a young age can have a positive effect on development. This benefit of bilingualism stems from the constant exposure to competing languages and focusing attention, inhibition, and working memory, thereby fortifying a child's executive functioning (Bialystok, 2015). Indeed, some studies have shown that compared to monolinguals, bi/multilinguals may have better self-regulatory and social-emotional skills (Chamorro & Janke, 2020; Halle et al., 2014) and early childhood educators are increasingly finding ways to promote DLLs' heritage/home language in addition to learning English (Callahan & Gándara, 2014). The developmental interdependence hypothesis proposed by Cummins (1979) posits that a child's second language (L2) competence is contingent, in part, on their first/home language (L1) competence. This hypothesis has been supported by subsequent studies demonstrating how harnessing both Spanish and English languages in classroom instruction promoted both languages without undermining the other (Barnett et al., 2007; Durán et al., 2014; Wagley et al., 2022), and even benefiting DLLs' school readiness skills. For instance, teacher code-switching between English and Spanish during small group activities benefited DLLs' discursive interactions (they spoke more frequently and longer) (Surrain et al., 2022). In another study, DLLs have higher approaches to learning skills when they had teachers who used more Spanish (vs. less Spanish) during instruction (Limlingan et al., 2020). These studies have shown the benefits of using DLLs' other languages in the classroom. However, majority of research has primarily focused on Spanish-English DLLs and have not examined how to support teachers when there is greater linguistic diversity in the classroom, and how such a classroom can impact learning. Thus, there is still a limited understanding of how teachers can feasibly support the diversity of languages represented within a classroom.

Connections between linguistic diversity and DLLs' communicative experiences

The preschool classroom constitutes a setting that is an integral part of the learning ecology of young children. Understanding linguistic diversity, that is, the linguistic variation within a classroom in terms of the number of languages and speakers of that language within the classroom, can be an important structural feature of early childhood environments (Reid & Ready, 2013). To date, research on linguistic diversity in early childhood settings has largely focused on just having one other additional language, often Spanish, the language most commonly spoken by DLLs in the United States (Barnett et al., 2007; Durán et al., 2014; Wagley et al., 2022). In instances where more than two languages are spoken, prior research has measured the percentage or number of DLLs in a classroom (% DLLs). For example, to facilitate understanding in both English and Spanish, teachers in classrooms with a higher percentage of DLLs used more contextualized language and environmental cues (Mistry et al., 2014). In another study, classrooms that had a higher number of DLLs were associated negatively with problem behaviors when teacher emotional support was high (Malloy, 2019). In these studies, researchers have identified that there are associations between the concentration of DLLs in the classroom, instructional practices and child outcomes. However, examining only the concentration (percentage) of DLLs assumes that DLLs are a monolithic group. Of interest is potentially how the variation in the number of languages DLLs speak as well as the concentration of DLLs speaking those languages in a particular classroom influence how children learn and communicate. This operationalization of linguistic diversity in the classroom may thus provide more nuanced information that teachers

could use to identify strategies to support the needs of DLLs as well as non-DLLs in their classroom.

In research with older children, more sophisticated methods have been used to measure linguistic diversity within the classroom. Simpson's (1949) diversity index, which was first used in the ethological literature, considers both the number of categories and the relative proportion of each category within a group. This index, which provides information on the structure and health of biological communities, ranges from 0 to 1, where 0 represents no diversity (only one species present), and values close to 1 indicate high diversity. Applying the Simpson's diversity index to education studies, Juvonen (2006) used the index to create a measure of ethnic diversity that accounts for both the number of different groups in the setting and the relative representation of each group and found that classrooms with higher ethnic diversity was associated with feelings of safety and social satisfaction for sixth grade students who identified as African American and Latino. In early childhood classrooms, Meng (2020) used the Simpson's index to measure classroom language diversity and found that having more DLL children was associated with lower socio-emotional skills for non-DLL children. On the other hand, DLLs with English proficiency demonstrated lower social skills in classrooms with low language diversity. This suggests that the influence of classroom linguistic diversity on children's socioemotional development is contingent on children's language status. These studies suggest that both the number of languages spoken and the relative share of children speaking those languages matter.

The complexity of facilitating language development within a linguistically diverse classroom can unintentionally undermine the language development of DLLs. Corrington and others (2018) have identified how various modes of communication—verbal (what is conveyed in words), nonverbal (what is conveyed through actions, e.g., facial expression), and paraverbal (how words are spoken, e.g., tone of voice)—could potentially lead to disparate experiences between, in this case, DLLs and non-DLLs. Understanding group differences in nonverbal behavior may be a function of power status and race. According to some theories, members of lower-status/minority groups—such as DLLs in this example—may be more sensitive and attentive to their social environment, thus more attuned to others' nonverbal behaviors. They may be more vigilant towards nonverbal cues as well as display greater defensiveness or inhibition in their verbal and nonverbal communication (Dovidio et al., 2006). Indeed, because DLLs are learning two or more languages, in addition to their unique needs communicating, there is evidence to suggest that DLLs have a heightened sensitivity to communicative contexts. Yow and Markman (2011) found that although monolinguals and DLLs were equally capable of using tone of voice (a paraverbal behavior) to identify emotion when there was no conflicting content, DLLs were better able than their monolingual peers to judge emotion when content conflicted with tone of voice. Thus, including nonverbal (and paraverbal) behaviors that are less consciously processed than verbal behaviors (Latha, 2014; Mandal, 2014) allows us to potentially capture a more holistic operationalization of communicative experiences.

Present study

With a plethora of languages represented in the classroom, and with varying demands already placed on preschool teachers, exploring how linguistic diversity in the classroom hinders or promotes the quality of communicative interactions—verbal and non-verbal, between and among teachers and children—illuminates the current realities faced in American classrooms. In this study, we explore how using the Simpson's diversity index, can provide a more nuanced way of operationalizing linguistic diversity in the classroom. We also explore associations between classroom linguistic diversity and verbal, nonverbal, and paraverbal communicative experiences of DLLs using a newly developed observational measure, as more researchers have noted the value and benefit of direct observation tools to capture children's social and emotional development and behavior (Campbell et al., 2016; Halle & Darling-Churchill, 2016)

Method

Participants

This study was approved by the lead institution's Human Subjects Committee (IRB Protocol ID 2000023764). Thirty-three preschool classrooms located in 17 program sites belonging to a nonprofit child care program in the West Coast participated in the study. This organization serves over 4,000 children, with 98% of families eligible for free- or reduced-cost child care. Teachers who participated in this study identified mostly as Hispanic/Latine (56.05%), followed by Asian (29.42%), Caucasian/White Non-Hispanic/Latine (7.60%), Black (6.52%), and multiracial (0.41%). They taught in classrooms that had an average of 22 students. Of note, our agreement with the nonprofit child care program was to include only those classrooms that had already completed participating in an intensive intervention that promoted the teaching of language/literacy skills of diverse learners. This potentially limits our ability to find significant results.

The child sample consisted of 263 preschoolers (M = 4.04 years old; SD = 0.54), 117 (44.5%) of whom were considered DLLs, 49% females, and 64.3% Hispanic/Latine. Only 12 children were Non-Hispanic/White (4.6%), and 11 children were Black (4.2%). Children's home languages include 55.5% English, 31.2% Spanish, 3.4% Vietnamese, 2.7% Punjabi, 2.3% Cantonese, 1.5% Mandarin Phutonghua, and the remaining (< 1%) include Arabic, Assyrian, Burmese, Cantonese, Farsi Persian,

Korean, and other non-English language. To be included in the sample, the researchers randomly selected 5 DLLs and 5 non-DLLs obtained from a class roster. When a child was unavailable for observation, the list identified which DLL or non-DLL child was to be observed next, which was also randomly selected.

Measures

DLL status: Preschoolers were identified as DLLs if their predominant home language indicated in a parent self-report survey was not English. Children whose parent self-reported their home language was only English were considered non-DLLs.

Linguistic diversity: Similar to Meng (2020), we applied the Simpson's diversity index to operationalize linguistic diversity within a classroom. The following equation was used:

$$D_c = 1 - \sum_{i=1}^{g} p_i^2$$

where D_c represents the diversity index in a particular classroom, and pi is the proportion of children in the classroom who speak a particular language. Higher D_c scores reflect greater linguistic diversity (more languages and greater representation in each language). To illustrate, in Classroom X, two languages are equally represented where 50% of children speak English as their home language and 50% of the remaining children speak Spanish as their home language. In turn, $D_c = 1 - (0.502 + 0.502) = 1 - (0.25 + 0.25) = 0.50$. In another classroom, Y, three languages are more or less equally distributed: 40% English, 30% Spanish, and 30% Mandarin. $D_c = 0.66$. In another classroom, Z, three languages are also represented, but unequally distributed: 80% English, 15% Spanish, and 5% Mandarin, making $D_c = 0.34$. In the current study, between two and six home languages (M = 3.11, SD = 1.08) were represented in each classroom, with Dc ranging from 0.05-0.66 (M = 0.39, SD = 0.17; Figure. 1).

Communicative experiences: Common measures of communicative experiences include the Language Interaction Snapshot (LISn; Atkins et al., 2011) and the Dual Language Learners Discourse Snapshot (DUALLS; Rojas et al., 2020). Both require assessors to observe DLL children individually within the classroom to illustrate frequency and quality of language interactions with peers and teachers. However, they were not developed to assess differential experiences between DLLs and non-DLLs. Moreover, these measures do not include more sophisticated ways of operationalizing verbal and nonverbal communication. Thus, the Differential Interactions in Spoken and Unspoken Relationships Scale-English learners (DISCOURS-E) was developed by the first author (P.I.) for this study. DISCOURS-E assesses teachers' differential attention and communication style (verbal and nonverbal communication) provided to DLLs in contrast to non-DLLs. It applies a time sampling technique by sampling as many as 10 focal children within a one-hour period consisting of 10 coding cycles, with each cycle lasting 6 minutes (5 min observations + notetaking, 1 min coding), totaling a one-hour sampling frame.

DISCOURS-E consists of the following sections: (1) adults' verbal and nonverbal communication with the focal child (i.e., the child who is the focus of attention for a particular coding cycle); (2) adults' attunement to the focal child's communicative attempts; and (3) focal child's behaviors (engagement, overall affect, interactions with others, and sustained conversations with others). Observers were trained how to observe and code for behaviors during a three-hour session with the P.I. Practice videos were used as examples until the entire group reached uniformity in coding behaviors. Prior to DISCOURS-E training, observers underwent an intensive observational training that included topics such as identifying behaviors versus impressions and identifying the different modes of communication. The training and certification lasted a total of 17 hours.

Prior to our site visits, we collected class rosters to identify DLLs and non-DLLs and assigned a study ID to each child. To facilitate data collection, we pre-filled the front page of the scoring sheet to identify the focal children in the classroom. This minimizes selectively choosing a focal child based on salience of the teacher's interactions with that child during the observation period.

First, we randomly selected five DLLs and five non-DLLs and assigned them to their respective cycle numbers (odd cycles for DLLs, and even cycles for non-DLLs). If there were fewer than 5 DLLs/non-DLLs, we alternated them accordingly. For instance, if total DLLs is 2, Cycle 1 = first DLL, Cycle 3 = second DLL, Cycle 5 = first DLL, Cycle 7 = second DLL, and Cycle 9 = first DLL. If there were more than five DLLs/non-DLLs, we randomly selected only five. To further facilitate data collection by easily identifying children, we assigned sticker colors to groups of children. We assigned blue or green stickers to pre-selected DLLs, yellow or orange to pre-selected non-DLLs, and purple or red to other children in the classroom who were not pre-selected for observation. We varied the sticker colors to mask the intention of observing the focal child and avoid biasing how adults and children behaved during observation.

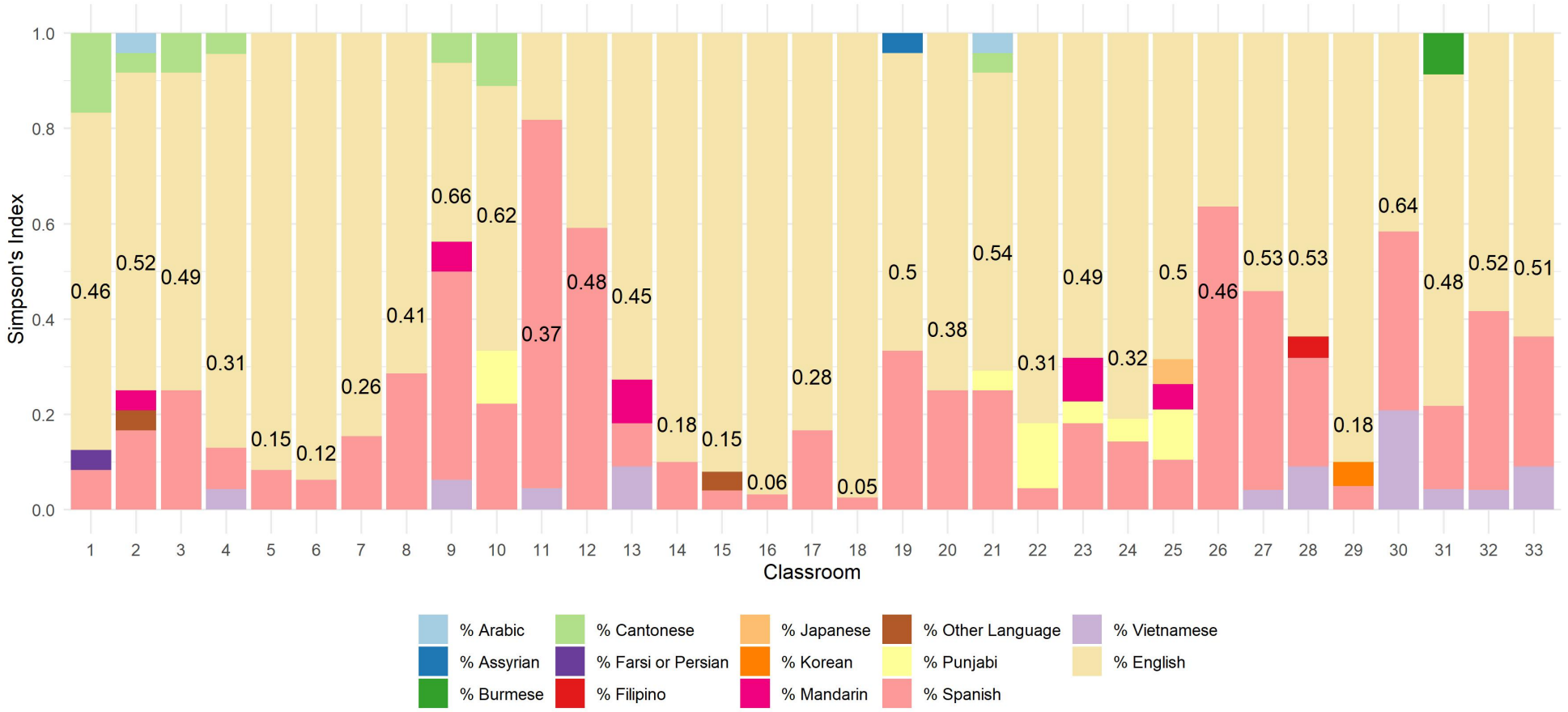

Figure 1. Accounting for the Unaccounted: Bars represent percentage of languages spoken within classrooms, and numbers represent linguistic diversity using the Simpson's Index, which captures both the number of different languages spoken in the classroom and the relative representation of each language.

Once in the classroom, observers showed the teacher the class roster they had filled out and asked teachers to identify the children, so observers could attach their pre-assigned stickers. If a pre-selected child was absent during observation, we randomly selected another child with the same DLL designation using the class roster. Children's sex and article of clothing were indicated on the front page of the scoring sheet as well as sticker color for easy reference. Observers positioned themselves at a comfortable distance where they could see and hear without being too conspicuous so that neither the focal child nor the adults knew whom the observers were observing. Observers were also trained to occasionally obscure their gaze (e.g., use peripheral vision at times; shift their gaze between focal child and non-focal children). Using a digital timer to monitor time, observers monitored each focal child during the designated cycle, where five minutes were spent paying close attention to the focal child and their interactions with any adults and peers. After five minutes, behaviors were noted and coded based on the specifications in the respective cycle of the sheet. After coding, observers moved on to the next focal child for the next coding cycle. We randomly selected 20% of classrooms to double-code focal children for inter-rater reliability; however, because of unforeseen circumstances (power outages in Northern California that disrupted data collection), only 12% of classrooms were double-coded (eight focal children). To determine which of the double-coded data to include in the analyses, we randomly selected from one of two raters. As shown in Table 1, inter-rater reliability ranged from moderate to strong, using Fleiss' Kappa (k) to determine inter-rater reliability (Zapf et al., 2016) for nominal data, and intraclass correlations (ICCs) calculated for ordinal data (Laerd Statistics, 2019). Given the very small number of cases that were double-coded (n = 8), variability of responses may be limited that resulted in some reliability coefficients not being computed.

Coding verbal communication: The Verbal Communication section consisted of four variables. First, verbal communication with the focal child examined how much verbal acknowledgment the focal child received during the coding cycle: 0 = no verbal interactions with the focal child were observed (the adults were engaged with another group of children during the cycle); 1 = verbal communication with focal child occurred only within the context of a whole group (entire class) activity such as circle time and no direct communication with focal child was observed; 2 = verbal communication with the focal child occurred only within the context of a whole group (entire class) activity, such as circle time and adult verbally acknowledged focal child's presence; 3 = adults directly engaged with focal child individually or as part of a small group interaction. Scores across the five coding cycles for each child was averaged to create a composite score where higher numbers represented more personalized verbal communication. Second, quality of conversations with focal child (= 1.00) was rated as follows: 0 = dismissive (e.g., makes punitive remarks or shuts down what focal child is saying; shushes focal child); 1 = responsive (e.g., supporting, encouraging responses, or naming a word for what the focal child is seeing, doing, or feeling); 2 = contingently responsive (e.g., extended serve-and-return/ sustained conversations). Composite score was calculated as the average across the five coding blocks. Third, variety of questions posed to focal child was based on whether the adult asked a question of some type (close-ended factual questions, open-ended factual questions, or open-ended questions that promoted critical/creative/ divergent thinking) where each type of question was coded as 1 when observed. Raters also had the opportunity to indicate that teachers did not ask any questions. Scores on all types of questions (except for never asked a question) were summed in each block then averaged across cycles to create a composite score where higher scores represented greater variety in types of questions posed to focal child. Fourth, teacher incorporated child's life outside the classroom context, a strategy that potentially nurtures a deeper bond between teachers and children (Reyes et al., 2020), is scored dichotomously (0 = no, 1 = yes). Scores were averaged across coding cycles (Table 1).

Coding non-verbal communication: Negative affect was a composite of hostile/aggressive affect and indifferent/ disinterested affect and rated 0 = no indication; 1 = some indication; and 2 = strong indication, and averaged across cycles. Positive affect was a composite of warm/ affectionate and engaged/attuned affect and rated 0 = no indication; 1 = some indication; and 2 = strong indication. To avoid impression-based scoring, coders were trained using example videos and were provided with a behavioral guide to classify the behaviors as accurately as possible. Scores were averaged across coding cycles, each for negative and positive affect (Table 1).

Coding adult attunement to focal child's communicative attempts: This item assessed how adults attended to the focal child's communicative attempts or subtle overtures for assistance. Item was scored as -1 = adult was dismissive verbally (e.g., makes punitive remark to focal child) or nonverbally (e.g., looks at focal child but abruptly changes gaze of direction); 0 = adult did not notice focal child's communicative attempts; 1 = adult acknowledges focal child verbally (e.g., "Yes, I'll get to you in a minute") or nonverbally (e.g., nods or holds index finger up) but with no follow-up within the coding cycle; 2 = adult responds verbally or nonverbally to the focal child and addresses the problem; and treated as missing if focal child engaged in activity but situation did not warrant immediate attention from adults. Scores were averaged across coding cycles where higher scores represented greater adult attunement (Table 1).

Table 1. DISCOURS-E Reliability and Descriptives: Adult Verbal + Nonverbal Communication Directed at Focal Child

	Inter-rater reliability (n=8)			DLL (n=117)				Non-DLL (n=146)			
	Coefficient[d]	% Exact Agreement	% Within One Point[e]	Valid[a]	M	SD	Range	Valid[a]	M	SD	Range
Verbal Communication											
Directed Focal Child (0-3)	1.00	100.0		117	2.03	1.09	0-3	146	2.01	1.12	0-3
Quality of Conversations (0-2)	1.00	100.0	100.0	101	1.04	0.33	0-2	124	1.07	0.35	0-2
Quality of Questions (0-1)				101				124			
No questions	0.62	62.5			0.56	0.46	0-1		0.63	0.47	0-1
Close-ended	0.62	62.5			0.50	0.48	0-1		0.49	0.49	0-1
Open-ended factual	0.73	75.0			0.14	0.33	0-1		0.11	0.29	0-1
Open-ended divergent	0.53	75.0			0.06	0.20	0-1		0.04	0.18	0-1
Incorporated child's life outside classroom setting (0-1)	1.00	100.0		101	0.07	0.23	0-1	124	0.10	0.30	0-1
Nonverbal/Paraverbal Communication[b] (0-1)				101				124			
Hostile, aggressive	-- [f]	100.0	100.0		0.06	0.24	0-1		0.04	0.20	0-1
Indifferent, disinterested	-- [f]	100.0	100.0		0.18	0.36	0-1		0.14	0.36	0-2
Warm, affectionate	-1.33	50.0	50.0		0.91	0.69	0-2		0.97	0.73	0-2
Engaged, attuned	-1.41	50.0	87.5		0.82	0.65	0-2		0.93	0.68	0-2
Attunement to Communicative Attempts[c]	-- [f]	87.5	87.5	74	1.14	1.02	-1-2	77	1.35	0.99	-1-2

[a] cases treated as missing when a child was the focus of the coding cycle but adults were not attending to that child
[b] scored 0-2 (no to strong indication)
[c] treated as missing if focal child engaged in activity but situation did not warrant immediate attention from teacher; scored -1 (dismissive verbally/nonverbally) to 2 (responsive verbally/nonverbally)
[d] Fleiss' Kappa for nominal data, and ICC for ordinal data based on data from 8 focal children. If left blank, inter-rater reliability coefficients could not be computed because of lack of variability. % agreement and % within one point (for ordinal data) are computed as additional gauges of inter-rater reliability.
[e] For ordinal data
[f] Coefficients could not be computed because of zero variance, including those that are coded as missing (i.e., when adult was not communicating with focal child, hence item is considered missing).

Coding focal child behaviors: First, classroom engagement was coded -1 = restless or engaged in off-task behaviors, 0 = withdrawn from activity, and 1 = on-task or engaged in activity. Second, overall affect was coded -1 = negative (e.g., scowling), 0 = flat (e.g., bored or disinterested), and 1 = positive (smiling or focused attention). Next, we coded whether or not the focal, child interacted predominantly with (1) other-language peers, (2) same-language peers, or (3) adults, which were coded as binary (0 = no, 1 = yes). Finally, we coded if the focal child engaged in sustained conversations (i.e., at least three back-and-forth, turn-taking conversations) with (1) adults, (2) same-language peers, and (3) other-language peers, which were coded as binary (0 = no, 1 = yes). Scores for each sustained conversation partner were averaged across coding cycles (Table 2).

Classroom- and child-level covariates: Classroom covariates included classroom size (M = 21.68 children, SD = 5.33), concentration (%) of DLLs (M = 31.04%, SD = 19.68%), concentration (%) of Hispanic/Latine teachers in the classroom (M = 61.83%, SD = 22.75%), and concentration (%) of White/Caucasian teachers (M = 7.80%, SD = 11.79%). Child-level covariates included child's sex (49% female), age in years (M = 4.04; SD = 0.54), Hispanic/Latine (64.3%), and length of stay at the program in years (M = 0.77, SD = 0.66).

Data collection procedures

To account for the nested structure of the dataset, all analyses employed a multilevel modeling approach (Peugh, 2010). This was deemed to be the appropriate analytic approach as it can reflect the nested structure of the data (i.e., children within classrooms), providing a more rigorous way of dealing with unmeasured variability at different levels by allowing the residuals to be partitioned at each level. Although rule-of-thumb for multilevel modeling suggests that a minimum of 30 level 2 units would provide reliable estimates, 20 Level 2 units (i.e., classrooms) can sometimes be adequate (Hox, 2010); results, however, are to be interpreted with caution. Our analyses treated child characteristics as Level 1 variables and classroom characteristics as Level 2 variables and were estimated in HLM 8 (Raudenbush et al., 2019) using restricted maximum likelihood with robust standard errors, grand mean centering (interval-scale variables), or uncentered (binary variables). Prior to main analyses, we ran a null (unconditional random intercept-) model to calculate intraclass correlation coefficients (ICCs) to assess total variance explained by classroom characteristics. For Adult Verbal/Nonverbal Communication variables (Table 3), ICCs ranged from ~0.00 (e.g., attunement toward non-DLLs) to ~0.45 (e.g., adult display of positive affect toward DLLs). Of interest, classroom-level covariates accounted to close to 0% of the variability in quality of conversations with non-DLLs, but 10.96% of the variability in quality of conversations with DLLs. There also seems a wide range in ICCs in (1) variety of questions posed (0.40 vs 0.24, respectively for DLLs and non-DLLs) and (2) incorporating child's life outside classroom context (0.34 vs 0.22, respectively, for DLLs and non-DLLs). Similarly for Child Behaviors (Table 4), ICCs varied between DLLs and non-DLLs. Because these findings suggest differential associations between classroom-level and child-level outcomes for DLLs and non-DLLs, separate analyses were performed, details of which are outlined next.

In the main analyses, we ran a conditional random intercept model where we controlled for Level 1 variables (child's sex, age, identification as Hispanic/Latine, and length of stay at the program), and Level 2 covariates (classroom size, %DLL, % Hispanic/Latine classroom composition, % Caucasian teachers). This model is represented as:

$$\text{DISCOURS-E}_{ij} = \beta_{0j} + \beta_{1j}(\text{female}) + \beta_{2j}(\text{NonHispanic}) + \beta_{3j}(\text{yrs\_program}) + \beta_{3j}(\text{age}) + r_{ij}$$

$$\beta_{0j} = \gamma_{00} + \gamma_{01}(D_{cj}) + \gamma_{02}(\text{Size}_j) + \gamma_{03}(\%\text{DLL}_j) + \gamma_{04}(\%\text{Hispanic}_j) + \gamma_{05}(\%\text{White}_j) + u_{0j}$$

$$\beta_{mj} = \gamma_{m0}$$

where DISCOURS-E scores for a child$_i$ in classroomj is a function of child's sex, age, identification as Hispanic/Latine, and length of stay at the program, as well as of Level 2 characteristics that include classroom size, concentration of DLLs, concentration of Hispanic/Latine teachers, and concentration of Caucasian teachers. Linguistic diversity (D_c) was the primary variable of interest. Finally, effect sizes (ES) were calculated using the following formula:

$$\sqrt{\frac{\gamma}{\tau_{00} + \sigma^2}}$$

where γ is the estimated coefficient of the predictor variable and τ_{00} and σ^2 are the between- and within-classroom variances from the unconditional model, respectively.

Table 2. Descriptives: Focal Child Verbal + Nonverbal Behaviors

	Inter-rater reliability (n=8)			DLL (n=117)			Non-DLL (n=146)		
	Coefficientd	% Agreement	% Within One Pointe	M	SD	Range	M	SD	Range
Engagement in classroom[a]	-0.33	75.0	100.0	0.78	0.49	-1-1	0.83	0.44	-1-1
Overall affect[b]	0.64	75.0	100.0	0.75	0.40	0-1	0.77	0.45	-1-1
Predominant interactions[c]									
with other-language peers	-0.55	25.0		0.30	0.40	0-1	0.32	0.44	0-1
with same-language peers	0.55	75.0		0.32	0.43	0-1	0.31	0.45	0-1
with adults	0.50	75.0		0.49	0.46	0-1	0.47	0.48	0-1
worked independently of peers/adults	-0.07f	87.5		0.36	0.44	0-1	0.35	0.46	0-1
Sustained conversations									
with adult	0.33	75.0		0.16	0.33	0-1	0.19	0.38	0-1
with same-language peers	0.24	50.0		0.24	0.40	0-1	0.22	0.40	0-1
with other-language peers	--g	100.0		0.12	0.28	0-1	0.09	0.28	0-1

Note. % agreement and % within one point (for ordinal data) are computed as additional gauges of inter-rater reliability. a scored -1 (restless, engaged in off-task behavior) to 1 (on-task, engaged in activity); b scored -1 (negative) to 1 (positive); c scored 0 (no) to 1 (yes); d Fleiss' Kappa for nominal data, and ICC for ordinal data based on data from 8 focal children. If left blank, inter-rater reliability coefficients could not be computed because of lack of variability. % agreement and % within one point (for ordinal data) are computed as additional gauges of inter-rater reliability. e For ordinal data; f 93.3% agreement on coding this item "0"
g Coefficients could not be computed because of zero variance, including those that are coded as missing (i.e., when adult was not communicating with focal child, hence item is considered missing)

Table 3. Multilevel Associations between Linguistic Diversity and Adult Verbal and Non-/Paraverbal Communication Directed at Focal Child: Coefficients (SE)

	Focal Child: DLL (n=117)							Focal Child: Non-DLL (n=146)						
	Direct	Conv	Variety	Life	Neg	Pos	Attn	Direct	Conv	Variety	Life	Neg	Pos	Attn
ICC%	9.07	10.96	39.66	34.22	8.56	44.85	0.10	8.98	0.07	23.28	22.03	9.13	39.78	0.03
D_c [a]	-1.28 (1.79)	-0.16 (0.45)	-0.92 (0.68)	0.07 (0.21)	**2.15 (0.76)****	0.53 (1.98)	-4.66 (2.37)†	1.47 (1.29)	-0.45 (0.29)	**-1.81 (0.67)***	**-0.83 (0.36)***	0.55 (0.31)	-0.34 (1.35)	-1.68 (1.33)

† p<.10 * p<.05 ** p<.01 ***p<.001

Note. Analyses performed separately for DLLs and non-DDLs, both controlling for child's sex, age, ethnicity, and length of stay at the program, and classroom size, %DLL, % Hispanic/Latine classroom composition, % Caucasian teachers. Most covariates were not significant or yielded small to negligible effect sizes.
Direct=Verbal communication directed at focal child (higher=more personalized); Conv=Quality of conversations (higher=more contingent responding); Variety=Variety of questions were posed to focal child (higher=more questions); Life=Teacher incorporated child's life outside the classroom context; Neg=negative affect; Pos=positive affect; Attn=Teacher attunement to child's communicative attempts
a Simpsons index (higher=greater linguistic diversity)

Table 4. Multilevel associations between Linguistic Diversity and Focal Child Verbal and Non-/Paraverbal Communication: Coefficients (SE)

Behaviors	Focal Child: DLL		Focal Child: Non-DLL	
	Engaged	**Positive Affect**	**Engaged**	**Positive Affect**
ICC%	0.02	0.02	13.77	10.10
D_c [a]	**-0.99 (0.32)****	-0.72 (0.36)	-0.27 (0.39)	**-1.15 (0.37)****

Predominant interactions	Focal Child: DLL			Focal Child: Non-DLL		
	Other-lang peers	Same-lang peer	Teacher	Other-lang peers	Same-lang peer	Teacher
ICC%	38.16	9.68	8.67	29.74	16.95	0.06
D_c [a]	-0.73 (0.55)	-0.25 (0.33)	0.76 (0.62)	**-1.27 (0.42)**	0.42 (0.57)	0.18 (0.46)

Sustained Conversations[b]	Focal Child: DLL			Focal Child: Non-DLL		
	Other-lang peers	Same-lang peer	Teacher	Other-lang peers	Same-lang peer	Teacher
ICC%	17.77	0.31	12.61	17.82	17.82	0.03
D_c [a]	-0.21 (0.28)	-0.42 (0.44)	-0.19 (0.40)	-0.03 (0.32)	0.15 (0.54)	-0.45 (0.56)

† p<.10 * p<.05 ** p<.01 ***p<.001

Note. Analyses performed separately for DLLs and non-DDLs, both controlling for child's sex, age, ethnicity, and length of stay at the program, and classroom size, %DLL, % Hispanic/Latine classroom composition, % Caucasian teachers.

a Simpsons index (higher=greater linguistic diversity)

b operationalized as having at least 3 back-and-forth-turn-taking conversations with focal child

Results

Descriptive statistics

The descriptive statistics for the DISCOURS-E by DLL category are summarized in Tables 1 (Adult Verbal + Nonverbal Communication Directed at Focal Child) and 2 (Focal Child Behaviors). When hierarchical linear modeling (HLM) was applied by nesting Level 1 (DISCOURS-E scores) with Level 2 (teacher/classroom demographics), no significant differences in DISCOURS-E scores were found between DLLs and non-DLLs. Regardless of DLL status, verbal communication with focus directed at focal children occurred, on average, during a whole-group (less intimate) activity in which some form of verbal acknowledgement was offered to focal child (M = 2.02, SD = 1.10). Adult conversations with focal children were responsive, but not a lot of contingent responding was observed (M = 1.06, SD = 0.34). More than half the time (M = 0.60, SD = 0.47), no questions were posed to focal children. On those occasions that questions were posed, they were mostly close-ended (M = 0.50, SD = 0.48), with few open-ended questions that facilitated higher-order thinking (M = 0.05, SD = 0.31). Adults did not engage in much incorporation of children's lives outside the classroom setting (M = 0.09, SD = 0.27). Adults generally displayed a positive affect toward focal children (M = 0.94, SD = 0.71 for warmth/affection and M = 0.88, SD = 0.67 for engagement/attunement). Adults generally acknowledged children's communicative attempts but did not follow-up immediately (M = 1.25, SD = 1.00).

With respect to focal children regardless of DLL status, they were observed to be engaged (M = 0.81, SD = 0.46) and displayed a generally positive affect (M = 0.76, SD = 0.43), interacted predominantly with adults almost half of the time (M = 0.48, SD = 0.47), and engaged in sustained conversations a quarter of the time with same-language peers (M = 0.23, SD = 0.40).

Linguistic diversity and observed adult (verbal, nonverbal, paraverbal) communication

As shown in Table 3 (adult verbal and nonverbal communication), for DLLs, greater linguistic diversity in the classroom was associated with adults displaying more negative affect (ES = 4.98, p = .004) and teachers being less attuned to DLLs' communicative attempts, albeit a trend finding (ES = -4.58, p = .079). For non-DLLs, greater linguistic diversity in the classroom was associated with less variety in types of questions teachers posed (ES = -3.42, p = .013), and teachers being less likely to incorporate non-DLLs' lives outside the classroom context during conversations (ES = -2.72, p = .030). Greater linguistic diversity in the classroom was associated with adults displaying more negative affect toward non-DLLs, albeit only a trend finding (ES = 1.39, p = .089).

Linguistic diversity and observed child (verbal, nonverbal) behaviors

As shown in Table 4 (child verbal and nonverbal behaviors), for DLLs, greater linguistic diversity in the classroom was associated with less engagement among DLLs (ES = - 2.86, p = .006) and DLLs displaying less positive affect, albeit a trend finding (ES = -1.84, p = .056). For non-DLLs, greater linguistic diversity in the classroom was associated with displaying less positive affect (ES = - 2.83, p = .004), and fewer interactions with other-language peers (ES = - 2.83, p = .006). No associations were found between linguistic diversity in the classroom and sustained conversations for either DLLs or non-DLLs.

Discussion

DLLs are often viewed as a monolithic group, but they are a diverse group that speaks different languages and identifies with many races and ethnicities with varying migration histories. As immigration numbers continue to rise in the U.S., the number of languages spoken will also increase, which will be reflected in the languages children speak in the classroom. This fact presents both challenges and opportunities when it comes to creating an equitable and language-rich learning environment for all children in the classroom. When children are immersed in high-quality language interactions, they develop language proficiency and thrive in the education system (Wasik & Hindman, 2015). With a plethora of languages represented in the classroom, and with varying demands already placed on preschool teachers, exploring how linguistic diversity in the classroom hinders or promotes the quality of communicative interactions—verbal and non-/paraverbal, between and among teachers and children—illuminates the realities faced in 21st century American classrooms. To date, there is very limited research that has measured linguistic diversity in the classroom using measures that account for both number of languages and speakers (Bredtmann et al., 2021; Juvonen, 2006; Meng, 2020). This is the first study to examine linguistic diversity and its role in the communicative experiences of young DLLs and non-DLLs. Rather than merely measuring the concentration of DLLs in the classroom, which showed no association with peer behaviors (Malloy, 2019), operationalizing linguistic diversity using the Simpson's diversity index that accounts for both the number of languages and number of speakers of those languages within a classroom to address aspects of the variation within the DLL population added nuance in our conceptualization of linguistic representation in the classroom.

Moreover, no study has operationalized the language environment as consisting of both verbal and non-/paraverbal communication. In this study, we found that conditional on other child- and classroom-level covariates, linguistic diversity in the classroom was differentially

associated with the communicative experiences of DLLs and non-DLLs. Results from this study are preliminary but suggest that there are both verbal and nonverbal aspects of adult and child behavior, as measured by the DISCOURS-E, that are associated with classroom language diversity, and should be further explored.

Linguistic diversity, adult attunement, and child engagement

Our findings suggest that adults generally did not facilitate language more deliberately. In more linguistically diverse classrooms, adults were more likely to ignore DLLs' communicative attempts, although this is a trend that should be interpreted with caution. Adult attunement and responsiveness to children's communicative attempts characterize a high-quality language environment, which is critical for DLLs (Helman, 2016; Hirsh-Pasek et al., 2015). Adult attunement promotes emotional regulation in toddlers (Mortensen & Barnett, 2019) and improves academic performance in elementary school (Poulsen & Fouts, 2001). Dismissive adults are more likely to attune to children's negative affect than to both positive and negative affect (Haft & Slade, 1989), which may lead them to miss subtle nonverbal cues that DLLs often exude. In addition, as the number of languages spoken in the classroom increases, DLLs appear to be less engaged in classroom activities, and non-DLLs interact less with DLLs. Perhaps because of less teacher attunement in linguistically diverse classrooms, DLLs who may need support in classroom activities go unnoticed, leaving them disengaged from the activity. Some coping theories of minoritized groups suggest that members of such groups tend to disengage or limit the extent to which they feel being minoritized (Dovidio et al., 2006), thus making DLLs less likely to participate in classroom activities.

Linguistic diversity and adult/child affect

Another finding of this study was that in classrooms with greater linguistic diversity, teachers displayed more negative affect toward DLLs. Studies have shown systematic differences in communication patterns toward minoritized groups such that members of the dominant group tend to display less positive affect and less person-centered communication (Dovidio et al., 2006). Thus, when teachers are in a linguistically diverse classroom, they may feel overwhelmed, which is displayed as negative affect (e.g., frowning). Perhaps smaller class sizes and the presence and co-facilitation of a bilingual aide may lessen the burden on the lead teacher, who in turn would display less negative affect. Adult affect has implications for the learning experiences of young children. Adults who display positive affect have higher self-reported ratings of physical and emotional well-being (Schiffrin, 2014), which may make them more emotionally responsive to the language and learning needs of children (Hamre & Pianta, 2005). Adult positive affect facilitates preschoolers' self-regulation skills (Ludwig & Rauch, 2018). Preschoolers, however, are more responsive to negative affect, which may hinder their executive functioning (Kashihara & Matsuda, 2022).

Similarly, we found that in classrooms with greater linguistic diversity, preschoolers, regardless of their DLL status, displayed less positive affect. This may be because young children take cues from adults, which are conveyed through nonverbal behaviors such as facial expressions, to navigate their social world and learn language (Lewkowicz & Hansen-Tift, 2012; Peltola et al., 2018). A child's affect also has an impact on how others perceive them. Children who display more negative affect are less accepted by their peers and are rated higher in dysregulated behavior by their teachers; whereas children who display more positive affect initiate positive peer interactions at a higher rate and they also are more accepted by their peers and rated higher on adjustment by their teachers (Shin et al., 2011). These social perceptions may later create a cascading cycle of negative appraisals of DLL attitudes and behaviors that may further undermine their learning.

These findings should not be taken to imply that linguistic diversity is detrimental for classrooms, but these negative associations may indicate that there might be gaps in knowledge and training teachers received related to supporting DLLs. For instance, if teachers only know one way to address DLLs' needs, they may feel overwhelmed about meeting the needs of classrooms with DLLs who speak a diverse number of languages. With the impact of the pandemic placing further strain on ECCE staff (Bassok, Smith et al., 2021), fostering a positive climate in linguistically diverse classrooms may bring additional stressors to an already overwhelmed early child care and education system. If linguistically diverse classrooms lower the likelihood of positive affect, as this study suggests, finding ways to promote positive affect potentially by reducing stress and burnout, and improving the social and emotional climate overall, may be an effective strategy (Reyes et al., 2020). Future work should also look at potential classroom language profiles, so teachers are able to better prepare instruction given the language needs of their classroom.

Linguistic diversity, child engagement, and peer interactions

Although conversations with peers often are shorter and less substantive than those with teachers (Piker, 2013), children converse more frequently with peers than with teachers (Sawyer et al., 2018). Peer conversations, especially when conversing with more language-proficient speakers, benefits the language acquisition of both DLLs and non-DLLs (Washington-Nortey et al., 2020). Our findings showed that linguistic diversity in the classroom was associated differentially with child engagement and peer interactions among DLLs and non-DLLs. Among

DLLs, greater linguistic diversity was associated with less engagement in classroom activities but was not associated with peer interactions—with either DLLs or non-DLLs, a finding that was inconsistent with those found in a systematic review where DLLs were more likely to interact with same-language peers than with other-language peers (Washington-Nortey et al., 2020). Among non-DLLs, greater linguistic diversity was associated with fewer interactions with other-language peers (i.e., DLLs). Thus, when more languages are spoken in the classroom, DLLs are less engaged in classroom activities, and non-DLLS interact less with DLLs. Perhaps because of less teacher attunement in linguistically diverse classrooms (see previous findings), DLLs who may need support in classroom activities go unnoticed, leaving them disengaged from the activity. Non-DLLs likewise may simply find it challenging to understand a language other than what they speak, making them avoid feeling discomfort in communicating with DLLs. Or, non-DLLs may interpret DLLs' lack of engagement as an indicator of disinterest in interacting with them, making the non-DLLs less likely to interact with DLLs. The lack of non-DLLs' interactions with DLLs pose risks to language skills of both non-DLLs and DLLs, who mutually benefit from peer interactions (Barnett et al., 2007; Durán et al., 2014). Indeed, Bredtmann and colleagues (2021) showed that although greater linguistic diversity had no adverse effects on language and math achievement of fourth grade DLLs and non-DLLs, it showed that it undermined the social integration of DLLs (e.g., had fewer friends in class). Classrooms with high linguistic diversity may benefit from adults who consciously foster peer collaboration. Because non-DLLs may probably feel uncomfortable interacting with DLLs who speak a different language than they do, adults could intentionally engage them in fun activities that require teamwork and where teachers consciously make the effort to apply words in different languages that children speak. For example, a teacher could facilitate a block-building activity among DLLs and non-DLLs: "That is a big, colorful house you are building out of those Lego blocks. I see there is an interior space where we can add more things or people. Who is living here in your casa, your bahay? Is your Áte Evelyn preparing the merienda?".

Limitations and future directions

While the study focused on measuring linguistic diversity as a more nuanced operationalization of the various languages spoken by children in a classroom, the sample of this study may not have allowed us to capture other aspects of variation within the DLL population, such as age of exposure to their multiple languages, migration history or country of birth, that may produce other differences in the communicative experiences of DLLs, as well as non-DLLs. Researchers are urged to explore how other subgroups of DLLs are differentially influenced by teaching practices and policies that may add nuance in our understanding of the complexity of superdiversity. For example, future studies should include DLLs' fluency in their multiple languages. As a result of different early experiences, DLLs may exhibit varying levels of proficiency in either expressive (i.e., speaking or writing) or receptive (i.e., understanding or reading) language ability. For example, some DLLs may be able to understand and speak Spanish and English, whereas other children may be able to understand both languages but can only converse in one of their languages. Several studies have begun to find ways to capture the variation in dual language fluency by using parent- and teacher-report and have generally found four groups of DLLs: DLLs who are English-dominant, DLLs who are other-language dominant, DLLs who have emerging skills in both/multiple languages, and DLLs who are fluent in both/multiple languages (Halpin et al., 2021; López & Foster, 2021; Melzi et al., 2017). More work with DLLs needs to continue to provide this information so teachers can devise ways to provide appropriate instructional strategies accounting for fluency.

Additionally, we measured communicative experiences using a time sampling technique, which captures only a snapshot of the communicative experiences of a randomly selected group of focal children. It is highly probable that during the designated coding cycle, adults may not be interacting with the focal child, which means that only the section about the focal child's behaviors would be coded. Time sampling is more practical and efficient but is a less accurate measurement of behavior relative to total-duration measurement (Cook & Snyder, 2020). Future work can include multiple days for observation to increase the number of coding cycles or research can capitalize on technology to measure communicative experiences more accurately such as Language Environment Analysis (LENA; Gilkerson, 2008) to capture mean language utterances and conversational turns, among other facets of the language environment, or locational technology that enables the tracking of children's conversational partners, and duration of language interactions (Messinger et al., 2019; Irvin et al., 2021). Applying an equity-focused lens, researchers are urged to purposefully reframe DLLs using a strengths-based paradigm and create assessment tools that are culturally and linguistically responsive and highlight their strengths, such as nonverbal communication, would elevate the way researchers and educators view DLLs in the early education system.

Finally, future studies should consider the role of teacher race/ethnicity (and the role of teacher-classroom racial match), teacher language proficiency, teacher training and experience in bilingual education that may moderate the association between linguistic diversity in the classroom and communicative outcomes. In addition to teacher characteristics, future studies may consider other familial and environmental factors such as socioeconomic status and prior exposure to language-rich environments. Enriching quantitative findings with qualitative findings would also strengthen the quality of the study.

Implications and recommendations

Linguistic diversity in the classroom should be celebrated. Young children enter the classroom with varying racial/ethnic backgrounds and immigration histories. Our findings are preliminary and should not be interpreted to mean that linguistic diversity discourages learning. Rather, the negative associations found in the study may indicate gaps in teacher training to support DLLs. At the program level, the results of this study can help educators reflect on the effects of language composition and diversity and work with their teachers to find different ways to support classrooms depending on the various languages and speakers represented. Regardless of teachers' linguistic backgrounds, celebrating linguistic diversity in the classroom entails deliberate efforts to engage DLL families in classroom life, building a sense of belonging and meaningfully engaging them in school activities and decision-making around their child's education, which are vital to maximizing children's developmental outcomes (Jeon et al., 2020). In relation to this issue of linguistic diversity, teachers can, for example, get to know families through casual conversations during drop-off and pick-up—learning about their family routines, traditions, and customs and key words that are used in their homes to create a classroom dictionary. These words can be applied in everyday classroom routines and activities (e.g., spontaneous conversations, mealtime, play time) so that all children are exposed to these languages. Preschool teachers could also encourage flexibility in allowing children to use their multiple language skills in the classroom as this increases children's comprehension in English (Hornberger & Link, 2012) as well as legitimizes a wide range of linguistic resources for thinking, communicating, and constructing meaning (Gort, 2019) and could increase positive affect. Thus, if linguistically diverse classrooms lower the likelihood of positive affect, as this study suggests, finding ways to promote positive affect potentially by reducing stress and burnout, and improving the social and emotional climate overall (e.g., implementing evidence-based social and emotional learning programs), may be an effective strategy (Cipriano et al., 2023; Reyes et al., 2020).

At the policy level, investing in strategies to promote multilingualism will change implicit ways of thinking about DLLs. For instance, incentivize bi-/multilingual teachers, who often serve as de facto classroom "translators", to apply for early childhood education programs by rewarding them with higher salaries or allowing them to receive student loan forgiveness programs. Another recommendation is to include explicit provisions in federal and/or state early childhood education guidelines and standards (e.g., as is done in the Head Start Performance Standards) for teachers to foster language and literacy in L1 and L2, highlighting the importance of having adults who can support the development of children's home languages. Finally, we encourage policymakers to fund efforts that are known to increase engagement and improve school readiness skills of DLLs. This includes, as an example, funding efforts to meaningfully engage families of DLLs to participate in the promotion of their home language in classrooms via story time, games, STEM-related activities (e.g., counting number of blocks in Mandarin), eating meals, among other everyday classroom activities. Moreover, funding studies that allows researchers to explore malleable protective factors that create equitable opportunities for DLLs will expand the knowledge base and provide concrete pathways to support preschool teachers.

Conclusion

American preschoolers are immersed in increasingly linguistically diverse classroom environments. In this study, applying the Simpson's diversity index in the operationalization of linguistic diversity in the classroom yielded some promising directions in advancing our understanding of DLL-non-DLL classroom dynamics. Exposure to a variety of peers who speak many different languages can benefit both their language and social development. This, however, requires adults' intentional facilitation of communicative experiences, as well as being attuned to their own affect and the affect and needs of all children. Acknowledging superdiversity, that DLLs are not a monolith, can lead to both challenges and opportunities in providing a high-quality language and communication-rich environment.

Authors' contributions

CRR conceptualized the study, developed the study design, developed the DISCOURS-E, data collection protocols, conducted the main analyses, drafted the manuscript, and finalized the submitted version. MCL and BR contributed to the conceptualization of the study, and writing and editing of the manuscript.

Conflict of interest

There are no conflicts of interest to declare.

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