



PURM

Perspectives on Undergraduate
Research & Mentoring

How Undergraduate Training Programs Make Science Better: Research We Would Not Have Known Was Needed Without Our Students' Contributions

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Introduction

From 2021 until 2025, when our funding was terminated, we at the Center for Children and Families (CCF) at the University of Texas at Dallas (UTD) led a year-long National Science Foundation Research Experiences for Undergraduates (REU) program called Culturally Responsive Research in Developmental Science. The goals of our REU program were like many others: increasing students' retention, involvement in science, and overall graduation rates, which we did successfully. Our focus was on culturally responsive research which meant teaching students to make science more relevant, effective, and generalizable by considering children's and families' backgrounds and perspectives throughout every stage of research, from question formation and study design to interpretation and dissemination. We learned that explicitly including students in our labs who are from communities traditionally underrepresented in research and, importantly, giving them a voice in the work, greatly improved our science.

This is not a new insight. Scientists are increasingly embracing the importance of moving beyond the typical Western, Educated, Industrialized, Rich, and Democratic ("WEIRD") populations, whose experiences may not necessarily reflect the lived experiences of children throughout the world (Henrich et al., 2010). This limitation is not only about who participates in the research, but also who designs the questions, interprets the findings, and translates the results into practice. Students with different lived experiences can bring perspectives that help researchers ask better questions, recognize gaps in assumptions, build trust with communities and interpret findings in ways that are more grounded in real-world contexts (Bang et al., 2007; Medin & Bang, 2014). In this sense, diversifying student participants in research is both a workforce development strategy and a scientific quality strategy, helping prepare future professionals while improving the rigor, relevance, and generalizability of the scientific inquiry (Hurtado et al., 2009; AlShebli et al., 2018).

To maximize diverse student perspectives, we actively sought out students during recruitment who had a range of lived experiences and were motivated to use science to give back to their communities. By using these selection criteria, the students who completed our program reflected the wide range of experiences that characterize American children today, such as the White student who experienced childhood homelessness, periodically living out of a car with her single mother; a

Kurdish student whose father was a prisoner in a concentration camp, which greatly impacted his parenting; and a Hispanic student who helped her mother, with limited English abilities, navigate care for her younger brother with autism in the US health and school systems.

Our program succeeded according to traditional metrics of REU evaluation, such as student knowledge increases, graduation rates, as well as their reported sense of belonging in science and at the university. Additionally, our students continually provided our faculty with new insights about the complexity and range of children's everyday experiences in the U.S. and, importantly, how such experiences factor into scientists' ability to conduct high quality, generalizable and representative research about socioemotional, cognitive, and linguistic development. For faculty mentors, this led to changes in our research questions, methodologies and interpretations that have allowed us to better study the universal features that impact child development. In this paper, we present traditional indicators of student success, alongside examples of several programmatic changes that occurred across mentors' laboratories, describing the origins and rationale for these changes and their significance for advancing student outcomes.

Ironically, although we were not given specific reasons for the termination of our grant, we suspect our inclusion of underrepresented students may have contributed to the loss of our federal funding in 2025, despite our program fully complying with Texas's relatively conservative SB 17 law governing how race and ethnicity can be considered in higher education. This paper provides evidence that the termination of programs like ours not only impacts the students but significantly limits scientific progress and workforce development in America.

Overview of our REU Program

Our REU program was created by the core faculty members of CCF. Our goal was to take what was unique about our center and the North Texas region to provide students with strong research experiences. CCF is unique in that we aim to merge robust community outreach programs, research, and student training to make science more responsive to and applicable for the needs of children, families, and those who work to support them. In addition to 12 affiliated faculty who each have active research labs, the center includes two outreach programs serving nearly 600 families per year through community partnerships. These programs primarily serve lower income, Hispanic families, though programming is open to everyone. Prior to applying for the REU, students had worked in these outreach programs, gaining real world experience about how to make developmental science accessible and actionable for parents. In the year-long REU, we paired these outreach experiences with lectures and discussions about child development across cultures (fall), followed by research experiences in faculty labs (spring) and disseminating their individual research projects in a university wide student conference (summer). Because this was a year-long program and we did not want to require that students move to take part, we focused on students in the North Texas region, an area that has surprisingly few R1 institutions given its large population. This included area universities and community colleges.

The decision to focus not just on developmental science, but on culturally responsive practices in developmental science, was to ensure our students were at the cutting edge of the field. The scientists at CCF study child development (social, linguistics, and cognitive) and family studies. By definition, these fields are dedicated to the systematic study of key factors that foster healthy development and strong family dynamics, as well as how these factors might differ across cultures and experiences. Recently, the field has increasingly recognized that understanding universal and generalizable factors that impact children and families requires moving beyond the traditional focus on monolingual English, White, highly-educated families in our work (Bornstein et al., 2013). This is difficult, though, when the field is dominated by scientists who themselves are from these groups. As a result, their understanding of, and ability to accurately study diverse populations is hindered.

Developmental researchers who try to study more diverse populations (in terms of race, culture, language, or socioeconomic status) often struggle to do it well because they: (1) rarely come from these diverse communities and as a result may fail to identify challenges or issues that influence social, cognitive, and language development in such populations, (2) often lack the cultural and/or linguistic skills to successfully carry out the research, and (3) often struggle to build trust within the community. The primary goal of our CCF-REU Site was to train the next generation of scientists to address these barriers to scientific advancement. Towards this goal, we provided students from previously under-represented communities with the training and tools needed to conduct high-quality research that addresses the needs of the communities.

Students in the Program

We recruited 10–14 students per year from our institution—one of the most diverse in the country—and from two large community colleges, Dallas College and Collin College, which together enroll over 100,000 students. Each year, NSF funded 10 students, with additional strong applicants occasionally supported by private donors. Selection prioritized students who (1) brought lived experiences underrepresented in developmental science, (2) were motivated to use science to give back to their communities, and (3) demonstrated scientific curiosity. Lived experiences were broadly defined to include factors beyond race, such as socioeconomic background, gender/sexuality, and regional or linguistic differences. These criteria became especially important following the passage of Texas SB 17, which restricts the use of race, gender, or ethnicity in academic programs. To reduce barriers to entry, we set a lower minimum GPA (3.0) than most REU programs and did not require letters of recommendation at the initial application stage, recognizing that our target applicants—often women, first-generation students, and those from nontraditional backgrounds—may be disproportionately affected by impostor syndrome (Peteet et al., 2015; Price et al., 2024).

Table 1. *Demographics of 467 Applicants and 46 Accepted Students Across 4 Cohorts*

	Applied		Accepted	
School Information	Total (467)	Percentage	Total (46)	Percentage
University of Texas at Dallas	276	59.10%	24	52.17%
Area Community College	175	37.47%	21	45.65%
Other area school (UNT, UT Arlington)	4	.86%	1	2.17%
Other School outside of DFW Area	12	2.57%	-	-
Other Demographics*				
Black/African American	83	17.77%	11	23.91%
Native American	12	2.57%	4	8.70%
Native Pacific Islander	4	.86%	1	2.17%
Hispanic/Latino	132	28.27%	27	58.70%
Asian/Asian American	174	37.26%	3	6.52%
Caucasian, or of European origin	57	12.21%	4	8.70%
First Generation College Student	151	32.33%	18	39.13%
Current or eligible for financial aid	144	30.84%	24	52.17%
Disability	19	4.07%	4	8.70%
Preferred group not listed	47	10.06%	1	2.17%

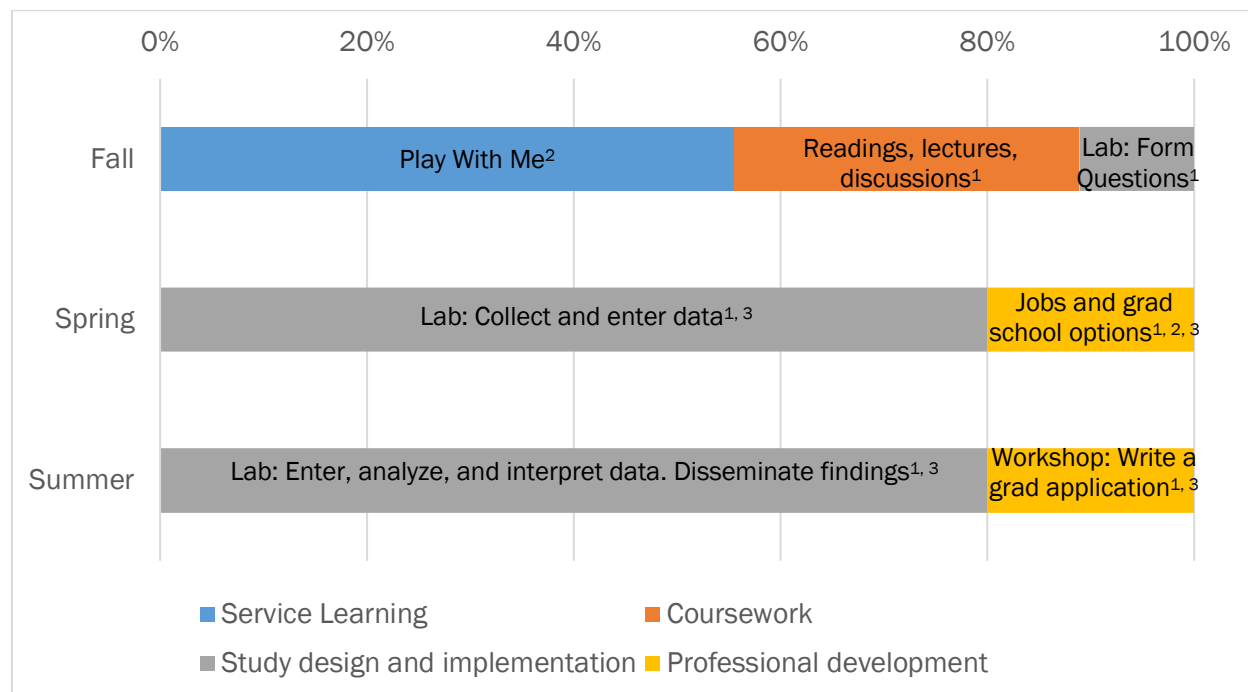
* Applicants could select all that apply.

Note: For students who applied multiple times within the same year, their latest application was kept for reporting purposes

Organizational Structure and Timetable

The REU required a 10-hour weekly commitment over 42 weeks. In the fall, students developed foundational knowledge in developmental science and engaged with families through *Play With Me* (PWM), a community-based outreach program. Spring focused on mentored laboratory research and professional development, and summer emphasized research writing and dissemination (Figure 1).

Figure 1. Allocation of Fellow's 10-hour Weeks



Note: Mentored by ¹UTD faculty; ²CCF staff; ³UTD graduate students and postdocs

PWM was a unique and important aspect of this REU. It is a free, 12-week, dual-generation, bilingual (Spanish–English) parenting program delivered at community sites across Dallas (e.g., libraries, churches, community centers). Grounded in attachment theory and developmental science, PWM provides parents with evidence-based strategies to support early learning, socioemotional development, and school readiness through weekly, topic-focused sessions (e.g., early learning, emotion regulation).

PWM has served as a highly effective training site for REU and service-learning students at UTD by integrating community engagement with rigorous scientific practice. Students learn principles of program evaluation and science communication while working with developmental specialists to translate empirical research into accessible, actionable guidance for diverse families. Within the REU, these experiences grounded students' research training in real-world contexts, informing their research questions, and fostering progression toward independent, culturally responsive developmental scientists.

Lectures and Discussions

In addition to their PWM experiences, in the fall students took part in group discussions with UTD faculty (Table 2). Discussions were based on readings (under 10 pages) and videos (under 1 hour) provided by the faculty member in advance. The goal was to enable students to identify theoretically

sound research questions and appropriate methodologies for conducting high-quality research in challenging-to-study, and underrepresented populations.

Table 2. *Fall Discussion Syllabus 2022*

Week	Topic	Faculty
1	Welcome, meet and greet, Q&A, overview of the program goals	Mandy Maguire and other REU faculty
2	IRB and ethical considerations	Andrea Warner-Czyz
3	Social determinants of health	Heidi Kane
4	Risk and resilience	Margaret Owen
5	Infancy	Melanie Spence
6	Child temperament & transactional relations with parents	Shayla Holub
7	Parental sensitivity & parent-child attachment	Margaret Owen
8	Child emotional development & parental socialization of emotions	Jackie Nelson
9	Home environment and language	Pamela Rollins
10	Precursors to language, word learning & early language acquisition	Mandy Maguire
11	Bilingualism	Raúl Rojas
12	Experiences and school readiness: Book reading, math, number, etc.	Candice Mills
13	Environmental impacts on early brain development and what that means for children	Mandy Maguire
14	Language disorders	Lisa Goffman
15	End of semester celebration	All faculty

Conducting Research and Professional Development

Spring focused on conducting research. Students spent 8 hours per week in their faculty mentor's lab collecting, transcribing, coding, and entering data, as well as attending lab meetings. Students also spent 2 hours per week on professional development, including exploring jobs in developmental science and applying to graduate school. Learning the application process was empowering for the students, even those not applying to graduate school at that time.

Disseminating Research and Graduate School Applications

The primary focus of summer training was analyzing, interpreting, and disseminating research findings and assembling components of a graduate school application. Students continued to spend 8 hours/week working in their labs, completing their projects and 2 hours/week on the process of applying to graduate school, (writing a personal statement and CV, approaching potential faculty mentors via emails). They also learned to write effectively for broad audiences through mentor feedback, peer review and work with a graduate student mentor.

By the end of the summer, each student presented their research as an individual poster at UTD's Summer Platform for Undergraduate Research event which included posters by over 200 students and was attended by the wider university community. Each year, 2-3 of our students won awards at this event for their research. After the program, students were encouraged to submit an abstract related to their research to a national conference (as lead or co-author). If accepted, costs to attend the conference were supported by UTD or the REU grant. Through this process a subset of students presented at a range of prestigious research conferences, including the Association for Psychological Science, the American Speech-Hearing Language Association, Society for Research in Child Development and Cognitive Development Society.

Summary

The goal of our year long program was to train the next generation of developmental scientists to use both their lived experiences and experiences with families in our outreach programs to conduct high-quality, culturally responsive research. As noted below, we met the goals of traditional REU programs related to students gains. In addition, our scientists gained so much more in what they learned from the students and how that informed their research.

Results: Student Outcomes

Over four years, the REU trained 46 students (21 community college, 24 UTD, 1 University of North Texas). Despite concerns about year-long retention—particularly for community college students—37 of 46 students completed the full program. Attrition was largely due to positive transitions (e.g., admission to graduate programs), career shifts, or family circumstances, and one student withdrew prior to the start of the REU after accepting a position that conflicted with the REU commitment. Although some students are still completing their degrees, outcomes to date indicate strong academic progress: 27 students earned a bachelor's degree or higher, and among the 23 community college students who earned associate degrees, 17 applied to four-year institutions. Additionally, 19 students continue engaging in research following their REU experiences, either by extending their REU project (e.g., interventions for children) or by pursuing a different research topic (e.g., Alzheimer's disease). Our REU trainees have demonstrated diverse academic trajectories, with students being accepted into graduate programs in fields such as speech language pathology, human development and social policy, counseling psychology, and developmental psychology across different institutions (e.g., University of Michigan, UT Austin, University of Illinois, University of Utah, University of Virginia). Professionally, our alumni have pursued careers related to early childhood education, research, and clinical practice, such as academic researchers, data analysts in public policy, early intervention specialists, speech language pathologists, clinical researchers, and certified counselors.

Additionally, at the beginning and end of the program, students rated their confidence, knowledge, and experiences related to a range of scientific and professional skills on a 5-point Likert scale, with lower number indicates less agreement to the statement. Results of paired t-tests indicated substantial improvements in various aspects of students' research skills, professional development, and cultural responsiveness (Table 3).

For example, at program entry, 23.81% of students reported little or no ability to understand or summarize journal articles, 23.81% reported some ability, and 52.38% reported moderate to substantial ability. By program completion, 85.71% of the 35 students who have valid survey data reported at least moderate proficiency, indicating substantial gains in scholarly literacy. Students showed significant increases in locating research literature, forming research hypotheses, collecting and analyzing data, and interpreting results, as well as in communicating research in various formats, such as oral communication, academic presentation, and manuscript writing. Regarding professional development, significant improvements were observed in their problem-solving capacity, capacity to work collaboratively and convey research to a broader audience that is not in their research field. Our program also helps cultivate students' connections with the science community, the university, and the community they serve, measures known to predict student retention and success in research careers.

Table 3. Means, Standard Deviations, and T-Test Results of Pre- and Post-REU Program Survey

Question	Pre-REU M (SD)	Post-REU M (SD)	t (df)	p
Understand/summarize journal articles	3.38 (1.18)	4.29 (.80)	4.57 (33)	<0.001
Locate research literature	4.06 (.98)	4.74 (.51)	3.70 (33)	<0.001
Form research hypotheses	3.74 (.96)	4.59 (.61)	4.74 (33)	<0.001
Data collection	3.65 (1.15)	4.44 (.79)	3.45 (33)	<0.001
Data analysis	3.09 (1.16)	3.68 (1.07)	2.58 (33)	0.01
Result interpretation	3.21 (1.20)	3.85 (1.05)	3.01 (33)	0.002
Communicate research verbally	3.39 (1.35)	4.61 (.56)	4.66 (32)	<0.001
Academic presentation	2.26 (1.19)	4.62 (.65)	10.55 (33)	<0.001
Manuscript writing	2.84 (1.30)	3.44 (1.01)	2.46 (31)	0.01
Problem-solving capacity	4.24 (.70)	4.65 (.54)	3.07 (33)	0.002
Work collaboration	4.71 (.52)	4.88 (.33)	2.24 (33)	0.02
Convey research to a broader audience	2.94 (1.35)	4.56 (.56)	7.11 (33)	<0.001
Belongingness to science	3.94 (1.04)	4.47 (.71)	3.21 (33)	0.001
Belongingness to scientists community	2.88 (1.12)	3.65 (.81)	3.55 (33)	<0.001
Belongingness to developmental science department	3.24 (1.16)	4.35 (.60)	5.43 (33)	<0.001

Notes: Bonferroni's correction was applied and the adjusted significance level was 0.003. One-tailed *p* value reported. Significant results in bold.

In Their Voices: Individual Stories from Faculty and Students

Students had a team of dedicated faculty from UTD's Psychology and Speech Language and Hearing departments who supported their success through mentorship, discussions, and professional development, including Lisa Goffman, Shalya Holub, Heidi Kane, Mandy Maguire (PI), Candice Mills, Jackie Nelson (PI/Co-PI, 2024-2025), Pamela Rollins, Pumpki Lei Su, Raúl Rojas, Melanie Spence, Alva Tang, Margaret Owen (Co-PI, 2021-2024), and Andrea Warner-Czyz. All faculty reported that working with the students was a positive experience related to mentoring and the science produced. Below, three faculty share how their experiences with REU students impacted their research for the better, well beyond the students' time in their labs.

Expanding Recruitment and Community Outreach

Candice Mills with support from Raven Bacchas and Yilin Liu

Several years ago, I was the lead investigator on a large-scale collaborative research project called Project GARDEN that used a website, ChildrenHelpingScience.com, for testing cognitive development in children. Historically, child development research has often focused on "easy-to-reach" participants living near universities or attending museums, with parents often highly educated and comfortable with scientific research (Bornstein et al., 2013). For our online project, my team and I were excited by the possibility of extending our reach: instead of having only participants living close to our universities, we could reach anyone in the United States who might be interested in participating and have access to a computer. The website testing platform we were using had initially been developed by MIT, had been used by other researchers for smaller projects (Scott et al., 2017), and kept increasing in the number of families interested in participating in studies. Based on these observations, we thought it would be possible to reach children and families who might not typically come to an on-campus study but would feel comfortable participating online remotely (Sheskin et al., 2020).

Once the demographic data came back from Project GARDEN, we noted that we had indeed increased our geographic reach: participants came from many different parts of the United States. But we also noticed that our participants were otherwise very similar to typical in-lab participants: for instance, over 85% of the parents participating held at least a bachelor's degree. This contrasts with the broader U.S. population, where the majority of adults do not have a bachelor's degree or additional education (McElrath, 2025). In addition, many parents reported that either they or their child had completed at least one other research study before our project, suggesting familiarity with research. My Project GARDEN collaborators and I still believed that online child development research had the potential to reach different families from those who typically participate in child development research, but we needed to do some more groundwork to determine how to best move forward.

At this point, two undergraduate students from the CCF-REU Site joined my team, and we began regular discussions about two issues: (1) how people with different backgrounds think and feel about child development research, particularly taking place online, and (2) what could be done to make research more meaningful for their families. Together, we reviewed related research finding lower levels of trust in research and more concerns about accessibility in some communities (e.g., Emery et al., 2023). These students also shared their perspectives on research, including what they had seen from people in their communities. For instance, one student noted that while growing up, her community was not near a university, and she would not have known about opportunities to participate in developmental research. She and her teammate talked about how communities with a deeper and nuanced history of mistrust in research may not be open to child development research, especially online studies, due to concerns about privacy and unfamiliarity with research teams. The students brainstormed ways we could make research more valuable for families that may not have heard of developmental science before and give back to these communities.

Our discussions and background research led us to develop and launch a new study to examine how families from diverse backgrounds, cultures, and educational experiences think about child development research. We were interested in their current perceptions of child development research, perceived barriers to participation, and ways to make research more appealing and helpful for their family. The REU students played an integral role in developing the survey by thinking of questions and responses that caregivers from underserved communities may have (e.g., including more statements about experiences and expectations they'll want to have from research), and they also helped complete the research ethics paperwork for our Institutional Review Board (IRB).

After IRB approval, one REU student continued with the lab during the following summer and fall to support data collection. Along the way, one doctoral student joined the team and helped sustain and expand recruitment efforts, collaborating with other lab members to maintain ongoing community outreach and data collection. Importantly, this project shifted our lab's recruitment toward a more community-based approach. Instead of recruiting near the university or online, we partnered with local organizations and schools and attended various public events across the Dallas-Fort Worth area. With this shift, all study materials were administered in both English and Spanish to broaden community reach.

Although data collection is still ongoing, we have presented a poster on this project at a national conference (Liu et al., 2025). Generally, we find that caregiver participation in online developmental research cannot be explained solely by recruitment logistics or incentives: although trust in child development research was generally high overall, parents raised some concerns about privacy with completing studies online. Although parents reported interest in flexible timing for participation, they also reported interest in making sure their child enjoys their experience and in helping researchers understand how their children grow.

Based on our findings so far, we believe that additional outreach efforts are needed, although some efforts will be easier to implement than others. It is straightforward for our online research study platforms to provide additional, user-friendly guidance on what it's like to participate in child developmental studies and how we work behind the scenes to keep their data private and secure. However, these online platforms can also feel impersonal and vaguely defined: different studies can be hosted by different researchers, and the goals of each research study and what the findings may tell us about development may not always be clearly explained. We think additional research is needed regarding how to design online research platforms in a way that addresses the interests and concerns of a wide audience of children and families.

Having students from the CCF-REU program develop and implement a survey based on both research and their own personal experiences and understanding of research has had an enormous impact on research. In my lab, new students joining the project are benefiting from learning about what the REU students learned and developed. More broadly, the findings from this project will have important implications for the future of child development research, as more and more people move online and could - in theory - be reached by online platforms for research. Overall, undergraduate training programs like CCF's have made the research in my lab more culturally responsive and will continue to have a broader impact on underserved communities and developmental science as a whole.

Shaping the Direction of My Research Program

Jackie Nelson

Rethinking household chaos

Household chaos is a characteristic of the family environment that includes noise, disorganization, and inconsistency (Matheny et al., 1995). In my research, household chaos is conceptualized as a stressor that undermines parents' ability to sensitively respond to their children, is associated with more negative parent-child interactions and less effective discipline (Dumas et al., 2005; Nelson et al., 2009), as parents may become overwhelmed and distracted in chaotic environments. In sum, household chaos is detrimental to parent well-being, family dynamics, and child language acquisition.

In the inaugural class of our CCF-REU program, I mentored a group of four Hispanic students (Mexican and Costa Rican heritage, 1st to 3rd generation) who were interested in parenting and family dynamics. We started by reading a chapter on home chaos from an ecocultural lens. In this chapter, Weisner (2002) argues that chaotic environments are problematic when they disrupt our well-being and prevent us from engaging in our communities. While some developmental contexts may be universally chaotic and detrimental (e.g., unpredictable violence in the home), other settings might seem chaotic to some, but actually are not, because they include valued exchanges in those communities. Thus, Weisner argues that our definition of chaos needs to adjust to consider whether the environment compromises well-being at subjective and objective levels. Our assumption that an environment is chaotic (i.e., detrimental to development and well-being) because it might be so by Eurocentric standards fails to recognize the cultural variability in how families engage with one another and find meaning in those interactions.

After reading and discussing Weisner's chapter, we examined the most commonly used self-report measure of household chaos in family and developmental psychology, the Confusion, Hubbub, and Order Scale (CHAOS; Matheny et al., 1995). I did not anticipate controversy during this review, as this was a measure I was quite familiar with, had used in my own research, and appreciated the range of everyday experiences referenced in the items. Interestingly, the REU students had a different perspective. They joked that all of their families were "chaotic" according to this scale. In response to the scale items "there is very little commotion in our home", "at home we can talk to each other

without being interrupted”, and “the atmosphere in our home is calm”, they all shouted a resounding “no!” For items such as “it’s a real zoo in our home”, and “there is often a fuss going on at our home”, they responded “yes!” But despite their answers on this scale that suggested maladjustment, the students emphasized the closeness and connection that was fostered in large, boisterous families, and how a quiet home environment without laughter, conversation, and interruption would be perceived as sad and lonely.

These insights guided the students’ projects that year, with one central discovery being that, unlike previous reports that generally included primarily white families, mother-reported chaos was unrelated to all objective measures of noise in the home environment among Hispanic families with young children. These home environments were captured using LENA devices, a small recording device worn by children that captures up to 16 hours of family interactions. After that cohort graduated, the students’ insights continued to impact my work and sparked valuable research collaborations among the faculty. The students’ questions led to new ways of thinking about home chaos, noise in family environments, and large family dynamics.

As the faculty shared their insights from their REU cohort, we realized that multiple fields made unexamined ethnocentric assumptions of which household environments were most beneficial for children’s development. This has led to ongoing productive collaborations for journal publications and federally funded grants. Here are two examples of this new line of research: a recent publication and a current study, both of which are multi-lab collaborations across faculty in psychology and speech, language, and hearing sciences.

Rethinking household density

In fellow REU faculty member Mandy Maguire’s field of language development, similar to household chaos, household density is consistently negatively correlated with child language and cognitive outcomes (Marsh et al., 2019; McCormick et al., 2022). Traditionally, research on large family dynamics and language has relied on household density measures to understand family size and space. Household density is a ratio of people in the home (adults and children combined) to the size of the home (often number of bedrooms). However, by treating adults and children as the same, this measure ignores the role of multigenerational households or those that include extended families (aunts, uncles, etc.), in which more adults might be a benefit to children’s overall development. This type of household is common in collectivists societies throughout Asia, South America, and Africa (Bester & Malan-Van Rooyen, 2015) and are quickly becoming more common throughout the U.S., having quadrupled in the last 50 years (Cohn et al., 2022). This was also something many of our REU students experienced growing up and was discussed related to chaos. Yes, having grandparents, aunts, and older cousins in the home led to more noise, but these were additional caretakers, providing conversational partners and story tellers in English and their heritage language that left a lasting impact on the students’ lives. An environment with few adults and many children leads to very different child language supports than an environment with more adults and fewer children. Furthermore, larger family size does not necessarily mean lower parental responsivity or higher household chaos.

Based on our experiences with the REU students and the work rethinking household chaos, we (Nelson and Maguire) reanalyzed a large data set that Nelson and Holub collected with 250 diverse grade schoolers to identify how predictors of language outcomes might differ if you measure the household environment based on density (people divided by bedrooms) vs. adult to child ratio, accounting for different types of households (Poudel et al., 2023). Among Hispanic families, we found that although a traditional measure of household density was negatively related to children’s vocabulary, more adults in the home relative to children was positively related to child vocabulary and negatively related to household chaos. These results highlight the protective effect of more

adults in the home for children's language development in larger families, a consideration that is missed when researchers make ethnocentric assumptions about the benefits of small family size for children's development.

Rethinking the role of the extended family

REU student-initiated inspiration to examine large and diverse family dynamics from an ecocultural perspective led us to our current study, which was recently awarded funding from the National Science Foundation. The MEAL (Multigenerational Environmental Analysis of Language) takes a unique holistic approach to language development. We are transcribing observations of natural family mealtimes to analyze language use and will be expanding an existing sample of 100 families with a 3- to 5-year-old child to include multigenerational bilingual (Spanish-English and Mandarin-English) families. Family conflict, cohesion, coparenting, and shared cultural values will be central considerations as we investigate how a child's daily interactions with the individual members of the household influence their language acquisition, in both English and their heritage language, within large families with cultural and linguistic diversity.

It has been four years since my discussions with the REU students led me to rethink household chaos, and relatedly, interactions within large and diverse families. Their insights inspired a cross-disciplinary collaborative line of research that better represents the future of families in the U.S. My work and my ability to meaningfully contribute to the field and positively impact families' lives benefitted from the students' scientific inquiry and lived experience.

Culturally Responsive Intervention Science

Pamela Rollins with support from Paola Golemon

When I began mentoring students participating in the CCF-REU, I did not anticipate that their questions would fundamentally reshape how I understood culture, mechanism, and responsibility in my own research. What initially seemed like a straightforward opportunity to involve students in coding videotapes of caregiver child interaction and analysis became a sustained process of intellectual collaboration that challenged my assumptions about intervention design and evaluation. Through ongoing dialogue, reflection, and shared inquiry, the REU experience transformed how I think about the role of culture in shaping both research questions and interpretations.

My research focuses on the implementation of parent-mediated early autism interventions, with particular attention to how Hispanic cultural values shape caregiver-child interaction and influence intervention effectiveness. Participation in the REU program created the container not only to advance this work empirically, but also to reconsider its conceptual foundations. Rather than simply extending an existing line of inquiry, collaboration with undergraduate researchers prompted me to take a closer look at the assumptions built into my assessments and to pay more attention to how cultural values shape interactions within intervention contexts.

At the time of the REU, our lab was focused on understanding child and caregiver outcomes after families participated in a parent-mediated autism intervention. For our Spanish-speaking families, we provided a direct linguistic translation of the intervention and evaluated outcomes using a standard set of assessments. Like many evidence-based interventions, the model was developed within a White, middle-class cultural framework emphasizing following the child's lead, minimizing adult control, and responsive, child-directed interaction. Although the materials had been carefully translated, the intervention had not yet been systematically examined for cultural alignment. This gap became a focal point of ongoing discussions with REU students, who reflected on parenting styles from their own backgrounds that differed from those emphasized in the intervention. The students described learning in coursework that their parents' approaches were framed as "wrong," despite their lived experience of parents who were loving, engaged, and deeply invested. As students

compared these experiences to the interaction patterns they observed in video data, they raised questions about whether commonly used outcome measures adequately capture culturally meaningful parenting practices, including values such as *respeto*, which emphasizes respect, relational harmony, and adult responsibility for guidance and how this value might shape parent–child interaction in ways not fully reflected in mainstream intervention models.

Together, we focused on two observational constructs developed by Tamis-LeMonda et al. (2020) that map onto dimensions of *respeto*: Parent Calm Authority (PCA) and Child Affiliative Obedience (CAO). PCA reflects a caregiver’s calm, structured guidance and expectations for cooperation without harshness, while CAO reflects a child’s willing, affiliative responsiveness that supports social harmony. REU students played a central role in learning the coding system, establishing reliability, and engaging in analytic discussions about how these behaviors should be interpreted. These activities created a space where methodological training and conceptual inquiry were intentionally intertwined.

Our analysis revealed a nuanced pattern of findings. Children showed positive change in affiliative obedience, and these gains were associated with increased social connectedness during interaction. In other words, children became more socially engaged and cooperatively responsive in ways that aligned with culturally meaningful expressions of respect. For students, this provided a concrete example of how culturally grounded constructs can reveal strengths that might remain invisible when using more conventional outcome measures.

In contrast, parent calm authority showed little change over time and was unrelated to demographic or child characteristics. While initially disappointing, this finding became a productive point of reflection in our conversations. Rather than viewing the lack of change as a failure of intervention uptake, we interpreted it as evidence of limited cultural alignment between the intervention’s assumptions and caregivers’ models of effective parenting. Caregivers tended to rely on more demanding interaction styles while parenting intellectually and linguistically delayed autistic toddlers, raising questions about whether a direct translation approach sufficiently conveyed the rationale for calm authority or engaged families’ beliefs about authority, respect, and responsibility. This realization marked a turning point in my thinking and prompted the use of the Ecological Validity Framework (Bernal et al., 1995) to guide subsequent adaptation efforts.

The Ecological Validity Framework emphasizes alignment across language, context, goals, methods, and values, helping distinguish surface-level translation from deeper cultural adaptation. Applying this framework clarified that the intervention had been linguistically translated but not yet adapted at the level of cultural meaning. Rather than interpreting stable PCA as resistance, we came to see it as reflecting limits in how the intervention communicated why certain caregiver–child interaction strategies mattered within the realities of caring for intellectually and linguistically delayed autistic toddlers.

This shift has had lasting implications for my research program and strengthened my commitment to designing interventions that are both effective and culturally responsible. What began as a study of a translated parent-mediated intervention evolved—through close collaboration with undergraduate researchers—into a sustained, community-engaged line of work. One undergraduate who participated in this REU went on to pursue a master’s degree and now works in my lab as a full collaborator, contributing to ongoing efforts to adapt the intervention through work supported by the 2023 Congressionally Directed Medical Research Programs Autism Research Program. Together, we engaged a diverse group of stakeholders, including Hispanic parents of autistic children, a Hispanic autistic adolescent, bilingual Hispanic early childhood educators from across our area, and the original authors of the intervention. Our approach, grounded in community partnership and shared

values, reflects the voices of those it is intended to serve and illustrates how the REU meaningfully shaped both mentoring relationships and the evolution of scientific inquiry.

Conclusions

The CCF-REU program made a profound impact not only on the lives of the students in the program, but on the researchers involved. For many of us, our work has fundamentally changed for the better because of the insights and passion that the students brought to our projects. These stories highlight that although there was a shift in more inclusive science over the course of our first REU program, many changes were a direct result of specific student input on our research projects that we did not even realize were needed. Without the students, these insights would not have happened. It is essential for Developmental Science as a field to take seriously issues surrounding representation and generalizability to truly understand the factors that play a role in child development beyond the historic myopic focus on highly educated, monolingual, White families. Without the direct input of people with diverse lived experiences in our science, we will continue to be limited in our ability to do this effectively. Student engagement, especially through federally-funded programs like the NSF REU plays a critical role in this work.

While we report quantitative outcomes such as graduation rates and research knowledge growth, these metrics alone do not capture what would be lost if undergraduate research training programs like this were discontinued. Federally funded training grants, awarded through rigorous peer-review processes, enable researchers to be intentional and strategic about defining the skills, values, and priorities needed to advance their scientific fields, and to implement this training at scale. Their most meaningful impacts, however, unfold over time and are inherently difficult to measure. At CCF, we often describe student training as “sowing seeds”, as many students go on to graduate training, establish labs, mentor future students, and shape the field for decades to come in ways that cannot be immediately quantified.

Although the federal government has terminated many programs like ours with little explanation, this work remains essential. As scientists, we will continue to advance it as best we can—not only because of its measurable outcomes, but because investing in the next generation of developmental scientists is critical to the long-term health, rigor, and relevance of our field.

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