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“...Because we do so together”: A Mixed-Methods Analysis of Assistant Teacher’s Work Environment, Conditions, and Teamwork Experiences

Marisa Schlieber^{1*}, Tobi Adejumo¹, Jenna Knight¹, Enrique Valencia Lopez² and Elizabeth Pufall Jones¹

*Correspondence:
marisa.schlieber@berkeley.edu

¹ Center for the Study of Child
Care Employment, Institute
for Research on Labor
and Employment, University
of California, Berkeley, 2521
Channing Way, Berkeley, CA
94720, USA

² Center for the Study of Child
Care Employment, Institute
for Research on Labor
and Employment and Graduate
School of Education, University
of California, Berkeley, USA

Abstract

Quality improvement strategies largely focus on lead teachers’ qualifications with little regard to their work environment, while also overlooking a significant segment of the workforce—assistant teachers. Early educators work in teams, and assistant teachers play an important role planning, implementing, and supporting classroom activities. Using an explanatory mixed-methods design, the present United States based study examines assistant teachers’ ($N=436$) assessments of their work environment, with a focus on teamwork. Findings reveal how features of the work environment are related to assistant teachers’ assessments of teamwork. Implications for policy, practice, and future research are discussed to address the work environment factors that support the ability of assistant teachers to collaborate and meaningfully contribute to the functioning and quality of children’s learning environment.

Keywords: Assistant teachers, Work environment, Working conditions, Teamwork, Collaboration, Well-being, Early care and education

Introduction

High-quality learning environments that promote children’s development require educators who are knowledgeable about appropriate pedagogy (Brown & Lan, 2013; Brunsek et al., 2020), experience positive working conditions (Johnson et al., 2021), and engage with colleagues who support their practice (Jungbauer & Ehlen, 2015; Løvgren, 2016). Young children depend on educators who are skilled in their teaching practice and have their professional well-being and needs supported. Assistant teachers (ATs) play an important role in children’s learning experiences, as they contribute their intellectual, experiential, and cultural knowledge to the planning, implementation, and support of classroom activities (Curby et al., 2012; Sosinsky & Gilliam, 2011). However, there is limited research on how assistant teachers experience their work environment and function as a member of a team of educators. The purpose of this study is to examine assistant

teachers' assessments of their work environment with a focus on teamwork and identify factors in their work environment that promote or hinder teamwork.

The landscape and context of assistant ECE teachers

Teaching and caring for young children is an emotionally, intellectually, and physically demanding job that requires a high level of collaboration and teamwork (Leana et al., 2009). Classrooms require that all teachers plan, communicate, and collaborate to meet children's developmental needs, in addition to ensuring their safety (DiCarlo et al., 2021; Jardí et al., 2022). Unlike kindergarten through grade 12 (K-12) educators, early educators work in teams. Varying by children's age, there are standards for the ratio of adults to children in a classroom (Perlman et al., 2017). For example, "two trained adults" must be present in a class of six to eight infants, or for a classroom of 12 to 20 preschoolers (ACE, OCC, HHS, n.d.). Working in support of a lead teacher, assistant teachers are uniquely positioned to offer pedagogical and structural support in the classroom (Cramer & Cappella, 2019). In spite of the instrumental role assistant teachers play in classroom experiences, there is a lack of research regarding how they assess their work environment, including teamwork, and how features of the work environment might influence their assessments of teamwork.

Nationally, two-thirds of center-based early educators work in the role of a teacher (i.e., head or lead teacher) and one-third in the role of assistant teacher (Whitebook et al., 2018a). Demographically, assistant teachers or aides are more likely to be culturally and linguistically diverse (Austin et al., 2019; Cramer & Cappella, 2019), often mirroring the cultural characteristics of children in their care (Ansari, 2017; Sandstrom & Gelatt, 2017); (Greenberg et al., 2018). Thus, assistant teachers offer an array of linguistic and cultural knowledge that contributes to providing culturally responsive practices (Curby et al., 2012; Jacoby & Corwin-Renner, 2022).

Despite this rich experience, the ECE workforce is one of the most underpaid in the United States, with assistant teachers earning less than other instructional roles, and in environments that undermine their practice and well-being (McLean et al., 2021). Moreso, the existing racial and social inequities that permeate the United States contribute to role stratification in the ECE system (Austin et al., 2019). For example, research shows an overrepresentation of Hispanic, Black, and individuals who speak English as a second language (ESL) in assistant teacher positions (Austin et al., 2019). This population of the workforce also earns an average of \$1.06 less per hour than lead teachers who are more likely to be White (Austin et al., 2019; Cramer & Cappella, 2019; Lee et al., 2022).

The work environment of assistant teachers

Given the essential role ECE assistant teachers play in the classroom, understanding the ways in which work environments support assistant teachers' practice and well-being is critical. However, strategies to improve work environments have largely focused on teacher training and qualifications while on-the-job supports have routinely been overlooked (Brunsek et al., 2020; Gomez et al., 2015; Heisner & Lederberg, 2011). Moreover, there is a dearth of research on assistant teachers' work environment in the context of how their teaching and classroom practices are supported, including training and

professional development; opportunities they have for decision-making and input; their professional relationships with coworkers and supervisor; and their financial and economic security.

Supports in the classroom

An assistant teacher's ability to plan for and facilitate learning depends on their access to teaching supports (Wells, 2017). Supports include access to curriculum, materials/equipment, assessments to guide teaching and learning, staffing to meet the needs of children, and paid time for professional responsibilities to plan, assess, do paperwork, reflect, and collaborate with colleagues (Whitebook & Ryan, 2011). Although many state standards indicate curriculum planning time as a requirement for developing quality learning experiences, they also lack clarity on how to plan, who to involve, and when to plan. This ambiguity can lead to assistant teachers being left out of classroom planning (Leana et al., 2009; Sosinsky & Gilliam, 2011).

Opportunities for decision-making and input

Organizational research indicates an individual's sense of autonomy, control, and empowerment in their work promotes positive organizational structure, collaboration, and coordination (Nakayama, 2018; Park & Searcy, 2012). Drawn from organizational research, early educators' involvement and awareness in decisions about program policies and their ability to make decisions regarding instructional practices (Jungbauer & Ehlen, 2015; Royer & Moreau, 2015) contributes to their well-being (Clausen et al., 2022), promotes a sense of empowerment (Wagner & French, 2010), and can predict higher job motivation and commitment (Park & Searcy, 2012). However, assistant teachers' lack this work experience as their roles are often subjected to organizational hierarchy with "little to no input in decisions regarding center policies and processes, daily curriculum planning, or often even with whom they work" (Wagner & French, 2010, p. 168).

Relationships with their coworkers and supervisor

In an ECE classroom, while educators work in teams, there is an assumed mentor/mentee relationship built into the structure of their roles as lead teacher and assistant teacher (Bullough, 2015; Wagner & French, 2010). Despite this inherent hierarchy, program leaders often encourage community and collegiality (Aubrey, 2011; Montgomery & Rupp, 2005). Lead teachers who report having supportive positive relationships with program leaders, in "fair" work environments, report a greater sense of job satisfaction (Helsing, 2007) and demonstrate increased instructional quality (Marvin et al., 2003). Conversely, conflictual relationships with program leaders are a strong predictor of turnover among teaching staff overall (Hall-Kenyon et al., 2014; Schaack et al., 2022). Therefore, assistant teachers' perceptions about leadership and the program culture influence educator's well-being and teaching practice.

Training and professional development

The minimal educational requirements for assistant teachers (Whitebook, 2014; Whitebook et al., 2018a) result in many entering the field without substantial background in

child development or culturally and developmentally responsive pedagogy (Administration for Children & Families et al., [n. d.](#); Hyson & Douglass, [2019](#)). Research links professional knowledge (Heisner & Lederberg, [2011](#)) and qualifications with effective teaching (Brunsek et al., [2020](#); Johnson et al., [2019](#)), and higher pay and promotion (Conley & Odden, [1995](#); Lee et al., [2022](#); Torquati et al., [2007](#)). Thus, positive work environments include access to opportunities for higher education and professional development, along with the application of professional learning in classrooms (Wagner & French, [2010](#)). Teachers learning together not only develop their skills and practices in the classroom, but also build cohesion among the teaching team and continuity in caregiving and instruction (Ackerman, [2008](#)). When assistant teachers exchange teaching ideas with lead teachers, they are also more likely to develop formal and informal mentoring relationships, which often lead to a positive work environment and improved well-being (Hall-Kenyon et al., [2014](#); Wagner & French, [2010](#)).

Economic security

Another important aspect of assistant teachers' work environment is economic and financial well-being. Economic well-being is conceptualized as having financial security and a low level of monetary worries (Whitebook et al., [2016](#)). While low wages and a lack of benefits in the ECE workforce contributes to financial stress and strain (Austin et al., [2019](#); McLean et al., [2021](#); Phillips et al., [2016](#)), assistant teachers often earn the lowest pay scale in their program (Jacoby & Corwin-Renner, [2022](#)), thus these stresses may be exacerbated for ATs. For example, in the state of Georgia, regardless of experience or educational attainment, assistant teachers earn \$16,190 annually, making about 125% of the federal poverty level (Georgia Early Education Alliance for Ready Students & GEEARS, [2021](#)).

Present study

This study was conducted in the United States and examines educator-assessed characteristics of ECE work environments using an explanatory mixed-methods design (Creswell & Clark, [2017](#)). It explores assistant teachers' assessments of their work environment across a broad range of workplace supports and how aspects of the work environment are associated with their assessments of teamwork. Given the research on assistant teachers' role in classroom quality (Curby et al., [2012](#); Sosinsky & Gilliam, [2011](#)) and diversifying the ECE workforce (Cramer & Cappella, [2019](#); Jacoby & Corwin-Renner, [2022](#)), a supportive workplace experience may be a catalyst to professional growth, ensuring a future of effective teachers in the field. Additionally, early educators work in classroom teams to plan and implement learning experiences (Bullough, [2015](#)). Therefore, understanding and improving assistant teachers' work environment may be an important way to help enhance the well-being, stability, and effectiveness of the general ECE teaching workforce in addition to how they function alongside their coworkers.

Methods

Participants

The sample for the current study was drawn from the larger Supportive Environmental Quality Underlying Adult Learning (SEQUAL) dataset. Utilizing a subset focusing

exclusively on assistant teachers, our analyses include 436 assistant teachers and/or aides employed in 305 center-based programs. By location, the sample includes 121 assistant teachers for study one, 41 for study two, 57 for study three, 42 for study four, and 175 for study five. Three of these studies were conducted at the state-level and two at the county-level. Demographics and workforce characteristics are presented in two tables in Additional file 1: Appendix S1; general characteristics are presented in Additional file 1: Table S1, and Additional file 1: Table S2 presents racial and ethnic background by educational attainment.

The goal of these studies was to document the experiences, resources and support that early educators needed to promote their well-being and improve practice. The findings from each study were used to inform policies and practices in the specific study location.

Procedures

The SEQUAL dataset comprises 4 studies that utilized a random stratified sampling design, and one that employed a census. The strata varied depending on the location and scope of the original study (e.g., region, centers serving birth to five vs. preschool aged children). Given that the strata varied between studies and were not a primary focus of this analysis, the design does not control for sample stratification. All teaching staff employed at a center who worked directly with young children were invited to participate. While the dataset contains studies across various locations spanning the United States (i.e., Northeast, Southeast, Midwest, and West), each was implemented with fidelity and the procedures across are standardized. While the survey went under slight revisions between studies, for example removing or revising items, only survey items that were consistent across the five studies were included in the dataset for this analysis.

A list of early childhood programs and early educator contact information were provided to the researchers by the local partner organization for each study. A week prior to the study launch, an announcement letter was sent to all centers in the population that described the study, highlighted their center may be selected to participate, and offered an opportunity to opt-out. About a week following the announcement, an email was sent via Qualtrics with a link to the survey to participate. The duration for data collection averaged 6 weeks. The procedures and study protocol were reviewed and approved by the authors' institutional review board (IRB).

Measures

Work environment

SEQUAL was implemented to capture assistant teachers' assessments of their work environment (Whitebook & Ryan, 2021). SEQUAL is a multipurpose, validated measure designed to measure the working conditions of early educators and focuses on the context in which teaching and learning occur. The measure is administered directly to early educators to identify supports and workplace conditions that impact their practice and well-being. SEQUAL features two parts: part 1 of the survey asked assistant teachers to rate their agreement or disagreement with statements regarding their work environments, and part 2 assessed their personal and work characteristics (e.g., race and ethnicity, educational attainment, tenure, wages).

Part 1 of the measure featured 97 items across five domains comprising the work environment. Alpha levels for each domain ranged from 0.74 to 0.96. Each domain includes smaller dimensions:

- 1) Teaching Supports (*Observation and Assessment, Materials, Support Services for Children and Families, Staffing*),
- 2) Learning Community (*Professional Development, Applying Learning*),
- 3) Job Crafting (*Decision-Making, Input, Teamwork*),
- 4) Adult Well-Being (*Economic Well-Being, Wellness, Quality of Work Life*), and
- 5) Leadership.

The survey captures both quantitative and qualitative data. For the quantitative data, participants were asked to self-report their level of agreement on a Likert scale of 1 to 6, with 1 representing “strongly disagree” and 6 representing “strongly agree”. A higher level of agreement thus indicates a more supportive work environment. For the qualitative data, assistant teachers also filled out an open-ended item at the end of each domain to share how that aspect of the work environment impacted their teaching practice and/or well-being.

Teamwork

To measure assistant teachers’ assessments of their relationships and collaboration with colleagues, the SEQUAL survey has a distinct dimension on the SEQUAL survey, Teamwork. The Teamwork dimension has four items that measures ability to collaborate and work together in the classroom on the six-point Likert scale. Assistant teachers rated their collaboration with their lead teacher in planning and implementing learning experiences for children.

Characteristics of the workforce

The SEQUAL survey also features an in-depth educator profile, asking participants about their demographic (e.g., age, race and ethnicity, languages spoken) and workforce characteristics (e.g., tenure, educational attainment, wages). This section features dichotomous variables (e.g., Do you speak another language? Yes or No), categorical variables (e.g., educational attainment: less than a high school degree, a high school degree or GED, some college but no degree, associate degree, bachelor’s degree, master’s degree or higher), and open-ended continuous responses (e.g., the year they started working in ECE, and wage/ income). Continuous variables were recoded, such as tenure, into categories (e.g., tenure—2 years or less, 3–5 years, 6 or more years). Education was recoded into some college or less, associate degree, and bachelor’s degree or higher. Hourly wage was adjusted for inflation using 2017 as the base year and imputed any missing values for the mean. Furthermore, to understand assistant teachers’ future career plans and whether they intended to stay at their center, two studies ($N = 217$) asked assistant teachers to report on their 3-year plans. Responses were coded to those that intend to stay at their current center, leave their center but stay in the ECE field, leave the ECE field entirely, or unsure.

Analyses

Quantitative analyses

Descriptive Descriptive analyses were run to compute assistant teachers' characteristics and assessments of their work environment which include domain and dimension mean scores, and frequencies on individual survey items. To understand how assessments of the work environment and teamwork varied by educator characteristics, we ran t-tests and ANOVA to explore group differences. These variables included languages spoken, race and ethnicity, tenure, educational attainment, and age group served in the classroom.

Hierarchical linear model (multilevel model) A Hierarchical Linear Model (HLM) was run to examine the relationship between Teamwork and other SEQUAL dimensions. The HLM model addressed the three-level nested structure of the data (assistant teachers, centers, and study location) to obtain accurate standard errors (Dyer et al., 2005) and the lack of center or location-level variables that could potentially bias results due to omitted variable bias (OVb). For example, the locations may have had different professional development or compensation policies. However, research indicates that lower-fixed effects estimators (in our case ratings on SEQUAL and sociodemographic characteristics) in HLM are robust against higher-level omitted variable effects (Kim & Swoboda, 2011; Oshchepkov & Shirokanova, 2022).

Our statistical analyses proceeded as follows: (1) assessing whether a three-level or a two-level model is appropriate for the structure of the data by testing cluster effects using likelihood-ratio tests and fitting the models by maximum likelihood (ML); and (2) proceeding to fit a model that examines the relationship between the Teamwork and other SEQUAL dimensions as well as sociodemographic characteristics. After taking into account the missing data for our relevant variables, our sample size for this model includes 266 assistant teachers across 185 centers with a range from one to eight teachers across centers (see Additional file 1: Table S3). For a description of the HLM model, see Additional file 1: Fig. S1.

Qualitative analyses

The quantitative analyses preceded and guided the qualitative analyses, which focused on the coding and interpretation of the open-ended responses from the survey. Responses along with participants' descriptive data (race/ethnicity, level of education, geographical location, position, and teamwork dimension score) were imported into Dedoose (Dedoose Version 9.0.17, 2021). The qualitative team then used an initial coding scheme developed etically (Berry, 1999) from the domains of SEQUAL to code five respondents from different geographic locations. As they engaged with the coding scheme and participant responses, the qualitative team added emic codes (Berry, 1999) that emerged from participants' responses. Subsequent to developing both the etically and emically derived coding scheme, the qualitative team met to discuss the scheme, and engaged in discussion to achieve intercoder agreement (Saldaña, 2009) regarding the codes, their definition, and application. The qualitative team then conducted the first cycle of descriptive coding (Saldaña, 2009) with sets of responses grouped by geographic location. As the team coded participant responses, members of the team memoed themes

and possible associations among codes. After completing the coding, the qualitative team met to discuss any further queries or adjustments necessary to the coding scheme and any notable themes based on the frequency of responses or other characteristics of the data. Notable frequencies and themes were shared with the quantitative team and integrated into the findings.

Results

Quantitative descriptive assessments of the work environment

Additional file 1: Table S4 in the Appendix provides the descriptive findings regarding assistant teachers' assessments of their work environments and includes the mean scores and standard deviations for the five SEQUAL domains and their respective dimensions.

The mean scores and standard deviations of assistant teachers' responses to items assessing teamwork in the Teamwork dimension are presented in Table 1. Overall, assistant teachers had high assessments of teamwork—with slightly higher mean scores on items assessing if teaching staff in their classroom consider themselves a team and all teaching staff are responsible for their share of work.

Quantitative results examining variations in teamwork scores

We examined assistant teachers' scores on the Teamwork dimension to see if these differed by educator characteristics. Among these variables, there was only one significant finding for the intention to leave variable. Assistant teachers whose 3-year plans include leaving the ECE field had statistically significant lower Teamwork scores ($M=4.62$) compared to those whose 3-year plans included staying at their center ($M=5.16$), $F(2,136)=3.35$, $p=0.038$.

Multilevel model: fixed effects model

Prior to running the HLM, a bivariate analysis was run to examine the correlations between Teamwork and the other dimensions (see Additional file 1: Table S6). All dimensions were statistically significant and moderately correlated with Teamwork.

Results from likelihood ratio and Wald tests show that a model with teacher-level predictors is more parsimonious than one with center or location-level predictors (see Additional file 1: Table S7). However, given our sampling design, we present results for a two-level HLM although some centers have one observation per group (Gelman & Hill, 2007). The HLM provides results of centering-within-cluster (CWC) since our primary interests are at the assistant teacher level (level 1) predictors and because SEQUAL dimensions are generic-level constructs that affect individual perceptions.

Table 1 Teamwork dimension mean scores

Item description	Mean (SD)
Teaching staff in my classroom consider themselves a team	5.23 (0.97)
All teaching staff in my classroom work together to plan learning experiences for young children	4.84 (1.33)
All teaching staff in my classroom are responsible for their share of work	5.06 (1.25)
Teaching staff in my classroom work well with teaching staff in other classrooms	4.90 (1.12)

CWC removes all between-cluster variation and produces an unbiased estimate of the SEQUAL dimensions (Enders & Tofighi, 2007). Between-effects (i.e., aggregated mean scores for the SEQUAL dimensions across assistant teachers at the same center) are also included in the model to differentiate from within effects (Shaw & Kay Flake, n.d.).

The results show that the ICC at the center level is 4.3% and at the location level is close to 0, which means that the nested structure of the data at the location level can be ignored. The results also show that the models account for a considerable amount of variation at the center and teacher-level; that is, the predictors explain 51% of variation in Teamwork scores between assistant teachers and 52% of variation in Teamwork scores within centers (i.e., aggregating assistant teacher responses at the center-level) (Table 2). The final model includes both characteristics of educators at a center and individual-level variables and results show that within effects, the dimensions of Support Services for Children and Families ($\beta=0.310$, $p=0.006$), Applying Learning ($\beta=0.446$, $p=0.004$) and Economic Well-Being ($\beta=0.145$, $p=0.068$) are statistically significant SEQUAL dimensions that positively predict assistant teachers' assessments on the Teamwork dimension. For example, a one-unit increase in the score for Support Services and Children within the center is associated with a 0.310-unit increase in the score for Teamwork.

Among effects between centers, the results show that dimensions focused on organizational characteristics (Wellness, Applying Learning, and Support Services for Children and Families Dimensions) are associated with the Teamwork dimension: a one-unit increase in the average score at the center level on the dimension of Wellness Supports ($\beta=0.181$, $p=0.034$) is associated with a Teamwork score increase of 0.181. Decision-Making ($\beta=0.102$, $p=0.012$), Applying Learning ($\beta=0.611$, $p=0.000$), and Support Services for Children and Families ($\beta=0.168$, $p=0.000$) dimensions also positively predict assistant teachers' assessments on the Teamwork dimension.

Qualitative results examining teamwork

Informed by the quantitative analysis, the qualitative analysis explored how domains are reflected in assistant teachers' experiences in their work environment. Given the quantitative results, our analysis focused on exploring what participants conveyed with regard to leadership and guidance, job crafting, and learning community. One theme that emerged was collaboration, more specifically how participants used "I" and "we" statements to convey teamwork. This was most notable in participant responses to Teaching Supports, Learning Community, and Leadership domain open-ended questions. Their responses illustrated how aspects of the assistant teacher's work environment interact to create collaboration and support among colleagues. Assistant teachers who used "we" often described positive interactions between leadership, staff input, and programmatic functioning. For example, one assistant teacher described how leadership encouraged professional development, and how this in turn contributed to a collaborative work culture.

"We have to take a certain amount of training time each year. Our supervisor gives us enough freedom & support to find new ways of teaching, and allows us to implement them into our classroom."

Table 2 Hierarchical linear model

	Coefficient	Std. error
(Within effects) dimension scores		
Observation	0.064	0.067
Materials	− 0.003	0.074
Support services for children and families	0.310**	0.112
Staffing	− 0.043	0.087
Professional development	− 0.051	0.058
Applying learning	0.446**	0.154
Decision-making	0.065	0.058
Input	0.035	0.106
Economic well-being	0.146 ⁺	0.080
Wellness supports	− 0.095	0.120
Quality of work life	0.140	0.109
(Between effects) mean dimension scores		
Observation	0.068	0.043
Materials	− 0.065	0.051
Support services for children and families	0.168***	0.064
Staffing	− 0.070	0.051
Professional development	− 0.028	0.045
Applying learning	0.611***	0.104
Decision-making	0.102**	0.041
Input	0.059	0.076
Economic well-being	− 0.031	0.062
Wellness supports	0.181*	0.085
Quality of work life	0.072	0.083
Sociodemographic characteristics		
Wage per hour	0.006	0.013
Educational attainment (ref. category: some college or less)		
Associate degree	0.066	0.118
Bachelor's degree or higher	0.011	0.131
Race (ref. category: Hispanic)		
POC	− 0.051	0.143
White	− 0.120	0.104
Center-level variables		
Bilingualism at the center (ref. category: no one is bilingual)		
At least one educator is bilingual	− 0.166	0.102
All are bilingual	− 0.208	0.210
Educational attainment of the staff at the center (ref. category: no one has a BA)		
At least one teaching staff has a BA	0.122	0.119
All teaching staff has a BA	0.245	0.220
Intercept	0.339	0.474
Goodness-of-fit statistics		
R-square level 1	0.5152	
R-square level 2	0.5190	
Observations	266	

Dependent variable Teamwork and SEQUAL dimensions are measured in a 1–6 scale from strongly disagree (1) to strongly agree (6)

Sensitivity analysis in Additional file 1: Table S1 suggests a limited impact of missing data since the descriptive statistics in our model do not substantially change from the full sample

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$, ⁺ $p < 0.1$

Alternatively, assistant teachers who used I statements in their responses conveyed a sense of isolation from the school staff and culture. For example, this assistant teacher indicated that she felt isolated in terms of professional development and its integration into classroom practices.

“My professional development is typically something I seek independently. Other teachers within the classroom seem to do the bare minimum and do not seem interested when I offer new approaches to teaching.”

This thematic analysis highlights the intersectionality of the assistant teachers’ perception of their workplace with their roles, responsibilities, and sense of belonging as part of an educator team.

In support of the quantitative analysis, the qualitative analysis also examined variations in a participant’s Teamwork mean score and their responses. Assistant teachers’ were grouped by their mean Teamwork dimension score: high (4.8–5.8), moderate (3.8–4.75), moderately low (2.8–3.75), and low (2.75 and below) to discern any variation in the open-ended responses. Similar to the quantitative results, there appeared to be an association between Teamwork scores and Input and Decision-Making, in addition to guidance from their program leader. Those with lower Teamwork dimension scores had responses reflecting a lack of input, lack of decision-making, and weak/unsupportive leadership. For example:

“Our school board is comprised of parents of students in the preschool classroom. Because of this, our class (the toddler classroom) does not have representation in the decision-making processes of the school. All policies seem to behave only to benefit the preschool classroom and our class is left in the dark about any changes to policies or potential access to grants.”

Similarly, responses from those with lower Teamwork dimension scores also reflected lower Learning Community scores, in particular, that there was a lack of collaboration between the assistant teacher and the lead teacher, making it hard to integrate practices they might garner or be able to take advantage of professional development opportunities. For example:

“Other teachers were less educated and were not interested or able to understand the importance of applying culturally appropriate interventions and behavioral techniques that would benefit children who had faced trauma.”

Or, as another assistant teacher responded:

“I know that I’ve learned a lot more from professional development than I did from my teaching staff.” and “I do not always believe the lead teacher uses best practices in the classroom but it is my job to follow the lead teacher.”

Lastly, instances of participants recounting strong positive leadership often co-occurred with positive teamwork and work culture codes such as “Instructional/Reflective Supervision”, “Collaboration”, “Opportunities for Growth”, and “Supported Teaching Practices”. Instances of strong leadership never co-occurred with negative elements of the work environment. For example:

“Our supervisor gives us a lot of room & support to make mostly our own decisions as to how we teach, what we teach, and when we teach it. We plan our own curriculum, and implement it mostly on our own, which mostly works out well.”

This suggests that how one is supported by leadership comprising the lead teacher with whom they work and the director of the school may relate to teamwork. Positive leadership that supports individuals professionally and in practice, may contribute to positive assessments of teamwork. Positive Learning Community codes (such as opportunities to integrate practice and for knowledge and skill development) often co-occurred with positive teamwork codes such as a “Positive Work Culture of Teamwork”, and “Involvement in Decision-Making”. For example, as one assistant teacher stated:

“My program has all lead and assistant teachers trained on the assessments that we use as well as curriculum planning. I am currently a teachers aide, but I am working with the lead teacher on assessments and then using that information to properly determine exactly what should be covered in the monthly/weekly curriculum.”

Or how this assistant teacher described positive strong leadership in relation to teamwork:

“...Our supervisor is always open to talk, whether it be about issues we may be having, or about implementing new methods, etc.”

And still another assistant teacher stated:

“We actually have to use what we learn, brainstorming with the team when we have difficulties.”

Thus, an assistant teacher’s perception about how and how well they can harness opportunities for professional development and integrate them into their classroom practices might be related to the level of teamwork that they perceived with both the lead teacher in the classroom and the director of their school.

Discussion

The present study utilized a mixed-methods design to examine assistant teachers’ assessments of their work environment and how aspects of their work environment are associated with their assessments of teamwork. Descriptive findings from the quantitative analysis indicate that features of the work environment rated more positively by assistant teachers were those assessing teamwork, the quality of relationships with their colleagues, supports and resources for working with children and families, supervision and guidance from their program leader within the dimensions of Teamwork, Support Services for Working with Children and Families, and Quality of Work Life. The dimensions rated more positively all encompass aspects of the work environment that connect with teamwork and relationships with colleagues that support their practice, which is especially important for ECE educators who work collaboratively in teams.

The theme of collaboration also emerged from the qualitative analysis—specifically the use of “I” and “we” statements in how individuals responded to their experiences across each domain of the SEQUAL survey. Assistant teachers that used the term “we” while sharing their experiences had favorable assessments of teamwork, guidance, supports,

and mentorship in comparison to those who used “I” statements. This finding corroborates research by Jacoby and Corwin-Renner (2022) examining workplace attributes that foster job satisfaction and retention for a group of bilingual assistant teachers working in Head Start centers. The authors’ findings indicate that Head Start teachers emphasized the ability to collaborate with lead teachers as a positive component of their work environment that contributed to their desire to stay. Taken together, these findings along with those of the current study point to the importance of the social fabric of a school, how it supports an assistant teacher personally and professionally, as a critical component of teamwork in assistant teachers’ work environment.

Features of the work environment rated less positively by assistant teachers were lack of input and decision-making at both the classroom and programmatic level within the Decision-Making and Input dimensions. Studies find an association between greater job satisfaction, commitment, and positive team climate and educators feeling like they can contribute to decisions and provide input (Jungbauer & Ehlen, 2015; Løvgren, 2016). Similarly, assistant teachers also rated professional development experiences less positively, particularly having input in selecting the PD they participate in and having time with other teachers to discuss approaches to teaching, within the Professional Development dimension. Both access to professional development that is meaningful for their practice and reflection with other teachers is part of a positive work environment that fosters an educators’ practice and relationships with colleagues (Hall-Kenyon et al., 2014; Wagner & French, 2010).

Assistant teachers in our study also reported high levels of economic insecurity within the Economic Well-Being dimension. This finding is unsurprising given chronically low wages across the ECE field, in particular for assistant teachers who earn less than lead teachers (Austin et al., 2019; Cramer & Cappella, 2019; Lee et al., 2022) and also have less access to benefits, thus impacting their work environment perceptions, their practice, and well-being (Kwon et al., 2020; McLean et al., 2021). The association between quality care and an educator’s autonomy and agency in their work along with their physical and economic well-being is well documented (de Schipper et al., 2008; King et al., 2016; Lower & Cassidy, 2007). Thus, taken together, teamwork, decision-making and input, professional development, and economic well-being are all fundamental to support an assistant teacher’s practice and well-being and may have implications for classroom and program quality.

While the descriptive analysis revealed that assistant teachers rated teamwork positively overall, the analyses also examined features of the work environment associated with higher and lower assessments of teamwork. A multilevel model was conducted to examine assistant teacher and center-level responses as some educators in the sample worked at the same center and thus could be influenced by the same working conditions and policies. Features of the work environment related to the organizational conditions of the center had a statistically significant relationship with the Teamwork dimension. That is, higher scores on the dimensions measuring features of the work environment related to supports for working with children and families, opportunities for decision-making and input at the classroom and program level, and ability to apply new teaching practices also predicted higher scores on Teamwork. The qualitative analysis found a similar trend in that assistant teachers with positive accounts of collaboration,

supervision, teaching supports, and professional development also had higher scores on Teamwork. These findings are consistent with the literature that shows teamwork does not exist in isolation but is influenced by the classroom and programmatic resources and supports available to teachers (Bullough, 2015; Curby et al., 2012; Jacoby & Corwin-Renner, 2022).

In addition, variations in educator responses were examined and there were very few significant differences by assistant teachers' sociodemographic or workforce characteristics and their assessments of teamwork. This finding suggests that many of the factors associated with teamwork in our sample may be a function of the center's working conditions and the climate that facilitates or hinders relationships among coworkers, and not the demographic or workforce characteristics of educators themselves. Such findings are supported by our multilevel model, where teacher-level SEQUAL dimensions were statistically significant, even after controlling for sociodemographic characteristics such as education and race and after accounting for center-level variance.

Examining intention to leave, assistant teachers whose 3-year plans were to stay at their center had significantly higher mean scores on the Teamwork dimension than those who planned to leave their center but remain in the field and those who planned to leave ECE field entirely. Research in K-12 has shown that schools with an integrated professional culture where teachers with different levels of experience share responsibility for students and peers are more effective at retaining teachers (Moore, 2012). Leanna et al. (2009) found a similar relation among collaboration, satisfaction and job attachment being associated with lower turnover intentions among ECE educators. These results point to the importance of collaboration with colleagues as a contributing factor in educator satisfaction and retention, which is especially important for assistant teachers who primarily work in support of a lead teacher, as a team collaborator.

There were many strengths of this study that add to the literature and our understanding of assistant teachers' work environment and their experiences. This mixed-methods study directly captured assistant teachers' unique assessments of their work environment including teaching supports, teamwork, and relationships with coworkers. However, there were a few limitations. This study relied solely on self-report data from assistant teachers which may be subject to social desirability bias (Burstein et al., 1995). While this can be a limitation, research supports the accuracy of self-report data in anonymous surveys because they are less susceptible to such bias than interviews or focus groups (Aquilino, 1998). Moreso, self-report methodology has been shown to be highly effective in measuring time-framed teaching practices, experiences, and characteristics (Koziol & Burns, 1986; Reddy et al., 2015), especially when rigorous secondary or administrative sources are unreliable (Donaldson & Grant-Vallone, 2002). In this study, educators were asked directly about their working conditions over a time period of 6 to 12 months, and their demographic and professional characteristics, instead of relying on administrative or registry data sources that may not be up-to-date or accurate (Whitebook et al., 2018b). A second limitation is that the dataset did not collect classroom-level data to match the assistant teacher to their lead teacher—only educators working at the same center or center-level data, which means the effects of these center-level variables on the Teamwork dimension (e.g., funding source of the center, program size, etc.) could not be estimated.

To our knowledge, this study is the first to provide a window into assistant teachers' assessments of their work environments, emphasizing teamwork and the support they receive from their coworkers across center-based programs. Future research can extend upon this study by examining the relationship between assistant teachers' assessments of teamwork and the relationship with program quality and child outcomes. How well educators work together as a team and the tenor of their relationships with their colleagues factor into both the classroom and program climate in addition to the learning experiences for young children (Curby et al., 2012; Sosinsky & Gilliam, 2011; Wagner & French, 2010). Additionally, future research can also explore both center-level variables (e.g., program funding, center size) to see if there are any variations in assessments of assistant teachers' work environments and their ratings of teamwork, and classroom characteristics (i.e., the characteristics of the assistant and lead teacher working in the classroom together) to better understand how educator characteristics play a role—for example, if an assistant teacher is bilingual but not the lead teacher.

Conclusion

Attention has traditionally focused on what educators should know and be able to do—with good reason—however, there has been little regard to the context in which teaching occurs and the conditions which enable early educators to apply their practice and support their well-being. The work environment is comprehensive and includes the policies, practices, supports, and relationships that surround the educator and impact their practice and well-being. As ECE educators work in teams in the classroom, teamwork and collaboration is fundamental to providing high-quality care. This study used a mixed-methods design to document assistant teachers' assessments of their work environment; teamwork; and how features of the work environment are associated with teamwork. Assistant teachers are integral members of the classroom who bring an array of linguistic and cultural knowledge, contributing to young children's learning and development by providing much-needed support and culturally responsive practice and instruction (Curby et al., 2012; Jacoby & Corwin-Renner, 2022). As the field seeks ways to support early educators, especially assistant teachers, we hope that more attention focuses on their work environment and how to foster teamwork.

Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s40723-023-00123-6>.

Additional file 1: Table S1. Descriptive Statistics for Characteristics of Assistant Teachers (Full and Restricted Sample). **Table S2.** Educational Attainment by Race and/ or Ethnicity. **Table S3.** Sample size of Assistant Teachers and Centers. **Table S4.** Domain and Dimension Mean Scores. **Table S6.** Correlation Matrix for Teamwork and SEQUAL Dimensions. **Table S7.** Unconditional Hierarchical Model (Center and Location). **Figure S1.** Equation and Description of HLM Model.

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Author contributions

The authors' contributions to the paper are as follows: TA conceived and proposed to submit the paper to the special issue. MS performed the quantitative data analysis, sample preparation and dataset development, interpretation of data, and led the original data collection. EVL conducted calculations and interpretation of the quantitative results. EPJ, JK, and TA conducted qualitative data analysis, coding, and interpretation. All authors were involved in conceptualization of the

study, providing critical feedback that helped shape the research analysis, and writing and review of the manuscript. EPJ and MS supervised the findings of this work. All authors read and approved the final manuscript.

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Availability of data and materials

The dataset used and analyzed for the current study are not currently publicly available. If you are interested in learning more about the SEQUAL dataset and or to inquire about its use, please reach out to the corresponding author.

Declarations

Competing interests

The authors declare that they have no competing interests.

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References

- Ackerman, D. J. (2008). Continuity of care, professional community, and the policy context: Potential benefits for infant and toddler teachers' professional development. *Early Education and Development*, 19(5), 753–772.
- Administration for Children and Families (ACF). (n.d.). *Ratios and group sizes*. U.S. Department of Health and Human Services, Office of Child Care (OCC). Retrieved September 25, 2022, from <https://childcare.gov/consumer-education/ratios-and-group-sizes>
- Ansari, A. (2017). The selection of preschool for immigrant and native-born Latino families in the United States. *Early Childhood Research Quarterly*, 41, 149–160. <https://doi.org/10.1016/j.jecresq.2017.07.002>
- Aquilino, W. S. (1998). Effects of interview mode on measuring depression in younger adults. *Journal of Official Statistics*, 14(1), 15.
- Aubrey, C. (2011). *Leading and managing in the early years*. Sage Publications.
- Austin, L. J. E., Edwards, B., Chavez, R., & Whitebook, M. (2019). *Racial wage gaps in early education employment*. Berkeley, CA: Center for the Study of Child Care Employment, University of California, Berkeley. Retrieved September 20, 2022, from <https://cscce.berkeley.edu/racial-wage-gaps-in-early-education-employment/>
- Berry, J. W. (1999). Emic and etics: A symbiotic conception. *Culture & Psychology*, 5(2), 165–171.
- Brown, C. P., & Lan, Y. C. (2013). The influence of developmentally appropriate practice on children's cognitive development: A qualitative metasynthesis. *Teachers College Record*, 115(12), 1–36.
- Brunsek, A., Perlman, M., McMullen, E., Falenchuk, O., Fletcher, B., Nocita, G., & Shah, P. S. (2020). A meta-analysis and systematic review of the associations between professional development of early childhood educators and children's outcomes. *Early Childhood Research Quarterly*, 53, 217–248.
- Bullough, R. V. (2015). Teaming and teaching in ECE: Neoliberal reforms, teacher metaphors, and identity in head start. *Journal of Research in Childhood Education*, 29(3), 410–427.
- Burstein, L., McDonnell, L. M., Van Winkle, J., Ormseth, T., Mirocha, J., & Guitton, G. (1995). *Validating national curriculum indicators*. RAND.
- Clausen, T., Pedersen, L. R. M., Andersen, M. F., Theorell, T., & Madsen, I. E. (2022). Job autonomy and psychological well-being: A linear or a non-linear association? *European Journal of Work and Organizational Psychology*, 31(3), 395–405.
- Conley, S., & Odden, A. (1995). Linking teacher compensation to teacher career development. *Educational Evaluation and Policy Analysis*, 17(2), 219–237.
- Cramer, T., & Cappella, E. (2019). Who are they and what do they need: Characterizing and supporting the early childhood assistant teacher workforce in a large urban district. *American Journal of Community Psychology*, 63(3–4), 312–323.
- Creswell, J. W., & Clark, V. L. P. (2017). *Designing and conducting mixed methods research*. Sage publications.
- Curby, T. W., Boyer, C., Edwards, T., & Chavez, C. (2012). Assistant teachers in head start classrooms: Comparing to and working with lead teachers. *Early Education and Development*, 23(5), 640–653. <https://doi.org/10.1080/10409289.2011.607361>
- de Schipper, E. J., Riksen-Walraven, J. M., Geurts, S. A., & Derksen, J. J. (2008). General mood of professional caregivers in child care centers and the quality of caregiver–child interactions. *Journal of Research in Personality*, 42(3), 515–526.
- Dedoose Version 9.0.17. (2021). *Web application for managing, analyzing, and presenting qualitative and mixed method research data*. Los Angeles: SocioCultural Research Consultants, LLC. Retrieved from www.dedoose.com
- DiCarlo, C., Hulin, C., Meaux, A. B., & Grantham-Caston, M. (2021). The impact of Responsive Partnership Strategies on the satisfaction of co-teaching relationships in early childhood classrooms. *SN Social Sciences*, 1(9), 1–20.
- Donaldson, S. I., & Grant-Vallone, E. J. (2002). Understanding self-report bias in organizational behavior research. *Journal of Business and Psychology*, 17(2), 245–260.
- Dyer, N. G., Hanges, P. J., & Hall, R. J. (2005). Applying multilevel confirmatory factor analysis techniques to the study of leadership. *The Leadership Quarterly*, 16(1), 149–167.
- Enders, C. K., & Tofighi, D. (2007). Centering predictor variables in cross-sectional multilevel models: a new look at an old issue. *Psychological Methods*, 12(2), 121.
- Gelman, A., & Hill, J. (2007). *Data analysis using regression and multilevel/hierarchical models (1st edition)*. Cambridge University Press.

- Georgia Early Education Alliance for Ready Students, (GEEARS). (2021). *Pre-k assistant teachers: Essential & skilled, yet undervalued. Addressing inadequate pay for Georgia's Pre-K Assistant Teachers*. Retrieved September 25, 2022, from <https://geears.org/research/publications/>
- Gomez, R. E., Kagan, S. L., & Fox, E. A. (2015). Professional development of the early childhood education teaching workforce in the United States: An overview. *Professional Development in Education*, 41(2), 169–186. <https://doi.org/10.1080/19415257.2014.986820>
- Greenberg, E., Michie, M., & Adams, G. (2018). *Expanding preschool access for children of immigrants*. Washington, DC: Urban Institute.
- Hall-Kenyon, K. M., Bullough, R. V., MacKay, K. L., & Marshall, E. E. (2014). Preschool teacher well-being: A review of the literature. *Early Childhood Education Journal*, 42(3), 153–162. <https://doi.org/10.1007/s10643-013-0595-4>
- Heisner, M. J., & Lederberg, A. R. (2011). The impact of Child Development Associate training on the beliefs and practices of preschool teachers. *Early Childhood Research Quarterly*, 26(2), 227–236. <https://doi.org/10.1016/j.jecresq.2010.09.003>
- Helsing, D. (2007). Style of knowing regarding uncertainties. *Curriculum Inquiry*, 37(1), 33–70.
- Hyson, M., & Douglass, A. L. (2019). More than academics: Supporting the whole child. In C. P. Brown, M. B. McMullen, & N. File (Eds.), *The Wiley handbook of early childhood care and education* (pp. 279–300). John Wiley & Sons.
- Jacoby, J. W., & Corwin-Renner, A. (2022). Assistant teachers, workplace satisfaction, and the creation of a culturally competent workforce pipeline in Head Start. *Journal of Career Development*, 49(5), 971–988. <https://doi.org/10.1177/0894845321993237>
- Jardi, A., Webster, R., Petrenas, C., & Puigdemívol, I. (2022). Building successful partnerships between teaching assistants and teachers: Which interpersonal factors matter? *Teaching and Teacher Education*, 109, 103523.
- Johnson, A. D., Partika, A., Schochet, O., & Castle, S. (2019). *Associations between early care and education teacher characteristics and observed classroom processes: Strengthening the diversity and quality of the early care and education workforce paper series* [Research Report]. Urban Institute. Retrieved September 1, 2022, from <https://files.eric.ed.gov/fulltext/ED601780.pdf>
- Johnson, A. D., Phillips, D. A., Schochet, O. N., Martin, A., Castle, S., Martin, A., Tulsa SEED Study Team. (2021). To whom little is given, much is expected: ECE teacher stressors and supports as determinants of classroom quality. *Early Childhood Research Quarterly*, 54, 13–30.
- Jungbauer, J., & Ehlen, S. (2015). Stress and burnout risk among teachers in day-care centers: Results of a questionnaire study. *The Health Service*, 77(06), 418–423.
- Kim, J.S. & Swoboda, C.M. (2011). Handling omitted variable bias in multilevel models: Model specification tests and robust estimation. *Handbook of Advanced Multilevel Analysis*.
- King, E. K., Johnson, A. V., Cassidy, D. J., Wang, Y. C., Lower, J. K., & Kintner-Duffy, V. L. (2016). Preschool teachers' financial well-being and work time supports: Associations with children's emotional expressions and behaviors in classrooms. *Early Childhood Education Journal*, 44(6), 545–553.
- Koziol, S. M., & Burns, P. (1986). Teachers' accuracy in self-reporting about instructional practices using a focused self-report inventory. *The Journal of Educational Research*, 79(4), 205–209.
- Kwon, K. A., Ford, T. G., Salvatore, A. L., Randall, K., Jeon, L., Malek-Lasater, A., ... & Han, M. (2020). Neglected elements of a high-quality early childhood workforce: Whole teacher well-being and working conditions. *Early Childhood Education Journal*, 1–12.
- Leana, C., Appelbaum, E., & Shevchuk, I. (2009). Work process and quality of care in early childhood education: The role of job crafting. *Academy of Management Journal*, 52(6), 1169–1192.
- Lee, Y., Zeng, S., Douglass, A., Reyes, A., & Johnson, N. (2022). Racial and ethnic wage disparities among center-based early educators. *Early Childhood Education Journal*. <https://doi.org/10.1007/s10643-022-01317-2>
- Løvgen, M. (2016). Emotional exhaustion in day-care workers. *European Early Childhood Education Research Journal*, 24(1), 157–167.
- Lower, J. K., & Cassidy, D. J. (2007). Child care work environments: The relationship with learning environments. *Journal of Research in Childhood Education*, 22(2), 189–204. <https://doi.org/10.1080/02568540709594621>
- Marvin, C., LaCost, B., Grady, M., & Mooney, P. (2003). Administrative support and challenges in Nebraska public school early childhood programs: Preliminary study. *Topics in Early Childhood Special Education*, 23(4), 217–228.
- McLean, C., Austin, L. J. E., Whitebook, M., & Olson, K. L. (2021). *Early childhood workforce index - 2020*. Berkeley, CA: Center for the Study of Child Care Employment, University of California, Berkeley. Retrieved September 30, 2022, from <https://cscce.berkeley.edu/workforce-index-2020/>
- Montgomery, C., & Rupp, A. A. (2005). A meta-analysis for exploring the diverse causes and effects of stress in teachers. *Canadian Journal of Education/revue Canadienne De L'éducation*, 28, 458–486.
- Moore, C. M. (2012). The role of school environment in teacher dissatisfaction among US public school teachers. *SAGE Open*, 2(1), 2158244012438888.
- Nakayama, T. (2018) The impact of job autonomy, psychological empowerment, and Japanese-style management on work performance and organizational commitment. Retrieved September 20, 2022 from https://jabr.sbs.edu/vol7/SBS_JABR_Vol7_Art03.pdf
- Oshchepkov, A., & Shirokanova, A. (2022). Bridging the gap between multilevel modeling and economic methods. *Social Science Research*, 104, 102689.
- Park, R., & Searcy, D. (2012). Job autonomy as a predictor of mental well-being: The moderating role of quality-competitive environment. *Journal of Business and Psychology*, 27(3), 305–316.
- Perlman, M., Fletcher, B., Falenchuk, O., Brunsek, A., McMullen, E., & Shah, P. S. (2017). Child-staff ratios in early childhood education and care settings and child outcomes: A systematic review and meta-analysis. *PLoS ONE*, 12(1), 10.
- Phillips, D., Austin, L. J., & Whitebook, M. (2016). The early care and education workforce. *The Future of Children*, 26, 139–158.
- Reddy, L. A., Dudek, C. M., Fabiano, G. A., & Peters, S. (2015). Measuring teacher self-report on classroom practices: Construct validity and reliability of the Classroom Strategies Scale-Teacher Form. *School Psychology Quarterly*, 30(4), 513.

- Royer, N., & Moreau, C. (2015). A survey of Canadian early childhood educators' psychological well-being at work. *Early Childhood Education Journal*, 44(2), 135–146. <https://doi.org/10.1007/s10643-015-0696-3>
- Saldaña, J. (2009). *The coding manual for qualitative researchers* (1st ed.). Sage Publications.
- Sandstrom, H., & Gelatt, J. (2017). *Child care choices of low-income, immigrant families with young children*. Urban Institute. Retrieved September 30, 2022 from <https://www.immigrationresearch.org/system/files/child-care-choices-of-low-income-immigrant-families-with-young-children.pdf>
- Schaack, D. D., Donovan, C. V., Adejumo, T., & Ortega, M. (2022). To stay or to leave: Factors shaping early childhood teachers' turnover and retention decisions. *Journal of Research in Childhood Education*, 36(2), 327–345.
- Shaw, M., & Kay Flake, F. (n.d.) *Introduction to multilevel modelling*. Retrieved from <https://www.learn-mlms.com>
- Sosinsky, L. S., & Gilliam, W. S. (2011). Assistant teachers in prekindergarten programs: What roles do lead teachers feel assistants play in classroom management and teaching? *Early Education and Development*, 22(4), 676–706. <https://doi.org/10.1080/10409289.2010.497432>
- Torquati, J. C., Raikes, H., & Huddleston-Casas, C. A. (2007). Teacher education, motivation, compensation, workplace support, and links to quality of center-based child care and teachers' intention to stay in the early childhood profession. *Early Childhood Research Quarterly*, 22(2), 261–275.
- Wagner, B. D., & French, L. (2010). Motivation, work satisfaction, and teacher change among early childhood teachers. *Journal of Research in Childhood Education*, 24(2), 152–171.
- Wells, M. B. (2017). Is all support equal?: Head Start preschool teachers' psychological job attitudes. *Teaching and Teacher Education*, 63, 103–115.
- Whitebook, M. (2014). Building a skilled teacher workforce. Berkeley, CA: Center for the Study of Child Care Employment, University of California, Berkeley. Retrieved October 30, 2022, from https://cscce.berkeley.edu/wp-content/uploads/publications/Building-a-Skilled-Teacher-Workforce_September-2014_9-25.pdf
- Whitebook, M., King, E., Philipp, G., & Sakai, L. (2016). Teachers'Voices: Work Environment Conditions That Impact Teacher Practice and Program Quality. Center for the Study of Child Care Employment, University of California at Berkeley. Retrieved October 30, 2022, from <https://cscce.berkeley.edu/wp-content/uploads/publications/2016-Alameda-SEQUAL-Report-FINAL-for-Dissemination-v2.pdf>
- Whitebook, M., McLean, C., & Austin, L. J. (2018a). *The workforce data deficit: Who it harms and how it can be overcome*. Center for the Study of Child Care Employment, University of California, Berkeley. Retrieved October 30, 2022, from <https://escholarship.org/content/qt1tj0w0gh/qt1tj0w0gh.pdf>
- Whitebook, M., McLean, C., Austin, L. J. E., & Edwards, B. (2018b). *The early childhood workforce index - 2018*. Berkeley, CA: Center for the Study of Child Care Employment, University of California, Berkeley. Retrieved October 30, 2022, from <https://cscce.berkeley.edu/files/2018/06/Early-Childhood-Workforce-Index-2018.pdf>
- Whitebook, M., & Ryan, S. (2011). *Degrees in context: asking the right questions about preparing skilled and effective teachers of young children*. National Institute for Early Education Research.
- Whitebook, M., & Ryan, S. (2021). Supportive environmental quality underlying adult learning (SEQUAL). Berkeley, CA: Center for the Study of Child Care Employment, University of California. Retrieved September 25, 2022, from <https://cscce.berkeley.edu/services/sequal/>

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