

Measuring Early Care and Education Quality

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Key words: *child care quality, early childhood education*, [AU: Please add one or two additional key words—e.g., early childhood education]

Abstract

High-quality early care and education (ECE) programs are thought to increase opportunities for all children to succeed in school, but recent findings call into question whether these programs affect children as anticipated. In this article, I examine research relating the quality of ECE to children's outcomes, finding that child outcomes are sometimes modestly associated with widely used measures of process and structural quality and more consistently and strongly associated with other dimensions of ECE such as curricula and type of ECype. I discuss why the associations between ECE quality and outcomes are so modest, including limited children's outcomes, psychometric issues with quality measures, and a need to revise and expand measures of ECE quality. The evidence indicates that we need to focus on the content of instruction and teaching practices, as well as the extent to which teachers actively scaffold learning opportunities. We also need to continue to focus on the quality of interactions between teachers and children, and on children's access to age-appropriate activities.

Early care and education (ECE) programs are implemented widely based on extensive evidence that high-quality ECE can enhance early learning and development for all children, with larger impacts for children whose families are poor or speak language other than English at home. (1). However, recent findings raise questions about whether ECE programs developed using current standards for quality for ECE produce the anticipated impacts for children (2). In this review, I examine ECE quality models in the context of developmental theories and the evidence relating children's outcomes to dimensions of ECE quality such as process and structural quality, type of ECE program, and curricula. Then I discuss explanations for associations that are weaker than expected, possibly due to limits in the conceptualization and measurement of ECE quality, and recommend revising and extending measures of ECE quality.

Models of ECE Quality

Socioecological, attachment, and learning theories guide models of ECE quality. According to socioecological theory, bidirectional interactions between children and their environment shape children's development in terms of many environmental systems, from the proximal family system to more distal community systems (3). The quantity and quality of interactions between a young child and his or her primary caregivers, including ECE providers, are the most important factors in early development, and are influenced by proximal and distal systems. Attachment theory argues that frequent, consistent, and sensitive interactions with caregivers create a secure base for the child, promoting social-emotional adjustment and approaches to learning (4). Piaget's constructivist learning theory suggests that cognitive skills develop through deep engagement in age-appropriate activities in the environment (5). Vygotsky's sociocultural learning theory argues that children's development is optimized when a

more skilled partner guides children in addressing slightly difficult tasks, extending children's knowledge and competence (6). All these theoretical frameworks focus on the quality of the relationship between the caregiver and child, and vary in terms of their focus on access to age-appropriate activities and the role of adults in scaffolding.

Current models of ECE quality are based on these developmental theories, perhaps articulated most clearly by the National Association for the Education of Young Children (NAEYC; 7). NAEYC outlines five guidelines for practitioners:

- 1) sensitive and responsive caregiving, in which caregivers [AU: Is there a word missing here?], including setting clear and reasonable limits and listening to and acknowledging children's feelings;
- 2) intentional teaching that involves understanding desired goals for instruction, scaffolding each child's learning, and incorporating the child's cultural and linguistic background into teaching and all interactions with children;
- 3) using a curriculum for instruction;
- 4) monitoring children's progress and differentiating instruction to match children's skills, and
- 5) establishing reciprocal relationships with families.

At the center of this model of ECE quality are the interactions between the caregiver and the young child, labeled *process quality*. The level of emotional support and intentional teaching provided by the caregiver is thought to promote early social and cognitive development (8). The current ECE model suggests that early development is influenced directly by process quality and indirectly by characteristics of the ECE program and of teachers, labeled *structural quality* (9). These structural factors are viewed as necessary, but insufficient, for higher process quality.

They include factors such as ECE providers' education and training, the ratio of children to providers, group sizes, providers' wages and benefits, the leadership and administration of the ECE setting, parental involvement, inclusion of children with special needs, and inclusion of the home language and culture in the setting (10). Simplistically represented, this ECE model suggests these causal links: structural quality -> process quality -> children's outcomes.

Researchers have used this model extensively to examine the association between ECE quality and children's outcomes, and their findings have contributed to funding public ECE programs and policies (1, 9). Implicit in these policies is the assumption that improving structural or process quality improves children's outcomes indirectly or directly, respectively. Next, I discuss the evidence for this model. I suggest that children's outcomes are related modestly to measures of process quality and related more strongly to other ECE dimensions. In the final section, I suggest ways to extend how ECE quality is measured.

Research on ECE Quality and Children's Outcomes

Process Quality

Measures of ECE quality are based on theoretical models, two of which are used worldwide. Based on ecological, attachment, and social-cultural developmental theories, the Classroom Assessment Scoring System (CLASS; 11) assesses the level of responsiveness and sensitivity of caregivers (labeled *emotional support*), the extent to which teachers provide and scaffold in-depth learning (labeled *instructional support*), and the overall organization of the classroom that teachers provide (labeled *classroom organization*; 8). Consistent with the socioecological, attachment, and constructionist models, the Environmental Rating Scales (ERS)

measure ECE quality in terms of access to enriching activities, supportive teacher-child interactions, and a healthy and safe environment (12).

In observational and quasiexperimental studies involving single and multiple sites, these measures of ECE quality are associated significantly with children's outcomes (c.f., 9). Most research conducted in the United States and worldwide in the last 10 to 15 years reported statistically significant, albeit modest, associations between some measures of ECE quality and some children's outcomes, with effect sizes typically less than .1 and often less than .05 (9). Studies conducted in the United States using more rigorous methods to address selection bias reported very modest or null associations in meta-analyses (10, 17) and large sample studies (18, 19). The observed associations were sometimes larger in threshold studies that asked whether ECE quality was a stronger predictor in preschool classrooms with moderate to high levels of teacher emotional or instructional support for children than in classrooms with low levels of teacher support (c.f., 20). Even in higher-quality classrooms, most effect sizes tend to be modest (20). While these findings may be conservative because the U.S. studies were typically of ECE programs with performance quality standards that ensured group size, ratios, and high standards of teacher education, the nationally representative Early Childhood Longitudinal Survey – Birth Cohort (ECLS-B) sample did not yield significant associations between ERS and any children's outcomes (10).

Researchers have reported somewhat larger effect sizes in international studies relating preschool quality to children's outcomes. Aside from the nations in Northern Europe, most countries have fewer regulations and lower quality overall in their ECE programs than in the United States. In Chile (21), Finland (22), China (23), and Portugal (24), associations ranged from null to modest in studies that examined linear association, and ranged from null to moderate

in threshold studies estimated associations separately for higher- and lower-quality classrooms (21).

The supplementary materials available online summarize the findings from these U.S. and international studies in terms of effect sizes that estimated anticipated differences in outcomes in standard deviation units related to a one standard deviation gain in ECE quality. ECE quality was related modestly to children's outcomes, with linear effect sizes that ranged from -.04 to .19. Of the 53 linear associations, 10 differed statistically from zero and 5 were .10 or larger. Stronger associations between observed quality and children's outcomes were seen in countries with lower-quality center care (e.g., China and Portugal) and classrooms with higher quality in threshold analyses (19-21).

Furthermore, mixed findings regarding these associations emerged in recent studies, with some rigorous quasiexperimental studies finding somewhat larger effect sizes (13). In experimental studies that manipulated other factors, process quality and children's outcomes changed, and in studies that manipulated process quality, one of many children's outcomes also changed (c.f., 8). However, in recent experimental studies that manipulated process quality, no children's outcomes changed, despite large increases in ERS (14) or CLASS (15, 16).

Structural Quality

Implicit in testing the ECE model is examining associations between structural quality and children's outcomes. Researchers have reported modest to moderate effect sizes in children's outcomes for the following structural quality factors: fewer children per teacher or smaller group sizes (e.g., 18), higher levels of teacher education (e.g., 25, but not in a large multistudy report; 26), use of inservice training (c.f., 9), and more supportive program administration and

leadership (27). Findings from a recent meta-analysis that related gains in children's outcomes to center-based preschool structural quality also appear in the supplemental materials, showing modest associations in language, reading, and math skills and in teachers' and directors' education, but not in teacher-child ratios and group size. Again, most studies looked at programs with performance standards such as Head Start or state pre-kindergartens, but analyses of the nationally representative ECLS-B data yielded somewhat similar findings, with statistically significant but modest ($d < .12$) associations between preschool math skills and teachers' and directors' education, and between larger (not smaller) group sizes and higher literacy and math skills.

Other ECE Dimensions

Evidence that other ECE dimensions have large effect sizes on children's outcomes, especially when process quality has modest effect sizes, suggests that more attention to those dimensions is warranted when evaluating ECE quality. These dimensions should be considered because either they affect [AU: what?] independently or our measures of process quality are too narrow to measure how they contribute to process quality. Two such ECE dimensions are ECE program type and curricula.

Program Type. Some of the largest impacts on children's outcomes have been in regression discontinuity evaluations of some of the strongest prekindergarten programs, with effect sizes ranging from .20 to greater than one (2). The strongest programs report larger impacts ($d > .50$) for dual-language learners and children from low-income families (1). While these prekindergarten programs also report high levels of process quality (28), the effect sizes of their child outcomes are substantially larger than the effect sizes in studies of associations

between process quality and children's outcomes. This indicates that current measures of process quality do not totally account for these prekindergarten impacts on children's outcomes.

Curricula. Increasingly, researchers have documented moderate to large impacts of curricula on children's outcomes. In studies, often randomized clinical trials, the use of evidence-based curricula, combined with aligned training or coaching, is related to substantial gains in children's literacy skills, with examples of effect sizes for a bilingual language curriculum of .39 to .94 (29), language curriculum of .27 (30), and literacy professional development programs of .91 to .99 (31). Similarly, large impacts have been reported for math curricula (e.g., effect sizes of .47 to 1.07; 32) and curricula that promote knowledge of emotions, executive functioning, and social skills (e.g., effect size of .63; 33). A prekindergarten program integrating an evidence-based literacy and math curriculum affected those domains significantly (effect sizes of .45 to .82) and affected executive functioning more modestly (effect sizes of .21 to .28; 34).

Not all curricula have had the anticipated impacts, especially on children's outcomes. In many evaluations of curricula, they were ineffective (c.f. 9) or did not have anticipated impacts. For example, in a study of Head Start's Classroom-based Approaches and Resources for Emotion and Social skill promotion (35), researchers contrasted three curricula that promoted social skills differently and tested whether each curriculum affected teachers' behavior and children's outcomes as expected. The three curricula had anticipated impacts on teachers' behavior but not on most children's outcomes.

Possible Explanations for Modest or Null Associations

Next, I discuss why children's outcomes might be associated only modestly with process quality and modestly or not at all with structural quality. I touch on increases in ECE quality,

limits in measures of children's outcomes, psychometric issues with measures of ECE quality, and limits in measuring current ECE models.

Increases in ECE Quality Over Time

Increased quality in ECE programs over the past 20 years, and subsequent reduction in variability, is one explanation for the markedly smaller associations between ECE quality and outcomes in recent than in earlier studies (25), but close examination suggests that increased statistical rigor is the more likely explanation. For example, the 1994 Cost, Quality and Outcome (CQO) study related ECE quality in child care centers to outcomes in 4-year-olds, with effect sizes of .21 to .24 (36). In contrast, more rigorous analyses of data collected at the same time yielded smaller effect sizes of .04 to .08 in National Institute of Child Health and Human Development Study of Early Child Care and Youth Development (SECCYD) (37), and .07 to .11 in higher-quality classrooms in threshold analyses of NCEDL (38). The CQO, SECCYD, and NCEDL studies were conducted at the same time and reported similar variances in their measures of ECE quality, but CQO included far fewer covariates. Thus, smaller effect sizes over time seem to be the result of more rigorous analytic methods.

Limits in Measures of Children's Outcomes

Batteries in most studies of ECE quality or ECE programs have been criticized for focusing too much on rote skills and too little on higher-order skills (39, 40). In a comprehensive review (41), rote skills such as early literacy and numeracy skills learned through direct instruction differed from higher-order skills such as oral language acquired through extended

scaffolded interactions with caregivers. The authors of the review argue that developing higher-order skills should be a higher priority for subsequent academic skills because higher-order skills predict later academic skills most robustly (41). Similarly, in another study (40), self-regulation and executive functioning skills predicted subsequent academic and social skills more successfully than either rote academic or vocabulary skills. However, studies of ECE often include brief, widely used measures of literacy, numeracy, and teacher ratings of social-emotional adjustment that fail to assess these self-regulation and higher-order cognitive skills. While associations among ECE quality and vocabulary, executive functioning, and social-emotional adjustment could reflect hypothesized impacts on these skills, the ECE literature has tended to examine hypothesized impacts on rote skills such as early literacy and math assessments.

Psychometric Issues with ECE Quality Measures

Researchers have identified psychometric issues with measures of ECE quality. Some cite concerns with interrater reliability standards that certify data collectors as reliable when they and a trainer rate 80-85% of the items on the ERS or CLASS as having the same score or a score within one point of each other. The item standard deviation often is one or less, so this certification criterion is certifying data collectors even when they score as much as standard deviation higher or lower than the trainer on all items. This almost certainly creates considerable variability among certified raters. The proportion of variance attributable to raters was estimated using data from Head Start's monitoring system when raters were certified based on agreement within one point of the trainer and on North Carolina's state prekindergarten evaluation when raters were certified based on agreement that accounted for chance agreements

related to the small standard deviations. (42). Variability among raters accounted for 40-45% of the variance using standard certification criteria (agreement within one point) and for 5-25% of the variance using the approach that accounted for chance agreements.

Others have raised questions about the items in these widely used scales. Low levels of variability on the items on the ECE quality scales make it difficult to distinguish among most classrooms, thereby reducing the usefulness of the ECE quality scores. Existing scales are very good at differentiating the very good from the very bad classrooms, but are less useful for distinguishing among the many classrooms with similar scores in the midrange. It would be useful if scales could make more nuanced assessments, distinguishing among these classrooms. Spreading out the scores of the 70-80% of classrooms that score in this midrange would be useful for more effective quality improvement and would likely resolve some of the problems with inter-rater reliability. . In general, underestimation of effect sizes due to psychometric issues in measures of ECE quality may be part of the problem, but associations between quality and outcomes remain modest even when corrected for reduced reliability (43).

Limits in Measuring Current ECE Models

Measurement issues in assessing both ECE quality and children's outcomes have likely limited our ability to estimate associations between ECE quality and children's outcomes, but our current ECE measures should also be extended, especially if they are to change academic and cognitive outcomes. Measures of ECE quality do not assess the content of what is taught and other dimensions of ECE quality. The NAEYC's position paper (7) includes dimensions of ECE quality that are not assessed in widely used measures of ECE quality, including evidence-based developmentally appropriate curricula, scaffolded learning, progress monitoring, differentiated

instruction, and family engagement.

The need for greater attention to the content of ECE activities and the level of scaffolded learning is suggested by the much stronger effect sizes in evaluations of prekindergarten programs and curricula than in observational studies of ECE quality. As described earlier, these evaluations of developmentally appropriate curricula within content areas yielded moderate to large impacts. These curricula involved engaging instructional activities with frequent scaffolded interactions between teachers and children, often in small groups (44). In a review of the literature (44), intentional teaching with a focus on sequenced content within engaging activities was identified as likely to produce larger impacts, especially when combined with the current focus on sensitivity of caregivers and access to activities.

Furthermore, according to the current ECE models, process quality mediates between structural quality and children's outcomes, but evidence supporting this part of the ECE quality model is limited. Modest indirect pathways from both teachers' education and class ratio at 36 months through observed teachers' sensitivity to children's outcomes were noted in the SECCYD (45), but not in analyses of the NCEDL 11-state study (18) or the meta-analysis of six other ECE data sets (see supplemental materials; 10). While these studies cannot address whether standards beyond those regulated by licensing and program performance standards are harmful, they suggest that further differentiation within the range typically observed may not be helpful. We need to continue examining pathways from structural quality to children's outcomes to inform policy and practice.

Looking Ahead

This review of research on associations between children's outcomes and both process and structural quality yields modest evidence for the widely accepted quality indicators. Based on this finding, models of ECE quality should include quality and content of instruction and the degree to which teachers actively scaffold learning, monitor children's progress and use that information to individualize instruction, and engage parents in their children's education, along with focusing on teacher-child interactions and developmentally appropriate activities. Ideally, measures of instruction would track the experiences of individual children, documenting the instructional content (e.g., measures for literacy could include categories such as phonemic awareness, letter knowledge, read alouds), level of instruction (e.g., focusing on rote to higher-order learning), level of teachers' talk and scaffolding with target children (e.g., from direct questions with binary responses to elaborated decontextualized conversations), and type of activity (e.g., large group, small group). Young children need warm, sensitive interactions with teachers and positive classroom management to thrive, but they also need scaffolded interactions with rich, extended conversations to acquire the language, self-regulation, and executive functioning skills that lay the foundation for school success.

Perhaps the most challenging aspect of extending the measurement of ECE quality is the current policy focus on ECE quality. Parents and government are deeply invested in ECE programs designed to provide high-quality care for children, especially children from low-income families. These policy initiatives are based on the measures—both structural and process quality—I have examined, and results suggest that they may be insufficient to meet policy goals. Despite the modest associations between the somewhat narrow children's outcomes and the process quality measures with psychometric problems (e.g., substantial rater effects), we should not simply discard all current standards and professional development associated with these

measures. Instead, we should rethink the focus on whole-child curricula and professional development based on measures of ECE quality—unless rigorously designed studies demonstrate their effectiveness. Ideally, models of ECE quality would be extended to include evidence-based curricula and professional development that focus on teacher-scaffolded learning through rich conversations and hands-on activities designed to promote young children’s unconstrained skills.

Author's Note

Some of the work reported in this article was conducted with funding from U.S. Department of Health and Human Services, Administration for Children and Families, Office of Planning, Research and Evaluation: Contract Number HHSP23320095642WC, awarded to Mathematica Policy Research and partners Child Trends and the University of North Carolina-Chapel Hill, Institute for Education Sciences, and the *Eunice Kennedy Shriver* National Institute of Child Health and Human Development of the National Institutes of Health under Award Number P01HD065704. The content is solely the responsibility of the author and does not represent the official views of these funders. Thanks to Sarah Wackerhagen for her assistance preparing the manuscript.

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