Quality in Early Education Classrooms: Definitions, Gaps, and Systems

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Summary

Parents, professionals, and policymakers agree that quality is crucial for early education. But precise, consistent, and valid definitions of quality have been elusive. In this article, Robert Pianta, Jason Downer, and Bridget Hamre tackle the questions of how to define quality, how to measure it, and how to ensure that more children experience it.

Definitions of quality in early education, the authors write, generally include four aspects. The first is a program's structural elements, such as length of the school day or teachers' qualifications. The second encompasses general features of the classroom environment, ranging from playground equipment to activities involving staff, children, or parents. Third are the dimensions of teacher-student interactions that children experience directly. Finally, aggregate indices—such as *quality rating and improvement systems*—combine measurements across types of program elements.

Pianta, Downer, and Hamre find very little evidence that programs' structural features influence children's development. Instead, they zero in on teacher-student interactions—characterized by teachers' sensitivity to individual needs, support for positive behavior, and stimulation of language and cognitive development—as a key indicator of classroom quality that appears to benefit all children from prekindergarten through third grade.

Teachers' interactions with children can be significantly and systematically improved through targeted and sustained professional development. Yet efforts to improve the quality of such interactions at scale and to ensure that quality remains consistent from prekindergarten through third grade have so far been ineffectual. If we accept the evidence that direct experiences within classrooms are the best indicators of program quality, the authors argue, then the next wave of science and policy must refine and advance the definition, measurement, production, and consistency of these experiences in early education.

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The authors wish to thank Shannon Reilly for editorial contributions to this article, and Amanda Williford, Andrew Mashburn, Jennifer Locasale-Crouch, and Joseph Allen for conceptual and technical contributions to the research on teacher-student interactions.

Martha Zaslow of the Society for Research in Child Development reviewed and critiqued a draft of this article.

In this article we describe efforts to define, measure, and promote quality in classrooms that serve young children from preschool to third grade (pre-K–3). Parents, professionals, and policymakers agree that quality is important in early education. But definitions of quality vary. In preschool, many features are bundled together as quality, including adult-child ratios, teachers' qualifications, length of the school day, curriculum and materials, and aspects of teacher-student interaction. In kindergarten to third grade (K–3), *quality* most often refers to teachers or schools, or is defined in terms of student achievement. The preschool and K–3 systems don't have common definitions, measures, or reference points for discussing quality, and that confuses efforts to increase early education's impact on children's learning. Scholars and educators agree that quality in early education matters, but precise, consistent, and valid definitions have been elusive. We must solve the issues of definition and measurement so that our focus on quality can improve children's development and learning across the critical early years.

Defining Quality in Early Education

Definitions of quality in early education generally include four aspects: a program's structural elements; features of the classroom environment; the dimensions of teacher-student interactions that children experience directly; and aggregate indices, such as quality rating and improvement systems, that combine measurements across types of program elements. Structural elements include the length of the school day, teacher training, and teacher-student ratios; these can be viewed as preconditions that set the stage for more direct experiences that foster children's learning. Features of the classroom environment might include cleanliness, learning and play materials, the daily schedule, and how the setting is arranged. Teacher-child interactions encompass teachers' behavior, language, and emotional warmth and tone as they conduct activities and manage the classroom. Interaction processes are inherently dynamic, of course, and may vary according to such factors as a given child's preferences; the teachers' knowledge, skills, or mood; and organizational features such as school leadership.

Structural Elements of Quality

Policymakers face pressing decisions about where to invest resources in educational programs. Often, they apply the minimal standards recommended by professional organizations. When it comes to structural elements in preschool programs, the American Public Health Association and the American Academy of Pediatrics, the National Association for the Education of Young Children, and the National Institute for Early Education Research have all recommended standards that have shaped investments.[1] The National Governors' Association, federal and state education departments, and teachers' unions have also created educational standards for kindergarten through third grade. Among the dozen or so structural elements included in most standards, those most often considered are teachers' qualifications and teacher-student ratio. The research on elements of structural quality in early learning indicates the following:

1. Prekindergarten and kindergarten class sizes above 20 are generally associated

with poorer outcomes for children, even after controlling for factors such as family income that may correlate with large class size.[2]

2. The duration of children's exposure to a program matters.[3] Children enrolled in full-day preschool (typically 6 to 6.5 hours a day, 5 days a week, and 180 days a year) achieve greater learning gains both in preschool and in kindergarten than children enrolled in shorter programs.

3. The evidence on whether a teacher's degree and certification make a difference is murkier. For lead teachers, credible research supports the hypothesis that a bachelor's degree leads to higher-quality teaching, though it also supports the hypothesis that a BA doesn't *ensure* effective teaching.[4] Retrospective analyses indicate that state prekindergarten programs that show promising impacts on student learning in elementary school (for example, those in North Carolina, Maryland, and Pennsylvania) all require teachers to have a BA, but this evidence doesn't prove a causal link.[5]

The structural elements of programs from prekindergarten through third grade vary considerably. Most state prekindergarten programs limit class size to 20 or fewer children; in 2011–12, the average elementary school class size in the United States was 26, with some states averaging more than 30.[6] As for the duration of the school day, children are much more likely to attend full-day programs in kindergarten through third grade than in preschool. Reforms in the past decades have dramatically increased the number of full-day kindergarten classrooms. In 1977, only 28 percent of kindergarteners attended a full-day program; by 2013, the number was 77 percent.[7] In contrast, many state prekindergarten and Head Start programs still last only half a day, although recent Head Start policy changes may push programs to add hours.

To be certified to teach K–3 children, nearly all states require a bachelor's degree (many call for a master's degree) and some level of specialized training. More than 95 percent of teachers in K–3 classrooms meet these criteria (shortages exist in urban districts and states with rapidly growing populations). In state-funded prekindergarten programs, minimum requirements range from a Child Development Associate certificate to a master's degree; only 30 of 53 state prekindergarten programs reviewed by the National Institute for Early Education Research required a BA.[8] In Head Start, almost 70 percent of lead teachers have a BA. Family- or center-based child-care programs are much less likely to have credentialed or degreed teachers.[9]

Building full-day programs with small class sizes and well-qualified staff can set the stage, but it doesn't ensure effective process quality and positive outcomes for children. Observational studies of programs from preschool to third grade show that even when classrooms meet the structural standards for quality (a full-day program, small classes, and fully credentialed teachers), teacher-student interaction is highly variable and low-quality instruction is common.[10]

General Features of the Classroom Environment

In the past few decades, researchers have used a suite of observational measures to assess various features of early education classrooms.[11] The most common is the Early Childhood Environmental Rating Scale–Revised Edition (ECERS–R), which

captures a range of features, from playground equipment to hygiene (for example, the staff's hand-washing) to interactions among staff, children, and parents.[12] The ECERS is the standard measure of quality to which others are compared, at least in early education.[13] A version of ECERS for elementary schools exists but isn't used often, so parallel K–3 data are uncommon.

ECERS's role as a measure of quality was supported by results of the Cost, Quality and Outcomes (CQO) Study conducted in 151 for-profit and nonprofit child-care centers across four states during the early to mid-1990s. Among a sample of 757 preschoolers, higher ECERS ratings predicted stronger academic skills—but most of the children attended programs that were rated mediocre or worse.[14] The ECERS–R has been included in a number of large-scale early education studies, including the National Institute of Child Health and Human Development's Study of Early Child Care and Youth Development, the Head Start Impact Study, the Multi-State Study of Pre-Kindergarten by the National Center for Early Development and Learning (NCEDL), and the Head Start Family and Child Experiences Survey. The evidence from these large-scale longitudinal studies (that is, studies that follow children over time), and from smaller intervention studies, has generally confirmed the findings of the CQO Study: that is, that the ECERS–R provides modest positive prediction of child outcomes.

More recent studies have evaluated specific components of quality assessed by the ECERS-R. These studies detect stronger associations for the ECERS–R indicators that reflect teachers' language and social behaviors.[15] A secondary analysis across four large-scale longitudinal studies (including NCEDL and CQO) examined partial correlations between the ECERS–R and child outcomes.[16] Controlling for background characteristics, partial correlations indicated positive (though modest) relations between the ECERS–R and preschool children's gains in academic, language, and social skills. Another recent study drew from the nationally representative Early Childhood Longitudinal Study–Birth Cohort (ECLS–B) to examine relations between the ECERS–R and children's academic, language, and socio-emotional functioning at age five.[17] After employing a rich set of controls, researchers found no evidence of a linear association between the ECERS–R and child outcomes in the whole sample. Nor was there any evidence that higher levels of quality improved growth in outcomes for low-income children.

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The ECERS has played a major role in early education program accountability and quality improvement, thanks to regulations and investments in aspects of quality measured by the ECERS-R. These have helped raise ECERS scores in child care and in Head Start, where scores have gradually increased nationwide, undoubtedly improving

children's experiences and enhancing their safety. Higher ECERS scores may also have contributed to benefits measured in aspects of children's development during earlier studies (such as CQO). But recent studies suggest that as programs have gotten up to speed on ECERS-defined quality, and as the variation among programs has decreased, links between early childhood education programs' ECERS scores and child outcomes may have weakened.[18] The latest studies suggest that the ECERS elements that best predict child outcomes are those related to teacher-student interactions. Not surprisingly, the new version of the rating scale, ECERS-3, puts more emphasis on these interactions. But research has yet to show that the ECERS-3 is more closely linked to child outcomes.[19]

Teacher-Student Interactions

There's a growing consensus that teachers' daily interactions with students are among the most important ways to foster child development in prekindergarten through third grade. When large-scale, longitudinal randomized controlled studies have examined the various indicators of quality (that is, structural elements, features of the physical environment, and interactions with teachers and peers), children's interactions with teachers have shown unique and positive associations with learning gains.[20] The same general pattern also appears in studies of K–3 classrooms.[21] Although the size of the effects in these studies tends to be small, teacher-student interactions hold up as significant predictors, even after controlling for numerous other family and school factors.

Unfortunately, few children consistently experience effective interactions with teachers. To begin with, children's interactions with teachers are sparse. According to data collected on state-funded prekindergarten programs in 10 states, children interacted with an adult only 27 percent of the time on a typical day.[22] It's a similar story for children in informal child-care settings and in kindergarten.[23] And in one of the few large-scale observational studies of US elementary classrooms (covering more than 800 classrooms in first, third, and fifth grades), the typical child interacted with a teacher for only four minutes each hour.[24] Although most teachers are busy all day interacting with children, the individual child has a different perspective: interaction with the teacher, whether one-on-one or in a small group, is the exception rather than the rule.

As for the quality of these interactions, research suggests that early childhood classrooms are moderately positive social settings for children. However, they're quite passive when it comes to whether teachers stimulate children's thinking and help them develop knowledge and concepts.[25] Instructional support is generally low for teachers in pre-K–3 classrooms, and it's even lower for teachers who work with disadvantaged students.[26] There are exceptions: some programs have worked to improve interactions, typically with aligned and focused professional development for teachers.[27] But most teachers continue to emphasize basic skills, assigning their students tasks requiring a discrete answer that's either right or wrong, rather than posing more ambiguous challenges that elicit analysis, reasoning, or problem-solving.

Most studies of teacher-child interaction were conducted in highly regulated state and federal early childhood programs, so these results may actually overestimate the

quality of teacher-student interactions in the broader world of public and private child-care centers and family child-care homes. For example, when a mix of state prekindergarten, Head Start, and child-care classrooms were observed in rural North Carolina and Pennsylvania, the programs scored lower on social and organizational aspects of teacher-student interactions than did Head Start or state prekindergarten.[28]

Moving up from prekindergarten to K–3 reveals a similar pattern. A study that drew on data from more than 4,000 prekindergarten through fifth-grade classrooms found that the quality of teacher-student interaction in elementary-school classrooms was consistent with that of prekindergarten. There was one exception, however: instructionally supportive interactions (such as asking open-ended questions to promote conceptual understanding, or providing specific feedback) tended to be somewhat higher on average in elementary school than in prekindergarten.[29] In the Study of Early Child Care and Youth Development, interactions that facilitate higher-order thinking and conceptual understanding were rated on a seven-point scale, in which 1–2 meant low quality, 3–5 meant mediocre quality, and 6–7 meant high quality. Ratings ranged from 1.85 to 2.90 in several prekindergarten and kindergarten samples, and from 2.11 to 3.61 in first- through fifth-grade classrooms. (Ratings of 5, 6, or 7 for instructional quality are fairly rare, and ratings of 3 and 4 are consistently associated with higher levels of student achievement.) The pattern of observing higher cognitive stimulation in elementary schools than in prekindergarten has also been found in more recent studies of first- through third-grade classrooms.[30]

Many studies that consider multiple domains of interaction simultaneously have also found that the quality of interactions varies markedly, ranging from sensitive and stimulating to harsh and dismissive. In the NCEDL study of state prekindergarten programs, only 15 percent of classrooms demonstrated high-quality interactions in both emotional and instructional support, whereas 19 percent scored well below the mean on almost all dimensions of emotional, organizational, and instructional supports.[31] Poor and African-American children are more likely to experience less-effective interactions in early childhood programs.[32]

Quality Rating and Improvement Systems

Quality rating and improvement systems (QRISs), which aggregate separate indicators of quality, play a prominent role in documenting and improving the quality of early childhood programs. Their guiding framework presumes that the ratings will create a local market for quality as parents seek higher-rated programs and that in this way, more children will experience high-quality programs that improve their readiness for school.[33]

Most QRISs rate programs according to an assortment of quality indicators, and then create a composite to produce an overall rating. These composite ratings are communicated to parents, and they can also trigger financial incentives and investments in improvement. The use of QRISs has expanded greatly, thanks in part to federal funding through the Race to the Top Early Learning Challenge Grants. In 2010, 26 states and communities employed a QRIS.[34] Today, all but a few states are either implementing or planning to implement such a system.[35]

The underlying assumption is that programs with high QRIS ratings will produce better outcomes for children, but that isn't well documented by research. Studies of several quality rating systems and the indicators they comprise demonstrate that although a few of the assessments aggregated to produce QRIS ratings are associated with children's learning outcomes, the ratings themselves are not.[36] These rating systems are complex, due to the large number of quality features, arbitrary cut points, and the method used to aggregate the quality indicators. Such factors may undermine the extent to which these measures predict children's learning. This limited evidence suggests that caution should be used in developing and deploying QRISs, since large investments in such systems may not lead to notable improvements in child outcomes. Experimentally controlled studies suggest that targeting specific aspects of quality—such as interactions and curriculum—is a more promising way to increase children's knowledge and skills.[37]

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Interactions Matter

Researchers have conducted hundreds of studies of children's development that focus on different aspects of quality. Not surprisingly, these studies have produced mixed evidence about the extent to which quality is directly associated with, or causes, children's developmental progress. In the studies with the largest samples and the strongest designs for causal inference, the size of any quality effects on learning has been modest. When researchers have examined several types of quality together (for example, structure, classroom features, and teacher-child interactions), they've found the most evidence for positive effects from aspects of quality that children experience directly, such as teacher-child interactions and the availability of stimulating learning materials.[38] And very little evidence has been found to support the hypothesis that structural features influence children's development.[39] In the remainder of this article, we more fully examine the research on teacher-child interactions and discuss how newer research may influence the way we conceptualize and measure quality in prekindergarten through third grade.

Teacher-student interactions—characterized by teachers' sensitivity to individual needs, support for positive behavior, and stimulation of language and cognitive development—are a key element of classroom experience that appears to benefit all children across the pre-K–3 span.[40] Children learn more when teachers emphasize conceptual understanding, give feedback that extends students' skills, and engage children in conversation.[41]

Longitudinal studies offer important insights into how teacher-student interactions can affect children. A recent longitudinal study of more than 1,000 children in rural schools found that in both prekindergarten and kindergarten, children whose classrooms were more emotionally supportive and better managed demonstrated stronger social skills and fewer behavior problems the next year than did children in lower-quality classrooms.[42] And those early experiences with teachers appear to have a lasting

influence. In the Study of Early Child Care and Youth Development, children who experienced more responsive teaching in early childhood demonstrated better cognitive and academic achievement and fewer outward-directed problems through elementary school and into adolescence.[43]

Recent work in a variety of international settings—including Central and South America, Europe, and Asia—has also shown that teacher-child interactions support development and learning. In a large-scale study of classroom quality and child outcomes in rural Ecuador, children in the first two years of schooling (ages six and seven) were assigned randomly to teachers. The children's academic skills improved more when they were assigned to classrooms in which teachers demonstrated particularly high levels of instructional support.[44] Studies in Chile, Finland, and Portugal produced similar findings.[45] Although the nature and magnitude of the associations between teacher-child interactions and student outcomes varied across these studies, there's growing evidence that elements of these interactions are important for children's learning across a wide spectrum of settings and cultures, and perhaps represent a universal resource for children's development.

Vulnerable children (such as those who come from low-income families, are dual language learners, or have problems with self-regulation) benefit more from effective teacher-student interactions than children who have more resources at their disposal.[46] And children reap the most academic benefit from effective teacher-student interactions when they're exposed to such interactions for a number of years.[47] Emerging evidence also suggests that the quality of teacher-student interactions can either reduce or increase children's susceptibility to developmental risks. For example, children who demonstrated high physiological and behavioral reactivity in first grade performed better than expected when they were examined for mental health symptoms as teenagers if they had experienced more positive teacher-student relationships. Meanwhile, their counterparts who experienced negative teacher-student relationships fared much more poorly.[48] And children with a history of being anxious and withdrawn have poorer outcomes (for mood, social skills, and peer rejection) when their classrooms lack emotional support.[49]

In the studies we've discussed, the size of the effects associated with teacher-student interactions has typically been modest; at least one recently published study found no consistent associations.[50] Most published studies have used only statistical controls to reduce or adjust for what are called *selection effects*—primarily, the concern that higher-achieving children may be pushed toward classrooms whose teachers display high-quality interactions. However, evidence from recent intervention studies and random assignment studies demonstrates a more compelling causal link. For example, when teachers improve their practices after being trained and coached in teacher-student interactions, the children in their classrooms benefit academically, socially, and behaviorally.[51]

Other evidence for a causal link between interactions and development comes from large-scale studies that randomly assigned children to classrooms to evaluate how the classrooms affected achievement and development. Two such studies have found significant associations between children's

learning and their exposure to interactions.[52] One of them, conducted in first- and second-grade classrooms in Ecuador, estimated that teachers in the top 25 percent in terms of the quality of their interactions with students produced the equivalent of almost nine months more growth in their children's achievement over teachers in the bottom 25 percent.[53]

Processes Embedded in Interactions

Recent work suggests several areas that require more research before we can refine the theory and measurement of teacher-student interactions. These areas include the different ways individual children experience the same classroom; combining features of interactions with aspects of instructional activities and curricula; and the characteristics and capacities that help teachers enhance their skills in interacting with children.

Children's individual interactions with teachers. Most research on pre-K–3 classroom quality combines the experiences of all children, even though children in the same classroom approach learning differently.[54] Children's own attitudes also predict how well they'll adjust to school.[55] Young children who display positive emotions toward teachers tend to have better academic and social outcomes, even when controlling for the large number of other factors that could affect the results.[56] Children's engagement in classroom tasks and activities forecasts greater achievement in preschool and the early elementary grades.[57] The emerging focus on individualized experiences appears likely to refine our understanding of which aspects of a program affect all children and which ones depend more on the children's individual characteristics and behaviors.

Content of instructional interactions. It's increasingly clear that well-organized instructional content can itself support more effective teacher-student interactions.[58] For example, teachers following a particular mathematics curriculum aren't just exposing children to math; they're also interacting with children, and the curriculum's instructional activities can shape the way they do so. A curriculum or activity that focuses on rote learning (such as counting or recognizing shapes) leads a teacher away from open-ended questions that promote reasoning. Problem- or project-based activities, on the other hand, help teachers develop children's thinking and analysis skills. This type of instruction can occur not only in areas of traditional academic content but also when it comes to teaching social, emotional, and self-regulatory skills. Researchers have identified teacher behaviors that focus on *emotion content*—for example, emotion coaching, modeling of emotions, use and labeling of emotion words, and social problem-solving dialogues—and these instructional experiences are embedded in many social-emotional learning curricula.[59] Finally, we need to know more about which types of instructional interactions are critical for certain groups, such as children with disabilities or dual language learners, even though they might be unimportant for other children.[60]

Teacher capacities. There's growing interest in the personal capacities that can help teachers interact with children. A better understanding of these capacities could guide regulation, policy, and teacher preparation. Here we briefly describe two such capacities that have shown particular promise of increasing quality of interaction: teachers' ability to observe children's cues and teachers' regulation of their own stress and emotion.

Giving teachers opportunities to learn from seeing others teach effectively may be one way to improve quality.

Teachers' behavior involves real-time processing of the information they pick up in everyday classroom interactions. Presumably, teachers who process information more accurately will have better-calibrated interactions with regard to their students' individual and collective needs. One area of research focuses on teachers' skills in observing and analyzing their own practices and those of others, typically using video. An experimental study demonstrated not only that teachers' observation and video-analysis skills can be quantified, but also that these skills are associated with gains in the quality of observed teacher-student interaction and student engagement.[61] And in treatment-on-the-treated designs (which examine how variation of intervention experiences might contribute to the effects of the intervention within the treatment group), exposing preschool teachers to more video examples of effective teaching correlates strongly with improvements in the quality of their interactions with children.[62] Studies of teachers in older grades have documented that watching effective teaching can bring about effective teaching.[63] Giving teachers opportunities to learn from seeing others teach effectively may be one novel way to support improvements in quality from prekindergarten through third grade.

Teachers' skills in self-awareness, regulating their own emotions, and stress management may also shape teacher-student interactions.[64] Growing evidence supports a link between teachers' classroom behavior and their mood, stress, and emotional resourcefulness. When teachers experience negative emotions, stress, and burnout, their classroom interactions are less likely to be effective and their students are more likely to exhibit problem behavior.[65] Unfortunately, nearly half of all teachers leave the profession in their first five years, citing stress or burnout as the primary factor. And half the teachers who retire early name chronic occupational stress and mental or physical health problems as the reasons for their decision.[66]

Evaluations of interventions that use mindfulness-based stress reduction have demonstrated that teachers' emotional wellbeing can affect their interactions with students.[67] In a number of randomized controlled trials, training teachers in mindfulness techniques or yoga dramatically lowered their stress levels. The decrease in stress was accompanied by an increased ability to detect cues, greater cognitive flexibility, and more-positive interactions with students.[68] Further research on the links across physiological, psychological, and behavioral features of teacher-student interactions could target interventions more precisely to improve students' behavior and learning.

Conclusions

The past two decades have seen unprecedented public investment in early education: the expansion of kindergarten to nearly universal enrollment, a movement from half- to full-day kindergarten for many low-income children, the expanded enrollment of low-income children in state-funded public prekindergarten, and expansions of Head Start and Early Head Start. These investments have increased early

education opportunities for young children tremendously. At the same time, the evidence very strongly indicates that the early learning opportunities provided by these investments don't lead to the improved outcomes that could help bridge the achievement gap between low- and middle-income children simply by virtue of children's enrollment or exposure.

Equally compelling evidence shows that in both prekindergarten and K–3, programs vary in impact from locality to locality and from classroom to classroom, and programs with a greater educational focus have more impact.[69] Furthermore, although the strongest public prekindergarten or Head Start programs can significantly reduce achievement gaps, we have few examples of such superior programs and far too many examples of programs with marginal effects that wane as children grow older. Thus when trying to understand variation in impacts and how to develop, design, and scale up early education opportunities that truly put children on a path to success in school, the question of quality is very relevant.

We believe that quality is the right focus for research and program development. But we have yet to identify clearly which ingredients of early education opportunities will yield the most positive and pronounced impacts on children from prekindergarten through third grade. To the extent that research has identified such ingredients, the data point to children's direct experiences with teachers who engage them in learning activities that have educational and developmental value. If we take it as a given that the term *quality*, when applied to an educational opportunity, should involve a direct link between that opportunity and its intended outcomes, then the evidence supports defining quality in terms of these proximal classroom experiences and not through an amalgamation of structural features.

What do we know about quality as defined in terms of children's direct experiences in the classroom? We know that children's experiences are linked only loosely to regulations and the policy infrastructure intended to support programs (for example, finances and credentialing). We know that effective interactions with a teacher are unevenly distributed and difficult to produce at scale. We know that effective teacher-child interactions and strong, developmentally aligned curricula are not as readily available to low-income children as they are to higher-income children. We know that teachers' capacities to interact effectively with young children, in social and instructional forms, are tied to their own mental health and social supports. And we know that teachers' interactions with children and their ability to carry out educational activities can be significantly and systematically improved through targeted and sustained professional development.

But despite all that we know, efforts to improve quality at scale and to ensure consistency in prekindergarten through third grade have been ineffectual at best. And because education has a cumulative impact on children, we must take a multi-year perspective on quality as a first step toward ensuring gains that last for low-income children. An effective, high-quality program can close achievement gaps and noticeably contribute to a child's development in just nine months. But most children are lucky to get nine months of exposure to a high-quality program, and even those who do are unlikely to receive it for a second, third, or fourth year in succession. This lack of coherence and

consistency is a fundamental and egregious shortcoming in our current approach to early education.

Most children are lucky to get nine months of exposure to a high-quality program, and even those who do are unlikely to receive it for a second, third, or fourth year in succession. This lack of coherence and consistency is a fundamental and egregious shortcoming in our current approach to early education.

To build coherence in early education, we need both a clear definition of quality and scalable approaches to measuring and improving quality. If we want actionable results from the next phase of research to promote early learning for low-income children, it may not be helpful to ask the high-stakes question, "Does prekindergarten impact third-grade test scores?" Rather, we may need to analyze the conditions under which large, diverse communities build and implement early education *systems* that promote learning and reduce gaps. We suspect that if we anchored such an analysis in assessments of children's actual experiences with teachers over the entire pre-K–3 period, we would get a richer, more actionable set of results than we'd receive from yet another high-stakes evaluation of the impact of preschool (such as the Head Start Impact Study). We would also better understand how the intersection between curriculum implementation and supportive, cognitively enriching teacher-student interactions can affect children's exposure to content and instructional activities.

US states and the country as a whole lack a coherent approach to providing educational opportunities for low-income children across the span from preschool to elementary school. Thus our investments in these programs aren't optimized. Although the evidence so far doesn't strongly support the view that programs' structural features (such as teacher credentials) have significant or lasting impacts on children's learning, we recognize that programs do need thresholds for minimally acceptable elements of their infrastructure. It's striking that we have yet to agree on a set of minimal qualifications for adults who teach young children, whether they're teaching in private child care, Head Start, public prekindergarten, or public school K–3 classrooms.

There's also little agreement among policymakers on the performance standards that should be applied to teachers, or on how to measure those standards. In short, to the extent that teachers of young children play an essential role in fostering high-quality learning opportunities, pre-K–3 children can expect a stunning level of variation—both from year to year and setting to setting— in classroom experience and even in the basic qualifications of school personnel (such as their educational level).

How can we reduce such variation? There's growing evidence that well-designed curricula, coursework, and coaching can improve pre-K–3 teachers' instructional interactions with students in ways that promote children's development. Yet we need to know more about how these classroom

supports work together. Can a strong, evidence-based curriculum suffice to help young children learn, or must it be paired with professional development that promotes high-quality interactions in instructional activities and lessons? What's the ideal combination of these classroom resources to help young learners prepare for and excel in early schooling? These are pressing questions for research and for experimentation and innovation in policymaking and regulation. If we accept the evidence suggesting that direct experiences within classrooms are the best indicators of program quality, then the next wave of science and policy must refine and advance the definition, measurement, production, and consistency of these experiences in early education.

In terms of basic research, we would benefit from further differentiating among associations between quality inputs and child outcomes. Are there specific properties of teacher-student interaction or curriculum and instruction that have different effects on specific child outcomes? Are there optimal doses of these resources, and is there an optimal timing for children's exposure to them? From the policymaker's perspective, what are the best ways to structure and deliver support for teachers, to embed it in incentive structures, and to program it into career development paths? This knowledge will let us help the early education workforce acquire and deepen the skills that foster children's learning.

The evidence suggests that it's time to shift our attention to children's and teachers' everyday experiences in classrooms, and to put those experiences at the core of what we mean by quality in early education. That should be the starting point for the next generation of science, policy, and practice.

ENDNOTES

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