Implementation Development Map: Literature Review for High Quality Teaching

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Literature Review for High Quality Teaching (HQT)

In this document, we summarize our literature review on the High Quality Teaching (HQT) element of the Implementation Development Map (IDM). We start with an overview, then provide a bulleted list that summarizes the strength of support from professional/expert recommendations or the research literature, and we discuss whether the research speaks to equity. Following the detailed notes are two graphics that summarize, for each IDM indicator, the strength of (1) the research evidence and (2) the support from expert recommendations and professional best practices. The appendix describes our literature search and review process.

A. Overview

High Quality Teaching (HQT) is one of seven elements in the Implementation Development Map (IDM). HQT assesses high quality teaching and learning policies and practices at the pre-K state agency level. It also focuses on implementation at the classroom level. At the state level, HQT examines the role that educator competencies, credentials, and guidelines play in ensuring high quality teaching, and focuses on making resources available to support teachers. At the program level, it focuses on examining teacher quality by collecting data on children, teachers, classrooms, and programs. Like other elements of the IDM, the HQT element has two types of indicators: those about infrastructure at the state level (eight indicators) and those about implementation at the local level (two indicators). Infrastructure indicators focus on state policy, supports, and data systems to support high quality teaching. Examples are statewide standards, whether the state has a clear process for collecting data, and using data for the purposes of continuous improvement. Implementation indicators capture the degree to which high quality practices are taking place at the program or classroom level.

> **Definitions**
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> **Research strength** is based on the number of *high quality studies* with favorable effects on child or teacher outcomes.
> - High quality studies are those in which the design is strong enough to suggest that outcomes can be attributed to the intervention, practice, or policy that is being studied.
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> **Practice strength** is based on whether the indicator is supported by professional best *practices or expert* recommendations.
> - Professional best practice standards include the Head Start Performance Program Standards (HSPPS) and the standards set forth by the National Association for the Education of Young Children (NAEYC).
> - Expert recommendations are from the National Academy of Sciences, Engineering, and Mathematics (NASEM). ◢

At the request of the Bill & Melinda Gates Foundation, Mathematica conducted a systematic literature review focused on HQT. (The full methodology appears in the appendix.) For the HQT element, after screening the studies collected for the literature review, we identified and reviewed 69 studies published since 2001 to assess their quality and key findings (see References). For this element, 56 studies supported at least one IDM indicator. Although high quality research for some HQT indicators is limited, we caution readers against drawing conclusions about the inherent value of the HQT indicator The reader should not conclude that a lack of high quality studies means that the indicator does not have valuable, nuanced information to offer about how to strengthen state systems.

Because the IDM is a tool designed to improve state systems, we also determined which elements and indicators were supported by professional best practice standards and expert recommendations. (The box on the first page defines high quality, best practice standards, and expert recommendations; see the

appendix for full definitions and a description of how we rated these dimensions to determine the overall research strength and practice strength of each IDM indicator.)

The IDM tool explicitly embeds equity into the indicators to ensure state leaders continue to value diverse groups of teachers and learners and provides high quality learning opportunities for all children. In our literature review, we examined equity by describing and placing value on studies that include teachers and students with diverse characteristics. We have captured whether the samples in high quality studies with favorable effects include dual language learners (DLLs), children whose families have low incomes, and children and teachers of racially and ethnically diverse backgrounds. Research that explicitly addresses questions of equity is limited, however, despite its importance for state systems that serve children from disadvantaged backgrounds.

B.   Details of support for indicators

In this section, we describe the extent to which the research literature or the recommendations of professionals and experts supported the indicators. This description includes details about high-quality studies with favorable effects, the part(s) of the indicator supported by the study, and any themes in the results that concern outcomes of teachers and/or children. We report whether any studies are particularly relevant to a specific IDM indicator. We also report whether the research addresses equity, particularly whether studies were based on diverse samples or showed effects for certain groups of teachers or children. If there were no studies related to an indicator (Figures 2 and 4), we do not discuss it.

IDM HQT 1: State has adopted clear, research-based core competencies for pre-K teachers that include the following components:

- **Early childhood development and pedagogy specific to pre-K (adequate to teach to the early learning and development standards)**

- **Knowledge of strategies for assessment of learning and development for preschoolers**

- **Cultural competence, knowledge of dual language development and strategies that support the development of children who are dual language learners (DLLs)**

- **Knowledge of strategies that support the learning and development of children with developmental delays and disabilities in inclusive settings**

- **Family engagement and partnerships (e.g., creating formal structures for communicating around child progress, incorporating children's cultures and home languages in instruction and classroom activities, and collaborating with families to encourage children's use of their home languages at school to support multilingual and multicultural development).**

Practice strength:

- The professional recommendations support the indicator. The HSPPS note that all staff must demonstrate competency to ensure effective implementation and use of the standards in the Head Start Early Learning Outcomes Framework: Ages Birth to Five, as well as applicable state early learning and development standards. The Head Start Early Learning Outcomes Framework addresses all five components. The National Association for the Education of Young Children (NAEYC) and the National Academy of Science, Engineering, and Mathematics (NASEM) also both underscore the importance of established competencies. The expert recommendations partially support this indicator because while NASEM notes the importance of strengthening competency-based qualifications for all

early care and education professionals, they do not specify a specific framework that includes all the components of competency noted in the IDM.

IDM HQT 2: The state has policies and clear guidelines on the structural features of HQT such as teacher-child ratio, group size, number of hours for teaching dosage (e.g., children have access to year-round, high quality pre-K teaching at least six hours per day). The state monitors and collects data to ensure programs are implemented within these guidelines, and uses data to identify and understand inequities in access to high quality programs to provide resources and support to programs.

Practice strength:

- Both sets of recommendations partially support this indicator. Both sets of recommendations speak to the value of specific structural features of HQT, such as teacher-child ratio and group size. Both NAEYC and NASEM address the value of having small class sizes. Neither addresses teaching dosage, the degree to which the program should offer full-year programming, or the degree to which the state should monitor or collect data to ensure programs are implementing these guidelines and understand inequity in access

IDM HQT 3: State has comprehensive early learning development guidelines for pre-K that include the following components.

- **Approaches to learning and executive functioning**
- **Social and emotional development**
- **Language and literacy**
- **Cognition**
- **Perceptual, motor, and physical development**
- **Guidelines to incorporate considerations for DLLs**
- **Guidelines to incorporate considerations for children with developmental delays and disabilities across all domains.**

Practice strength:

- Professional recommendations fully support this indicator. The HSPPS include the Head Start Early Learning Outcomes Framework as an example of an early learning development guideline. NAEYC underscores that educators consider what children are expected to know, understand, and be able to do when they leave the setting. Expert recommendations partially support this indicator by noting that learning guidelines are critical for setting expectations of what young children should learn and understand. Guidelines give teachers directions to go in when developing activities and lessons that support these expectations. The guidelines should be comprehensive, covering multiple domains of development and learning. However, unlike HSPPS and NAEYC, NASEM does not specify the specific components of the early learning development guidelines.

IDM HQT 4: State licensure/ECE credit standards for early childhood teachers require the following components.

- **alignment with core competencies**

- **supervised early learning field experience**

- **competency-based assessment**

Practice strength:

- Both sets of recommendations partially support this indicator. Both sets of recommendations reinforce the importance of early childhood teachers meeting core competencies, but do not suggest that states offer credit for fieldwork experience or for getting training specific to competencies. Although the HSPPS require that half of the teachers in a program have a B.A., the HSPPS do not discuss competency-based qualifications. Expert recommendations identify and value early learning field experience, which would be offered alongside formal coursework. NASEM acknowledges the role that fieldwork plays in developing core competencies but does not suggest that states offer credit for fieldwork.

IDM HQT 5: State collects HQT data (e.g., on-site observations) at the program level with a valid and reliable classroom observation tool. State verifies that programs are using the data to inform improvement plans and track progress, and state uses the data to guide resource allocation and technical assistance to local programs and for continuous quality improvement.

Practice strength:

- Professional recommendations partially support this indicator. The HSPPS requires all classrooms to use the Classroom Assessment Scoring System (CLASS), which is a quality assessment tool. The NAEYC does not address whether high quality teaching should be assessed. The expert recommendations support this indicator. They note that federal and state policymakers and other key stakeholders should have more assessment procedures for early care and education staff that include assessing professional knowledge and competencies to improve professional practice.

IDM HQT 6: State provides effective and adequate resources (e.g., funding, written guidance, and training) to support teachers in the implementation of HQT. All resources are equitably distributed, meaning resources are allocated at a higher level, as appropriate, to educators based on their needs and the demographics and socioeconomic status of the populations they serve. For example, writing guidance is available in multiple languages and is Section 508 compliant, training is distributed regionally in various mediums, is accessible, and is available in multiple languages that represent the field. [1]

Practice strength:

- Both sets of recommendations partially support this indicator. Both professional and expert recommendations support the value of offering resources to professionals working with children. Training teachers is critical to their having the necessary preparation, knowledge, and skills in child development to promote children's learning. However, neither set addresses the fact that training and

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[1] The IDM specific indicator ratings define resources as funding, written guidance, and training. The IDM outlines the scale of emerging, developing, accomplished, and exemplary by examining the resources and the degree to which they are adequate and equally distributed, as defined by being available in multiple languages, being 508 compliant, and ensuring the resources are distributed regionally. We did not identify studies that examined whether providing those resources and distributing those resources equitably led to effects on child outcomes or program quality.

associated resources need to be allocated to educators on the basis of their needs and the demographics of the population they serve.

IDM HQT 7: State provides equitable, accessible, and effective written guidance and resource materials to support or deliver training that addresses the following range of topics to support lead and assistant teachers in the implementation of HQT.

- **Learning environments and materials**
- **Emotionally supportive and responsive interactions**
- **Positive behavior guidance**
- **Classroom schedules and effective use of time**
- **Instructional supports to promote understanding vs. rote learning, to guide learning through play, and to use questions, conversations, and feedback to extend learning**
- **Instructional strategies for specific content areas (e.g., social and emotional learning, math, science, literacy)**
- **Culturally responsive practices**
- **Supports for DLLs**
- **Supports for children with developmental delays and disabilities**
- **Partnering with families to create meaningful and effective learning opportunities at home and at school including incorporating children's cultures and home languages in instruction and classroom activities**

Research strength:

- Fifty-two studies with favorable effects on child, teacher, or classroom outcomes examined a wide range of approaches, curricula, or models that states could make available to programs to support high quality teaching. Most of the studies examined teacher training or coaching approaches, and many also examined a new curriculum paired with teacher training. Together, they showed that interventions covering a wide range of teaching domains—including academic instruction in language, literacy or math; behavior or classroom management approaches; and approaches that facilitate supportive teacher-child interactions, including teacher responsiveness to children—improved a variety of child, teacher, or classroom-level outcomes.

- Nearly all of the study samples are diverse. Most (38 of 52 studies) represent programs with high concentrations (at least 75 percent) of low-income students, racial/ethnic minority children (37 studies), or racial/ethnic minority teachers (28 studies). Dual-language learners were represented in 14 studies. In three of the studies, a program that coupled a curriculum with scaffolding or culturally and linguistically appropriate enhancements for dual-language learners and professional development for teachers improved teaching practices and/or students' vocabulary and phonological awareness skills.

Practice strength:

- Both sets of recommendations suggest that programs provide resources and training to teachers on a wide range of topics included in the IDM element related to highly qualified teachers. Both the

professionals, and the experts reinforce the value of providing teachers with supports and training to advance staff understanding and application of information in the classroom.

IDM HQT 8: With regard to state policies and practices around HQT, such as adopting core research-based teaching competencies and providing resources and support to teachers to implement HQT, the state collects data and disaggregates available data to understand equity issues. The state's efforts to understand and address inequity with regard to high-quality teaching include ongoing data collection, disaggregation of data, active discussions, data-driven decision-making, action planning, implementing, assessing implementation, and refining as needed. The state specifically collects data to understand and address the following components:

- **Variation in instructional quality across the state, by collecting program quality data on all pre-K programs and disaggregating by location**

- **Access to high-quality programs, and the barriers to attaining access, by collecting demographic data on children, including targeted populations**

- **Equitable distribution of resources that support implementation of HQT (e.g., funding, training, PD, human capital).**

Practice strength:

- The professional recommendations partially support this indicator. HSPPS supports the idea of collecting classroom quality data and assessing quality. However, there is nothing in their standards about equity per se. NAEYC does not describe the extent to which there should be a CQI process or that data should be collected at the classroom level to improve quality. Expert recommendations support this indicator. NASEM notes that strategies for improving outcomes and classroom quality can be informed by developing longitudinal data systems that are linked across early childhood providers and state agencies and can be disaggregated by age, gender, race/ethnicity, and socioeconomic status.

IDM HQT 9: Classroom quality is assessed using a research-based reliable and valid tool and classroom data collection protocols are standardized across the state. State can link data to gauge whether children identified as part of the most vulnerable populations (identified subgroups) are enrolled in the highest-quality programs, and use these data for resource allocation, training, and other improvement measures.

Practice strength:

- The professional recommendations partially support this indicator. HSPPS supports the idea of collecting classroom quality data and assessing quality using a research-based reliable and valid tool. However, there is nothing in their standards about equity per se. Expert recommendations support this indicator: NASEM notes that strategies for improving outcomes and classroom quality can be informed by developing longitudinal data systems that are linked among early childhood providers and state agencies and can be disaggregated by age, gender, race/ethnicity, and socioeconomic status. NASEM also notes that stakeholders should review and improve their current policies and systems for evaluation, including the assessment and observation tools. The intention is to assess not only children's progress but account for setting-level and community-level factors and embed data use to inform and improve professional practice.

IDM HQT 10: Teachers incorporate children's cultures and home languages in instruction and classroom activities and collaborate with families to encourage children's use of their home languages at school to support multilingual and multicultural development.

Research strength:

- Evidence from 12 studies with favorable outcomes support that teachers' incorporation of children's cultures and home languages into instruction or classroom activities helps improve children's language or literacy development. The studies examined the relationship between language of instruction (that is, whether children were taught in English, Spanish, or a mix of both) or professional development and curricula supports for teachers of dual-language learners, and the effects on preschooler's cognitive skills such as vocabulary acquisition or literacy. For example, to implement bilingual instruction, one of the studies tested the use of text-to-speech software that allowed teachers who spoke English only to translate vocabulary words into Spanish. This study found that the Spanish intervention, which was coupled with extra vocabulary instruction, led to significant improvements in English and Spanish vocabulary measures as compared with extra vocabulary instruction that was only delivered in English.

- One descriptive study analyzed data from tribally based public preschool programs that seek to incorporate culture into classrooms, and found that participating in the preschool is related to kindergarten readiness.

- All of the studies were conducted with samples in which at least 25 percent of students were dual-language learners; samples were predominantly Spanish-speaking and low-income.

Practice strength:

- Both sets of recommendations support this indicator. They note that programs and teachers should incorporate children's cultures and home language in classroom instruction. Professional recommendations such as the HSPPS note that if program staff do not speak the home language of all children in the learning environment, the program should support the development of the home language for dual language learners by having culturally and linguistically appropriate materials available. NASEM notes that although all teachers cannot teach in all languages, all teachers can learn specific strategies that support the maintenance of all languages.

C. Overall ratings of research and practice support for indicators

Figures 1 and 2 summarize the indicators and the overall strength of the research and practice support for each HQT indicator.

Figure 1. Indicator Key for overall ratings of research and practice strength

Research Strength	Practice Strength
■ Strong Support	■ Strong Support
◪ Some Support	◪ Some Support
☐ No Support	☐ No Support

Figure 2. Overall ratings of research and practice strength

High Quality Teaching	Research strength	Practice strength
1 Core Competency Contents	☐	◪
2 High-Quality Program Structures and Monitoring	☐	◪
3 Learning and Development Standards	☐	◪
4 Early Childhood Education (ECE) Credit Standards	☐	◪
5 HQT Data	☐	◪
6 HQT Supports	☐	◪
7 HQT Resources	■	■
8 HQT Data Collection for Equity Goals	☐	◪
9 Classroom Quality	☐	◪
10 HQT and Home Language	■	■

D.   Detailed ratings of research and practice support for indicators

Figures 3 and 4 give additional detail on the research and practice support for each IDM indicator.

Figure 3. Indicator key for detailed ratings of research and practice strength

▶**Research Strength**

| | 1 | 2 | 3 | 4 |

Number of high quality studies

High quality studies provide rigorous causal evidence

High quality studies show improved teacher outcomes

High quality studies show improved child outcomes

High quality studies that show improved teacher or child outcomes have diverse samples

▶**Practice Strength**

Supported by professional best practices

Criteria met?
■ Yes   ☐ No   ◪ Partially

Supported by expert recommendations

Criteria met?
■ Yes   ☐ No   ◪ Partially

Figure 4. Detailed ratings of research and practice strength

High Quality Teaching	Research strength				Practice strength
1 Core Competency Contents	1	2	3	4	
2 High-Quality Program Structures and Monitoring	1	2	3	4	
3 Learning and Development Standards	1	2	3	4	
4 Early Childhood Education (ECE) Credit Standards	1	2	3	4	
5 HQT Data	1	2	3	4	
6 HQT Supports	1	2	3	4	
7 HQT Resources	1	2	3	4	
8 HQT Data Collection for Equity Goals	1	2	3	4	
9 Classroom Quality	1	2	3	4	
10 HQT and Home Language	1	2	3	4	

Appendix

A. Identifying literature

Mathematica staff reviewed the literature on the use of research-based curriculum in preschool classrooms. We worked with our professional librarians to develop targeted search terms. We then searched eight databases for published articles.[2] Using the information in the abstracts, we screened out studies that did not meet our inclusion criteria. All eligible studies had to meet the following criteria:

- Based in the United States

- Focused on children ages 3 to 5

- Implemented in a prekindergarten setting (Head Start, child care center, or state prekindergarten program)

- Evaluated child or teacher/classroom outcomes using a randomized controlled trial, quasi-experimental, or correlational design

- Published in 2001 or later

We procured the full text of the eligible studies. Next, we screened the studies again to identify whether the studies mapped to any of the Implementation Development Map (IDM) indicators and to confirm that the studies met our inclusion criteria. We screened out any studies that did not focus on an IDM indicator (Table A.1). For the HQT element, after examining the full text of the 105 studies initially identified, 69 studies met the inclusion criteria, 60 were rated high quality, and 56 of the high quality studies had at least one favorable outcome (see the reference list for the high quality studies)

Table A.1. Number of studies identified and reviewed, and found to support the HQT element

IDM element	Studies identified	Studies fully reviewed	High quality studies	High quality studies with favorable outcomes
High Quality Teaching	105	69	60	56

B. Assessing support for IDM indicators

We assessed each indicator on seven dimensions (Tables A.4 and A.5) to summarize the support for the indicator in the research and professional/expert recommendations.

To identify high quality studies, reviewers rated the rigor of the study design (Dimensions 1 and 2). To identify whether the studies show an improvement in outcomes, reviewers summarized the study impacts on children or teachers (Dimensions 3 and 4). To identify the extent to which high quality studies provided evidence of improvements with diverse groups of children and teachers, reviewers examined the groups of children and teachers included in the studies (Dimension 5). To determine the extent to which

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[2] The eight databases are Academic Search Premier, APA PsycInfo, Cochrane Database of Systematic Reviews, Education Research Complete, ERIC, ProQuest Dissertations, SAGE Journals, and Scopus.

professional best practices and expert recommendations supported the indicators, we reviewed key practice documents (Dimensions 6 and 7). Below, we describe each step.

1. Rating study quality

We wanted to identify studies with results we could be confident were valid. We categorized studies as those that provide rigorous causal evidence, strong evidence, or low quality evidence (Table A.2).

Table A.2. Study quality ratings

Study rating	Description
Provides rigorous causal evidence[a]	Well-conducted randomized controlled trials with limited attrition (< 20 percent) and no other design concerns provide the strongest evidence because outcomes can be attributed to the intervention, practice, or policy rather than to existing differences between groups.
Provides strong evidence[a]	Studies that show that their comparison groups are similar or include relevant control variables suggest that outcomes can be attributed to the intervention, practice, or policy but that unmeasured differences might exist between groups.
	These studies could include randomized controlled trials with high attrition or quasi-experimental designs that (a) show that the comparison groups used in analysis were equivalent on demographics and a baseline measure of the outcome (or another outcome in the same domain) or (b) controls for demographics and baseline measures. These studies could also include correlational designs and ones that have a comparison group but no baseline measures, provided they use a strong set of relevant controls (including demographics and other characteristics that could influence the outcome).
Provides low quality evidence	These are studies with unconvincing results. These studies could include randomized controlled trials with high attrition, quasi-experimental designs, or correlational studies that do not use adequate control variables or that have a confound such as using different data collection methods in the treatment and comparison groups.

[a] Both of these ratings were considered to provide high quality evidence.

We then summarized the number of high quality studies—studies that provide rigorous causal evidence and strong evidence—and the percentage of high quality studies that provide rigorous causal evidence for each indicator. Studies can support several indicators.

2. Rating study findings

We categorized whether the high quality studies had statistically significant effects on any child or teacher/classroom outcomes included in the studies (Table A.3).

Table A.3. Definitions of study impacts

Study impacts	Definition
Favorable	Significant effects on at least one outcome that benefits children or teachers/classrooms; for example, improving classroom quality
Unfavorable	Significant negative effects on at least one outcome for children or teachers/classrooms and no favorable effects on any outcomes; for example, children's receptive vocabulary scores decrease
No effect	No significant effects on any child or teacher/classroom outcomes
Mixed	At least one favorable and unfavorable effect

We next summarized for each indicator the percentage of high quality studies with favorable effects on children, teachers/classrooms, or both.

3. Rating whether studies include diverse samples

For high quality studies with favorable effects on children and teachers/classrooms, we examined whether the studies included different population groups. We assessed whether studies reported that they included the following:

- Racially/ethnically diverse children (at least 25 percent of children are Hispanic, African American, or American Indian/Alaska Native)

- Racially/ethnically diverse teachers (at least 25 percent of teachers are Hispanic, African American, or American Indian/Alaska Native)

- Children who are dual language learners (DLLs) (at least 25 percent of children are DLLs)

- Children from low-income households (at least 75 percent of children are in low-income households or the educational setting is low income)

We then looked at whether each indicator has high quality studies with favorable effects with racially/ethnically diverse children, racially/ethnically diverse teachers, DLLs, and children from low-income households.

4. Assessing professional best practices and expert recommendations

Because the IDM is a tool designed to improve state systems, we determined which elements and indicators were supported by professional best practice standards, including the Head Start Performance Program Standards, the standards set by the National Association for the Education of Young Children, and expert recommendations from the National Academy of Sciences, Engineering, and Mathematics. The latter organization analyzes available evidence to advance the learning and development of children, youth, and families and presents consensus recommendations that undergo peer review before publication.[3]

A team of researchers reviewed IDM indicators to determine how well they aligned or agreed with these professional standards. We assessed whether each indicator was supported by professional recommendations and expert recommendations by using a three-part scale that included "met," "partially met," or "not met." We used "partially met" when aspects of the indicator were supported, but not necessarily when the full indicator was met, because each indicator often covers several ideas.

5. Assigning overall ratings on dimensions

Based on the rating of study quality, study findings, the diversity of samples, and professional and expert recommendations, we rated each indicator on seven dimensions (Table A.4 and Table A.5). Ratings for

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[3] See, for example, (1) the Head Start Program Performance Standards, available at https://eclkc.ohs.acf.hhs.gov/policy/45-cfr-chap-xiii/part-1302-program-operations; (2) the NAEYC standards at https://www.naeyc.org/our-work/families/10-naeyc-program-standards#top; (3) "Professional Standards and Competencies for Early Childhood Educators," A Position Statement Held on Behalf of the Early Childhood Education Profession; November 2019; (4) the NAEYC Early Childhood Curriculum, Assessment, and Program Evaluation (2003) ; (5) National Research Council, "Eager to Learn: Educating Our Preschoolers" (Washington, DC: National Academies Press, 2001); and (6) National Research Council, "Transforming the Workforce for Children Birth Through Age 8: A Unifying Foundation" (Washington, DC: National Academies Press, 2015).

the research support dimensions ranged from 1 to 4; ratings for the recommendation support dimensions included met, partially met, and not met.

Table A.4. Definitions of dimension ratings for research support

Research support dimension	1	2	3	4
Number of high quality studies	1 to 3 high quality studies	4 to 6 high quality studies	7 to 9 high quality studies	10 or more high quality studies
High quality studies that provide rigorous causal evidence	1–25% of high quality studies provide causal evidence	26–50% of high quality studies provide causal evidence	51–75% of high quality studies provide causal evidence	76–100% of high quality studies provide causal evidence
High quality studies that show improved teacher/classroom outcomes (show at least one favorable effect on a teacher outcome and no unfavorable effects)	1–25% of high quality studies show improved teacher/classroom outcomes	26–50% of high quality studies show improved teacher/classroom outcomes	51–75% of high quality studies show improved teacher/classroom outcomes	76–100% of high quality studies show improved teacher/classroom outcomes
High quality studies that show improved child outcomes (show at least one favorable effect on a child outcome and no unfavorable effects)	1–25% of high quality studies show improved child outcomes	26–50% of high quality studies show improved child outcomes	51–75% of high quality studies show improved child outcomes	76–100% of high quality studies show improved child outcomes
High quality studies that show improved teacher or child outcomes with diverse samples	Studies include one of the following groups: racially/ethnically diverse children, racially/ethnically diverse teachers, DLLs, children from low-income households	Studies include two of the following groups: racially/ethnically diverse children, racially/ethnically diverse teachers, DLLs, children from low-income households	Studies include three of the following groups: racially/ethnically diverse children, racially/ethnically diverse teachers, DLLs, children from low-income households	Studies include four of the following groups: racially/ethnically diverse children, racially/ethnically diverse teachers, DLLs, children from low-income households

DLLs = dual language learners.

Table A.5. Definitions of dimension ratings for practice support

Practice support dimension	Not met	Partially met	Met
Supported by professional best practices	The indicator was not supported by the HSPPS or NAEYC	Part of the indicator was supported by the HSPPS or NAEYC	The full indicator was supported by the HSPPS or NAEYC
Supported by expert recommendations	The indicator was not supported by NASEM	Part of the indicator was supported by NASEM	The full indicator was supported by NASEM

NAEYC = National Association for the Education of Young Children; NASEM = National Academies of Sciences, Engineering, and Medicine; HSPPS = Head Start Program Performance Standards.

6. Assigning overall ratings on research and practice strength

To make the recommendation support rating even more accessible, we summarized two dimensions of support: research strength and practice strength (Table A.6).

Table A.6. Definitions of research and practice strength ratings

Recommendation support dimension	No support	Some support	Full support
Research strength (number of high quality studies with favorable effects on child or teacher/classroom outcomes)	No high quality studies show improved child or teacher/classroom outcomes	One or two high quality studies show improved child or teacher/classroom outcomes	Three or more high quality studies show improved child or teacher/classroom outcomes
Practice strength (whether supported by professional best practices or expert recommendations)	Neither professional best practices nor expert recommendations support the indicator	At least one set of professional best practices or expert recommendations partially supports the indicator, or only one (and not both) set fully supports the indicator	Both professional best practices AND expert recommendations support the indicator

References

Alamos, P., & Williford, A. P. (2020). Teacher-child emotion talk in preschool children displaying elevated externalizing behaviors. *Journal of Applied Developmental Psychology, 67*. https://doi.org/10.1016/j.appdev.2019.101107.

Ansari, A., & Pianta, R. C. (2018). Effects of an early childhood educator coaching intervention on preschoolers: The role of classroom age composition. *Early Childhood Research Quarterly, 44*, 101–113.

Bedrosian, J. L. (2010). A comprehensive language curriculum may benefit the expressive language skills of at-risk preschool children under specific circumstances. *Evidence-Based Communication Assessment and Intervention, 4*(2), 73–77.

Bingham, G. E., Quinn, M. F., & Gerde, H. K. (2017). Examining early childhood teachers' writing practices: Associations between pedagogical supports and children's writing skills. *Early Childhood Research Quarterly, 39*, 35–46.

Buysse, V., Castro, D. C., & Peisner-Feinberg, E. (2010). Effects of a professional development program on classroom practices and outcomes for Latino dual language learners. *Early Childhood Research Quarterly, 25*(2), 194–206.

Byington, T. A., & Kim, Y. (2020). Impact of a language and literacy training and coaching intervention on early childhood outcomes in low-income communities. *Journal of Extension, 58*(4).

Castro, D. C., Gillanders, C., Franco, X., Bryant, D. M., Zepeda, M., Willoughby, M. T., & Méndez, L. (2017). Early education of dual language learners: An efficacy study of the Nuestros Niños school readiness professional development program. *Early Childhood Research Quarterly, 40,* 188–203. https://doi.org/10.1016/j.ecresq.2017.03.002.

Clements, D. H., Sarama, J., Mary, E. S., Lange, A. A., & Wolfe, C. B. (2011). Mathematics learned by young children in an intervention based on learning trajectories: A large-scale cluster randomized trial. *Journal for Research in Mathematics Education, 42*(2), 127–166.

Conroy, M. A., Sutherland, K. S., Algina, J. J., Wilson, R. E., Martinez, J. R., & Whalon, K. J. (2015). Measuring teacher implementation of the BEST in CLASS intervention program and corollary child outcomes. *Journal of Emotional & Behavioral Disorders, 23*(3), 144–155.

Conroy, M. A., Sutherland, K. S., Algina, J., Ladwig, C., Werch, B., Martinez, J., Jessee, G., & Gyure, M. (2019). Outcomes of the BEST in CLASS intervention on teachers' use of effective practices, self-efficacy, and classroom quality. *School Psychology Review, 48*(1), 31–45.

Curby, T., LoCasale-Crouch, J., Konold, T., Pianta, R., Howes, C., Burchinal, M., Bryant, D., Clifford, R., Early, D., & Barbarin, O. (2009). The relations of observed pre-K classroom quality profiles to children's achievement and social competence. *Early Education & Development, 20*(2), 346–372.

Daniel, A. (2016). Key influences on the quality and outcomes of preschool education for dual language learners: Professional development and bilingual staffing patterns [Doctoral dissertation, Rutgers]. *ProQuest Dissertations and Theses.*

Domitrovich, C. E., Gest, S. D., Gill, S., Bierman, K. L., Welsh, J. A., & Jones, D. (2009). Fostering high-quality teaching with an enriched curriculum and professional development support: The Head Start REDI program. *American Educational Research Journal, 46*(2), 567–597.

Downer, J. T., Pianta, R. C., Fan, X., Hamre, B. K., Mashburn, A., & Justice, L. (2011). Effects of web-mediated teacher professional development on the language and literacy skills of children enrolled in prekindergarten programs. *NHSA Dialog, 14*(4), 189–212.

Driscoll, K., & Pianta, R. (2010). Banking time in Head Start: Early efficacy of an intervention designed to promote supportive teacher-child relationships. *Early Education & Development, 21*(1), 38–64.

Farver, J. M., Lonigan, C. J., & Eppe, S. (2009). Effective early literacy skill development for young Spanish-speaking English language learners: An experimental study of two methods. *Child Development*, *80*(3), 703–719.

Feil, E. G., Walker, H., Severson, H., Golly, A., Seeley, J. R., & Small, J. W. (2009). Using positive behavior support procedures in Head Start classrooms to improve school readiness: A group training and behavioral coaching model. *NHSA Dialog, 12*(2), 88–103.

Fuhs, M. W., Farran, D. C., & Nesbitt, K. T. (2013). Preschool classroom processes as predictors of children's cognitive self-regulation skills development. *School Psychology Quarterly, 28*(4), 347–359.

Garcia, E. B. (2018). The classroom language context and English and Spanish vocabulary development among dual language learners attending Head Start. *Early Childhood Research Quarterly, 42*, 148–157.

Gropen, J., Kook, J. F., Hoisington, C., & Clark-Chiarelli, N. (2017). Foundations of science literacy: Efficacy of a preschool professional development program in science on classroom instruction, teachers' pedagogical content knowledge, and children's observations and predictions. *Early Education & Development, 28*(5), 607–631.

Hamre, B. K., Pianta, R. C., Burchinal, M., Field, S., LoCasale-Crouch, J., Downer, J. T., Howes, C., LaParo, J., and Scott-Little, C. (2012). A course on effective teacher-child interactions: Effects on teacher beliefs, knowledge, and observed practice. *American Educational Research Journal, 49*(1), 88–123.

Hamre, B., Pianta, R., Mashburn, A., & Downer, J. (2012). Promoting young children's social competence through the preschool PATHS curriculum and MyTeachingPartner professional development resources. *Early Education & Development, 23*(6), 809–832.

Hanno, E. C., & Gonzalez, K. E. (2020). The effects of teacher professional development on children's attendance in preschool. *Journal of Research on Educational Effectiveness, 13*(1), 3–28.

Hemmeter, M. L., Snyder, P. A., Fox, L., & Algina, J. (2016). Evaluating the implementation of the pyramid model for promoting social-emotional competence in early childhood classrooms. *Topics in Early Childhood Special Education, 36*(3), 133–146.

Hindman, A., Erhart, A., & Wasik, B. (2012). Reducing the Matthew Effect: Lessons from the ExCELL Head Start intervention. *Early Education & Development, 23*(5), 781–806.

Jackson, B., Larzelere, R., St. Clair, L., Corr, M., Fichter, C., & Egertson, H. (2006). The impact of HeadsUp! reading on early childhood educators' literacy practices and preschool children's literacy skills. *Early Childhood Research Quarterly, 21*(2), 213–226.

Kermani, H., & Aldemir, J. (2015). Preparing children for success: Integrating science, math, and technology in early childhood classroom. *Early Child Development & Care, 185*(9), 1504–1527.

Kinzie, M. B., Whittaker, J. V., Williford, A. P., DeCoster, J., McGuire, P., Lee, Y., & Kilday, C. (2014). *MyTeachingPartner—Math/Science* pre-kindergarten curricula and teacher supports: Associations with children's mathematics and science learning. *Early Childhood Research Quarterly, 29*(4), 586–599.

Knight, D. S., Landry, S., Zucker, T. A., Merz, E. C., Guttentag, C. L., & Taylor, H. B. (2019). Cost-effectiveness of early childhood interventions to enhance preschool: Evidence from a randomized experiment in Head Start centers enrolling historically underserved populations. *Journal of Policy Analysis & Management, 38*(4), 891–917.

Landry, S. H., Anthony, J. L., Swank, P. R., & Monseque-Bailey, P. (2009). Effectiveness of comprehensive professional development for teachers of at-risk preschoolers. *Journal of Educational Psychology, 101*(2), 448–465.

Landry, S. H., Swank, P. R., Smith, K. E., Assel, M. A., & Gunnewig, S. B. (2006). Enhancing early literacy skills for preschool children: Bringing a professional development model to scale. *Journal of Learning Disabilities, 39*(4), 306–324.

Landry, S. H., Assel, M. A., Swank, P. R., & Anthony, J. L. (2009). *An experimental study evaluating a state funded pre-kindergarten program: Bringing together subsidized childcare, public school, and Head Start.* Society for Research on Educational Effectiveness.

Mashburn, A., Downer, J., Hamre, B., Justice, L., & Pianta, R. (2010). Consultation for teachers and children's language and literacy development during pre-kindergarten. *Applied Developmental Science, 14*(4), 179–196.

Massetti, G. M. (2009). Enhancing emergent literacy skills of preschoolers from low-income environments through a classroom-based approach. *School Psychology Review, 38*(4), 554–569.

McClelland, M. M., Tominey, S. L., Schmitt, S. A., Hatfield, B. E., Purpura, D. J., Gonzales, C. R., Tracy, A. N. (2019). Red light, purple light! Results of an intervention to promote school readiness for children from low-income backgrounds. *Frontiers in Psychology*, *10*, 1–15.

Méndez, L. I., Crais, E. R., Castro, D. C., & Kainz, K. (2015). A culturally and linguistically responsive vocabulary approach for young Latino dual language learners. *Journal of Speech, Language & Hearing Research, 58*(1), 93–106.

Méndez, L. I., Crais, E. R., & Kainz, K. (2018). The impact of individual differences on a bilingual vocabulary approach for Latino preschoolers. *Journal of Speech, Language & Hearing Research, 61*(4), 897–991.

Pfannenstiel, J., & Lente-Jojola, D. (2011). The family and child education (FACE) program and school readiness: A structural model approach in an American Indian reservation context. *Journal of American Indian Education, 50*(2), 84–96.

Pianta, R., Hamre, B., Downer, J., Burchinal, M., Williford, A., LoCasale-Crouch, J., Howes, C., LaParo, K., & Scott-Little, C. Early childhood professional development: Coaching and coursework effects on indicators of children's school readiness. *Early Education & Development, 28*(8), 956–975.

Pollard-Durodola, S., Gonzalez, J. E., Saenz, L., Resendez, N., Kwok, O., Zhu, L., & Davis, H. (2018). The effects of content-enriched shared book reading versus vocabulary-only discussions on the vocabulary outcomes of preschool dual language learners. *Early Education & Development, 29*(2), 245–265.

Powell, D. R., Diamond, K. E., Burchinal, M. R., & Koehler, M. J. (2010). Effects of an early literacy professional development intervention on Head Start teachers and children. *Journal of Educational Psychology, 102*(2), 299–312.

Raikes, H. H., White, L., Green, S., Burchinal, M., Kainz, K., Horm, D., Bingham, G., Cobo-Lewis, A., St. Clair, L., Greenfield, D., & Esteraich, J. (2019). Use of the home language in preschool classrooms and first- and second-language development among dual-language learners. *Early Childhood Research Quarterly, 47*, 145–158.

Raver, C. C., Jones, S. M., Li-Grining, C. P., Metzger, M., Champion, K. M., & Sardin, L. (2008). Improving preschool classroom processes: Preliminary findings from a randomized trial implemented in Head Start settings. *Early Childhood Research Quarterly, 23*(1), 10–26. doi:10.1016/j.ecresq.2007.09.001.

Reid, E. E. (2011). Promoting early numeracy skill growth in Head Start children. *Dissertation Abstracts International Section A: Humanities and Social Sciences, 72*(1-A), 71.

Rivera Perez, J. F. (2019). The use of text-to-speech to teach vocabulary to English language learners. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 80*(3).

Rosenfeld, D., Dominguez, X., Llorente, C., Pasnik, S., Moorthy, S., Hupert, N., et al. (2019). A curriculum supplement that integrates transmedia to promote early math learning: A randomized controlled trial of a PBS KIDS intervention. *Early Childhood Research Quarterly, 49*, 241–253.

Schwanenflugel, P. J., Hamilton, C. E., Neuharth-Pritchett, S., Restrepo, M. A., Bradley, B. A., & Webb, M. (2010). PAVEd for success: An evaluation of a comprehensive preliteracy program for four-year-old children. *Journal of Literacy Research, 42*(3), 227–275.

Simon-Cereijido, G., & Gutiérrez-Clellen, V. F. (2014). Bilingual education for all: Latino dual language learners with language disabilities. *International Journal of Bilingual Education and Bilingualism, 17*(2), 235–254.

Snyder, J., Low, S., Schultz, T., Barner, S., Moreno, D., Garst, M., Leiker, R., Swink, N., & Shrepferman, L. (2011). The impact of brief teacher training on classroom management and child behavior in at-risk preschool settings: Mediators and treatment utility. *Journal of Applied Developmental Psychology, 32*(6), 336–345.

Solari, E. J., Zucker, T. A., Landry, S. H., & Williams, J. M. (2016). Relative effects of a comprehensive versus reduced training for Head Start teachers who serve Spanish-speaking English learners. *Early Education & Development, 27*(7), 1060–1076.

Son, S. C., Kwon, K., Jeon, H., & Hong, S. (2013). Head Start classrooms and children's school readiness benefit from teachers' qualifications and ongoing training. *Child & Youth Care Forum, 42*(6), 525–553.

Spencer, T. D., Moran, M., Thompson, M. S., Petersen, D. B., & Restrepo, M. A. (2020). Early efficacy of multitiered dual-language instruction: Promoting preschoolers' Spanish and English oral language. *AERA Open, 6*(1), 1–16.

Sutherland, K. S., Conroy, M. A., Algina, J., Ladwig, C., Jesse, G., & Gyure, M. (2018). Reducing child problem behaviors and improving teacher-child interactions and relationships: A randomized controlled trial of best in class. *Early Childhood Research Quarterly, 42*, 31–43.

Wasik, B. A., & Hindman, A. H. (2011). Improving vocabulary and pre-literacy skills of at-risk preschoolers through teacher professional development. *Journal of Educational Psychology, 103*(2), 455–469.

Wasik, B. A., & Hindman, A. H. (2020). Increasing preschoolers' vocabulary development through a streamlined teacher professional development intervention. *Early Childhood Research Quarterly, 50,* 101–113. doi:10.1016/j.ecresq.2018.11.001.

Wasik, B. A., Bond, M. A., & Hindman, A. (2006). The effects of a language and literacy intervention on Head Start children and teachers. *Journal of Educational Psychology, 98*(1), 63–74.

Whalen, S. P., Horsley, H. L., Parkinson, K. K., & Pacchiano, D. (2016). A development evaluation study of a professional development initiative to strengthen organizational conditions in early education settings. *Journal of Applied Research on Children, 7*(2), 1–43.

Whittaker, J. V., Kinzie, M. B., Vitiello, V., DeCoster, J., Mulcahy, C., & Barton, E. A. (2020). Impacts of an early childhood mathematics and science intervention on teaching practices and child outcomes. *Journal of Research on Educational Effectiveness, 13*(2), 177–212.

Wilson, S. J., Dickinson, D. K., & Rowe, D. W. (2013). Impact of an Early Reading First program on the language and literacy achievement of children from diverse language backgrounds. *Early Childhood Research Quarterly, 28*(3), 578–592. doi:10.1016/j.ecresq.2013.03.006.

Zhang, C., & Cook, J. C. (2019). A reflective professional development intervention model of early writing instruction. *Journal of Early Childhood Teacher Education, 40*(2), 177–196.