



Promoting content-enriched alignment across the early grades: A study of policies & practices in the Boston Public Schools



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ABSTRACT

As states and districts expand access to publicly funded PreK programs, researchers and policymakers have been grappling with experimental evidence demonstrating that the benefits of PreK on academic skills are not likely to last into early elementary school. A leading hypothesis to explain this phenomenon is that PreK and the elementary grades are not aligned with respect to content and mode of instruction. The Boston Public Schools Department of Early Childhood has begun to implement an aligned curriculum and professional development model called *Focus on Early Learning* to address this issue. The current study describes the components of this aligned model, identifies the facilitators and barriers to implementation, and examines the extent to which the model has been implemented to date. Findings demonstrate that a critical component of *Focus on Early Learning* is a combination of aligned structures and rich instructional content. A number of structural and process factors have facilitated implementation, but the district has also faced barriers, including funding and the challenge of creating a culture that supports alignment. Although survey and observational data suggest that PreK and kindergarten teachers are implementing the curriculum at moderate levels, there was significant variation in implementation across the study sample. In addition, teachers were less likely to receive professional development to support implementation. Although teachers generally supported the idea of aligning instruction across grades, they were less likely to engage in specific activities to do so, such as having common planning meetings with teachers across grades. Implications are discussed.

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1. Introduction

A number of studies have found that the positive impacts of PreK programs on cognitive skills are not sustained as children progress through elementary school (Lipsey, Farran, & Durkin, 2018; Ludwig & Phillips, 2008; Puma et al., 2012). There is evidence from older studies that high-quality PreK can improve a number of longer-term life outcomes, such as high school graduation and employment, even when cognitive gains are not sustained in the medium term (Yoshikawa et al., 2013). But it is unclear if this pattern will hold for today's large-scale PreK programs, given

broad changes in the alternative types of care settings available to children who make up control groups in experimental studies of PreK programs (Chaudry, Morrissey, Weiland, & Yoshikawa, 2017), changes in the demographics of children enrolled (Phillips, Johnson, Weiland, & Hutchison, 2017), and increases in parents' investments in their young children (Bassok, Finch, Lee, Reardon, & Waldfogel, 2016).

Importantly, there is limited knowledge about *why* the effects of preschool are not sustained over time (Bailey, Duncan, Odgers, & Yu, 2017). There are some hints that the quality (broadly defined) of children's post-PreK environments can help to sustain early PreK impacts (Johnson, 2013; Swain, Springer, & Hofer, 2015). In addition, aligning curriculum across the early grades has emerged as a particularly promising strategy, given descriptive evidence that existing kindergarten curricula often repeat the content that children – and PreK attenders in particular – already know (Engel,

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Claessens, & Finch, 2013). At this juncture, stakeholders' ability to create conditions in which PreK benefits can last is limited by the lack of empirical evidence on effective strategies for sustaining impacts. Further, there are no proven, aligned PreK to 2nd grade curricula for districts to turn to for models of what alignment might look like in practice, though there are some frameworks to guide alignment efforts (Kauerz, 2010). A clearer understanding of the causes of – and potential solutions to – fadeout will help guide policy and practice at a time of increased investment in PreK programs.

In the present study, we detail efforts by the Boston Public Schools Department of Early Childhood (BPS DEC) to align instruction and professional development in the early grades through implementation of a PreK to 2nd grade model called *Focus on Early Learning*. In this study, we describe specific components of *Focus on Early Learning*, identify factors that have supported its development and implementation, and explore key barriers to implementation. In considering the very early stages of these reforms, we also provide evidence about the extent to which schools and teachers have adopted and implemented the approach thus far. This study draws on a document review, key informant interviews, administrative school-level data, teacher surveys, and observations of fidelity to the *Focus on Early Learning* model to achieve these aims. Given the lack of PreK to 2nd grade models, our study provides a concrete example of an at-scale effort that can be useful to other localities and researchers undertaking similar efforts. Yet, we acknowledge upfront that we would not recommend implementation or replication of this approach until further research demonstrates that it is effective in improving outcomes for schools and students.

1.1. What “alignment” is and why it might matter

There are multiple definitions and conceptualizations of alignment in the early grades (e.g., Spain, Ehrlich, Cowhy, Dasgupta, & Lockaby, 2018; Valentino & Stipek, 2016). We define alignment in the present study based on the conceptualization put forth by Kauerz (2010) and further discussed by Stipek, Franke, Clements, Farran, and Coburn (2017). Specifically, Kauerz (2010) describes alignment as being composed of both *vertical* and *horizontal* components. When schools are vertically aligned, standards, curriculum and assessment from each grade level serve as a foundation on which to build the standards, curriculum, and assessment of the next grade. In contrast, *horizontal* alignment refers to alignment of standards, curriculum, and assessment *within* grade levels. When schools are horizontally aligned, what children should know and be able to do at each grade level (standards) is supported by what is taught in the classroom (curriculum), both of which are reflected in assessments.

Developmental theory suggests that strong alignment will provide children with the regular exposure to content that is both beyond their current skill level and within their range of abilities – both critical conditions for children's intellectual development (Bronfenbrenner, 1989; Vygotsky, 1978). When children enter elementary school with the foundational early math and literacy skills learned during PreK (e.g., letter recognition, cardinality), they should be exposed to sequentially more challenging tasks and concepts as they progress through the early grades for continued cognitive development. These practices and standards should ideally be implemented across schools and classrooms in a similar way in order to support educational equity for different types of students and learners (Scott-Little & Reid, 2010).

However, empirical evidence reveals that children's early learning experiences are likely to be characterized by misalignment (Abry, Latham, Bassok, & LoCasale-Crouch, 2015; Piotrkowski, Botsko, & Matthews, 2000). Research using large datasets from both the U.S. and Australia has found that teachers in the early elementary school grades spend substantial instructional time focused on

teaching skills already mastered by most kindergarten students, including those who did and did not attend PreK (e.g., Engel et al., 2013; Gervasoni & Perry, 2015). Data from large school districts suggest substantial variation in policies, standards, and assessments used across schools serving children from PreK to 2nd grade, even within the same district (DeBruin-Parecki & Slutzky, 2016).

To address these challenges, some states and school districts have taken steps to begin implementing policies to support alignment in the early grades. A recent report from the federal Department of Education (Manship, Farber, Smith, & Drummond, 2016) summarized a number of efforts to align standards from PreK to third grade. For example, Marietta and Marietta (2013) used case studies to document the development of early learning standards aligned with kindergarten to 12th grade standards in New Jersey. The state of Hawaii has undertaken efforts to develop PreK standards that align with early elementary school standards and the Common Core Standards. The DOE report found that these efforts appeared successful in aligning standards and curricula within and across grades. However, work still needs to be done to determine whether those policy changes translate into better continuity in children's learning experiences.

There is also a small but growing empirical literature documenting the potential power of aligned experiences – tested in intervention efficacy studies – to support early PreK gains. Findings from these studies show some early evidence that cross-grade curricular interventions – implemented with similar standards and assessments across schools – paired with training and coaching can have positive impacts on student outcomes at the end of kindergarten (Clements, Sarama, Wolfe, & Spitler, 2013; Mattera, Jacob, & Morris, 2018). Yet, efforts to promote alignment may be difficult to implement due to the decentralized nature of early childhood education systems, lack of existing evidence-based curricula that cut across the early grades, and significant differences in the workforces and professional development opportunities in PreK versus elementary school (Stipek et al., 2017). In addition, instructional alignment on its own – in the absence of rich content and high-quality instruction across the full period of early learning – is unlikely to support lasting gains for students. Research by Claessens, Engel, and Curran (2014) using data from the ECLS-K demonstrates that all children, regardless of skill levels or prior care experiences, benefit from exposure to advanced content. More work is thus needed to understand scaled curricular models that align content and instruction across the early grades, while at the same time delivering rich content and high-quality instruction.

To date, there are few (if any) examples of school districts that have developed and implemented curricula to promote both horizontal and vertical alignment across the early grades at-scale (see Whyte, McMahon, Coburn, Stein, & Jou, 2016). Although researchers, practitioners, and policymakers have identified lack of alignment as perhaps *the* critical reason explaining the fadeout of PreK impacts (see Bailey et al., 2017), there are few examples of aligned models that can be tested in order to test the veracity of this hypothesis, and limited information on what exactly an aligned, content-rich curricular and professional development model would look like when implemented at-scale in real world conditions.

1.2. The BPS Focus on Early Learning program

One example of a district taking steps to address this lack of knowledge is the BPS DEC. Prior work has found that the BPS PreK program – which consists of two evidence-based curricula paired with substantial training and coaches for master's level teachers – has moderate to large impacts on students' math, language, and literacy skills and small impacts on children's executive functioning and socio-emotional skills (Weiland & Yoshikawa, 2013). Even

so, an evaluation of PreK and early elementary school completed in 2012 demonstrated that PreK graduates in Boston were likely to transition to kindergarten classrooms where instruction was of lower quality, instructional content was not thematic and could be redundant for PreK attenders, and the typical mode of instruction was whole group rather than the play-based and child-directed modality used in PreK classrooms (Marshall, Robeson, & Roberts, 2012). Accordingly, in 2012 the BPS DEC began rolling out a program called *Focus on Early Learning* to align the content and mode of instruction, as well as teachers' professional development within and across PreK through 2nd grade.¹ Although school-level adoption of the *Focus on Early Learning* model is optional (BPS schools are highly autonomous), the BPS DEC has encouraged schools and teachers to volunteer to implement the approach.

BPS is a concrete example of a district that has developed and implemented carefully designed policies and practices in order to promote two-way alignment across the early grades. A 2016 report by the federal Department of Education conducted a case study of BPS's efforts to implement *Focus on Early Learning* (Manship et al., 2016) and the New America Foundation published a report on the *Focus on Early Learning* model in 2018 (Bornfreund & Loewenberg, 2018). Our study builds on these efforts in several ways. We provide more in-depth information on the curricular and professional development model itself. We also consider the key factors that have served as facilitators and barriers to effective implementation – critical information for replicating the full model or its components. Finally, our study is able to follow-up to measure the extent to which the *Focus on Early Learning* program has been adopted by schools across the district and implemented by classroom teachers. We aim to answer four research questions:

- 1 At this time, what is the BPS model for promoting continuity in children's learning experiences within and across the early grades and how does it differ from prior practice?
- 2 What contextual factors have supported implementation of the BPS aligned model?
- 3 What key barriers have posed challenges to implementation of the BPS aligned model?
- 4 Is there evidence to date that *Focus on Early Learning* has been adopted and implemented by schools and teachers in BPS?

Taken together, findings from this study aim to inform a variety of stakeholders on a potential set of lessons they can draw on when working to make two-way alignment in their district a reality.

2. Method

2.1. Participants and data sources

There were a number of different data sources and participants included in this study. First, the research team conducted a review of key documents from September to November 2016 (e.g., curriculum materials, grant applications, funding information, state and district policies and regulations) relevant to the conceptualization, design, and implementation of the *Focus on Early Learning* program (see Table A1 for overview of documents and information on document selection below). Based on findings from the document review, it became clear that there were three key individuals who were the main stakeholders engaged in the design and implementation of model. The team selected these individuals

to participate in in-depth key informant interviews in December of 2016 to learn more about the processes supporting design and implementation of the model not fully. Informants' identities are blinded in the manuscript.

The research team accessed administrative data from the BPS district documenting implementation and school-level adoption of the *Focus on Early Learning* program in the 76 public elementary schools that included a BPS PreK program during the 2017–2018 academic year. Schools that were represented in these data have diverse demographic characteristics: 33% of students in BPS elementary schools are Hispanic, 28% are Black, 22% are White, 14% are Asian, and 3% are another race. Sixty-three percent of students qualify for free or reduced-price lunch and 52% are Dual Language Learners. Within the district, 50% of the 76 schools offering PreK are PreK – 5th grade schools, 8% are PreK – 1st grade, and 32% are PreK – 8th grade.

Finally, the team randomly selected a subset of public schools to participate in more in-depth classroom observations and teacher surveys. Of all public schools implementing a PreK program in 2016–2017 ($N=76$), the team randomly selected 25 to participate in PreK. Twenty-one schools agreed. The team enrolled twenty of the schools in the study and randomly selected one to help pilot measures for the broader study. All PreK teachers within each school were asked to participate and 94% consented to the study. As a broader part of this study, we followed individual students longitudinally over time. A number of students who enrolled in Year 1 during PreK switched to other schools in the district for kindergarten and we thus enrolled an additional 33 schools in the study beginning in the kindergarten year. Ninety-four percent of kindergarten teachers agreed to participate across the 53 total study schools. The total classroom sample size thus includes 41 PreK teachers and 114 kindergarten teachers. The current study does not include survey and observational data from 1st and 2nd grade teachers, although future work will report on findings from those grades. PreK data were collected in the Spring of 2017 and kindergarten data were collected in the Spring of 2018. The schools that participated in data collection had similar demographic characteristics to the broader school district, noted above. Table A2 summarizes the characteristics of participating teachers.

2.2. Procedures²

2.2.1. Review of BPS documents and document review protocol

A three-person team consisting of one master's-level staff person, one BA-level research assistant, and one graduate student reviewed existing documents to identify policies and programs supportive of or in conflict with efforts to promote two-way alignment. The research team set out to include a comprehensive set of documents in the review that explicitly or tangentially addressed one of four key topics: (1) development and implementation of the BPS PreK program; (2) development and implementation of the *Focus on Early Learning* curriculum; (3) centralized policy and oversight of PreK and kindergarten to 2nd grade settings; and (4) state and district policies related to early childhood education across kindergarten through 2nd grade. The team came up with this set of key topics based on our examination of existing policy reviews and consultation with the BPS DEC. The team determined that the set of documents included must fall into one of the following typologies – grant and funding applications, program planning materials, presentations and reports to funders and the BPS School Committee, and curriculum and professional development materials. Documents had to be produced between 2005 (the beginning

¹ The rollout of *Focus on Early Learning* has been by grade. The program was piloted in kindergarten classrooms in 2012 and 2013 with formal implementation in 2014. First grade classrooms began full implementation in 2015, followed by 2nd grade classrooms in 2016.

² A timeline for data collection activities is included in Fig. A1.

of the PreK program implementation) and 2016 (the start of the current research project and the year when the *Focus on Early Learning* model was fully rolled out to teachers in PreK through 2nd grade). Documents were identified and collected through conversations and meetings with district staff, web searches via Google, and review of the websites for the Massachusetts Departments of Elementary and Secondary Education, Early Care and Education, and BPS.³

2.2.2. Key informant interviews

We conducted three 90–120 min semi-structured interviews to understand key informants' perceptions of alignment and implementation of *Focus on Early Learning* in BPS. The team used these answers to address research questions 1, 2, and 3. Interviews included questions focused on four primary topics: (a) goals for PreK – 2nd grade alignment; (b) definition of alignment; (c) implementation of alignment, best practices, and barriers to alignment; and (d) state and district policies and practices that influence alignment.

2.2.3. Teacher survey

In the Spring of 2017 and 2018, respectively, PreK and kindergarten teachers were asked to complete a survey reporting on whether they were implementing the *Focus on Early Learning* model and whether they had received training and/or coaching on the model in the current academic year, or in a prior academic year. Teachers were asked to report on the key reasons why they decided to implement the model or not and any challenges they encountered with implementation. Respondents reported on the extent to which teachers in their school used a common curriculum, the extent to which they made an effort to align their instruction with teachers in their grade and other grades, and the extent to which their school leadership communicated a clear vision to align instruction from PreK through 2nd grade. Finally, teachers reported on the extent to which teachers in their schools worked together to coordinate curriculum across grades. Teachers rated these questions on a scale from 1 (Strongly Disagree) to 5 (Strongly Agree). These items were written by the research team in consultation with BPS instructional staff.

2.2.4. Observations of fidelity to Focus on Early Learning model

The research team built off of earlier iterations of a fidelity tool created for earlier observational studies conducted in BPS and updated those tools following an extensive review of the PreK version of the *Focus on Early Learning* curriculum. Then, the creators of the curriculum from the DEC reviewed the instrument and provided feedback. The team iterated on the instrument through a series of additional meetings with DEC staff before finalizing the tool for PreK. The kindergarten version built off the PreK instrument but did make small adjustments for any key changes in the content covered in that grade.

Table A3 summarizes the core components of the *Focus on Early Learning* curriculum from PreK to 2nd grade and defines the structure of each component. As listed, there are a range of components that do cut across both grades and are the core focus of the current study – Introduction to Centers, Centers, Read Aloud, Literacy Small Group, Literacy Whole Group, Thinking and Feedback, Math Whole Group, and Math Small Group. As noted in Table A3, there are some additional components (e.g., Number Talks, Story-

telling/Storyacting) that are either specific to a subset of grades or are currently just being rolled out in schools and thus are not yet ready for in-depth study. Although 1st and 2nd grade teachers did not participate in the current study as explained earlier, we do highlight in Table A3 the components that are further aligned in those grades.

In line with recommendations from Hulleman and Cordray (2009) and Durlak and DuPre (2008), the team initially aimed to capture measures of implementation dosage (the amount of time spent implementing key components of the *Focus on Early Learning* model), adherence (the extent to which curriculum was implemented as designed), and quality (the extent to which the curriculum was implemented using high-quality practices). For the purposes of the current paper, we summarize findings from the adherence analyses because this metric assesses the extent to which the curriculum was implemented as designed during the observation periods and is most appropriate for answering research question 4.

In the winter and spring of 2017 and 2018, respectively, PreK and kindergarten classrooms were observed live for a 2-h block of academic instruction. The focus of the observation was on the full classroom including the lead teacher, the students, and any other assistant teachers and adults in the classroom. In PreK, all 41 teachers were observed on two separate occasions, while in kindergarten 72 teachers were observed on one day and 42 teachers were observed on two separate days. Coders participated in a three-day training during each year of the study and had to establish reliability with a master-coded video prior to collecting data in the field. In situations where teachers were observed twice, codes were aggregated across the two measurement occasions. Twenty percent of observations were double-coded to assess interrater reliability. Results demonstrated that there was 92% exact agreement on items that asked about the presence of a practice, behavior, or activity specific to the curriculum in PreK and 86% exact agreement in kindergarten. The team used the data from the observations of implementation fidelity to answer research question 4. Although we recognize that assessing fidelity during the PreK year does not constitute alignment on its own, it is the combination of fidelity across both PreK and kindergarten that is important for establishing whether there is continuity in children's learning experiences over time.

2.2.5. School characteristics and adoption of Focus on Early Learning model

We accessed administrative information from BPS on whether each school offering a public PreK program adopted the *Focus on Early Learning* program in 2016–2017 (including the specific grades that were participating). We further compared school administrative records to teachers' survey reports on using the *Focus on Early Learning* model. These data helped the team to understand overall adoption of the model and provided further information to answer research question 4.

2.3. Analytic approach

2.3.1. Document review and key informant interviews

We first audio-recorded and transcribed interview data to enable extraction of data fragments. We also created a document review protocol that included a matrix used to extract text regarding key areas of PreK to 2nd grade alignment in BPS and the district and state policies that intersect with the alignment effort. For example, the protocol included topics, stated goals, description of core components, and internal and external partners. The team identified several categories to guide and organize the collection of data from these sources based on the study research questions. See Table 1 for the specific coding categories, definitions of cate-

³ The terms for web searches were Boston PreK, Boston *Focus on Early Learning*, Boston Department of Early Childhood, Massachusetts early childhood education, Massachusetts PreK, Boston Public Schools instructional alignment, Massachusetts instructional alignment, Boston early childhood education policy, and Massachusetts early childhood education policy.

Table 1
Overview of qualitative data codes used for document review and key informant interviews.

Coding category	Definition	Examples	Number of instances identified in document review and interviews
Assessment	Required assessments on children	The BPS district requires that students are assessed on the Phonological Awareness Literacy Screening (PALS) in the fall and spring of their PreK year. The BPS district requires that students are assessed on the Expressive Vocabulary Test (EVT) in the fall and spring of their PreK and kindergarten year. Source: Wagner Lam, N. (October 3, 2016). <i>SY 2016 – 2017 BPS Formative Assessment Update</i> [Memorandum]. Roxbury, MA: BPS Office of Data and Accountability. Retrieved from https://www.bostonpublicschools.org/cms/lib07/MA01906464/Centricity/Domain/238/Preliminary%20SY16-17%20Assessment%20Calendar_112116.KtoHS.pdf	Document review: 46 Informant interviews: 18
Alignment	Extent to which structures are put in place to match the content and mode of instruction across PreK and the early elementary school grades.	Review of the <i>Focus on Early Learning</i> curriculum in PreK – 2nd grade demonstrating a similar set of curricular components across grades. Source: https://www.bpsearlylearning.org/ The PreKindergarten-3rd Curriculum, Instruction, and Alignment Program developed in part with the Boston Public Schools. Source: Jacobson, D. (2016, August). Building state P-3 systems: Learning from leading states. (Policy Report). New Brunswick, NJ: Center on Enhancing Early Learning Outcomes.	Document review: 62 Informant interviews: 53
Funding	Extent of funding (amount and duration) and/or requirements or benchmarks to receive funding	In 2014, per pupil spending in BPS was \$21,567. This can be compared to New York City which spent \$21,154 per pupil and Los Angeles Unified which spent \$10,851 per pupil. Source: Educational Finance Branch, Economic Reimbursable Surveys Division, U.S. Census Bureau. (2016). <i>Public Education Finances: 2014</i> . Retrieved from https://www2.census.gov/govs/school/14f33pub.pdf	Document review: 38 Informant interviews: 12
Licensing	Credentialing and licensure for lead Pre-K to third grade teachers: educational requirement, experience requirement, continuing education requirement (amount and content)	To receive a provisional teaching license in Massachusetts, you must: <ul style="list-style-type: none">• Hold a Bachelor's degree• Be seeking a license as a core academic teacher but do not hold the Sheltered English Immersion Endorsements (SEI)• Passed all required Massachusetts Tests for Educator Licensure (MTEL) tests Source: Massachusetts Department of Elementary. (n.d.). Teacher License Types and General Requirements. Retrieved from http://www.doe.mass.edu/licensure/academic-PreK12/teacher/license-types.html	Document review: 42 Informant interviews: 9
Policy	Local, state, national policies and regulations around early education and alignment	In 2012, Massachusetts established an Early Literacy Panel to make recommendations on strategies for evaluating effectiveness of curricula on language and literacy development for children in early education and care programs through third grade. Source: An Act Relative to Third Grade Reading Proficiency. (2012). Retrieved from https://malegislature.gov/Laws/SessionLaws/Acts/2012/Chapter287	Document review: 40 Informant interviews: 14
Professional Development	Content, amount, frequency, and requirements around professional development	BPS teachers annually participate in 18 hours of professional development activities beyond the regular school day hours. Source: Boston Teachers Union. (n.d.). Teachers Contract 2016-2018. Retrieved from https://btu.org/wp-content/uploads/Final_BTU_Contract_No_Index.pdf The Massachusetts Department of Early Education and Care offers trainings in the fields of health and hygiene, safety, data collection, and instructional quality. Source: Massachusetts Department of Early Education and Care A-Z Training Index. (n.d.). Retrieved from https://www.mass.gov/lists/eec-a-z-training-index	Document review: 34 Informant interview: 27
Structural Features	Duration (number of days; hours per day), class size, content (minutes or hours for various subjects/activities), curriculum, number of students, school assignment, classroom designations	A BPS inclusion classroom should have a ratio of no more than 20 students to 1 teacher. Source: Boston Teachers Union. (n.d.). Teachers Contract 2016-2018. Retrieved from https://btu.org/wp-content/uploads/Final_BTU_Contract_No_Index.pdf	Document review: 58 Informant interviews: 13

gories, and examples of text that would fall under each category. We included a set of open-ended questions in the protocol for reflection on the significance of the document, supports and barriers to alignment, and to identify additional topics for the protocol. The team used the document review to answer research questions 1, 2, and 3.

We used qualitative content analysis as our analytic strategy for the purpose of classifying large amounts of text into an efficient number of categories that represent similar meanings (Weber, 1990). We were guided in our process of analysis by Mayring's (2000) concept of qualitative analysis using inductive category application, which uses an iterative process of category definition based on text data. We compiled text from both key informant interviews and the documents reviewed into a categorization matrix based on the primary topics of the interviews and key research questions to facilitate straightforward, focused, detailed descriptions of the components of alignment, goals, supports, challenges, factors, reasons, and results. We then extracted data from larger texts in at least one sentence and summarized data within each category to address the questions.

We used a directed approach to content analysis based on previous theories of early childhood alignment (Hsieh & Shannon, 2005). We generated matrix categories based on our primary research questions, literature on alignment of early childhood instruction, as well as the initial set of BPS documents that we reviewed containing descriptions of the various program components. Using these sources and building on Kauerz's framework for alignment (2010), we initially identified the following codes – alignment, funding, licensing, policy, professional development, and structural features (see summary with findings and examples in Table 1).

The team initially chose aspects that fit the matrix of analysis from the data. We reviewed those that did not immediately fit again later to determine whether they represented a new category or sub-category. We reviewed all data for content and coded for correspondence or exemplification of the identified categories in the matrix (Polit & Beck, 2012). To increase reliability, the steps of initial coding, extraction of data from larger texts, and summarization of data across categories was conducted such that all sources were coded by two individuals across stages, with discussion of gaps or disagreement in coding across categories.

By allowing for iteration in the coding process, we were also able to determine whether there were additional codes that emerged over time. Throughout this process, we identified one new code – assessment. By using the double-coding process highlighted above, we found that there was 84% exact agreement in coding the categories within each of the documents between the designated lead coder and a doublecoder. Our coding team – consisting of a masters-level staff person and a BA-level research assistant – presented results of the categorization to senior and PhD researchers, including individuals involved in previous BPS research efforts. In cases where the coders did not agree, the team discussed the codes at a broader meeting involving one PhD level researcher and came to a group consensus on the final code.

2.3.2. School-level data

A series of dummy codes were used to describe whether each grade within each school had adopted the *Focus on Early Learning* model. The dummy codes reflected whether the school implemented the model in: (a) PreK – 2nd grade; (b) PreK – 1st grade; (c) PreK and kindergarten; (d) kindergarten – 2nd grade; (e) kindergarten and 1st grade; (f) in some other combination of grades (e.g., PreK and 2nd grade); and (g) none of the grades. These codes were then used to describe the percentage of schools implementing the full PreK – 2nd grade model versus various grade combinations.

2.3.3. Teacher survey

We used teacher responses to calculate percentages describing teachers' experiences with training and coaching in general and on the *Focus on Early Learning* model in PreK and kindergarten. We also calculated descriptive statistics for individual items capturing information on teachers' beliefs about the importance of alignment and engagement in activities supportive of aligning instruction within and across grades.

2.3.4. Fidelity observations

As noted above, 41 BPS classrooms participated in live observations in PreK and 114 participated in kindergarten observations. We computed overall adherence percent scores for the components of the curriculum that were typically observed during the morning literacy block (Introduction to Centers, Centers, Read Aloud, Literacy Whole Group, Literacy Small Group, Thinking and Feedback), and overall adherence score for components observed during the math block (Math Whole Group and Math Small Group). Even if a classroom reported that they were not using the curriculum, we still calculated a percentage score for them to understand general patterns of implementation across the district.

3. Results

3.1. Research question 1: At this time, what is the BPS model for promoting continuity in children's learning experiences within and across the early grades and how does it differ from prior practice?

The team drew on the findings from the document review and key informant interviews to answer the first research question. Taken together, findings revealed that BPS is implementing a model that aims to achieve *horizontal alignment* in the early grades by:

- aligning the curricula itself with grade-specific standards; and
- making the *Focus on Early Learning* program from PreK to 2nd grade available to all BPS public schools offering any combination of the early grades.

Findings from these same sources suggest that vertical alignment has been supported by:

- developing a manualized, intentional, and scripted curriculum that explicitly cuts across PreK to 2nd grade in the content that children learn (e.g., making sure that instructional content effectively builds on itself over time in a way that limits any redundancy to the extent possible);
- mapping the mode of instruction in the PreK program – primarily in child-directed centers and small group instruction – to the later grades (which now implement less whole group instruction and worksheets in favor of modalities that more closely align to developmentally appropriate early learning pedagogical approaches);
- embedding opportunities to differentiate instruction that supports the individual skill sets of all children, regardless of the competencies that they bring to the classroom; and
- aiming to implement a similar set of professional development supports through training and coaching to kindergarten to 2nd grade as had previously only been offered to PreK teachers when this model was a stand-alone PreK curriculum.

There are both process (including curricular and teaching/learning) and structural supports that make up the model. See Table A4 for a comparison of prior practice with current implementation of the *Focus on Early Learning* program. This table also

provides more information on the document review coding that identified these differences over time.

3.1.1. Process supports

As evidenced in the document review (specifically, the PreK, kindergarten, 1st, and 2nd grade curricula), the model starts with a well-developed PreK program and builds on it with a system-wide language, literacy, and STEM (science, technology, engineering, mathematics) curriculum that aligns content and instruction from kindergarten through 2nd grade. The PreK program consists of two evidence-based curricula: an adapted version of Opening the World of Learning (Schickedanz & Dickinson, 2004), a language and literacy curriculum that includes a social-emotional skills component in each unit, and Building Blocks (Clements & Sarama, 2007), an early mathematics curriculum that also promotes language development by requiring children to explain their mathematical reasoning verbally. Play-based classroom instruction focuses on extending children's learning and deepening their understanding of language, literacy, and mathematical concepts through problem solving and peer interaction. As identified in the document review (A–Z Training Index: Dept. Early Education & Care Training list), the district provides PreK teachers with some curriculum-specific training and in-class support from experienced early childhood coaches.

The intensive examination of the curriculum completed as part of the document review illustrates how the *Focus on Early Learning* program is designed to ensure that kindergarten teachers build effectively on what children are taught in PreK, 1st grade builds on kindergarten, and 2nd grade builds on 1st grade. To take a simplified example pulled directly from the PreK and kindergarten curricula review, the PreK model ends the year with a unit on “things that grow,” incorporating vocabulary instruction on animal and plant names and related verbs into the daily activities of the classroom. PreK children are exposed to such words as *tadpole*, *cub*, *flock*, *hatch*, and *burrow*. Early in kindergarten, children participate in an “animals and habitats” unit, which introduces more complex vocabulary (*hibernate*, *life cycle*, *habitat*, *discover*, *transform*) and knowledge (such as how animal habitats change across the season) that explicitly build on the introduction to the theme children learned in PreK. Another core part of the *Focus on Early Learning* program is the use of thematic units across grades.⁴ The thematic units are intended to help students make connections across content areas and develop their content-specific skills.

Professional development to support model fidelity and improve teacher practice is the other core part of the model. Teachers who are new to the curriculum are expected to attend two days of training prior to the start of the academic year. They can attend monthly professional development workshops hosted by BPS DEC staff on key topics relevant to implementing the curriculum. Teachers also have the option to participate in coaching sessions with a BPS DEC instructional coach. Prior to *Focus on Early Learning*, PreK teachers could engage in training and coaching but opportunities were limited for teachers in kindergarten – 2nd grade.

3.1.2. Structural supports

BPS uses a set of standards and regulations in implementing its programming within- and across- grades (e.g., teacher-child ratios, group size, licensure, teacher education and training, pay, paid professional development), negotiated with teachers' unions (see Table A5). The licensing and structural feature codes from the document review were used to define these standards. One key informant gave credit to those structural factors for helping BPS maintain a stable and high-quality instructional program in PreK,

reducing teacher turnover, and increasing fidelity of implementation, noting that:

“If you have a well-trained, well-compensated work force they're going to do a better job. . . I absolutely believe that a lot of our success is because we have master degree teachers who came from higher ed- organizations that supported this. And so if you don't pay them you get high turnover and if you don't require a degree of them then they can't interpret a curriculum and they can't deal with a kid who's kicking and screaming. . .”

Based on the information compiled on teacher union contracts by the National Council on Teaching Quality as part of the document review, a teacher in BPS with a bachelor's degree and five years of experience is entitled to \$73,327 per year. Data from the Bureau of Labor Statistics (2018) demonstrate that the average annual salary for a PreK teacher in the United States is \$33,590, with wages as low as \$22,480 in non-metro areas. BPS caps class size at 22 students in PreK through 2nd grade, requires a 1:11 teacher: student ratio in PreK and a 1.5:22 teacher-student ratio in kindergarten to 2nd grade, and allocates 48-minute blocks of common teacher planning 4 times per week. All BPS elementary school teachers – including PreK – participate in 2 days of paid orientation when they first start with the district and receive 18 h of paid professional development plus one day assigned by their principal. See Table A5 for BPS structural characteristics compared to other major cities.

3.2. Research question 2: what contextual factors have supported implementation of the BPS aligned model?

To answer this question, we drew on data from the document review and the key informant interviews. Six core contextual factors emerged: leadership, reorganization of PreK – 2nd grade under one department, use of research to drive decision-making, allowance of sufficient time during the *Focus on Early Learning* rollout to generate buy-in from principals and teachers, access to and recruitment of highly qualified coaching staff, and adequate funding to initially develop and implement the PreK – 2nd grade model.

3.2.1. Contextual factor 1: leadership

The first key factor supporting implementation is strong leadership at three key levels – the city of Boston, the BPS district, and the BPS DEC – supporting the notion of alignment. Over the past 13 years, the BPS PreK program has enjoyed substantial support from Boston's mayors and superintendents. Indeed, the document review identified 12 separate instances in which the BPS DEC leadership received public support and/or accolades from local government personnel. Key informant A reported:

“Leadership matters and that we've been really fortunate to have the mayor and the superintendent behind this. . . and there has been this sustained investment in early childhood for ten years which is remarkable [. . .] The other thing that's really been helpful is we've had four different superintendents and twelve different bosses and so we can show people that what we do does make a difference and they give in immediately and they don't want to mess with it. And we have really good internal data that says it's making a difference in kids.”

Key informant C concurred, reporting that:

“They've [BPS DEC] gotten a lot of press and they've raised a lot of money to work on these things and they've been doing it over a number of years and they've got a great team. . . And they have incredible leadership.”

⁴ Notably, math is kept separate and has its own curriculum.

3.2.2. Contextual factor 2: reorganization at the district level

Related to this leadership component is the creation of a Department of Early Childhood that adopted oversight over the full PreK to 2nd period. Results from the document review and informant interviews found that prior to the 2016–2017 school year, the academics department in BPS was organized in kindergarten to 12th grade subject matter (i.e., math, science, social studies, etc.) teams. The DEC oversaw the PreK and kindergarten academic year and summer programs. In the 2016–2017 school year, the structure was reorganized into grade-bands with the Executive Director of Early Childhood overseeing PreK to 2nd grade. This shift made the DEC well-positioned to lead the alignment initiative. Key informant B reported support for this grade-banded approach:

“Well so this grade banding is going to be really interesting because I think it, it both leaves room for vertical and horizontal alignment. And I think it’s going to give the DEC oversight to make some curricular choices. So I think definitely districts in general should think about grade banding, absolutely.”

This central oversight over PreK to 2nd grade aims to avoid inefficiencies from having separate offices working in PreK versus early elementary school. Indeed, the team identified 22 instances in the key informant interviews remarking on “efficiency” in this approach. The document review corroborated this result, identifying 14 times where “common oversight” was a noted goal of this restructuring. Results from the document review also revealed that the creation of this department allowed for efficiency in seeking out funding and being awarded three grants to support curriculum and professional development for PreK to 2nd grade.

3.2.3. Contextual factor 3: research

Key Informant B referred to the department’s philosophy as one of “evidence-based practices and learning.” The DEC has used evidence to shape its decisions since its inception. For example, the DEC conducts bi-annual quality observation studies, uses the results to identify and target weaknesses, and shares results back with teachers. The document review showed that all successful external funding applications have referenced the results of BPS’s rigorous PreK evaluation (Weiland & Yoshikawa, 2013). All three informants reported that the findings from this rigorous studies have afforded the DEC the opportunity to be creative in developing and implementing programming. Key informant C also reported that these impact results may have played a key role in the district reorganizing the early grades to all be under the leadership of the DEC.

At the same time, document review results showed that the district consistently monitors internal data to identify issues in the efficacy of its programming in the short- and long-term. As reported in all key informant interviews, and corroborated by four funding applications, district staff noted that although children who attended the BPS PreK program appeared to perform better on state tests in third grade than students who did not attend the program the differences were fairly small.⁵ Key informants and funding applications cited a lack of consistently high-quality educational practices in kindergarten, 1st, and 2nd grade in explaining this difference. As DEC staff looked to shift these trends, they developed an approach focused on alignment that considered the importance of high-quality instruction. As reported by Key Informant B:

“So a student enters into Boston Public School. . . what will the experience for that child be? Will they get taught about animals

six times for the next six years? Will they have the same teacher? Will they be in the same school, receive the same respect, the same pedagogy? [. . .] what would that child experience from day one? . . . Alignment, to me, is really based on the instructional quality and the instructional practices within and across grades. If we can gather data on where kids are when they start, we’ll be better able to serve them.”

Moreover, as noted earlier, the review of descriptive data on kindergarten quality that the BPS DEC did in collaboration with Wellesley College (Marshall et al., 2012) allowed them to have empirical evidence that children were transitioning from a high-quality PreK program to kindergarten settings with generally lower levels of instructional support.

3.2.4. Contextual factor 4: Buy-in is critical

Fourth, all three key informants reported that rolling out a program like *Focus on Early Learning* is a time-intensive activity that requires multiple years to implement, tweak, and adapt. As reported by Key Informant A:

“We can design the world’s greatest curriculum that aligns instruction beautifully but if no one uses it – it’s never going to work. So getting buy-in from teachers and principals is the biggest and hardest part of this. It’s the critical piece.”

Part of that timeline is generating buy-in from teachers and administrators and integrating *Focus on Early Learning* into typical practice rather than conceptualizing it as an add-on program. Indeed, there were 19 instances across the key informant transcripts that mentioned “buy-in.” Results from the document review (specifically, all funding applications for the aligned curriculum, summary of the curriculum description) revealed that BPS staff solicited teacher feedback and designed the model to be flexible to teacher needs and how they may change across time. The curriculum was developed by DEC instructional coaches with intimate knowledge of the district, and the team engaged teachers in the development of the model.

3.2.5. Contextual factor 5: human capital and instructional coaches

As evidenced through results of the key informant interviews and document review, having instructional staff with content-specific knowledge on developmentally appropriate practices that span the early grades has been a critical factor in being able to design and implement the *Focus on Early Learning* program. Teachers and DEC leadership recognize the unique supports they receive from DEC instructional staff, namely coaches. For example, Key Informant B reported that:

“So we are the last department in the district to still have coaches. Almost every other department has cut its coaches. Essentially there’s been decisions to do that, I think in part that’s because there were fights over who owned the coaches and what the coaches were focused on. But because early childhood made coaching a priority, we have been able to maintain coaching. Our coaches do all of the professional development as well, so you have people who are in classrooms seeing what the challenges are, helping teachers implement a curriculum that essentially supported.”

Because the BPS PreK model has yet to be tested without instructional coaches, we cannot ascertain their value-add in concrete terms. Yet, findings from all the data sources for the current study revealed that they are a critical component of the development and implementation of the PreK to 2nd grade model, with their role being noted 18 times in the key informant transcripts, and their expertise being described in 92% of the documents coded for the review.

⁵ These applications also acknowledge that PreK attenders and non-attenders do select into the program and differ in their background characteristics so these internal evaluation results cannot be interpreted causally.

3.2.6. Contextual factor 6: money matters

The final factor identified in our analysis is *sufficient* financial support for the DEC to allocate staff time to curriculum development and provision of training and coaching for teachers. Document review results showed that much of this funding (~80% of the total) was made available through grants that BPS may have been uniquely suited to win, given previous evidence of PreK program impacts and a continued commitment to using data to inform program improvement (see [Table A1](#) and [Table 1](#)). Even so, having structural supports in place to fund staff to develop aligned curricula and professional development opportunities for teachers was a critical factor in the broad implementation of this plan. The importance of funding was corroborated by key informant interviews who all remarked that having funding has been a necessary condition supporting the rollout of the model.

3.3. Research question 3: what key barriers have posed challenges to implementation of the BPS aligned model?

In answering this question, we identified four barriers: shifting the culture in schools to support alignment and coherence, model implementation challenges encountered by teachers, challenges to broader implementation created by having autonomous schools, and insufficient funding to dedicate the ideal level of coaching supports to teachers.

3.3.1. Barrier 1: shifting to a “culture of coherence.”

The district’s structural shift to a grade-band structure for academics is not sufficient in itself to change the culture to be fully supportive of two-way alignment. Academic departments and the English language learner and special education programs are now navigating a combined curriculum and instructional program which has posed significant challenges. Data from the key informant interviews and teacher survey revealed evidence for this barrier. Key Informant A said:

“Coherence is not a thing that you can draw on a diagram or on a whiteboard. It’s like a greased pig. You gotta chase it down and wrestle it kicking and screaming to the floor [...] It’s a bunch of pretty nitty gritty processes that are messy and involve personalities and involve tense language. It involves loss. It involves people saying goodbye to things.”

At the school level, there has also been a change in how students receive instruction, and how instructional quality is evaluated. Although the *Focus on Learning* model supports child-directed intentional play as a paradigm for learning, all three key informants noted that it will take time to generate buy-in from all kindergarten to 2nd grade teachers for the idea that play-based learning can support academic outcomes for children in early elementary school. The new curricula ask teachers to engage in student-led, small-group learning which is a shift from the explicit and whole-group instruction many kindergarten to 2nd grade teachers are familiar with in BPS. Related, results of the kindergarten survey revealed that 56% of teachers did report that one of their biggest challenges in implementing the model was that they feared losing control of their classroom, given greater focus on student-directed learning, small groups, and peer interaction.

3.3.2. Barrier 2: implementation challenges

The teacher survey was the data source that revealed significant implementation challenges. For example, in addition to the fear of losing control of the classroom (56% reported this as a challenge), 44% of kindergarten teachers reported that the major challenge they faced was the range of activities they were expected to do as part of the model. Thirty-two percent of teachers noted that they needed more support from their principal and/or the district to

implement the model appropriately. Finally, a major issue encountered by teachers in bilingual classrooms – which made up about 15% of the classroom-level sample – is that the materials have yet to be translated into Spanish. Teachers who want to use the model in bilingual classrooms need to create and translate materials on their own.

3.3.3. Barrier 3: working with autonomous schools

Findings from the document review and key informant interviews demonstrated that working with autonomous schools has posed a key barrier to implementation. Adoption of the model has remained optional, with an expectation that teachers attend professional development if their school is implementing *Focus on Early Learning*. Study results revealed that district staff considered school autonomy as a major factor to address when they began rolling out *Focus on Early Learning*. There were 31 instances of “autonomy” in the document review and 21 instances noted in the key informant interviews. Examples of school autonomy include altering the master schedule and lengthening the school day or year, deciding which texts and supplies to buy, deviating from district-assigned curriculum and assessments, specifying the amount of professional development and collaborative time, and opting into or out of district-provided professional development services.

As summarized in the Quality School Plan outline examined as part of the document review, the DEC has gained buy-in from schools for the model by leveraging schools’ accountability for outcomes in student achievement. Schools are required to conduct an annual self-assessment and create a Quality School Plan articulating their specific instructional focus, professional development plan, improvement process, and the specific steps they are taking to meet their goals. Two of the three key informants reported that these Quality School Plans are one access point for the DEC to market themselves to schools. Yet, the fact that schools – and to some extent grades within schools – do not need to implement the model if they do not want to is a major challenge for promoting district-wide adoption within and across grades and schools.

3.3.4. Barrier 4: Funding for kindergarten to 2nd grade coaching and curriculum materials

Findings from the document review and key informant interviews further showed that funding for kindergarten to 2nd grade coaching and curriculum materials has created a fourth barrier to implementation. As the BPS PreK program expanded, the DEC took on significant fundraising responsibilities in order to support district efforts to build a strong early childhood program. The largest funder of this work is the Barr Foundation. As identified in the document review summarizing funding allocations, several of the individuals within the DEC (3–4 at any given time) spend a great deal of time on grant applications to support ongoing and future efforts. In BPS, the development of curriculum and professional development for teachers in kindergarten and 1st grade has largely been supported by grant funds. Results of the document review revealed that DEC staff also apply for supplemental grant funding from the state to support the development of instructional resources. In order to support early childhood work at BPS, only 39% of the early childhood department’s employees are funded through the district’s general fund with the remainder coming from grant and private sources.

Two of three key informants noted that instructional coaches would prefer additional funding to support regular and more intensive coaching. Although past state budgets have included Kindergarten Expansion Grants to support funding for kindergarten, document review results illustrated that Massachusetts does not actually allocate state funding for full-day kindergarten. As summarized in a review of multiple financial documents, BPS has used expansion grant funds to provide a half-day paraprofes-

sional in kindergarten classrooms, support NAEYC accreditation, and cover costs associated with curriculum development and professional development. All funding for developing the *Focus on Early Learning* curriculum in kindergarten to 2nd grade and providing professional development to support its implementation comes from private foundations. Document review findings demonstrated that the Kindergarten Expansion Grant was eliminated in the fiscal year 2017 budget, and the Barr Foundation only committed to funding through the end of the 2017–2018 school year. Accordingly, the *Focus on Early Learning* model as initially conceptualized – a strong evidence-based curriculum paired with coaching and training – cannot continue to be implemented without additional funding.

3.4. Research question 4: is there evidence to date that Focus on Early Learning has been adopted and implemented by schools and teachers in BPS?

Results from analyzing the administrative school-level data, the classroom-level fidelity observation data, and the teacher surveys demonstrate that on average, the majority of elementary schools with a PreK program are using the model in some capacity. However, there is substantial variation in the range of grades that have adopted the model and teachers' experiences with training and coaching. Below, we summarize study results by data source.

3.4.1. Administrative data

As illustrated in Fig. 1, 80% of all schools are implementing some *Focus on Early Learning* programming in at least one grade, and 72% are implementing at least two grades in succession. Schools have been much more likely to implement the model in PreK and kindergarten, and substantially less likely to adopt it in 1st and 2nd grade. Indeed, as illustrated in Fig. 1, although 73% of schools implemented the PreK model in 2016–2017, only 34% implemented the 2nd grade curriculum. Accordingly, although it appears that the curriculum itself is being implemented in the field, children in 1st and 2nd grade are less likely to be exposed to it, raising questions about the extent to which the majority of children are going to have a fully aligned PreK to 2nd grade experience. Indeed, only 32% of the schools in BPS were implementing the full PreK to 2nd grade model in 2016–2017. We also found disagreement in the extent to which the district reported that schools were implementing the model relative to what teachers reported. For example, there were 8 PreK teachers and 22 kindergarten teachers that self-reported using the model, but then lacked a corroborating report from the district.

3.4.2. Implementation fidelity

Implementation data revealed moderate levels of implementation fidelity with significant variation across classrooms. Findings from the adherence scores are presented in Table 2. Classrooms where we did not observe particular components do not have adherence scores. Independent samples *t*-test tests demonstrated that adherence was significantly higher in PreK than kindergarten for Introduction to Centers (Mean difference = .18; $t(2, 153) = 5.62, p < .01$), while Adherence was higher in kindergarten for Literacy Small Group (Mean difference = .33; $t(2, 153) = 9.81, p < .05$), and Math Small Group (Mean difference = .16; $t(2, 153) = 6.62, p < .01$). There were no statistically significant differences across grades for the other components.

3.4.3. Teacher surveys

Findings from the teacher surveys revealed that 88% of PreK teachers and 88% of kindergarten teachers participating in the study reported using the *Focus on Early Learning* model in their classroom during the academic year when they were interviewed. Seventy percent of teachers implementing the model said they were using

it because their principal encouraged it. Other non-mutually exclusive reasons for implementing the model included its alignment with reporters' teaching philosophy (45%), other teachers in the school adopting it (44%), and liking the professional development model (21%). Only 15% of teachers reported using *Focus on Early Learning* because they wanted to align instruction across grades.

There was more variation in the extent to which teachers received training and/or coaching on the model during the current or prior academic year. For example, 65% of PreK teachers and 40% of kindergarten teachers reported receiving at least one day of training on the *Focus on Early Learning* model in the current academic year, while 67% of PreK teachers and 60% of kindergarten teachers reported receiving training on the model in previous years. Although 54% of PreK teachers and 53% of kindergarten teachers met with an instructional coach at least one time in the current academic year, only 16% of PreK and 19% of kindergarten teachers met with a coach at least one time about the *Focus on Early Learning* model.

Additional results about teachers' perspectives on implementing the model and experiences with aligned instruction are presented in Table 3. As illustrated, although teachers generally agreed that they had a common curriculum with other teachers in their grade, and worked to align instruction within their grade at their school, they were less likely to report aligning their instruction with teachers in earlier or later grades.

4. Discussion

Findings from this multi-method analysis demonstrate that BPS is implementing a curricular and professional development (training and coaching) model with the goal of promoting horizontal and vertical alignment in the early grades. A notable takeaway from BPS's alignment effort is that the approach aims to align the early elementary grades with PreK, rather than adjusting PreK and kindergarten to look more like 1st and 2nd grade. There is a focus on using rich instructional content as the core part of the curriculum, acknowledging that instructional alignment without high-quality instruction is unlikely to have the positive impact on student learning that the district seeks to make.

Importantly, this study does not provide evidence about whether this model does effectively align instruction and improve outcomes for students. Complementary work evaluating the model is in progress. Even so, lessons from BPS may be helpful to other districts seeking to align content and instruction both within and across grades. Recent work examining national data from 1998 and 2010 has shown that contemporary kindergarten teachers have increasingly higher academic expectations for children prior to and during the kindergarten year, and that they are spending more time on advanced literacy and math content and teacher-directed instruction (Bassok, Latham, & Rorem, 2016). Some have argued that reforms introduced as part of No Child Left Behind have led districts to impose increasingly stringent academic standards on PreK and the early grades, in a way that may not be developmentally appropriate or productive for supporting children's early learning (Kagan & Kauerz, 2007). *Focus on Early Learning* may serve as a model for a curriculum that introduces increasingly advanced content to children across the grades, but uses a play-based, student-directed learning paradigm to achieve those goals, as has been demonstrated to be important for children's early learning in prior work (e.g., Bassok et al., 2014; Clements & Sarama, 2014; Snow & Pizzolongo, 2014). Rather than promoting general structures to support alignment, it is likely critical to consider how to root aligned models in rich, developmentally appropriate instructional content.

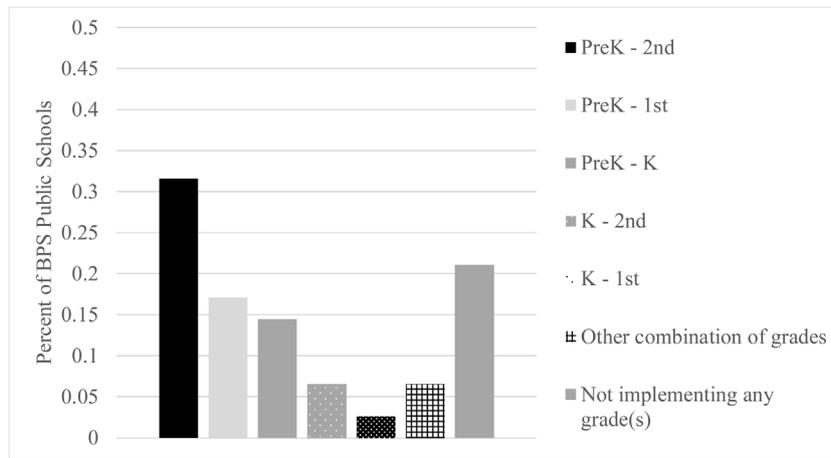


Fig. 1. Percent of BPS elementary schools with PreK program implementing varied components of the Focus on Early Learning model in 2017–2018.

Table 2
Fidelity of implementation to Focus on Early Learning components in PreK and Kindergarten.

Curricular component	PreK		Kindergarten	
	% classrooms observed	% implemented with fidelity	% classrooms observed	% implemented with fidelity
Intro to Centers	93%	66%	75%	48%
Centers	100%	71%	85%	61%
Read Aloud	93%	82%	71%	73%
Thinking & Feedback	32%	53%	33%	55%
Literacy Small Group	63%	60%	61%	93%
Literacy Whole Group	80%	78%	66%	89%
Math Whole Group	66%	72%	69%	74%
Math Small Group	49%	68%	67%	84%
N	41		114	

Table 3
PreK and Kindergarten teacher reports on experiences and behaviors related to aligning instruction in BPS.

Survey question (1–5 where 1 = Strongly Disagree and 5 = Strongly Agree)	PreK		Kindergarten	
	Mean	SD	Mean	SD
Aligning instruction across grades is important for students.	4.68	0.87	4.75	1.03
All teachers in my grade at my school use a common curriculum	4.61	0.92	4.42	1.11
My school's leadership communicates a clear vision for aligning instruction.	3.46	1.13	3.50	1.34
I align the content of my instruction with other teachers in my grade.	4.51	0.84	4.45	0.96
I have a clear idea of the instructional strategies being used in earlier grades.*	–	–	3.58	1.04
I have a clear idea of the instructional strategies being used in later grades.	3.83	1.26	3.35	1.14
I align the content of my instruction with teachers in earlier grades.*	–	–	3.18	1.17
I align the content of my instruction with teachers in later grades.	3.05	1.34	3.10	1.28
The district has communicated a clear vision for aligning instruction from PreK - 2nd grade.	3.90	1.21	3.52	1.04

Note: N = 41 PreK teachers; N = 114 Kindergarten teachers.

There are key structural factors that have supported implementation of Focus on Early Learning in BPS that districts may consider. For instance, having highly-qualified and well-paid teaching staff in PreK to 2nd grade in BPS has likely facilitated fidelity to the model. As illustrated in Table A5, BPS’s pay scale and qualifications are generally a bit higher than other major urban districts. Having a department that oversees PreK – 2nd grade appears to be critical for developing and implementing an aligned approach on a large-scale. Although it may be difficult for other districts to consider merging oversight of these grades – particularly in places where PreK is implemented in both public schools and community-based settings – there may be opportunities for offices to work together to promote alignment efforts. For example, New York City recently consolidated direction of the early grades underneath a central Department of Early Learning (Veiga, 2017). The BPS DEC shares

all Focus on Early Learning curriculum materials on their website.⁶ As such, districts interested in this approach have the tools they need to consider what this model looks like in practice. Even so, we would not formally recommend wide adoption of the approach until more rigorous impact results are published.

Importantly, even when supportive structures are in place, funding will likely pose a major challenge for districts interested in alignment. Across the country, there are still a substantial number of children – many of them lower-income – who lack access to high-quality PreK on its own (Bassok & Galdo, 2016; García & Weiss, 2015), let alone access to a strong aligned PreK to 2nd grade

⁶ See <https://www.bpsearlylearning.org>.

model. BPS itself lacks sufficient financial resources to serve all eligible children with public PreK programming, although there are efforts in place to move toward a more universal model through a mixed-delivery system (Johnson, 2017). Moreover, descriptive research suggests that the instructional quality in PreK in general is fairly low (Sabol, Bohlmann, & Downer, 2018). As such, it is clear that there are competing demands on districts and policymakers to accomplish several goals at once: increase access to PreK particularly for underserved populations; improve the quality of existing PreK programming; and promote structures and practices to align the early grades so that the work that goes into increasing access to and quality of PreK can promote benefits for students in the long-term. Given these competing demands, funding allocations for early childhood continue to be debated. This tension may be especially true when kindergarten to 2nd grade already receive adequate public funding, and PreK is the component of the model that policymakers seek to expand and improve upon.

Indeed, while the popularity of publicly-funded PreK has been evolving across the last 20 years, initiatives to align instruction and content across PreK and elementary school are relatively new. A key finding from this study is that aligning instruction within and across grades in school districts represents a significant cultural change, a shift that BPS is just beginning to engage in now. This is difficult and time-consuming work which requires district staff to build trust and collaboration among content experts, grade band departments, and departments that support special populations. In schools, this type of buy-in requires a deep understanding among principals and teachers about what early childhood education and development looks like in practice, and more collaboration across grades to create continuity between processes, practices and expectations. A key concern of kindergarten to 2nd grade teachers implementing the model is that the approach requires them to shift from whole group instruction – a paradigm that has allowed them to have control over their classroom for the bulk of the time – to a play-based, small-group model wherein children will have freer range to engage in their own learning. This represents a significant shift for teachers who are used to a whole-group format.

Although the development and implementation of the *Focus on Early Learning* model certainly face a range of challenges in fully expanding to the broader district, BPS remains committed to adjusting and working to improve the program over time, rather than treating it as a pilot program that will be changed to another model in the future. Even so, the future of the alignment effort in BPS – and potentially other districts – is uncertain. Continued improvement will be difficult without additional funding. It is clear from this study that the professional development model and specifically coaching is lacking in implementation relative to the curriculum piece. As noted, BPS is currently engaged in conducting rigorous research to better understand implementation of their model – and its effects on children – in order to adapt and improve their professional development for teachers, and to generate empirical evidence for the approach that may be attractive to funders.

4.1. Contributions, limitations, and directions for future research

The current study adds to the literature in four key ways. To our knowledge, this is the first attempt to describe the key components of a curriculum and professional development model that aligns instruction from PreK to 2nd grade and assess the extent to which it is being implemented across a large school district. Although we cannot definitively say whether the model does in fact align instruction, nor whether aligned instruction across PreK and elementary school does benefit children, the paper summarizes the components of an approach for aligning instruction that can, should, and will be tested in future work. The field needs more research

describing core components in early childhood programs that do improve quality (Weiland, McCormick, Mattera, Maier, & Morris, 2018). Second, this paper uses multiple data sources to clearly identify a range of factors that can facilitate or inhibit districts' abilities to align instruction across the early grades. Even as researchers seek to understand the effects of instructional alignment on students' outcomes, districts are moving towards creating policies and practices to align instruction. The current set of findings provide evidence of some considerations that can support those efforts. Third, this paper provides quantitative data on the extent to which an aligned curriculum being used in a real-world context is being implemented. Findings indicate moderate levels of fidelity with significant variation in implementation. This result suggests that models like these are feasible, but may require supports in order to achieve higher and more consistent levels of fidelity across classrooms. Finally, policy studies in education sometimes lack intensive implementation data on the extent to which models were actually adopted and implemented with fidelity. Current study results will help contextualize findings from future work estimating the impacts of instructional alignment on schools and students.

Importantly however, this study also has a number of limitations. First, all data used in this study are descriptive in nature. Future papers will leverage quantitative methods to determine whether *Focus on Early Learning* does in fact support children's positive academic and social-emotional development. Second, the key informant interview data are limited to three individuals with intimate knowledge of the program and do not necessarily generalize to a broader group of school and district officials involved in efforts to align instruction across PreK and elementary school. Third, the observational and survey data only come from PreK and kindergarten classrooms. We found that 1st and 2nd grade teachers were less likely to adopt the model at this point in time (likely related to the fact that the rollout to 1st and 2nd grade came after implementation in the younger grades) and future observational and survey data collected in these grades will help inform the full roll-out of *Focus on Early Learning*. Further work summarizing the specific components of the *Focus on Early Learning* model and reporting more extensively on findings specific to dosage and quality is also in preparation. Finally, this study was unable to explicitly disentangle structures surrounding alignment from processes to support high-quality instruction. Future work should and will address this question more carefully.

4.2. Implications

In sum, the BPS DEC has developed and is currently implementing a PreK to 2nd grade curriculum that aims to align content-rich instruction within and across grades. Descriptively, it appears that the curriculum may have the capacity to improve the continuity of children's learning experiences across time. Some of the core tenets of the model may be helpful frameworks for other districts looking to align instruction across the early grades. For example, considering the importance of rich content and high-quality instruction as part of an aligned model is likely important everywhere. In addition, taking teachers' and principals' perspectives into account and gaining buy-in for alignment will probably be critical in most localities. Similarly, districts looking to create policies and programs to align instruction will definitely need to consider funding, partnerships between districts and early childhood providers, and staff capacity to develop and implement an aligned model. These lessons from Boston can guide other districts in their planning. As we wait for information on the impacts of *Focus on Early Learning* on schools and students, findings from the current study can help districts begin laying the groundwork for effectively integrating early childhood education into a streamlined PreK to 3rd grade approach. Future evaluation findings can then provide concrete lessons about the

expected benefits of such programming (or lack thereof) for districts and students.

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Appendix A

Table A1
Document review overview and categorization matrix.

Document Title	Overview	Source
Assessment SY 2016-2017 BPS Formative Assessment Update	Internal memo from Executive Director of Office of Data and Accountability that includes a calendar for interim/formative assessments.	http://www.bostonpublicschools.org/cms/lib07/MA01906464/Centricity/Domain/238/Preliminary%20SY16-17%20Assessment%20Calendar.112116.KtoHS.pdf
Assessment Program and Benchmark Requirements: 2008-09	Description of an assessment program BPS instituted in 2008-2009 to improve MCAS scores. The assessment system includes multiple formative and summative assessments that address classroom, school, and district level goals.	https://drive.google.com/file/d/0B3uV5Tndvx1zdXdVR3dXMzI1RFE/view
Funding Pre-K teacher annual mean wage across states and metropolitan localities	Annual mean salary for MA pre-K teacher: \$36,090 Annual mean salary in Boston-Cambridge-Nashua: \$39,310	http://www.bls.gov/oes/current/oes.ct.htm
Weighted Funding	Annual Salary for teachers with BA and 5 yrs. experience in Boston: \$73,967 Funding for classrooms is weighted based on structural factors and student types, such as: grade level, disabilities, poverty, High risk students, etc.	http://www.bls.gov/oes/current/oes.35620.htm
Full-Day Kindergarten	Since 2000, Massachusetts DESE provided Kindergarten Development Grant program to assist districts in provision of full-day kindergarten. As a result, the proportion of Massachusetts' children enrolled in full-day kindergarten classrooms has increased to 96% from 29% in 2000.	https://www.nctq.org/contract-database/district/Boston-Public-Schools http://www.bostonpublicschools.org/cms/lib07/MA01906464/Centricity/Domain/184/WSF%20all%20schools%202015-0130.pdf http://www.strategiesforchildren.org/doc-research/FDK/FDK.Factsheet.pdf
Pre-K and K funding	MA FY16 State funding towards Early Education: \$42,289,713. 2015-2016 MA spending level on PreK was \$26,869,279 overall (54.87% increase from previous year). Every Student Succeeds Act (ESSA) increased funding for early childhood education in three ways- Title 1 funding, Title II funding, and preschool development grants. BPS receives title 1 funding, in the amount of \$38,082,660 this year, Title IIA funding in the amount to \$5,733,551.	http://www.ecs.org/ec-content/uploads/01252016_PreK-K.Funding_report_revised_02022016.pdf http://www.strategiesforchildren.org/state-budget.html
The PreKindergarten-3rd Curriculum, Instruction, and Alignment Program	Program providing small grants to over 40 districts to identify needs and develop strategies (Boston worked on curriculum) beginning January 2009.	Cited in Jacobson, D. (2016, August). Building state P-3 systems: Learning from leading states. (Policy Report). New Brunswick, NJ: Center on Enhancing Early Learning Outcomes. http://nieer.org/wp-content/uploads/2016/05/Massachusetts.2015_rev1.pdf
Per child spending in MA	In 2014-2015, the state spent \$3626 per preschool child enrolled. In 2014-2015, the state spent \$5252 per child enrolled in UPK programs. In 2014-2015, BPS spent \$18,371.88 per pupil. MA per pupil spending in FY2014: \$15,087. Ranked 8 th in the nation.	https://www2.census.gov/govs/school/14f33pub.pdf https://www2.census.gov/govs/school/14f33pub.pdf
State funding comparison nationally School district funding comparison nationally Licensing Teacher License Types and General Requirements	BPS spending per pupil: \$21,567. Highest among 100 largest public-school systems by enrollment. Temporary License = Has been employed in another state under a valid license or certification comparable to Massachusetts initial license for 3+ years. Preliminary License = Bachelor's degree; No SEI endorsement Initial License = Bachelor's degree + Holds the SEI endorsement Professional License = Initial license + Employed under the Initial license for at least three (3) years and completed an induction and mentoring program + Master's/advanced degree in academic discipline appropriate to the license sought, OR completed an approved program for the professional license sought, OR completed a program leading to eligibility for master teacher	http://www.mass.gov/edu/government/departments-and-boards/ese/programs/educator-effectiveness/licensure/academic-PreK-12/teacher/teacher-license-types-and-general-requirements-.html

Table A1 (Continued)

Document Title	Overview	Source
Starting Young: Massachusetts Birth-3 rd grade policies that support children’s literacy development	Level 1: Infant-Toddler or Preschool Teacher (assistant teacher)= 21 years old or have a high school diploma and complete a three-credit course in child growth and development (alternatives include CDA or specific coursework). Level 2: Lead Infant-Toddler or Preschool Teacher= Same as level 1 +9 credits in early childhood education DESE requirement for teacher of student with or without disabilities (PreK-2nd Grade teacher Certification, includes pre-K teacher) = Bachelor’s degree, completion of an approved program, passing communications and literacy test; Passing score on early childhood education subject matter test, a TBE or SEI endorsement; 300 hours of practicum (at least one setting must include children with disabilities)	https://static.newamerica.org/attachments/11901-starting-young/StartingYoung11.13.3ebe6fdcefde4d86b28717e2399119af.pdf (see page 25: Pathways to Early Childhood Credentialing)
Policy An Act Relative to the Achievement Gap	PreK, full-day K, and targeted reading interventions are three of the strategies superintendents can use to address underperformance as part of a school turnaround plan.	https://malegislature.gov/Laws/SessionLaws/Acts/2010/Chapter12
Building Foundations for Future Success for Children from Birth through Grade Three An Act Ensuring High-Quality Pre-Kindergarten Education	Vision document for Massachusetts linking college and career readiness to 5 core competencies to learn in P-3. Grant to support implementation of high-quality Pre-k programs in Mass. Districts. Priority given to districts with large % of high need students and with lower scores.	http://www.mass.gov/edu/docs/eoe/birth-grade-three/building-the-foundation-for-college-and-career-success.pdf https://malegislature.gov/Bills/189/House/H462
An Act Relative to Third Grade Reading Proficiency Early Literacy Panel	Established Early Literacy Panel to advise DESE, EEC on early literacy development. Focuses of ELP include effective curricula for early ed. and care programs, effective literacy practices, pre-service training and PD, child screening, family partnerships, strong implementation of policy initiatives.	https://malegislature.gov/Laws/SessionLaws/Acts/2012/Chapter287 http://www.mass.gov/edu/docs/eoe/early-literacy/early-literacy-panel-annual-report.pdf http://www.mass.gov/edu/docs/eoe/early-literacy/fy15-early-literacy-panel-annual-report.pdf
Professional Development A-Z Training Index: Dept. Early Education and Care Training list	Trainings offered are in the fields of health and hygiene, safety, data collection, and instructional quality. Orientation to the Field for Family Child Care Assistants and orientation to the field for new group and school age educators is required.	http://www.mass.gov/edu/government/departments-and-boards/departments-of-early-education-and-care/a-z-training-index.html
Structural Features Teacher: Child ratios	Class size maxima goals for years 2010-16: 22 students in kindergarten to 2 nd grade.	https://btu.org/wp-content/uploads/7-BTU%20Contract-Article%20V.pdf
Number of teachers in a classroom	In Inclusion classrooms, the general ed teacher- child ratio is 1 to 20 with a maximum of 6 SpED kids. For every general ed teacher there is a 1 SpEd teacher in the inclusion classroom. Full-time paraprofessionals are in every K0 and K1 classroom	https://btu.org/wp-content/uploads/Final-BTU.Contract.No.Index.pdf

Table A2
Demographic characteristics of teachers participating in observations and surveys.

Teacher characteristic	PreK % or Mean (SD)	Kindergarten % or Mean (SD)
Teacher age	42.18 (SD = 9.43)	38.37 (SD = 8.61)
Years teaching	14.83 (SD = 8.86)	12.62 (SD = 8.48)
Years teaching at current school	8.41 (SD = 7.26)	6.95 (SD = 5.89)
Teacher has master’s degree	71%	82%
Teacher female	96%	91%
Teacher Black	28%	14%
Teacher White	47%	59%
Teacher Hispanic	13%	24%
Teacher Asian or other race	12%	4%
Classrooms per school	1.35 (SD = .42)	2.81 (SD = 1.04)
N	41	114

Note: PreK teachers participated in the study in the Spring of 2017 and kindergarten teachers participated in the Spring of 2018.

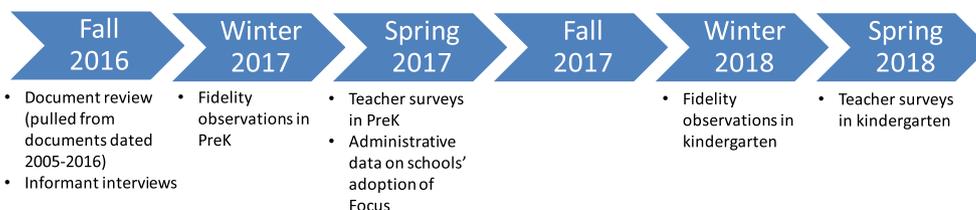


Fig. A1. Timeline for study data collection activities.

Table A3
Overview of *Focus on Early Learning* curricular components from PreK to 2nd grade.

	Curricular component and description		Included (or adapted) in grade-specific curriculum			
			PreK	Kindergarten	First grade	Second grade
Reviewed in current study	Introduction to centers	Teachers identifies centers that are available to students and models some activities that children can engage in during center time.	✓	✓		
	Centers	Children use various media to communicate their ideas about a topic. Children are able to choose which Center to go to, and are able to move freely.	✓	✓	✓	✓
	Thinking and feedback	Specific protocol for looking, noticing, listening, wondering, and suggesting/inspiring about some specific work done in Centers.	✓	✓	✓	✓
	Read aloud	Class follows a specific protocol for reading a book that is part of the curriculum four separate times with explicit goals and activities for each read.	✓	✓	✓	✓
	Literacy Whole Group	Whole group time focused on phonics, phonological awareness, or other literacy topics (depending on grade).	✓	✓	✓	✓
	Literacy Small Group	Small groups of children being led by teacher to work on literacy-related topics (e.g., reading, vocabulary, guided writing, word study). Should occur during other components.	✓	✓	✓	✓
	Math Whole Group	Math time in a whole group format. This is a time for launching/introducing the math concepts prior to math workshop/small group.	✓	✓	✓	✓
Not yet reviewed	Math Small Group	Math time in a small group format. Children may be doing the same OR different math activities in small groups. Teacher should be circulating around.	✓	✓	✓	✓
	Storytelling/ Storyacting	Children write/act out stories to share and discuss with class.	✓	✓	✓	✓
	Learning Stations	Stations focused on literacy. Children practice skills (e.g., content writing, listening/speaking, reading) and are often assigned to rotate through particular Stations.		✓	✓	✓
	Vocabulary & Language Number Talks	Introduce key words, engage in vocabulary or language lessons, and discuss understanding of new vocabulary. Practice math ideas like cardinality, addition, subtraction. Children use what they already know to firm up strategies and work on efficiency.		✓	✓	✓

Table A4
Key features of focus on early learning model compared with previous practice: comparisons made with data from document review and key informant interview data.

Curricular feature	Previous practice	<i>Focus on Early Learning</i>
Content of instruction	<ul style="list-style-type: none"> Substantial repetition of preschool content in elementary school Lessons are focused on basic skill development, not integrated into thematic lessons directed at content knowledge Subjects (literacy, language, math, science, social studies) taught separately Shallow content instruction, spread across many content areas (e.g., 16 topics for language/literacy in kindergarten) 	<ul style="list-style-type: none"> Content builds from preschool to 2nd grade with little repetition Lessons are theme-based and focus on building critical thinking and content knowledge Connections are made across subject areas
Format of instruction	<ul style="list-style-type: none"> Kindergarten/elementary school structures and formats not aligned with preschool Primarily whole-group Teacher-directed, with mostly passive listening and individual seatwork 	<ul style="list-style-type: none"> Deep content instruction (e.g., 4 themes for language/literacy in kindergarten, 6 in 1st grade) Structures and formats mirror preschool Primarily small-group Student-directed, with teacher support Promotes active engagement with materials and tasks that relate to broader themes
Opportunities to tailor instruction	<ul style="list-style-type: none"> Tailored instruction difficult to implement with whole-group instruction Level of difficulty aimed at lower to middle performers 	<ul style="list-style-type: none"> Project-based, including collaborative work with peers Small-group instruction centers and multiple learning modalities allow for differentiated instruction Tailored instruction designed to bring less skilled students (who are less likely to have attended preschool) up to speed without holding back more skilled students
Professional development	<ul style="list-style-type: none"> Preschool teachers receive intensive training and ongoing coaching Kindergarten through 2nd grade teachers receive mostly one-shot curriculum training 	<ul style="list-style-type: none"> All preschool through 2nd grade teachers receive curriculum training and coaching Monthly curriculum-focused seminars, led by a coach, encourage kindergarten – 2nd grade teachers to share problems, successes, and resources

Note: To summarize these findings we drew on our document review - specifically the comprehensive review and comparison of the curriculum in place prior to *Focus on Early Learning* relative to the new *Focus on Early Learning* model. We directly compared the language, literacy, and math activities across both sets of curricula in PreK and the early elementary grades. We first coded similarities and then coded explicit differences based on four key codes: mode of instruction; content of instruction; differentiation opportunities, and professional development supports. Codes were reviewed and then quantified to describe differences across the two that had at least four occurrences in the comparison where the prior and current practice were systematically different. The differences are summarized in the table.

Table A5
Salary for teacher education and experience, minimum teacher education requirements, and teacher–child ratios by city.

City	Certified, first-year teacher with bachelor's degree	Bachelor's degree and 5 years experience	Master's degree and 5 years experience	Master's degree on highest step of salary schedule	Maximum salary (degree, years experience)	Minimum teacher education	Required teacher certification for early care and education	Teacher-child ratio in early care and education classrooms
Seattle	\$50,604	\$52,727	\$61,847	\$73,439	\$98,982 (PhD, 14 years)	Bachelor's degree, WA teacher prep program	Washington residency teaching cert.	1:10
Los Angeles	\$50,368	\$51,645	\$57,969	\$67,467	\$89,421 (PhD, 29 years)	Bachelor's degree, Approved CA teacher prep program	Preliminary credential	1:24
San Antonio	\$52,350	\$53,142	\$55,142	\$60,268	\$60,268 (Master's, 26 years)	Bachelor's degree, Educator prep program	Initial certificate	No limit
New York	\$54,000	\$58,914	\$65,618	\$108,199	\$114,900 (Master's, 22 years)	Registered teacher prep program	Initial certificate	1:10
San Francisco	\$55,225	\$58,159	\$61,766	\$70,807	\$96,368 (Bachelor's, 26 years)	Bachelor's degree, CA approved teacher prep program	Preliminary credential	1:24
Chicago	\$55,283	\$60,953	\$64,782	\$97,717	\$105,602 (PhD, 26 years)	Bachelor's degree, Approved teacher prep program	Professional educator license	1:10
Boston	\$55,295	\$73,327	\$78,373	\$97,191	\$110,632 (PhD, 8 years)	Bachelor's degree, Approved educator prep program	Initial license	2:22

References

Abry, T., Latham, S., Bassok, D., & LoCasale-Crouch, J. (2015). Preschool and kindergarten teachers' beliefs about early school competencies: Misalignment matters for kindergarten adjustment. *Early Childhood Research Quarterly, 31*, 78–88.

Bailey, D. H., Duncan, G. J., Odgers, C. L., & Yu, W. (2017). Persistence and fadeout in the impacts of child and adolescent interventions. *Journal of Research on Educational Effectiveness, 10*(1), 7–39.

Bassok, D., Claessens, A., & Engel, M. (2014, June 4). The case for the new kindergarten: Challenging and playful. Education Week. Retrieved from http://www.edweek.org/ew/articles/2014/06/04/33bassok_ep.h33.html.

Bassok, D., Finch, J. E., Lee, R., Reardon, S. F., & Waldfogel, J. (2016). Socioeconomic gaps in early childhood experiences: 1998 to 2010. *AERA Open, 2*(3), 1–22, fabr

Bassok, D., & Galdo, E. (2016). Inequality in preschool quality? Community-level disparities in access to high-quality learning environments. *Early Education and Development, 27*(1), 128–144.

Bassok, D., Latham, S., & Rorem, A. (2016). Is kindergarten the new first grade? *AERA Open, 1*(4), 1–31.

Bornfreund, L. & Loewenberg, A. (2018, November). A focus on teaching and learning in PreK through 2nd grade. New America Foundation Report. Retrieved from <https://www.newamerica.org/education-policy/reports/focus-teaching-and-learning-prek-2nd-grades>.

Bronfenbrenner, U. (1989). Ecological systems theory. In R. Vasta (Ed.), *Annals of child development. Volume 6: Six theories of child development: Revised formulations and current issues* (pp. 187–249). Greenwich, CT: JAI Press.

Chaundry, A., Morrissey, T., Weiland, C., & Yoshikawa, H. (2017). *Cradle to kindergarten: A new plan to combat inequality*. New York, NY: Russell Sage Foundation.

Claessens, A., Engel, M., & Curran, F. C. (2014). Academic content, student learning, and the persistence of preschool effects. *American Educational Research Journal, 51*(2), 403–434.

Clements, D. H., & Sarama, J. (2007). Effects of a preschool mathematics curriculum: Summative research on the Building Blocks project. *Journal for Research in Mathematics Education, 38*(2), 136–163.

Clements, D. H., Sarama, J., Wolfe, C. B., & Spitler, M. E. (2013). Longitudinal evaluation of a scale-up model for teaching mathematics with trajectories and technologies persistence of effects in the third year. *American Educational Research Journal, 50*(4), 812–850.

Clements, D. H., & Sarama, J. (2014). *Learning and teaching early math: The learning trajectories approach* (2nd ed.). New York, NY: Routledge.

DeBruin-Parecki, A., & Slutzky, C. (2016). Exploring pre-k age 4 learning standards and their role in early childhood education: Research and policy implications. *ETS Research Report Series, 1*, 1–52.

Durlak, J. A., & DuPre, E. P. (2008). Implementation matters: A review of research on the influence of implementation on program outcomes and the factors affecting implementation. *American Journal of Community Psychology, 41*(3–4), 327–350.

Engel, M., Claessens, A., & Finch, M. A. (2013). Teaching students what they already know? The (mis) alignment between mathematics instructional content and student knowledge in kindergarten. *Educational Evaluation and Policy Analysis, 35*(2), 157–178.

García, E., & Weiss, E. (2015). *Early education gaps by social class and race start US children out on unequal footing: A summary of the major findings in inequalities at the starting gate*. Washington, DC: Economic Policy Institute.

Gervasoni, A., & Perry, B. (2015). Children's mathematical knowledge prior to starting school and implications for transition. In B. Perry, A. MacDonald, & A. Gervasoni (Eds.), *Mathematics and transition to school* (pp. 47–64). New York, NY: Springer.

Hsieh, H. F., & Shannon, S. E. (2005). Three approaches to qualitative content analysis. *Qualitative Health Research, 15*(9), 1277–1288.

Hulleman, C. S., & Cordray, D. S. (2009). Moving from the lab to the field: The role of fidelity and achieved relative intervention strength. *Journal of Research on Educational Effectiveness, 2*(1), 88–110.

Johnson, A. (2017, March 10). Boston pre-K programs that make the grade. The Boston Globe. Retrieved from <https://www.bostonglobe.com/>.

Johnson, R. (2013). *School quality and the long-run effects of head start*. Berkeley, CA: Goldman School of Public Policy.

Kagan, S. L., & Kauerz, K. (2007). Reaching for the whole: Integration and alignment in early education policy. In R. C. Pianta, M. Cox, & K. L. Snow (Eds.), *School readiness and the transition to kindergarten in the era of accountability* (pp. 11–30). Baltimore, MD: Brookes.

Kauerz, K. (2010). *PreK-3rd: Putting full-day kindergarten in the middle*. New York, NY: Foundation for Child Development.

Lipsey, M. W., Farran, D. C., & Durkin, K. (2018). Effects of the Tennessee Prekindergarten Program on children's achievement and behavior through third grade. *Early Childhood Research Quarterly, 45*, 155–176.

Ludwig, J. A., & Phillips, D. A. (2008). Long-term effects of Head Start on low-income children. *Annals of the New York Academy of Sciences, 1136*(6), 257–268.

Manship, K., Farber, J., Smith, C., & Drummond, K. (2016). *Case studies of schools implementing early elementary strategies: Preschool through third grade alignment and differentiated instruction*. Washington, DC: Office of Planning, Evaluation and Policy Development, U.S. Department of Education.

Marietta, G., & Marietta, S. (2013). *PreK-3rd's lasting architecture: Successfully serving linguistically and culturally diverse students in Union City, New Jersey*. New York, NY: Foundation for Child Development.

Marshall, N. L., Robeson, W. W., & Roberts, J. (2012). *Boston Public Schools K2-3rd grade needs assessment 2012*. Wellesley Centers for Women, Wellesley College. Internal Report to the Department of Early Childhood, Boston Public Schools.

Mattera, S., Jacob, R., & Morris, P. (2018). *Strengthening children's math skills with enhanced instruction: The impacts of Making Pre-K Count and High 5s on kindergarten outcomes*. New York, NY: MDRC.

Mayring, P. (2000). Qualitative content analysis. *Forum: Qualitative Social Research, 1*(2), 1–28.

Phillips, D., Johnson, A., Weiland, C., & Hutchison, J. E. (2017). *Public preschool in a more diverse America: Implications for next-generation evaluation research*. Ann Arbor, MI: Poverty Solutions.

Piotrkowski, C. S., Botsko, M., & Matthews, E. (2000). Parents' and teachers' beliefs about children's school readiness in a high-need community. *Early Childhood Research Quarterly, 15*(4), 537–558.

Polit, D. F., & Beck, C. T. (2012). Sampling in qualitative research. *Nursing research: Generating and assessing evidence for nursing practice, 515–528*.

Puma, M., Bell, S., Cook, R., Heid, C., Broene, P., Jenkins, F., . . . & Downer, J. (2012). *Third-grade follow-up to the Head Start impact study: Final report*. OPRE Report

- 2012–45b. Washington, DC: Administration for Children and Families, U.S. Department of Health and Human Services.
- Sabol, T. J., Bohlmann, N. L., & Downer, J. T. (2018). Low-income ethnically diverse children's engagement as a predictor of school readiness above preschool classroom quality. *Child Development, 89*(2), 556–576.
- Schickedanz, J. A., & Dickinson, D. (2004). *Opening the world of learning*. Iowa City: Pearson Early Learning.
- Scott-Little, C., & Reid, J. (2010). Aligning the content of early childhood care and education. In S. L. Kagan, & K. Tarrant (Eds.), *Transitions for young children: Creating connections across early childhood systems* (pp. 109–133). Baltimore, MD: Paul H. Brookes.
- Snow, K. L., & Pizzolongo, P. (2014). *Not yesterday's kindergarten* [Weblog post] Retrieved from: <http://www.naeyc.org/blogs/gclarke/2014/02/notyesterday%E2%80%99skindergarten>
- Spain, A. K., Ehrlich, S. B., Cowhy, J. R., Dasgupta, D. K., & Lockaby, T. (2018). *A community effort to support the transition from pre-K to kindergarten*. Chicago, IL: University of Chicago Consortium on School Research and Chapin Hall at the University of Chicago.
- Stipek, D., Franke, M., Clements, D., Farran, D., & Coburn, C. (2017). PK-3: What does it mean for instruction? *Social Policy Report, 30*(2), 1–23.
- Swain, W. A., Springer, M. G., & Hofer, K. G. (2015). The persistence of Pre-K effects and early grade teacher quality: evidence from Tennessee-voluntary Pre-K experiment. *AERA Open, 1*(4), 1–17.
- Valentino, R., & Stipek, D. J. (2016). *PreK-3 alignment in California's education system: Obstacles and opportunities*. Stanford, CA: Stanford University Policy Analysis for California Education.
- Veiga, C. (2017, May 16). With a major but little-noticed move, New York City signals that learning starts at birth. *Chalkbeat*. Retrieved from <https://www.chalkbeat.org/>.
- Vygotsky, L. (1978). Interaction between learning and development. *Readings on the development of children, 23*(3), 34–41.
- Weber, R. P. (1990). *Basic content analysis* (2nd ed). Thousand Oaks, CA: Sage.
- Weiland, C., & Yoshikawa, H. (2013). Impacts of a PreKindergarten program on children's mathematics, language, literacy, executive function, and emotional skills. *Child Development, 84*(6), 2112–2130.
- Weiland, C., McCormick, M., Matterna, S., Maier, M., & Morris, P. (2018). Preschool curricula and professional development features for getting to high-quality implementation at scale: A comparative review across five trials. *AERA Open, 4*(1), 1–16.
- Whyte, K., McMahon, K., Coburn, C. E., Stein, A., & Jou, N. (2016). *PreK-3 alignment: A review of the evidence*. Stanford, CA: DREME Network.
- Yoshikawa, H., Weiland, C., Brooks-Gunn, J., Burchinal, M. R., Espinosa, L. M., Gormley, W. T., & Zaslow, M. J. (2013). *Investing in our future: The evidence base on preschool education*. New York, NY: Foundation for Child Development.