1 Introduction
Increasing and Sustaining Gains in Early Learning

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How gains from early childhood experiences are initiated, increased, and sustained is fundamental to developmental and educational science, and has increasing policy relevance given new public investments over the past decade. The effectiveness of these investments in producing gains is also critical for accountability and identifying future investment priorities. The challenge of maintaining gains has received increased attention as early childhood programs expand. Evidence from recent evaluations of state prekindergarten (Lipsey, Farren & Hofer, 2015) and federal Head Start programs (Puma, Bell, Cook et al., 2012) shows positive benefits but reduced gains as children matriculate into elementary school. Directly supporting the theme of this volume, more recent evidence reported by Johnson & Jackson (2018) demonstrates that the longer-term benefits of the early intervention of Head Start are bolstered by subsequent greater investments in public schools. Another example is Ansari & Pianta's (2018) study that shows linkages between elementary school quality and the persistence of preschool effects. This is further supported by Reynolds, Ou, & Temple's (2018) study of the long-term benefits of programs that continue into elementary school.

This volume emphasizes not only key interventions and practices over the first decade of life that promote healthy development, but also elements and strategies through which learning gains can be enhanced by schools, families, communities, and public institutions. Scaling and expansion of effective programs also are considered. The approaches and principles covered in the volume that show evidence of enhancing learning gains include: (a) program dosage and quality; (b) teacher background, curriculum, and instruction; (c) preschool to third grade (P–3) continuity and alignment; and (d) school quality and family support. Lessons from long-term studies since the 1960s and from current practices will be described to help move the field forward.

The chapter authors are leading researchers and thought leaders in the multidisciplinary fields of human development, education, and behavioral

science. Coverage of topics has a strong emphasis on policy and program improvement as well as translational research. Many implications for policy and practice are discussed. The book is based on a national invitational conference that was held at the Federal Reserve Bank of Minneapolis in October 2015. The chapters are updated versions of the papers presented at the conference. Sponsored by the Human Capital Research Collaborative (http://hcrc.umn.edu), an interdisciplinary research center at the University of Minnesota, this book is the third in the series on education and child development.

Themes for Promoting Effectiveness

The book addresses three key themes for research, policy, and practice. They have been a focus of multidisciplinary scholarship for decades, but have increased in priority as access to early education has expanded and evidence of effectiveness is more valued.

Theme 1: Assessing the Impacts of Increased Investment in Early Childhood. The first is the importance of documenting the impact of increased federal and state investments in early childhood development. In recent years, public funding of early childhood programs has continued to grow. The US Department of Education's Race to the Top and Preschool Development Grants to states, enhancements in federal Head Start programs and Child Care and Development Block Grants, and state expansion of prekindergarten programs total more than $5 billion in new funding over the past five years. Total public funding at all levels exceeds $30 billion annually (Council of Economic Advisors, 2015, 2016), which is a doubling of investment over the past two decades (US General Accounting Office, 1999). Public–private sector initiatives, such as Pay for Success, have also been implemented to expand access (Government Accountability Office, 2015; Temple & Reynolds, 2015). Documenting and understanding the extent to which these investments lead to sustained gains in the elementary grades is of great importance not only for accountability but for identifying the elements of programs and contexts that promote longer-term effects on achievement, socio-emotional learning, and educational attainment.

As a consequence of new investments, program participation has increased. Figure 1.1 shows that enrollment of 4-year-olds in public preschool (state pre-K, Head Start, special education) has increased from a decade ago to 43% (NIEER, 2017). For 3-year-olds, 16% are enrolled. Because these rates do not include federal Title I and local funding, they are likely to have been underestimated by at least 5 percentage points. Full-day preschool enrollment also has increased to 54% (includes 3- and

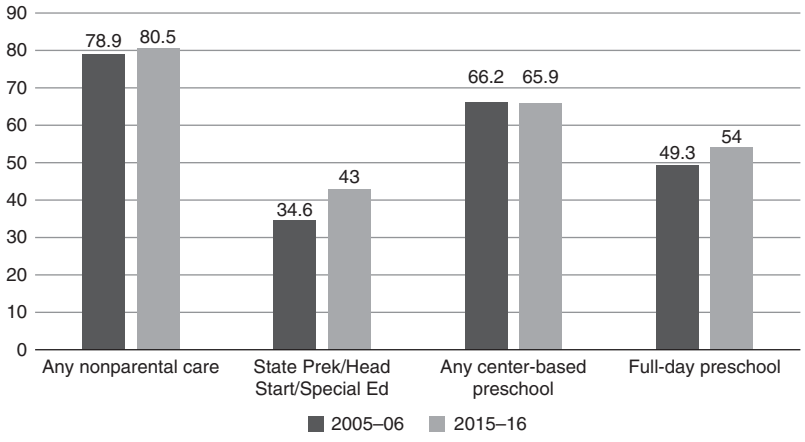

Figure 1.1 Percentage of US 4-year-olds in early education

4-year-olds). Although 80% of 4-year-olds are in nonparental care for at least part of the day (about 3.2 million out of 4 million children), this is relatively unchanged from a decade ago (US Department of Education, 2017). This indicates that it is the type of early education that has changed the most rather than enrollment itself. Consequently, understanding and addressing ways to improve quality and the size of impacts over time has the potential to improve the well-being of millions of young children each year. It also increases the importance of regular accountability to ensure programs are providing sufficient benefits that can be sustained.

Differences in enrollment by socio-economic status, race, and ethnicity continue to be large. Parental education is a good predictor of enrollment in center-based programs, as 18% of children whose parents were high school dropouts were enrolled in such programs compared to 41% for those with advanced degrees (US Department of Education, 2016). A similar pattern occurs for family income, with enrollment in center-based programs nearly three times higher for nonpoor children than poor children (US Department of Education, 2016). Hispanic and American Indian children are less likely to participate in center- and school-based preschools (42% and 46%, respectively) compared to White and Black children (49% and 53%, respectively). Dual-language learners of all ethnicities are underrepresented in programs (42%) relative to English-language-only children (48%; Park et al., 2017). Participation across P–3 should be fully inclusive and strive to tailor instruction to promote learning optimally.

Many chapters discuss the lessons from landmark and current projects to inform policy and program improvement. Extensive research has consistently shown that participation in effective preschool and early education programs can improve school readiness skills and subject matter achievement, and can reduce the need for later remedial education services (Camilli et al., 2010; Cannon et al., 2017). Ensuring that these benefits continue for contemporary programs and for children from diverse backgrounds and experiences is a major goal. Access to high quality programs that support the transition to school and can also lead to long-term benefits is highlighted. The measurement of sustained effects and methodological issues about successfully tracking cohorts and monitoring implementation quality is salient as well.

Theme 2: Focus on Key Elements and Principles of Effectiveness. The second theme of the volume is a comprehensive focus on the elements and principles for sustaining gains in well-being. These elements are also the presumed causes of why continued gains are not observed for many programs and interventions. A major limitation in the field is a focus on one or two of the elements or principles, such as insufficient program quality or poor elementary school quality, without addressing the full scope of possibilities. This may involve, for example, teacher educational and preservice background, class size and support staff, high mobility from preschool to the school grades, differences in class sizes or curriculum, or inconsistent family involvement over time. These explanations have not been fully explored for state pre-K programs, Head Start, and similar programs.

Historically, early childhood programs were designed to promote the development of children with elevated risks of poor cognitive, socioemotional, and parenting outcomes. Center-based and family-focused programs provided intensive and enriching educational experiences from birth to age 5 to improve foundational skills for school success and social competence (Consortium for Longitudinal Studies, 1983). Influenced by the environmentalism of the 1960s, intellectual effects of programs were emphasized, especially gains in IQ scores (Zigler & Trickett, 1978). Over time, the scope of outcomes expanded to school and social competence, school readiness, and to the current conception of well-being.

Whether improvements in learning and well-being are sustained throughout childhood and into adulthood depends to a large extent on the quality of the program. For example, the landmark prospective cohort studies of the Cornell Consortium, Perry Preschool, Abecedarian Project, and Child–Parent Centers all showed large preschool gains that were

sustained to adulthood. For three of the program evaluations, economic returns exceeded costs by at least a factor of 3. The key common elements of the programs were (a) small classes and child-to-staff ratios no higher than 17:2; (b) an intensive focus on language and literacy within a whole-child, developmental philosophy; (c) comprehensive family services; (d) staff compensation that was competitive with public schools; and (e) frequent monitoring and feedback for improvement.

Most current programs financed by states and school districts have few of the key elements of the landmark studies. Child-to-staff ratios are usually 20:2. Family services and expectations for parent involvement are minimal. Curriculum and instruction often lack a strong evidence base, and emphasize teacher-directed activities. Program monitoring is cursory, and is designed for accountability rather than improvement. Costs per child are also lower. As one illustration, the Tennessee Voluntary Prekindergarten program may be classified as a routine state pre-K program based on these criteria. Child-to-staff ratios are 20:2, and although full-day services are provided, none of the comprehensive family services found in the landmark studies are evident. A recent experimental study of the program found positive effects at the end of preschool but no detectable effects on learning from kindergarten to third grade (Lipsey, Farren & Hofer, 2015). This is not surprising given the accumulated evidence that only high-quality programs that follow the established principles of effectiveness from the field yield long-term effects.

Table 1.1 shows three common sets of program elements that promote effectiveness in early childhood programs. Programs for preschool children and beyond that meet more of these elements are likely to have larger and more enduring effects than those meeting fewer of the elements (Cannon et al., 2017; Reynolds et al., 2010). Zigler et al.'s (2006) and the National Institute of Early Education Research's (NIEER, 2017) effectiveness elements are similar in most respects, with the Zigler framework including parent involvement as a key element. The Child–Parent Center (CPC) elements described in Reynolds et al. (2017) also emphasize parent involvement as well as curriculum alignment and continuity across ages and grades. The organizational component of collaborative leadership helps create a positive learning environment that is further enhanced by professional development for staff.

How these common elements align with key principles of effective intervention described by Ramey and Ramey (1998) is noted in the last column. Among the six principles are: developmental timing, program intensity, and ecological and environmental maintenance of development. They are reasonably represented by the three frameworks, though not perfectly. Environmental maintenance of development, which is

Table 1.1 *Core elements of early childhood programs and services and linkage to key prin*

CPC–P–3 Program Elements Reynolds et al. 2017	Essential Elements of High-Quality Pre-K Gates Foundation 2015	Zigler et al. 2006	NIEER
Collaborative leadership A team led by head teacher to create a strong learning climate Delegated responsibilities for curriculum, family support	Strong leadership Integrated system of learning goals, curriculum, professional development, formative assessments, and data	Monitoring system with on-site observation	Monitor least
Effective learning experiences Small classes (<18 in pre-K; <26 in K–3) Balance of teacher-and child-directed instruction Extended learning time, including full-day, multi-year programs Teacher has BA degree; Assistant has CDA, AA degree, or equivalent Engaged in learning and instruction	Maximum class size of 22, adult: child ratio between 2:15 and 2:22 Two adults in the classroom Learning time: 6–6.5 hours per day, 180–205 days per year Support for dual-language learners Support for students with special needs Teacher–child interactions focused on learning	Maximum of 10 children per teacher or assistant teacher Teacher with BA and EC specialization; Assistant with CDA or equivalent Full-day and two-year option	Maximu per st Maximu Teacher Teacher traini Assistan equiv
Aligned curriculum & practices Evidence-based curriculum Annual curriculum alignment plan Across-grade collaboration	Age-appropriate learning standards Proven (research-based) curriculum Formative assessments Data-driven decision-making	Curriculum is evidence-based Parent involvement plan	Compre stand Health s plus a servic 1 meal p

Parent involvement & engagement Menu-based system of home and school support Annual parent involvement plan Parent resource teacher and outreach worker Physically located parent room Needs assessment			
Professional development In-person and online coaching support Site mentors Review of online modules	Ongoing professional development focused on teacher–child interactions Education and compensation: Teachers have a BA and early learning credential, and are compensated at the same level as K–3 teachers	System of in-service training for all staff Teachers are compensated at rates competitive with schools	Teacher i at least
Continuity and stability Participation from preschool to third grade Colocation or close proximity Outreach efforts to reduce mobility	Public support from elected officials, courts and the policy environment	Funding levels support high quality of programs	

Note. Some elements may span multiple categories, but have been assigned to the one that fits most close

related to duration, is central to CPC-P–3 but not directly addressed in the others. Relatively few programs include all of the elements at high levels of quality, especially over P–3. Fewer than 10% of students have been shown to experience features similar to CPC-P–3 (Reynolds et al., 2010). Some elements have shown improvement, however, such as full-day kindergarten, in which 83% of 5-year-olds are enrolled compared to 69% a decade ago (US Department of Education, 2017). With these elements and principles as a framework, the volume addresses how changes in quality and alignment of programs and practices can improve long-term outcomes. The elements and principles in Table 1.1 provide a checklist for identifying core features influencing learning and gains over time.

The volume is organized according to the main sources of sustained and long-term effects identified in the literature. These include: (a) dosage and length of participation; (b) program quality in the dimensions of learning experiences, curriculum and instruction, and teacher background and qualifications; (c) continuity and alignment over P–3; and (d) school quality and family support. Federal, state, and local-level institutional funding is also covered. Authors delve into these issues by summarizing what is known, effectiveness, and next steps to better improve program performance and consistency in learning. Examples from programs showing long-term effects include the Child–Parent Centers, Perry Preschool, Abecedarian Project, and Infant Health and Development Program.

The reasons for a drop-off in effects, for example, may vary by outcome. Achievement effects tend to show larger drop-offs over time compared to socio-emotional learning, special education placement, and crime prevention (Reynolds & Temple, 2008). Even if gains in one domain drop off, they may carry over to other domains. A common finding is that benefits on school readiness, for example, carry over to reduced special education even if achievement gains are not sustained (Consortium, 1983; Schweinhart et al., 2005). To illustrate and organize the alternative possibilities for sustaining gains from early childhood experiences, the Five-Hypothesis Model of Effectiveness (5HM; Reynolds, 2000) was developed (described in further detail in the next major section of this chapter). In this model, long-term and sustained effects are evaluated according to the extent to which programs impact (1) cognitive-scholastic skills (cognitive advantage), (2) socio-emotional adjustment, (3) motivation, (4) family support behavior, and (5) school quality and support. Program components such as dosage and intensity can also be assessed according to these hypotheses. Programs showing long-term effects tend to demonstrate impacts on two or more of the five

hypotheses. Attention to all five can help enhance impacts and address gaps in program implementation.

Theme 3: Multiple Levels of Programs, Policies, and Practices Need to Be Integrated. The third theme is the focus on multiple levels of strategies for initiating and sustaining learning gains as well as promoting well-being. Approaches for enhancing early childhood learning vary dramatically in scale, breadth, and specificity. With regard to scale, the new Every Student Succeeds Act of 2015 provides, at the federal level, several avenues for enhancing early childhood programs and outcomes. The required school improvement plans prepared by states and districts provide opportunities to include early learning as a key goal, and organize resources and practices to sustain gains in achievement, performance, and socio-emotional learning. How schools will enhance parent involvement and school climate, which are also requirements under the Act, can also spur systemic strategies to bolster P–3 programs and practices.

At the state and district levels, alignment of standards, assessments, and professional development for principals and staff are key to promoting continuity and integration of services across the continuum of early education. Many states, including Minnesota, Washington, New Jersey, and North Carolina, have accelerated P–3 and broader alignment across grades to promote consistency in learning (Takanishi, 2016). Resources for professional development and capacity building also are central to further improvement. States such Wisconsin and California have implemented class-size reduction policies that can further support the continuum of learning in the early grades. Due to discontinuities in instructional support and philosophy between early childhood and school settings, improvements in the integration and alignment of services can improve children's levels of readiness for kindergarten and the early grades that are sustained over time (Takanishi, 2016; Zigler & Styfco, 1993). Increased teacher preparation and ongoing resource support reinforces instructional improvements (Manning et al., 2017).

At the school and classroom levels, many structural and process elements have been shown to increase learning, including teacher background and education, positive teacher–child relationships, engaged instruction, school climate, and small classes (Manning et al., 2017). Professional development and support for teachers and staff also make positive contributions to learning. With regard to specificity within and across levels of scale, enhancements in all of the above elements across the age continuum, from child care through school-age programs, increase the dosage and duration of services. Family and community engagement are also salient to building capacity and support through the schooling

process. Given the historic focus on specific elements of reform, including curriculum enhancement and small classes (Reynolds, Magnuson & Ou, 2010), comprehensive approaches may not only have larger effects on child development but may also provide a greater likelihood that gains will be sustained. Principles of effective school improvement developed in the 1970s have not been successfully utilized in early childhood programs and their follow-on efforts (Reynolds et al., 2017; Zigler & Styfco, 1993). Among these are principal leadership, school climate and high expectations of performance, and engaged learning communities (Takanishi & Kauerz, 2008). These principles have been incorporated in school reform, most notably the Five Essentials framework of effective leaders, ambitious instruction, involved families, supportive environment, and collaborative teachers (Bryk, 2010).

Each of these levels is part of the ecological perspective that is necessary to ensure developmental continuity over time and maintain learning gains. State and local efforts and major research projects that have documented effective programs that could be expanded are discussed in many chapters. Consistent with the ecological perspective, this book includes a range of strategies and research findings that have important policy implications.

These themes provide a comprehensive approach to better understanding how to create immediate learning gains and sustain these gains as children transition to elementary schools and beyond. Findings and principles of effectiveness covered in the chapters can be translated to programs and policies at multiple levels of scale. They also support the principle of developmental continuity in which supportive and tailored learning experiences can yield enduring impacts if they occur on a regular basis over extended time periods. Key outcomes addressed in the chapters include school readiness, reading and math achievement, socio-emotional learning, parent involvement, remedial education, delinquency, educational attainment, and socio-economic status, and well-being in young and middle adulthood.

Mechanisms of Long-Term Effects

No volume on promoting long-term and sustained effects would be complete without discussing the long history of research on the processes and mechanisms through which experiences in intervention lead to improved well-being. Because early interventions were largely designed to enhance cognitive development (Consortium for Longitudinal Studies, 1983; Zigler & Trickett, 1978), the mechanism of change was believed to be from IQ to achievement, leading to long-term benefits on