Nurturing Space

The Ecology of Early Childhood Facilities

A National Children's Facilities Network White Paper

Part of NCFN's *Making Space: Leading Perspectives on Child Care Facilities* series

By Carl Sussman

sussman associates

125 Franklin Street
Newton, MA 02458

June 30, 2022

1. Forward

Thirty years ago, United Way and a group of foundations in eastern Massachusetts approached the state's Community Economic Development Assistance Corporation (CEDAC), the quasi-public community development agency I led at the time. They wanted help launching and managing what is now called the Children's Investment Fund (CIF). Their idea was to pool their resources to capitalize a loan fund to finance center-based nonprofit child care facilities in the greater Boston area. CIF would later expand to serve the entire state of Massachusetts.

Prompted by Bill Clinton's campaign promise (or threat) "to end welfare as we know it," the funders anticipated the need to expand the supply of child care in low-income communities. Yet capital grant requests already far exceeded the philanthropic community's grant-making capacity. They feared an unmanageable surge in grant proposals. So, to fill the capital gap, they reasoned loans, by spreading the capital costs over years, might meet some of the need in the likelihood that welfare reform became law. Since conventional lenders were unprepared to shoulder the risk of originating loans to financially fragile child care providers, the funders chose to capitalize a nonprofit entity to make and service these facility loans.

Several other community development finance organizations like ours anticipated the same facility capital gap in the child care sector. So, Trinita Logue of the Illinois Facilities Fund and Jim Klein of Ohio's Finance Fund joined me in forming the National Children's Facilities Network (NCFN or Network). We envisioned the Network as a vehicle for sharing information and for promoting federal legislation to cushion welfare reform's impact on young children in low-income communities.

Over the years, as NCFN's members worked with the child care sector and became more familiar with both the vast unmet capital need and to appreciate the value of high-quality child-development services, we became more convinced that addressing this issue represented a growing part of our organizational missions. Since then, NCFN has become the leading voice and advocate for federal policy initiatives relating to physical capacity of early childhood programs.

Supply continues to be a serious problem. Of equal concern, however, is the scarcity of *high-quality* center-based programs; not just the physical capacity to serve more children. The evidence is overwhelming: for many children the early years — the period before a child enters the public education system — and the material circumstances of their birth can be decisive in mapping the trajectory of their lives. The material conditions of the community or neighborhood where a child spends those early years etches the contours of the opportunity landscape he or she will face in life. The evidence also demonstrates that high-quality early childhood programs dramatically improves every child's future prospects and wellbeing. For Trinita, Jim and me, and for many other NCFN members, our work in community development had begun to merge with the field of child development.

Assessing the history of the nation's community development movement in 2014, the Urban Institute concluded: "an enormous opportunity remains for strategic innovation at the intersection of place-conscious and child-focused antipoverty work (Turner, et al, 2014, p.2)." Given the Urban Institute report's emphasis on "addressing the needs of *both* children and their parents (a dual-generation approach)," that strategic intersection might be better described as *place-conscious, child-centered, and*

family-focused (Turner, et al., 2014, p. 26). It is only natural, therefore, that community development organizations, like those active in NCFN today, are on the forefront of a growing movement to address the scarcity and dismal condition of child care centers in disinvested neighborhoods. Community developers have embraced early childhood development because of its proven potential to promote greater educational equity. Investing in well-designed and adequately capitalized child development centers is a promising strategy to address this need as part of a larger place-based social justice agenda.

NCFN recognizes child care centers as an indispensable part of a community's social infrastructure. The Network has become an important voice in the growing movement to treat early childhood development as a public good conferring important benefits on the country as a whole; not just the children and families these centers serve. It is gratifying to see a new generation of community development leaders come forward, grow NCFN's membership to more than 70 organizations, and turn it into the dynamic and effective advocate it is today.

To advance its mission, NCFN has stepped forward to be a thought leader regarding physical environments for group-care of young children. *Nurturing Space* is a new addition to the Network's on-going series of reports: *Making Space: Leading Perspectives on Child Care Facilities.* This series of reports describe the emerging elements in the field's place-conscious approach for strengthening families and supporting healthy early childhood development in low-income communities.[1] This white paper introduces an additional rationale for facility investments; one rooted in ecology and foregrounding the evidence that links a center's built and natural environment with program quality and child outcomes. This "*developmental*" case for investing in early childhood facilities has important implications for NCFN's policy advocacy.

This white paper introduces an additional rationale for facility investments; one rooted in ecology and foregrounding the evidence that links a center's built and natural environment with program quality and child outcomes. This "developmental" case for investing in early childhood facilities has important implications for NCFN's policy advocacy.

The default arguments for capital investments have been to expand supply, especially in child care deserts, and to improve health and safety conditions. These are important goals, and they must be among the outcomes of any serious public sector investment in early childhood facilities. However, they have rarely proven sufficiently compelling to forcefully advance NCFN's public policy agenda.

This publication describes the developmental case and argues that NCFN and other advocates adopt it as the principal argument for public investments in early childhood facilities. We know attendance in high quality center-based early childhood programs confers significant developmental benefits for children, especially for those growing up in the distressed neighborhoods where community development organizations work. Research has persuasively demonstrated that these children are better prepared when they enter elementary school; have better long-term educational outcomes, and that the benefits are evident well into adulthood. For half a century this developmental case has been

[1] I wish to thank the Network for inviting me to contribute this white paper to its *Making Space* series and for its financial support in preparing it. In addition to NCFN, I also wish to thank Barbara Reisman, the senior adviser to the Maher Charitable Foundation, for permission to incorporate portions of *Constructing the Third Teacher: New Jersey Center-based Facilities for Low-Income Children;* a report I prepared for that philanthropy in 2020.

made successfully for the federal Head Start program. In many jurisdictions it is also proving persuasive in winning funding to expand public pre-K. Rarely, however, is the cost of a well-designed, purpose-built facility factored into the funding formula that underwrites these services.

It is assumed that facilities are an incidental input. They are overlooked as a factor contributing to programmatic quality and child outcomes. They are not even mentioned as a feature that might indirectly impact quality because of their effect on working conditions and teacher effectiveness. I include myself among those who had been too quick to lament the paucity of evidence linking facilities quality to child development. The evidence, however, is there. In fact, as I hope this document demonstrates, there is a compelling case to be made by marshaling this evidence and integrating it into our policy advocacy. Our challenge is to translate it into an intuitively grasped message. People know smoking is bad for their health without reading the decades of scientific research that proves it. They know the evidence is there. Similarly, we need to embrace the data and logic that demonstrate the built environment's importance to child development without requiring policymakers to earn a doctorate in either child psychology or environmental design.

While demonstrating the many ways that inadequate facilities thwart quality and undermine otherwise strong child development programs, it is important to avoid the impression that facilities drive quality independent of the other complementary inputs that work holistically to nurture positive outcomes for children. Theodore D. Wachs, a professor of psychology, writes extensively about the many factors that shape a child's development. The title of one of his books, *Necessary but Not Sufficient*, sums up a theme that runs through his explorations of child development. Recognizing this important caveat, Section 2 of this white paper places facilities in this larger policy context. Child development is an incredibly complex process. To achieve the developmental impact associated with High Scope, the Abecedarian Project, and other highly effective and rigorously evaluated child development successes, programs must be intensive and extremely high quality. No one has yet discovered a business model that can deliver quality without generous funding. Only high levels of investment earn the stunning rates of returns generated by these model programs.

But how do facilities fit into the quality equation? Section 3 tackles this question by describing a natural experiment carried out at one Connecticut early childhood center, the School for Young Children (SYC) in West Hartford. The findings from that demonstration are significant because they reveal some of the underlying mechanisms and the intuitive causal logic linking attributes of the built environment to program quality.

Section 4 situates the SYC findings in a larger theoretical framework rooted in ecological psychology. Ecology involves the dynamic interplay between living things with the physical environment they share. Child development programs treat facilities as a peripheral or incidental consideration: Minimize its cost, satisfy licensing requirements, and settle for what the market offers. This is such an established pattern, it is hard for early childhood professionals, policymakers, and the public to grasp the value of investing heavily in purpose-built structures. This white paper argues that making the connection between the build environment's physical characteristics and child outcomes in ecological terms may be an effective strategy for communicating the efficacy of committing far more attention and resources to the settings where young children spend much of their time and do much of their early development.

2. A Broken System

The system of early childhood education and care (ECEC) in the United States is not working.[2] It is fragmented, with a hodgepodge of funding mechanisms and service delivery models. It is expensive. And, despite its cost, the quality of most ECEC is considered mediocre, or worse. Choices are frequently limited and, in some locales, absent, regardless of quality. This cost, quality, and supply quagmire is often described as a "**trilemma**." This encapsulation of the coexisting affordability, quality, and availability crises summarizes the complex interdependencies that make their resolution so challenging. A contributor to *The Atlantic* observed, "The state of American child care might be defensible if it were expensive and high-quality or if it were crummy but cheap. Instead," the author continued, "the U.S. has the worst of both worlds…American day care is a shambles." He cites a National Institute of Child Health and Human Development finding "that only one in 10 facilities offered 'high-quality' care (Thompson, 2019)." Despite this miserable statistic, the value of "**high-quality**" has been thoroughly documented by neuroscientists, educators, psychologists, economists, and social justice activists.

However difficult it will be, it is imperative that the country find solutions to this trilemma. The evidence is overwhelming: a child's experience during early childhood has an enormous impact on later school success and lifelong wellbeing. In part, that is because early childhood is a period of rapid physical, cognitive, and social-emotional growth, and change. As a recent World Bank report explained, early childhood experiences build the substructure required to support subsequent development and learning.

> Learning is possible at all ages, and every child can benefit from a good education, but older children will advance more easily in later grades if they achieve a firm foundation for learning during the early years. The basic science of young children's learning sheds light on the conditions that allow all children to build that foundation, regardless of their nationality, culture, or material and social advantages or disadvantages (Whitebread & Sitabkhan, 2022, p. 46).

To summarize that scientific consensus, ECEC quality is an essential characteristic for healthy child development and school success. Of course, there are other compelling rationales as well, such as family economic welfare. The nuclear family functions as the most rudimentary economic unit in society. To meet a family's basic material needs, most parents must work. This is especially true for low- and moderate-income families. To sustain employment, parents rely on dependable child care. However, no parent wants to make the Solomonic choice of working at the expense of their child's development.

[2] This document uses terms like "early childhood education and care" and "day care" or "child care" colloquially to describe a wide range of early childhood programs. Parental employment is the most common reason children are enrolled in such programs. Nonetheless, in addition to being safe and content, young children need developmental stimulation. Early education is another rationale for children to participate in center-based programs. Without getting bogged down in critiques of the implicit limitations of either custodial "care" or instructional style pre-K "educational" models, this paper focuses on early childhood *development*. A developmental framework emphasizes play-based curriculum that supports health and physical development; emotional well-being and social competence; positive approaches to learning; communication skills; and cognitive and general knowledge. The verb "**nurture**," rather than "**care**" or "**education**," is used here to underscore the priority assigned to developmental outcomes in gauging quality in early childhood programs.

High-quality ECEC eliminates the need to choose by accommodating both employment and child development. Finally, high-quality ECEC generates enormous and long-term positive spillover effects for the economy and society.

As you drill down to explore the characteristics and performance of individual, center-based ECEC programs, one of the intriguing ironies is the ubiquitous use of "**environment**" to describe the elements that influence quality. The most widely used tool for assessing preschool, and child care classroom quality are the *Early Childhood Environment Rating Scales* (ECERS). These tools measure six domains that influence developmental quality, such as program structure and interpersonal interactions. The irony is that "environment," in this case, largely excludes the center's building and grounds. Even the space and furnishings subscale largely circumvents observations that relate to the built and natural environment. It emphasizes, variables within the relatively easy control of teachers and administrators. Locational and capital investment decisions concerning the built environment and grounds, on the other hand, take a long period of time to plan and implement. They require an enormous commitment of staff time and financial resources. They have significant strategic implications for the sponsoring organization's short- and long-term viability. Given the modest size, lean staffing, and tight finances that characterize most ECEC centers, decisions to relocate are reserved for circumstances beyond the center's control, such as a landlord's decision to dramatically raise rents or to terminate a lease.

These dynamics explain the scant attention paid to the physical facility as a factor influencing quality. Ignoring it, however, constrains the ability to dramatically raise quality. By exploring the intersection of the built environment and child outcomes, this white paper illustrates the potential that thoughtful facility investments can have on quality. It assembles evidence from multiple perspectives to argue that ignoring the influence of a center's built and natural environment on child development is a mistake and possibly a conspicuous barrier preventing many programs from achieving quality.

"I pay you too much," Marybeth Mattingly complained to her daughter's child care provider, "and you charge me too little." That paradoxical sentiment encapsulates the inherent problem that hounds the delivery of early childhood services in the United States.

Sacrificing Quality

"I pay you too much," Marybeth Mattingly[3] complained to her daughter's child care provider, "and you charge me too little (Lindsay, 2021)." That paradoxical sentiment encapsulates the inherent problem that hounds the delivery of early childhood services in the United States.

It also provides a succinct explanation for why *Bloomberg Businessweek* declared child care "the most broken business in America (Suddath, 2021)." Parents, like Mattingly, find child care fees unaffordable. And yet, the high-quality care parents crave, and researchers celebrate, would require providers to charge far more than they do. Costs are so out of line with parents' ability to pay, that the profit margin for most child care facilities is less than 1 percent according to the U.S. Department of the Treasury (*The*

[3] Mattingly is an assistant vice president of the Federal Reserve Bank of Boston and an expert on public policy effecting low- and moderate-income families.

Economics of Child Care Supply in the United States, 2021). Such dismal financial returns guarantee that child care supply lags far behind demand, making care scarce, regardless of quality.

Fundamentally, the problem with child care in the United States is economic. As Mattingly's reflection implies, to maintain business viability, child care centers must maintain high enrollment and, therefore, feel compelled to curb spending wherever possible. It would be only a little overly dramatic to compare the harsh financial circumstances child care businesses face to a mountaineer's life and death struggle when caught in a sudden storm. Confronted with plunging temperatures, low visibility, and punishing winds, to maintain the climber's core temperature the body sacrifices the extremities to frostbite. Paying staff at levels that hover close to minimum wage, settling for austerity levels of organizational administration, and sheltering the program in the brick-and-mortar equivalent to the mountaineer's flimsy tent is the prevailing child care business model. It ensures the enterprise's survival by sacrificing programmatic quality.

To fill the gap between a center's modest budget and the cost for high quality child care, someone, other than parents, needs to foot the bill. In most of the world's developed countries, ECEC is a public good: It is fully funded or deeply subsidized by government. But in the U.S. parents purchase child care through the private market and typically bear most of the cost. The country's two subsidy programs — Child Care and Development Block Grant vouchers and the Child and Dependent Care Tax Credit — fail to bridge the gap between quality care and most parents' ability to pay. Moreover, only one in six voucher-eligible child receives assistance.[4] The case for treating child care as a public good is overwhelming.

- First there is the widespread need for child care. According to Kids Count's 2019 data, sixty-eight percent of children under 6 live in homes where working parents require they spend time in child care. Moreover, 62% of children in child care are in some form of center-based care. But like Mattingly, few parents can either find or afford high-quality programs. Quality is an ambiguous construct. Small group sizes, credentialed and well-compensated teachers, high adult-to-child ratios, and national accreditation are commonly used proxies for quality.

- Second, neuroscientists have determined a child's early years provide a uniquely fertile period during which the developmental foundation for school success and lifelong wellbeing is built. As Nobel laureate James J. Heckman argues, children realize the greatest developmental benefit "…from investing as early as possible, from birth through age five." Heckman continues:

  > Starting at age three or four is too little too late, as it fails to recognize that skills beget skills in a complementary and dynamic way. Efforts should focus on the first years for the greatest efficiency and effectiveness.

  The places where children spend their time; the relationships available to them, and the activities at hand supply the raw materials for constructing that developmental foundation.

  For children whose parents work full-time, one-third to one-half of their waking hours are spent in child care. Working parents are not only entrusting early childhood programs with providing a safe and welcoming environment while they are at work; in effect they are relying on these

[4] There are a few noteworthy exceptions: Head Start, some state or locally funded public pre-K programs, and the country's military child care system.

programs to provide an environment that is at least as focused on their children and as developmentally stimulating as being at home with family. Parents need those child care hours to be well-spent, providing their children with life-long benefits. There is plenty of evidence that center-based child care can provide a developmentally enriched setting. Too often, however, reconciling the quality-affordability trade off compromises the ability to create a sufficiently enriching environment to take full advantage of the window of opportunity that exists during these early years. In other words, to achieve the best outcomes for children, only government can fill the financial gap between what Mattingly's child care provider needs to charge her and what Mattingly can afford to pay.

- Third, society as a whole benefits from children receiving a high quality, developmentally-geared early childhood education. Yes, child care is an essential service. It frees parents to work and to meet their families' material needs. Quality care is an investment in a child's future too, not just an immediate benefit to working parents. Importantly, however, highly motivated and school-ready children also pay a handsome dividend to society. Over their lifetime, children who receive such services cost society so much less in outlays for public programs and generate so much more tax revenue that the nation as a whole nets a 13% return on tax-funded, "*comprehensive, high-quality, birth-to-five early education* (Heckman, 2022. Emphasis added)." Commonly cited indicators of quality, however, also drive costs.

It is easy to focus on Heckman's eye-popping projection of a 13% return. That is enough to convince many people to support public funding, neglecting to absorb his carefully chosen *comprehensive* and *high-quality* modifier. That rate of return declines as a child development program's scope, depth, and quality ebb. Less ambitious and lower-quality child care can still be valuable, even essential to a working parent. And society will still realize some benefit from the productive capacity of more adults participating in the work force. But without the high quality that contributes to positive child outcomes, the rate of return declines along with the case for treating child care as a public good.

Comprehensive and High-Quality

A principal benefit of comprehensive and high-quality developmentally oriented early childhood programs is economic mobility and racial equity. The rational for federal Head Start funding, for example, is to disrupt patterns of inter-generational poverty by delivering to low-income families some of the advantages that enable children from wealthier and higher-income backgrounds and communities to have a lifelong competitive advantage.

To deliver high quality developmentally oriented programs, the public sector's outlays must be sufficient to address four critical barriers:

- **Workforce**: The early childhood workforce earns extremely low wages, suffers from high turnover, and attracts few professionally trained practitioners. Since child care is inherently labor-intensive, personnel represent the largest expense category. To build a stable and professionally trained workforce, compensation, benefits, working conditions, professional development, and supervision must be improved. While more training and credentials are often cited as a foundational requirement for early childhood educators, more critical is the way these adults apply that knowledge in their interactions with children. Lev Vygotsky, one of the giants

in developmental psychology, emphasized the social nature of cognitive development. For Vygotsky, a child's knowledge is co-created through their day-to-day relationships with the adults in their lives. These interactions enable children to discover knowledge and meaning for themselves rather than through instruction. So, investments in skillful practice – on-going professional development, reflection, and supervision – are as important as each provider's educational credentials and the material conditions of his or her employment.

- **Organizations**: Tight budgets and the small size of many early childhood programs result in essential organizational functions being shortchanged. Often casually dismissed as wasteful overhead, every effective organization needs an infrastructure that supports its core mission-related activities. These functions include human resource capacity to recruit, incentivize, develop, supervise, and retain the workforce. Financial management, marketing, quality control, and strategic leadership also fall into the organizational infrastructure bucket. High performing programs rely on this crucial organizational infrastructure. Noting the critical functions center directors and their administrative supervisees perform, a report issued by the Institute of Medicine and National Research Council on transforming the early childhood workforce included a series of recommendations on the role of organizational leadership as "an important factor in the quality of early learning experiences for the children."

- **Family Focused**: Psychologist Uri Bronfedbrenner's developmental theory groups together as "microsystems" the places where children regularly spend significant periods of time, principally their home and child care setting. These physical and social environments are at the center of a child's universe, and, during early childhood, they are the venues for most of their activities, the places they spend most of their time, and the locus of their most important interpersonal relationships. That is one reason parent engagement is considered a best practice in the ECEC arena. Support for parents, a National Academy of Sciences report explains, "is critical to enhancing healthy early childhood experiences, promoting positive outcomes for children, and helping parents build strong relationships with their children (*Parenting Matters*, 2016 p 16)."

  When sociologist Mario Small studied child care centers in New York City he discovered that centers that were intentional about their partnership with parents created a supportive community of children and their young parents. These centers cultivated networks of organizational relationships with community agencies offering complementary services, ensuring that children and families had their physical, emotional, material, and developmental needs met. That kind of family focused service is valuable because it serves the developmental needs of children. Embracing this function adds to the cost of care but yields better developmental outcomes for children. Therefore, references to quality in this document assumes such programs are intentional about, and devote resources to, a high level of parent engagement.

- **Facilities**: The physical environment is also treated as a cost center to be minimized rather than a critical input that can, and should, contribute materially to the programmatic quality of early childhood programs. Like every other expense category in a child care center's budget, economic sustainability requires that most centers minimize their occupancy costs. Consequently, when building or relocating, centers preemptively pare down their selection criteria, settling for less space and a less desirable locations to stay within budget. Seldom do they have the capital or creditworthiness to build or adapt a facility to assure a stimulating

learning and work environment. Compromises are unavoidable in any locational decision, but financial realities prevent most child development centers from envisioning a site without aspiration-killing physical constraints.

This last topic — facilities — is commonly overlooked. Yet, facilities play a role in addressing the preceding challenges and in lifting the quality of early childhood programs. The term "facility" refers to the physical environment. In modern usage, it is often associated with a physical complex that houses a large bureaucratic institution, like a medical or research institution. Grammatically, "facility" derives from "facilitate," meaning "to make easy." This refers to the built environment meeting its users' highly specialized requirements. In ECEC, the facility encompasses the structure that houses the center and the surrounding outdoor space. This is the asset typically purchased or leased as real estate. The built component of the physical environment does not include furnishings and equipment, except for built-ins, such as cabinets and counters. Outdoor play structures, since they are secured to the property, are treated as part of the physical environment, as is fencing, paved walkways and parking areas. The natural elements of the physical environment consist of the land, including the physical features like trees, plantings, rock outcroppings and other topographic and landscape attributes. Thus, the word facility embraces both the built and natural environment.

In addition to the obvious economic and financial barriers to first-rate physical environments, there is an aspirational obstacle as well. That hurdle is a tacit assumption that pervades the child care field, and the public at large, that physical environments exert little influence over many essential domains of child development.

This white paper trains a spotlight on the ways facilities buttress or undermine efforts to support healthy child development in center-based settings. Nonetheless, ECEC requires investments in the four expense-related categories bulleted above. The rest of this white paper probes the field's challenges in securing appropriate facilities. It addresses the question: why do the facilities that house early childhood programs matter?

Facilitating Early Childhood Development

Lack of financial capital impedes both child care supply and can compromise health and safety. It also places other objectives out of reach. Many centers function poorly because capital investments, like installing sinks in every classroom and equipping older buildings with mechanical ventilation systems, are out of financial reach. Additional revenue and access to capital would likely relieve the supply bottleneck. However, capital investments that only add capacity and mitigate obvious health and safety risks are insufficient to impact qualitative factors that foster positive child outcomes.

In addition to the obvious economic and financial barriers to first-rate physical environments, there is an aspirational obstacle as well. That hurdle is a tacit assumption that pervades the child care field, and the public at large, that physical environments exert little influence over many essential domains of child development. That is the misguided premise this report seeks to challenge.

Heckman and others have been transfixed by early childhood because it is such a fertile period for growth and development. Children learn to act with greater autonomy, to manage their behavior, and to understand themselves and the world around them. Development during that stage of life refers to

changes children need to undergo to position themselves for success in school and, ultimately, to realize their full potential in life. High-quality, therefore, comes down to a program's success in supporting a child's healthy development. During the first five years children must gain competency in areas that set them confidently on the path to middle childhood, adolescence, and adulthood. The emerging consensus among developmental psychologists, educators and neuroscientists is that those competencies include:

- health and physical development,
- emotional well-being and social competence,
- positive approaches to learning,
- communication skills; and
- cognitive and general knowledge (Hayes, 2007, p. 6).

Any discussion of early childhood development and a child's ability to achieve his or her full potential raises the perennial nature vs. nurture debate and the murky world of gene-environment interactions. The relationship between genetic gifts and experience is far more complex than the simplistic nature-nurture dichotomy suggests. That's because genes are far less deterministic than generally assumed. Environmental variables influence the way genes express themselves. As a Colby College blog on psychology and neuroscience explains, "…the regulatory systems in place impacting gene expression respond directly to information from the environment. This includes both the environment in the cell and all that constitutes our surrounding environment." The blog post continues by quoting Robert Sapolsky, a Stanford neurobiologist: "…genes aren't about inevitability. Instead, they're about context-dependent tendencies, propensities, potentials and vulnerabilities (Psychneuro, 2019)." Epigenetics is the terms used to describe this type of environmental influence over gene expression.

Harvard University's Center for the Developing Child reliably generates the most user-friendly explanations of the neuroscience of early childhood. The Center's website provides this concise explanation:

> Experiences very early in life, when the brain is developing most rapidly, cause epigenetic adaptations that influence whether, when, and how genes release their instructions for building future capacity for health, skills, and resilience. That's why it's crucial to provide supportive and nurturing experiences for young children in the earliest years…. Supportive relationships and rich learning experiences generate positive epigenetic signatures that *activate* genetic potential.

A child's genotype can be compared to the seeds sown on a farm. The seeds contain the plants' genetic potential. However, weather conditions, the farmer's effort, fertilizer, and equipment performance dictate the actual crop yields. Similarly, children are born with enormous genetic potential. The environments in which they spend their early years play a decisive role in determining whether they reach their full genetic potential.

In the case of young children, the physical component of those environmental influences includes facets of the built and natural settings where children spend their time. Since children in full-time ECEC spend roughly as many waking hours in those facilities as they do at home, a significant dose of development happens in group care settings. Given the developmental stakes, those settings – including the physical facilities – need to be thoughtfully designed to awaken a young child's full potential.

The flawed and largely subconscious premise that the physical environment has a negligible, if any, effect on child development deflects attention from the need to invest more money and ingenuity into reimagining the types of environments that support healthy child development. Children too often spend their days in physical settings where 35 square feet per child, regulatory health and safety dictates, and affordable rent are the overriding requirements. Adherence to those regulatory and market constraints limit a program's ability to achieve the quality and produce the positive child outcomes that parents, early childhood professionals, and advocates seek. Facility characteristics nurture children's development, create professional and rewarding working conditions for early childhood professionals, and provide a welcoming and supportive community for the children's families.

3. A Revelatory Lesson

Carlota Schechter sat at her desk, deep in thought, a stack of data sheets neatly arranged in front of her. An associate professor of early childhood studies at Saint Joseph College in West Hartford, Connecticut, Schechter was disturbed by the implications of her students' research. She had assigned them an exercise requiring them to observe classrooms at the School for Young Children (SYC), a campus-based preschool that serves as the department's learning laboratory. The plan was for her students to gain experience using time-sampling techniques, an observational research method used in the early childhood education field.

During free-play time, when children engage in activities of their choice, Schechter's students, clipboard, stopwatch and scoring sheets in hand, observed each child for 30 seconds. After entering the data for each child, the students repeated the process so that each had multiple observations of every child. The task required her students to categorize and record the type of play — dramatic, constructive, art, etc. — the child was engaged in during each observation. In addition, with each observation, the students were instructed to also note whether an adult was also interacting with the child.

Schechter excluded any qualitative assessment of the interactions.[5] She was simply interested in having her students track two variables – classifying the child's play and noting the presence of caregiver interactions.

The School for Young Children is a model program accredited by the National Association for the Education of Young Children (NAEYC). In a hand-to-mouth industry, SYC is unusually well resourced thanks to its relationship with the college. The staff enjoys generous benefits. Consequently, unlike the child care industry as a whole, staff turnover is very low. As a result, SYC teachers tend to be older and more experienced than is typical of the early childhood workforce. Moreover, the staff is composed exclusively of college graduates trained in early childhood development; many even had master's degrees. These workforce characteristics are well-established metrics of structural quality in early childhood programs. Schechter thought it would be valuable to have her students take note of adult-child interactions since they are a valued indicator of process quality.

Unexpected Findings

It was the adult-child interactions data that Schechter found so puzzling. Teachers were interacting with a child during only 3% of the observations. Schechter searched and found a few somewhat similar studies quantifying teacher-child interactions in preschools. While the literature was skimpy, the results were disquietingly similar to her students' findings. How was it possible that the percentage of one-on-one interactions were so low at such a high-quality center? And how would she break this news to the school's director, Beth Bye?

Bye was a seasoned and energetic preschool director who was also prominent in the local child care field. Above all, she was passionate about quality care.[6] Schechter knew Bye would find her results equally disquieting.

[5] There is a rating tool, the *Classroom Assessment Scoring System* (CLASS), used to qualitatively gauge such interactions but it requires both more time and specialized training to use than the exercise Schechter assigned.
[6] Today Bye is the gubernatorially appointed Commissioner for Connecticut's Office of Early Childhood.

"I have to have lunch with you," Schechter remembers telling Bye. "I have to show you something." They sat down to review the results on a cold January day. Like Schechter, Bye found the findings mystifying. How could a program they both knew to be especially high quality have such a low level of staff-child interactions? Schechter repeated the assignment over the next few years with a fresh crop of students. Each time the exercise produced the same dismal results. So, she was pleasantly surprised one year by a class whose data indicated a seven-fold increase in adult-child interactions. Given the track record, however, she was also skeptical. Had she prepared her students for the exercise differently than in previous years? Had something happened to bias the results? If so, the methodological mystery eluded Schechter.

"Holy smokes!" Bye exclaimed when Schechter shared the news. They followed-up with the teachers. "What do you make of this," they asked. "How do you explain it?" Ironically, the teaching staff was unsurprised by the results: They attributed the improvement to the building. Prior to the most recent set of classroom observations the center had relocated to a building the college had acquired and renovated to house the early childhood program. Previously the center occupied basement space in one of the campus buildings. Like many other nonprofit child care facilities, SYC felt lucky to have inexpensive space. The college invested in only those improvements required to get the basement licensed by the state. So SYC's newly renovated facility, with its generous grounds and large windows, represented a dramatic improvement.

The teachers quickly ticked off an inventory of changes that to them explained the research findings. Importantly, some of the conditions in the new facility allowed them to spend more time in the classroom engaging in developmentally productive interactions with the children:

- **Bathrooms**: Instead of a single shared bathroom in the old center, each classroom had its own bathroom at the new site.
- **Classroom sinks:** Unlike the old center, each classroom in the new one was equipped with a sink for preparing for and cleaning up after activities.
- **Classroom telephone:** Rather than leaving the classroom to have a phone conversation with a parent for instance, each classroom in the new building had a phone.
- **Materials storage:** The old facility lacked enough classroom storage space for basic materials, like art supplies. The new classrooms had enough storage space to reduce the frequency with which teachers had to leave the classroom.

The teachers also identified changes that supported a more orderly classroom:

- **Space:** Each classroom had one-third more space, creating a more orderly and less crowded ambiance.
- **Better-defined activity areas:** The larger classrooms meant each could accommodate more activity areas, and these were better defined so that children in one area were less likely to distract children involved in adjacent activity areas.
- **Windows:** Each classroom had a wall with large windows, flooding the space with natural light, dramatically enhancing the ambiance.

The key implication of this research is stunningly simple and logical. For example, everyone at the center had become inured to the disruptive and counterproductive process of teachers chaperoning gaggles of children to the shared bathroom throughout the day. It was time-consuming. It left only one teacher in the classroom. This was one factor that could account for some of the variance in teacher-child

interactions. Meanwhile, the teacher accompanying children had to improvise activities to occupy them while waiting for their turn to use the bathroom: time children might otherwise have been engaged in more developmentally productive and self-directed classroom activities. With bathrooms in the classroom, children could also exercise greater autonomy and become more self-reliant. That too increased the classroom time teachers had available to interact with children.

Many of the other errands that took teachers out of the classroom — to use a sink to prepare for or clean-up after activities; to take a phone call, or to retrieve supplies — evaporated with the new and appropriately equipped classrooms. This too freed the teachers to spend their time interacting with children.

The Larger Lessons

High quality programs have been shown to have significant developmental benefits for young children. Measuring quality is complicated, however. Researchers commonly categorize measures that contribute to a center's programmatic quality as being structural or process related. The structural ones are generally easier to objectively quantify, such as group size, adult-child ratios, and square feet per child. That's why these form the regulatory foundation for licensing. Requiring teachers to have a child development associate degree or the center to be NAEYC accredited also represent structural indicators of quality because they are clearly demarcated categories. The process factors, such as adult-child interactions, have a more direct impact on children. Yet measuring them is trickier because they are harder to quantify. Despite only measuring the number of interactions and not their quality, the dramatic increase in adult-child exchanges at SYC is striking.

Assessing quality is also hindered by the interdependence of a host of process and structural variables that can influence programmatic excellence. As a result, to deliver high quality developmental services, a center must be well resourced and deploy those assets effectively. The evidence from the SYC student exercise illustrates this interdependence. The new building, by making it possible for staff to spend more time interacting with children around developmentally productive activities, indirectly unleashed the staff's underutilized professional skills. With such highly trained and compensated teachers and national accreditation, one would naturally expect the quality of SYC's staff's interactions with children to be high. The research signals that the old center's physical limitations obscured the full process quality potential at SYC. Relocation alone apparently freed teachers to spend more time in developmentally constructive classroom interactions.

The other intriguing implication of the students' research concerns children's behavior. At a focus group with SYC's staff to better understand the findings, teachers insisted the classroom atmosphere was calmer. Children had fewer tantrums and were less aggressive in the new space. They reasoned that the new space granted children greater autonomy, less crowding, and required fewer transitions; all factors the teachers experienced as creating a calmer and more orderly climate in the classroom.

- Instead of the sometimes abrupt or frustrating transition to usher a group of children down the hall to the bathroom, after the move children had the flexibility to find their own way to the bathroom. From the teacher's perspective, fewer transitions may have relieved some of the emotional stress caused by frequent interruptions. At the same time, replacing the regimented and teacher-directed process for toileting with one that allowed the children to exercise more agency benefited both the teachers and the children.

- The teachers also noted that the larger classrooms provided the space to create more appropriately sized and better-defined activity areas. This, they surmised, created conditions where children were less likely to be distracted or come into conflict with their playmates. Consequently, the classrooms seemed calmer and less stressful for both teachers and children.

The net effect of these improvements, the teachers reasoned, not only accounted for the more frequent interactions observed by the researchers, but it also explained why they found their work less stressful and more rewarding.

After listening to her staff dissecting the new center's impact on the atmosphere in their classrooms, Bye suggested there might be an additional explanation for the perception that things were calmer. Rather than shuttling in and out of the classrooms, the presence of a full complement of teachers meant they were more apt to see and intervene in potentially disruptive situations before they escalated, helping children to negotiate with each other about how they might share a toy, for example.

The students' research also suggests, as the School for Young Children's director concluded, that facilities are not a neutral factor in the program quality equation. They can both bolster and impede programmatic performance. After the focus group concluded, Bye noted, "the research provided such a good lesson," for her as a supervisor. She continued:

> You have this idea – a simple model of how change happens. If I tell the staff how to fix this, it will get better. But what the staff truly needed in this case was a better facility… Having a well-thought-out functional classroom makes teaching easier with more time available to spend with kids…As a supervisor, my job is to support my staff. If you have good staff, tend to their needs, and make things easier, they do better. Coming to work in a nice facility in itself has a payoff.

Facilities buttress quality through a variety of avenues. SYC demonstrates that the built environment can serve as an enabler. Like the mechanical advantage achieved with the simplest of machines – a lever and fulcrum to lift a heavy weight -- a facility designed to support developmentally appropriate activities, can release untapped drivers of programmatic quality: in SYC's case, the skill and knowledge of its staff. Facilities can also impact process quality directly by supplying developmentally constructive opportunities that engage children without a teacher's mediation.

The research results demonstrate that facilities — the built environment — can have a profound impact on programmatic quality via multiple pathways. The new building supported dramatically increased levels of adult-child interactions. It created a calmer and more stress-free classroom for children and teachers.

Put another way, the research results demonstrate that facilities — the built environment — can have a profound impact on programmatic quality via multiple pathways. The new SYC building supported dramatically increased levels of adult-child interactions. It created a calmer and more stress-free classroom for children and teachers.

Bye also reflected on how the new facility enhanced the staff's sense of professionalism:

> When visitors come through our center, they often exclaim, "Oh my god, look at this classroom." We need that to remind us of what we have. For me the best thing that came out of the focus group was

> the acknowledgment that the teachers feel more like professionals. We all have the experience of going to a party and having people say with surprise, "Beth, you're still in day care?" For our staff there is beginning to be a cultural shift. When you deliver the goods in a building like this with the level of programmatic quality that we have, there is a shift. Teachers feel like professionals.

These astonishing results would seem to have enormous implications for the early childhood field. But can they be trusted? After all, the assignment was an instructional exercise. Schechter did not design it around a research hypothesis. Does that fact make the findings any less significant?

Paradoxically, this lack of intention makes the results even more credible by eliminating placebo effects and other threats to the finding's validity. One could argue that teachers might have modified their behavior knowing that they were being observed — a Hawthorne effect. But why wouldn't that have been true during the observations carried-out in the old facility. Moreover, as a lab school for St. John's College, SYC routinely has student observers in the classrooms. There was nothing unusual about the experimental conditions.

While Schechter never designed the data collection process with the objective of fashioning a quasi-experimental, before-and-after, research design, assigning the student exercise in successive years unwittingly delivered one. The situation also controlled for the most obvious competing variables, like staff turnover or a different curriculum between the initial and final data-collection periods. The only condition that changed between the earlier data collection and the final set of observations was the physical site. And methodologically, observational data-collection, like that used for the SYC project, are widely utilized and accepted as reliable in the early childhood field.

While research undertaken to assess the physical environment's effect on child care quality is limited, the SYC researchers were not the only ones to produce incidental findings about the environment's role in supporting favorable adult-child interactions.

Our data…revealed that there was an association between spatial quality and behavior. In centers in which spatial quality was rated high, children were found to be more involved and teachers spent less time on management and enforcement of rules and more time in responding to children and fostering social interactions.

- Elizabeth Prescott

Over several decades beginning in the 1960s, Pacific Oaks College in Pasadena, served as the home for a pioneering team of academic researchers that included Elizabeth Prescott, Elizabeth Jones, Sybil Kritchevsky and others. In 1967, as female workforce participation entered a period of rapid growth, this team produced a 450-page report for the agency that is now the US Department of Health and Human Services. The researchers conducted extensive observations of 50 child care centers. They assessed teaching behavior at each site to evaluate their effectiveness in meeting the developmental needs of preschool aged children. Writing about the project some years later, Prescott described how "sometimes a center that did not seem to have much to offer felt like a good place and vice versa." The team decided they "needed to look more closely at teacher-child interactions and…work towards developing some rudimentary vocabulary for talking about the context in which moment-to-moment events occurred (Prescott, 1987, p. 74)."

> We finally realized that the physical environment was the variable that appeared to be implicated. We then devised a scheme for evaluating the quality of the centers in our sample….Our data…revealed that there was an association between spatial quality and behavior. In centers in which spatial quality was rated high, children were found to be more involved and teachers spent less time on management and enforcement of rules and more time in responding to children and fostering social interactions (Prescott, 1987, p. 75).

That last sentence could have been the concluding sentence of a report summarizing the SYC findings. The bottom line is that in center-based early childhood development, space matters.

While studies, such as these, present a prima facie case for the physical environment's influence on the quality of center-based early childhood programs, this topic rarely appears on the field's research agenda. The environment's effect on primary and secondary education has received more attention. Yet even in that better funded arena, "the investigation into the physical environment's influence on learning outcomes has been largely ignored, or maybe avoided, in favour of research into other areas within the school, for instance, pedagogical, psychological, and social variables (Martin, 2005, p. 91)." The social and economic reality is, however, that many working parents rely on out-of-home group care for their preschool-age children all day, every day, five days a week. Consequently, during these most developmentally critical years, young children spend much of their waking hours in facilities in which little money or evidence-based thought has gone into creating environments that effectively meet their unique needs.

Despite the lean body of research specifically about the built environment of early childhood programs, there exists a rich, extensive, highly regarded, and empirically grounded theoretical literature on early childhood development that supplies systematic explanations for the physical environment's influence on human behavior. These lend credence to the underlying premise about the environment observed by the Pacific Oaks team and the SYC students' research project.

4. The Ecology of Child Development

During the second half of the twentieth century, several academic psychologists became disenchanted with the field's dominant behavioral and cognitive strains. They questioned the orthodoxy that all behavior emanated from within the individual. They were particularly skeptical about the reliance on experimental research methods conducted under artificial laboratory conditions. When it came to the study of child development, Uri Bronfenbrenner, (1917-2005) for example, mockingly wrote, "much of developmental psychology is the science of the strange behavior of children in strange situations with strange adults for the briefest possible period of time." Bronfenbrenner was one of the psychologists who gravitated to an *ecological model.* Ecology reflected their thesis that behavior arises from the interplay of the person's biological abilities and psychological predispositions with external circumstances.

Ecological psychology provides a rich evidentiary and theoretical framework for understanding the remarkable impact SYC's new building had on the way classroom teachers used their time, on their job satisfaction, and on their sense of professionalism. Like the ecological psychologists, Carlota Schechter's students at SYC adopted a naturalistic observational approach that left the context undisturbed. Their before and after observations occurred in an operating child care center with children and staff going about their everyday activities. Because SYC is a lab school, both the children and staff were accustomed to the presence of the college's student observers. In short, the research methodology satisfied the naturalistic conditions favored by ecological psychologists.

Life in the Microsystem

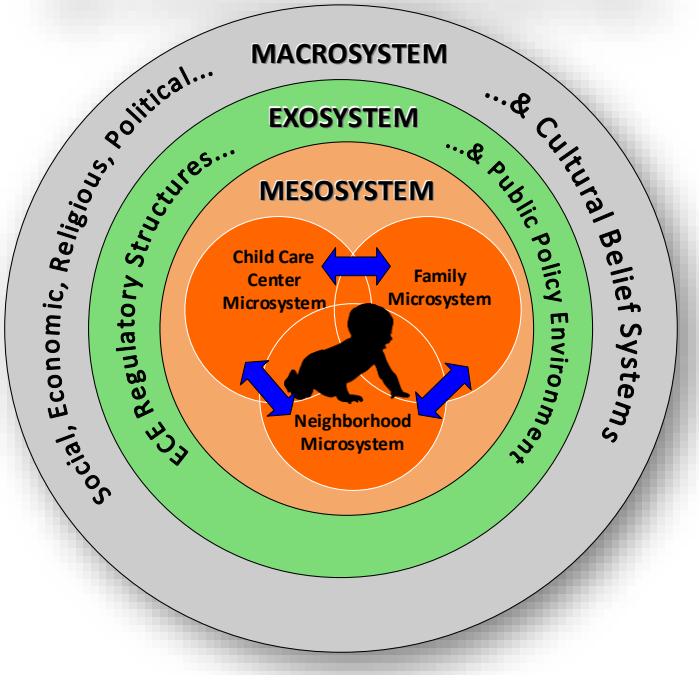
Bronfenbrenner developed his ecological systems theory to illustrate the multiplicity of factors that impact a child's development. For him, the word "ecological" captured "the embedded and holistic nature of human development (Hayes, et al., 2017, p. 6)." Bronfenbrenner's bioecological model visualized environmental influences on the developing child as four concentric circles. He designated the circle at the center — the bullseye — as the home of *microsystems*. Microsystems are the environments that children directly inhabit, like their home and child care setting. While the outer rings of Bronfenbrenner's model influence a child's development indirectly, by the nature of their direct, ongoing, and intensely relational character, microsystems serve as the crucible of early childhood development.

Bronfenbrenner described the mechanisms through which microsystems exert their influence as *proximal processes*. That concept represents one of Bronfenbrenner's principal contributions to the field of child development. "Especially in its early phases," Bronfenbrenner wrote, "human development takes place through processes of progressively more complex reciprocal interaction between an active, evolving [child]…and the persons, objects, and symbols in its immediate external environment." Through the child's everyday contacts with her environment, and especially through the consistent relationships with her primary caregivers, she develops an understanding of her world and how her life fits into it. "To be effective," Bronfenbrenner emphasized, these interactions "must occur on a fairly regular basis over extended periods of time" (Hayes et al, 2017, p. 30). Imagine a pie chart illustrating where children spend their waking hours, one-third to one-half

would be labeled “child care” and most of the balance marked as “home.” He saw proximal processes as the primary vehicles driving child development.

Contrast that with the indirect influence of the other more distant systems in Bronfenbrenner’s model. The outermost ring, for instance, the *macrosystem*, subsumes prevailing cultural attitudes, norms, and ideologies. Because their impact on a child is so removed, the Macrosystem’s influencing factors are the most distal. For example, the United States’ fragmented, largely unsubsidized, and market-based system for provisioning child care services reflects deeply engrained cultural attitudes about the role of family and ideological beliefs about appropriate governmental functions. These are some of the easily overlooked drivers limiting child care options for most parents.

Figure 1. Bronfenbrenner’s Ecological System’s Theory



As the exclusive domain of proximal processes, microsystems serve as the seedbed of every child’s development. Therefore, microsystem interactions – the proximal processes – need to be “high quality.” (Hayes et al., 2017, p. 9) “Children develop within an environment of relationships,” Jack P. Shonkoff explains. These begin “in the family but also involves other adults who play important roles in their lives,” including child care teachers with whom young children can spend much of each day. The reciprocal relation-based interactions that comprise proximal processes, “affect virtually all aspects of development – intellectual, social, emotional, physical, and behavioral.” Shonkoff uses a commonplace “serve and return” description of adult-child interactions to illustrate “high quality” proximal processes. “Young children naturally reach out for interaction through babbling, facial expressions, gestures, and words, and adults who are responsive *return* these *serves* with similar vocalizing, gesturing, and emotional engagement. This serve and return behavior continues like a game of tennis…” However, “if the adult’s responses are unreliable, inappropriate, or simply absent, the architecture of the child’s developing brain may be disrupted, and later learning, behavior, and health may be impaired” (Shonkoff, 2017, p. 9).

Carlota Schechter’s student researchers at the School for Young Children recorded adult-child interactions because they are the medium through which proximal processes operate. Even though they made no effort to gauge the quality of the interactions, the fact that the physical setting could apparently account for a seven-fold increase in interactions is highly significant.

Shonkoff’s serve and return interplay is part of high quality, child-initiated, early childhood pedagogy. These interactions are especially significant because *zones of proximal development* (ZPD), a related

concept formulated by one of Bronfenbrenner's predecessors, Lev Vygotsky, provide the basis for a pedagogy based on a teacher or parents' spontaneous and timely coaching. The ZPD describes the leading edge of the developing child's abilities. To continue to progress and master the next developmental step, children benefit from being coaxed by supportive adults, or even by other children who has already navigated through the same capacity-building zone. Scaffolding is the metaphor educators use to describe this type of impromptu and brief mentoring. Construction scaffolding consist of barebone platforms of pipes and planks. These allow carpenters and bricklayers to temporarily access hard-to-reach areas on a building's exterior. To facilitate a child's development, scaffolding provides just enough motivational support to prevent a child from abandoning a novel challenge but not so much as to rob him or her of the power that comes with a triumphal breakthrough insight or experience. Most commonly it involves a hint, encouragement, or tool that points the child in the direction where he or she can discover and master some new knowledge or ability.

These interactions are especially significant because they provide the basis for a pedagogy based on a teacher's or parent's spontaneous and timely coaching and that enables children to construct and deepen their own knowledge. This model is antithetical to traditional didactic teaching methods. The dramatic increase in adult-child interactions at SYC provides the space for skilled teachers to meet children in Vygotsky's ZPD.

Behavioral Settings

Another version of ecological psychology surfaced in Kansas in World War II's wake. With federal government funding, University of Kansas psychologist Roger G. Barker (1903-1990) established the Midwest Psychological Field Station where he, and a team of colleagues, studied the everyday lives of children growing up in the small town of Oskaloosa.

Barker's team adopted the descriptive ethnographic research method employed by anthropologists. They observed Oskaloosa children and documented in minute detail the places they spent time, and their activities and behavior in those locations. They observed behavior through a prism that gathered and concentrated the environmental influences that surrounded their subjects' everyday lives. In his book, *Ecological Psychology: Concepts and Methods for Studying the Environment of Human Behavior*, Barker reported that his team "could predict some aspects of children's behavior more adequately from knowledge of the behavior characteristics of the drugstore, arithmetic classes, and basketball games they inhabited than from knowledge of the behavior tendencies of particular children (1968, p. 4)." Those different venues became the units of analysis for the Field Station's researchers. A child's day was like a television series with a succession of distinct dramatic episodes. Barker saw each scene – at home preparing for school, the school bus ride, classroom instruction – as distinctive "behavioral settings." Each noticeably influenced a child's actions and behavior.

The School for Young Children illustrates the behavioral setting concept in a center-based early childhood program. The center as a whole – the building and grounds, equipment and materials that support the full-day child care program – fulfills Barker's definition of the physical dimension of a behavioral setting. But like many behavioral settings, nested within SYC's building are a series of smaller behavioral settings, such as classrooms. Each classroom serves as a behavioral setting for the daily indoor activities of a specific group of infants, toddlers, or preschool children. Classrooms, in turn, are

further subdivided into activity centers, like the block corner and the dramatic play area. These too can be analyzed as behavioral settings.

In addition to the people occupying it, a behavioral setting has a physical-spatial-temporal structure dubbed the *milieu*, and a *programmatic format* that serves as a framework for peoples' interactions within the milieu. To illustrate Barker's theory, take the example of the block corner.

> **The Milieu** - The block area is physically located within the classroom in a bounded and protected area away from high-traffic pathways. It is equipped appropriately with blocks, shelves for storage, and a bare floor to provide a stable base for assembling block constructions. Children can use it during certain parts of the day. Barker would describe this as the milieu.
>
> **Programmatic Format** – Barker described the activities that take place in a milieu as a "standing pattern of behavior." A "program" is a more familiar term for these sets of structured and purposeful human activities. Within the center's curriculum, the block area supports open-ended constructive play; a type of activity that strengthens fine motor skills, encourages creativity and imagination, and improves a child's spatial awareness, among other developmental benefits. Within the behavior setting, teachers and children enact relatively stable programmatic roles. Moreover, similarly qualified individuals are interchangeable. So, for instance, any of the classroom teachers can supervise the block area and different children may play there at different times. These substitutions do not fundamentally change the play, roles, and behaviors of those present in the behavioral setting. The program, or standing pattern, includes a set of routines, procedures, or rules. Take for example the common classroom practice of limiting the number of children in the block corner to avoid crowding and prevent a child from unintentionally toppling a playmate's block structure. These are the types of specifications used to fully describe the program in a behavioral setting.

In his book, Ecological Psychology: Concepts and Methods for Studying the Environment of Human Behavior, Barker reported that his team "could predict some aspects of children's behavior more adequately from knowledge of the behavior characteristics of the drugstore, arithmetic classes, and basketball games they inhabited than from knowledge of the behavior tendencies of particular children."

The milieu is the vessel that surrounds the activity. To function as a behavioral setting, that container's contours need to conform to the programmatic requirements of the activity it encompasses. No one would book a football stadium as the venue for a poker game. The milieu and the activity would be incompatible. On the other hand, the size, location, access points, surfaces, illumination, materials, and furnishings brought together to accommodate block play in the typical preschool room do form a behavioral setting: These elements provide the appropriately proportioned, appointed, and equipped bulwark to support block play. It is not surprising, therefore, that the behavior of children entering the block corner is reasonably predictable. To return to Barker's ecological framing, the block area provides a well-suited habitat for block play. For Barker the milieu is functionally analogous to an ecological niche in the biological sphere.

Barker's behavioral settings theory helps explain the phenomena documented at SYC. It may not be as ludicrous as a poker game in a football stadium, but one shared bathroom located far from SYC's preschool classrooms impeded the rhythm of its developmentally oriented program. Economic constraints often force early education programs to settle for minimally functional, and often dysfunctional, physical settings. The jump in adult-child interactions after SYC's relocation affirms architect Louis Sullivan's adage that form follows function. In other words, the milieu should reflect the functional requirements of the program and not the other way around.[7] It also demonstrates the physical environment's influence on human behavior: The more appropriate post-move milieu produced a dramatically increased level of adult-child interactions.

Barker's behavioral settings research prompted him to formulate a related staffing theory. He noticed that the ecological equilibrium of a behavioral setting changed with the number of inhabitants. In particular, he focused on relative staffing levels. Under-staffing and over-staffing erode the ecological balance between the milieu and the activity it supports. Comparing SYC's pre- and post-move adult-child interactions provides an excellent example of this phenomenon. If the heart of a child care center's function – its core program – is child development, and the proximal processes of adult-child interactions is a pivotal means for supporting it, the facility's limitations left classrooms understaffed relative to the utilization of staff time achieved after the relocation. Phil Schoggen, one of Barker's colleagues, used an eight-person baseball team to illustrate the stresses created by an underpopulated setting. Since the rules of the game make a nine-players team "adequate," the short-handed team is underpopulated. Without a player in the center field, "the distribution of the center fielder's environmental 'load'" is redistributed among the remaining team members (1989, p. 194). It goes without saying that the eight-person team is at a competitive disadvantage. The location of SYC's bathrooms prior to the center's relocation often left the classroom short-staffed. Remember SYC director Beth Bye's reaction to the teachers' observation that the classrooms were calmer in the new location. Following the move, Bye theorized, the consistent presence of two teachers in each classroom ensured that an adult was available to intervene or assist children in a timely manner where necessary. With just one teacher, the classroom behavior was less orderly.

Spatial dimensions are another feature of behavioral settings. The SYC teachers observed that the new facility's more generous dimensions meant less crowding and fewer situations to distract children from their play. They attributed the more tranquil atmosphere to the larger classrooms. Research suggests crowding affects more than the atmospherics: It can affect teacher behavior and child outcomes "by undermining the quality of caregiver-child interactions. For instance, child-care providers in crowded, poor-quality child care tend to be less responsive, less involved, less likely to demonstrate how something works, and less vocally stimulating compared with their counterparts in less crowded child-care settings (Corapci, 2010, p. 71)."

In short, more space and more consistently staffed classrooms, by aligning the milieu with SYC's child development goals, created a better functioning behavioral setting. Visualizing child development programs ecologically reveals these unexplored avenues for making programmatic gains by engineering

[7] A criticism sometimes leveled at architects is that they prioritize a building's form — the overall shape and aesthetic appeal of the object— over functionality. Too often in ECEC money, not form or function, is the de facto priority. In effect, prior to SYC's move, *dysfunction* followed the inadequately designed and inefficaciously configured basement location.

modifications to the physical environment. In studying child care center environments Sybil Kritchevsky and Elizabeth Prescott found the "clues to the need for spatial improvement primarily…in teachers' and children's behavior. Tired or irritable teachers; apathetic, hyperactive, or uninterested children; high noise level; large amounts of time spent in routine management; and excessive use of teacher-directed activity, all have a high likelihood of being spatially induced (1977, p. 42)." They found that by changing the physical environment they could solve behavioral challenges. In other words, a maladapted facility can interfere with programmatic goals. The converse is also true; a well-designed space can facilitate programmatic goals. At SYC it took the center's relocation to reveal this relationship. If the spatial status quo is accepted as a given, or it is assumed that physical space and behavior are unrelated, of course observed behavior would be unlikely to prompt program operators to modify the physical milieu.

Given staffing limitations, a built environment that creates difficult working conditions – settings that have not been adequately adapted to the extraordinarily unique demands created by staff-to-child ratio constraints – is like fielding a short-handed team. Without either more staff or better designed facilities, the complementary fit required between the milieu and the program stresses and distorts the behavioral setting's performance. It does not function as teachers and parents would like it to. This lack of fit makes working conditions more arduous and yields fewer and less rewarding developmental experiences for children. It is all too common that early childhood facilities suffer from this mismatch between the holding environment created by the facility and the conditions required to support child development.

Affordances

While Barker was toiling on the frontiers of social psychology, James J. Gibson *(1903–1979*) was making waves among perceptual psychologists. This branch of psychology explores how information gathered through our senses, like sight and smell, translates into the actions people take. Gibson is best known for the theory of *affordances*; a byproduct of research he conducted for the Air Force beginning with his military service during World War II. His research sought to understand how pilots use visual information to orient themselves while flying.

Gibson asserted, a person's perceptual systems continuously and methodically scan the immediate environment and, from this raw data stream, directly extract the actions available to the observer. He christened those potential actions "affordances."

"The verb to afford is found in the dictionary," Gibson wrote in his groundbreaking book, *The Ecological Approach to Visual Perception*. "The noun *affordance* is not. I have made it up (1979, p. 127)." Affordance is an awkwardly unfamiliar word; one Gibson concocted because our language lacked a suitable alternative to describe his wholly new way for understanding visual perception. Although the word "affordance" is uncommon to the public and most early childhood professionals, because of Gibson's work the term has gone viral among environmental psychologists, webpage graphic artists, industrial designers, and others.

Gibson argued that our perceptual systems are constantly harvesting information about the immediate surroundings. The information is not just one more ingredient poured into a cerebral slurry that flows through our preexisting mental constructs and cognitive biases. Rather, Gibson asserted, a person's

perceptual systems continuously and methodically scan the immediate environment and, from this raw data stream, *directly* extract the actions available to the observer. He christened those potential actions "affordances."

This view conflicted with the established psychological understanding of the perception-action cycle. Prior to Gibson, it was assumed that a cognitive process invariably stood between perception and action. Gibson, however, asserted that people often act without that kind of cognitive reflection. Take for example "…backing away from the 'close talker,' in stepping skillfully over the obstacle, in reaching 'automatically' for the proffered handshake, we find ourselves acting in definite ways without ever having decided to do so (Withagen, 2012, p. 257)."

To illustrate the distinctive character of affordances, the environmental psychologist Harry Heft uses the example of a tree. Linguistically, the word "tree" is an abstract mental representation of an object. In Gibson's view, an affordance is not the thing, in this case a tree. Nor is it the symbolic representation the word evokes in our mind. Instead, people perceive objects, such as a tree, as a resource upon which the person can act. It is a potential action. Echoing Louis Sullivan, Heft characterizes the use of the word "tree" to describe an environmental feature as "form based" in contrast to Gibson's "functionally-based" approach (Heft 1988, p. 29). The observer's process of categorizing the large plant as a "tree" entails fitting a particular tree, with specific physical properties, into a preexisting cognitive framework. It shifts the focus from a specific tree's functional utility into a lifeless and subjective form that includes saplings, giant redwoods, and everything in between. Perceiving potential actions, Gibson maintained,

The log on the left "affords" balancing. The slide on the right "affords" climbing up a surface designed for sliding down.

does not require this cognitive detour. Instead, an affordance "…is a direct and unmediated determinant of perception *and* action (Heft, 1981, p. 227, emphasis added)." What is functionally important, for example, might be whether the tree "affords climbing." That, in turn, depends on the physical characteristics of this specific tree – the height of the lowest branches and sturdiness of its limbs – and

the specific perceiver's weight, reach and strength (Heft, 1988, p. 31). See the accompanying photographs on the preceding page. They illustrate a log as an affordance for balancing and a playground slide as an affordance for climbing up rather than sliding down.

"Whether they recognize it or not," the architectural critic, Sarah Williams Goldenhagen, observes, people "experience built environments by selectively focusing on the opportunities a given space or object or structure affords them." The same is true of the natural environment. "Gibson's notion of affordance has to do with the properties of an object or the features of an environment that suggest to us how it is to be used. A doorway clearly asks us to walk through it. It's almost as if something about the space or the object or the structure speaks to us, signaling how we might engage with it (2017, p.110)." In other words, people are primed to search their immediate environment for the actions the environment makes available to them.

Probably no one has done more to popularize Gibson's conception of affordances than Don Norman, the design guru and author of *The Design of Everyday Things*. Norman highlights the central thesis: "an affordance is a relationship between the properties of an object and the capabilities of" the individual perceiving the object. It is the individual's capabilities "that determine just how the object could possibly be used (Norman, 2013, p. 11)." To illustrate this, imagine how a long corridor might prompt young preschoolers to run its length. Their teacher, on the other hand, is unlikely to see the corridor as an invitation to run. For a grown-up the hallway is the walkable route from where she is to where she is going.

As Gibson cautioned, "some offerings of the environment are beneficial and some are injurious (Gibson, 1979, p. 137)." Discussions of affordances tend to focus on the environment's beneficial affordances. A child may be able to jump off a boulder six feet off the ground as well as a one-foot-high rock. However, one is dangerous, and the other is benign. Gibson described a cliff as "a *negative* affordance (Gibson, p. 157)." Licensing regulations, being principally about health and safety, focus on preventing negative affordances, rather than imposing requirements for positive development-enhancing affordances. While these regulations do not use the word affordance, they recognize the natural propensity for young children to explore. This can lead to their discovery of negative affordances, like accessing toxic cleaning products. Having bathrooms in the classroom, as SYC discovered, is a positive affordance.

Neo-Gibsonians, like Don Norman, have extended Gibson's theory of affordances to the field of user-centered design and has coined the term "anti-affordance " (Norman, 2013, p.11). While that expression stretches Gibson's identification of positive and negative affordances, it also highlights a useful distinction. Whereas Gibson's negative affordance describes a dangerous situation, Norman used anti-affordance to describe objects whose functionality is ambiguous, confusing, or, like the safety cap on a prescription medicine bottle in the hands of someone with crippling arthritis, an impediment. Anti-affordances are hindrances. When it comes to early

At the School for Young Children's old basement facility, the location of bathrooms outside the classroom was a hindrance or anti-affordance, but not an inherently dangerous negative affordance. Located within the classroom, as they were after the move, the bathrooms offered a positive affordance to the children enabling greater agency.

childhood facilities, hindrances — desirable activities impeded or prevented by the physical space — are an all-too-common challenge. At SYC's old basement facility, the location of bathrooms outside the classroom was a hindrance or anti-affordance, but not an inherently dangerous negative affordance. Located within the classroom, as they were after the move, the bathrooms offered a positive affordance to the children enabling greater agency. It also offered affordances for the teachers, enabling them to spend their time in the more rewarding proximal process of interacting with children around child-initiated classroom activities.

Applying the Theory of Affordances

At first blush, Gibson's assertion about direct perception seems convoluted. However, an elegant Darwinian logic underpins his theory of affordances. "The affordances of the environment," he wrote, "are what it [the environment] offers the animal, what it provides or furnishes, either for good or ill (Gibson, 1979, p. 127)." Scanning for and instinctively reacting to the opportunities and resources the environment affords, as well as the threats to be evaded, would have been a significant evolutionary advantage on the African savanna. This sort of unmediated perception-action cycle foreshadowed ideas about embodied cognition that are today cutting-edge topics emerging from neuroscience laboratories.

In the world of ECEC, affordances provide a lens for evaluating the physical environment. What might attract a child's attention and prompt their engagement? Is the affordance developmentally positive, in that it falls within what Vygotsky would describe as the age group's zone of proximal development? Are there spatial characteristics that create anti-affordances, like play materials stored on a high shelf outside of a child's reach?

Kritchevsky and Prescott propose a pair of more granular questions: Does the setting provide enough variety and complexity (1977, p. 11)? Variety refers to activities, like digging, climbing, and sensory play. Complexity alludes to an activity's immersive potential. They would categorize a swing as simple because it lends itself to only one type of use. That is less true of a sandbox. But while there is little that can be done to make a swing more multifaceted, shovels, pails, water, and toy bulldozers can be placed in a sandbox to create a more complex behavioral setting. The sandbox taps and nurtures multiple abilities. It also lengthens and intensifies a child's engagement.

Despite their corrosive effects on SYC's program quality, these everyday inconveniences went largely unnoticed prior to the move; obscured from view by the field's financially driven acquiescence to low expectations.

> It is probably obvious that if children are expected to stay in any play area for only a short time, high complexity may well lead to unhappy children unwilling to leave their play. But if children are expected to stay in a play area for a long time without complexity, teachers probably will need to compensate, through their own active participation, for the failure of the setting to provide enough play ideas (Kritchevsky, et al., p. 12).

Person-Environment Interactions

Despite the "…different theoretical frameworks and research programs," from which, microsystem proximal processes, behavioral settings, and affordances evolved, "it is noteworthy," Heft argues, that Bronfenbrenner, Gibson and Barker "…arrived quite independently at essentially the same conclusion; namely, that *the functional properties of the environment are perceived qualities that emerge from person-environment relations* (Heft, 1988 p. 32)." Anyone thinking seriously about environments that support early childhood development will find these three ecologically-framed concepts – Bronfenbrenner's proximal processes, Barker's behavioral settings and Gibson's affordances – to be indispensable tools to have in their workshop. They can be used to fix broken early childhood environments and to craft new and more functional ones.

How might Roger Barker have explained the dramatic improvement in adult-child interactions at the School for Young Children? How about the teachers' claims that the center's relocation yielded a calmer classroom ambiance? He would likely look at each location and compare how compatible the two physical environments were with the functional needs of SYC's early childhood program. How snug was the fit between the physical milieu and the goals and operational requirements of the center's early childhood program? What kinds of demands does it put on teachers' time and how are they able to use their skills?

The SYC teaching staff was unanimous in observing how disruptive it was to have essential resources located outside the classroom, especially toilets and sinks which are used frequently throughout the day. The same was true for adequate classroom storage and, this being before the ubiquitous presence of a smart phone in every back pocket, telephones. The basement location limited natural illumination and prevented children from experiencing the time of day, seasonal changes, and weather conditions. Awareness of these temporal and meteorological conditions help orient people along multiple dimensions and influence mood. They are also raw material for proximal processes between children and caregivers – opportunities to talk about what makes the seasons or how certain weather conditions effect mood. Moreover, SYC basement classrooms were cramped causing children to be easily distracted by adjacent activities. The irony is that these dysfunctional conditions went unnoticed until after the center's move to its new facility. Despite their corrosive effects on SYC's program quality, these everyday inconveniences went largely unnoticed prior to the move; obscured from view by the field's financially driven acquiescence to low expectations.

Form – a child development center's physical shape – should follow from its function. When envisioning the physical environment — one that supports a young child's development, provides a rewarding work environment for staff, and caters to the needs of harried parents — start with affordances.

Form – a child development center's physical shape – should follow from its function. In other words, before drafting a list of site selection criteria or sketching the first schematic layout, when envisioning the physical environment — one that supports a young child's development, provides a rewarding work environment for staff, and caters to the needs of harried parents — start with affordances. What functions does the facility need to facilitate and what behaviors does it seek to discourage? How do we

create a holding environment that meets such complex and demanding specifications? Too often fiscal constraints thwart the opportunity to even pose such challenging and consequential questions.

Ecosystems that Nurture Child Development

There is an implicit assumption that child development centers – the physical structure – are like cereal boxes. It is immaterial to the cereal and the protective internal packaging. However, if instead, you visualized such programs ecologically, the facility provides the habitat that can either stress the occupants or ensure that they thrive. In general people grasp the inherent interdependence of the living and physical components of ecosystems. There is a great deal of evidence that child development facilities are in fact an essential part of the ecosystem that nurtures young children.

For the sake of the nation and its families and children, the country needs to absorb this ecological insight and invest in the physical habitats in which many of the nation's most vulnerable young children grow and develop. Quality center-based child development facilities will only be possible with a broader and deeper system for subsidizing the cost of child development services as well as a substantial public investment in the physical infrastructure of early childhood. We need built and landscaped facilities conceived with the developmental needs of young children as their central purpose. That also means physical space that supports the workplace needs of professionals. It also involves locations and facilities that honor a mutually beneficial partnership with parents. Early learning programs should be expected to function as indispensable allies with parents in nurturing each child's development.

Finances pose an undeniable barrier to more suitable built environments. After decades during which practitioners have settled for minimally acceptable quarters, the field has become accustomed to inadequately capitalized facilities. Capital and enhanced revenues are essential to the larger project of rethinking how the physical environment can provide programmatically dynamic ecosystems that nurture each child's full potential.

Bibliography

Adolph, K. E., & Kretch, K. S. (2015). Gibson's Theory of Perceptual Learning. In *Internaltional Encyclopedia of the Social & Behavioral Sciences* (2nd Edition, Vol. 10, pp. 127–134). Elsevier.

Allen, J. G. (Ed.). (2017). *The 9 Foundations of a Healthy Building* (p. 36). Harvard T.H. Chan School of Public Health. https://9foundations.forhealth.org/wp-content/uploads/2020/02/9_Foundations_of_a_Healthy_Building_February_2017_R1.8.pdf

Allen, J. G., & Macomber, J. D. (2020). *Healthy Buildings: How Indoor Spaces Drive Performance and Productivity* (2020th ed.). Harvard University Press.

Allen, L., & Kelly, B. B. (Eds.). (2015). *Transforming the Workforce for Children Birth Through Age 8: A unifying Foundation* (p. 689). Institute of Medicine and National Research Council.

Anthes, E. (2020). *The Great Indoors: The Surprising Science of How Buildings Shape our Behavior, Health, and Happiness*. Scientific American: Farrar, Streaus and Giroux.

Azab, N. (2000). Beyond the Gap: An Optimistic Re-visit to Behavior Settings Theory. *Beirut Arab University Journal*.

Barker, R. G. (1968). *Ecological Psychology: Concepts and Methods for Studying the Environment of Human Behavior*. Stamford University Press.

Benfield, J. A., Rainbolt, G. N., Bell, P. A., & Donovan, G. H. (2015). Classrooms With Nature Views: Evidence of Differing Student Perceptions and Behaviors. *Environment and Behavior*, *47*(2), 140–157.

Blume, C., Garbazza, C., & Spitschan, M. (2019). Effects of light on human circadian rhythms, sleep and mood. *Somnologie*, *23*(3), 147–156. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6751071/

Calkins, S. B., & Bell, M. A. (Eds.). (2010). *Child Development at the Intersection of Emotion and Cognition*. American Psychological Association.

Charles, E. P., & Sommer, R. (2012). Ecological Psychology. In *Encyclopedia of Human Behavior* (2nd ed.). Elsevier.

Children under age 6 with all available parents in the labor force | KIDS COUNT Data Center. (n.d.). Retrieved March 18, 2022, from https://datacenter.kidscount.org/data/tables/5057-children-under-age-6-with-all-available-parents-in-the-labor-force#detailed/1/any/false/1729,37,871,870,573,869,36,868,867,133/any/11472,11473

Classroom Applications of Vygotsky's Theory. (n.d.). Retrieved May 1, 2021, from https://wps.ablongman.com/ab_slavin_edpsych_8/38/9951/2547689.cw/content/index.html

Classroom Applications of Vygotsky's Theory. (2021, April 23). https://wps.ablongman.com/ab_slavin_edpsych_8/38/9951/2547689.cw/content/index.html

Cohen, D., & Mikaelian, A. (2021). *The Privatization of Everything: How the Plunder of Public Goods Transformed America and How We Can Fight Back*. The New Press.

Corapci, F. (2010). Child-Care Chaos and Child Development. In G. W. Evans & T. D. Wachs (Eds.), *Chaos and Its Influence on Children's Development: An Ecological Perspective* (pp. 67–82). American Psychological Association.

Creating a Child Care Environment that Supports Children's Exploration. (2019, August 15). *EXtension Alliance for Better Child Care*. https://childcare.extension.org/creating-a-child-care-environment-that-supports-childrens-exploration/

Danziger Halperin, A. K. (2020). An Unrequited Labor of Love: Child Care and Feminism. *Signs*, *45*(4).

Duncan, S. (n.d.). Using the Spatial Conditions of Emotions to Design Inspiring Early Childhood Environments. *Potential Place*. https://www.enspirement.co/potential-place

Eberhard, J. P. (2009). *Brain Landscape: The Coexistence of Neuroscience and Architecture*. Oxford University Press.

Educational Implications of Piaget's Theory. (n.d.). Retrieved May 1, 2021, from https://wps.ablongman.com/ab_slavin_edpsych_8/38/9951/2547688.cw/content/index.html

Educational Implications of Piaget's Theory. (2021, April 23). https://wps.ablongman.com/ab_slavin_edpsych_8/38/9951/2547688.cw/content/index.html

Ellard, C. (2015). *Places of the Heart: The psychogeography of Everyday Life*. Bellevue Literary Press.

Enspirement - Inspiring The Potential Place for all children. (n.d.). Retrieved September 18, 2021, from https://www.enspirement.co/potential-place

Evans, G. W., & Wachs, T. D. (Ed.). (2010). *Chaos and its influence on children's development: An ecological perspective.* American Psychological Association.

Fast Facts: Child care (4). (n.d.). Retrieved March 18, 2022, from https://nces.ed.gov/fastfacts/display.asp?id=4

Fischer, S., & Orlowski, T. (2020). *Trends in Child Care Center Licensing Requirements and Policies for 2017 - Research Brief #1*. National Center on Early Childhood Quality Assurance; 12/26/2021. https://childcareta.acf.hhs.gov/sites/default/files/public/2003_center_licensing_trends_brief_2017_final_0.pdf

Gibson, E. J. (2013). *Perceiving the Affordances: A Portrait of Two Psycholgists*. Psychology Press.

Gibson, J. J. (1966). *The Senses Considered as Perceptual Systems*. Greenwood Press.

Gibson, J. J. (1979). *The Ecological Approach to Visual Perception*. Psychology Press. https://www.taylorfrancis.com/books/mono/10.4324/9781315740218/ecological-approach-visual-perception-james-gibson

Goldhagen, S. W. (2017). *Welcome to Your World: How the Build Environment Shapes Our Lives*. Harpers Collins.

Hassinger-Das, B., Hirsh-Paske, K., & Golinkoff, M. (2017). The Case of Brain Science and Guided Play: A Developing Story. *Young Children*, *72*(2), 45–50.

Hayes, N. (2007). *Perspectives on the Relationship between Education and Care in Early Childhood: A Research Paper* (p. 25). National Council for Curriculum and Assessment.

Hayes, N. (2008). Teaching Matters in Early Education Practice: The Case for a Nurturing Pedagogy. *Early Education and Development*, *19*(3), 430–440.

Hayes, N., & Kernan, M. (2008). *Engaging Young Children: A Nurturing Pedagogy* (e-book). Gill & MacMillan.

Hayes, N., O'Toole, L., & Halpenny, A. M. (2017). *Introducing Bronfenbrenner: A Guide for Practitioners and Students in Early Years Education*. Routledge.

Heckman, J. J. (2021). *Invest in early childhood development: Reduce deficits, strengthen the economy*. https://heckmanequation.org/www/assets/2013/07/F_HeckmanDeficitPieceCUSTOM-Generic_052714-3-1.pdf

Heckman, J. J. (2022). 13% ROI Research Toolkit. *Heckman: The Economics of Human Potential*. https://heckmanequation.org/resource/13-roi-toolbox/

Heft, H. (1981). An Examination of Constructivist and Gibsonian Approaches to Environmental Psychology. *Population and Environment*, *4*(4), 227–245. https://www.jstor.org/stable/27502945

Heft, H. (1988). Affordances of Children's Environments: A Functional Approach to Environmental Description. *Children's Environments Quarterly*, *5*(3), 29–37.

Jacobson, M., Silverstein, M., & Winslow, B. (2002). *Patterns of Home: The Ten Essentials of Enduring Design*. The Taunton Press.

Jones, Elizabeth, & Prescott, E. (1978). *Dimensions of Teaching -- Learning Environments: Focus on Day Care II. Focus on Day Care*. Pacific Oaks College.

Kamerman, S. B., & Gatenio, S. (NA). Definitions, Context, and Provision. In *OECD Thematic Review of Education and Care Policy USA: Background Report* (pp. 4–22). U.S. Department of Education, OERI.

Kania, John, Kramer, M., & Senge, P. (2018). *The Water of Systems Change*. FSG.

Key Program Elements: Use of Physical Space. (ND). Center for the Study of Social Policy. https://cssp.org/wp-content/uploads/2018/10/06_Physical_Space_REV4.pdf

Kritchevsky, Sybil, & Prescott, Elizabeth, with Walling, Lee. (1977). Planning Environments for Young Children: Physical Space. National Association of Young Children.

Lally, J. R., & Mangione, P. (2017). Caring Relationships: The Heart of Early Brain Development. *Young Children*, *72*(2), 17–24.

Lang, H. (2005). The Trouble With Day Care | Psychology Today. *Psychology Today*. https://www.psychologytoday.com/us/articles/200505/the-trouble-day-care

Lindsay, J. (October 26, 2021.). *What is the Real Economic Impact of Child Care?* (Season 2: Episode 1-A Private Crisis) [Mp3]. Retrieved January 15, 2021, from https://www.bostonfed.org/publications/six-hundred-atlantic/season/two/ep-1-whats-the-real-economic-impact-of-child-care.aspx

Marberry, S. O. (2010). A Conversation with Roger Ulrich. *Healthcare Design*, *10*(November 2010), 40–49. https://healthcaredesignmagazine.com/architecture/conversation-roger-ulrich/

Martin, S. H. (2005). The classroom environment and children's performance – is there a relationship? In *Children and their Environments: Learning, Using and Designing Spaces* (pp. 91–107). Cambrdge University Press.

Matthews, E., & Lippman, P. C. (2016). The Physical Environment of Early Childhood Centers: A Case Study in the use of Break-Out Spaces. *International Journal for Cross-Disciplinary Subjects in Education*, *7*(2), 2774–2781.

McGhee, H. (n.d.). *Heather McGhee Interviews Ai-jen Poo for 'The Ezra Klein Show.'*

Michnick, R., & Hirsh-Pasek, K. (2016). *Becoming Brilliant: What Science Tells Us About Raising Successful Children*. American Psychological Association.

Monsur, M. (2015). *Does Childcare Architecture Matter? Investigating how Indoor-Outdoor Spatial Relations Influence Child Engagement and Teacher Motivation*. https://repository.lib.ncsu.edu/bitstream/handle/1840.16/10040/etd.pdf?sequence=2&isAllowed=y

Mulder, H., Oudgenoeg-Paz, O., Hellendoorn, A., & Jongmans, M. J. (2017). How Children Learn to Discover Their Environment: An Embodied Dynamic Systems Perspective on the Development of Spatial Cognition. In *Neuropsychology of Space* (pp. 309–360). http://dx.doi.org/10.1016/B978-0-12-801638-1.00009-4

Nishizaki, M. (2015, September 25). *Visualizing the Positive and Negative Affordances in the Home Environment During the First Year of Life Using Augmented Reality* [Poster Session]. EuroAsianPacific Joint Conference on Cognitive Science, Torino, Italy. http://ceur-ws.org/Vol-1419/

Norman, D. (2013). *The Design of Everyday Things*. Basic Books.

Number of children under 6 years old and not yet enrolled in kindergarten, percentage in center-based programs, average weekly hours in nonparental care, and percentage in various types of primary care arrangements, by selected child and family characteristics: 2012. (n.d.). Retrieved March 18, 2022, from https://nces.ed.gov/programs/digest/d15/tables/dt15_202.30.asp

Olds, A. R. (2001). *Child Care Design Guide*. McGraw-Hill.

Pakulak, E., Gomsrud, M., Reynolds, M. M., Bell, T. A., Giuliano, R. J., Karns, C. M., Klein, S., Longoria, Z. N., O'Neil, L. V., Santillan, J., & Veville, Helen. (2017). Focusing on Families: A Two-Generation Model for Reducing Parents' Stress and Boosting Preschoolers' Self-Regulation and Attention. *Young Children*, *72*(2), 25–37.

Parenting Matters: Supporting Parents of Children Ages 0-8 (p. 506). (2016). National Academies of Sciences, Engineering, and Medicine. https://doi.org/10.17226/21868.

Paul, A. M. (2021). *The Extended Mind: The Power of Thinking Outside the Brain* (2021st ed.). Houghton Mifflin Harcourt.

Piaget, Vygotsky, and Preschoolers. (2021, April 23). Liberty University - Course Apps. https://www.liberty.edu/courseapps/book/psychology-201/module-3/section-1-title-2/article-title-0/

Postma, A., & van der Ham, I. J. M. (2017). *Neuropsychology of Space: Spatial Functions of the Human Brain*. Academic Press.

Prescott, E. (1987). The Environment as Organizer of Intent in Child-Care. In C. S. Weinstein & T. G. David (Eds.), *Spaces for Children: The Built Environment and Child Development* (pp. 73–88). Plenum Press.

Prescott, E., Jonnes, Elizabeth, & Kritchevsky, S. (1967). *Group Day Care as a Child-Rearing Environment: An Observational Study of Day Care Program* (p. 455). Pacific Oaks College.

Psychneuro. (2019, March 22). Nature vs. Nurture vs. UH, Nanurture? – On Psychology and Neuroscience. *On Psychology and Neuroscience*. https://psych-neuro.com/2019/03/22/nature-vs-nurture-vs-uh-nanurture/

Read, M. (2019a). Designing with Color in the Early Childhood Education Classroom: A Theoretical Perspective. *Creative Education*, *10*(6), 1070–1079. https://www.scirp.org/journal/paperinformation.aspx?paperid=92974

Read, M. (2019b). Environmental Color and the Coooperative Behavior of Children with Sensory Processing Challenges: An Exploratory Study. *Creative Education*, *10*(11), 2448–2456. https://www.scirp.org/journal/paperinformation.aspx?paperid=96430

Reed, E. S. (1996). *Encountering the World: Toward an Ecological Psychology*. Oxford University Press.

Rietveld, E., & Kiverstein, J. (2014). A Rich Landscape of Affordances. *Ecological Psychology*, *26*(4), 325–352. https://www.tandfonline.com/doi/full/10.1080/10407413.2014.958035

Sakman, E. (n.d.). Child Care. In *Encyclopedia of Evolutionary Psychological Science*. https://www.academia.edu/41598529/Child_Care?email_work_card=view-paper

Schoggen, P. (1989). *Behavioral Settings: A Revision and Extension of Roger G. Barker's "Ecological Psychology."* Stanford University Press.

Shonkoff, J. P. (2017a). Breakthrough Impacts: What Science Tells Us About Supporting Early Childhood Development. *Young Children*, *72*(2), 8–16.

Shonkoff, J. P. (2017b). Breakthrough Impacts: What Science Tells Us About Supporting Early Childhood Development. *Young Children*, *72*(2), 8–16.

Sternberg, E. M. (2009). *Healing Spaces: The Science of Place and Well-Being* (2010th ed.). Harvard University Press.

Suddath, C. (2021). How Child Care Became the Most Broken Business in America. *Bloomberg Businessweek*. https://www.bloomberg.com/news/features/2021-11-18/biden-s-build-back-better-wants-to-save-america-s-child-care-business

Sussman, A., & Hollander, J. B. (2015). *Cognitive Architecture: Designing for How We Respond to the Built Environment*. Routledge.

Theories of Development. (n.d.). Retrieved May 1, 2021, from https://wps.ablongman.com/ab_slavin_edpsych_8/38/9951/2547653.cw/index.html

Thompson, D. (2019). Why Child Care Is So Ridiculously Expensive. *The Atlantic*.

Tucker-Drob, E. M., Rhemtulla, M., Harden, K. P., Turkheimer, E., & Fask, D. (2011). Emergence of a Gene × Socioeconomic Status Interaction on Infant Mental Ability Between 10 Months and 2 Years. *Psychological Science*, *22*(1), 125–133. JSTOR. http://www.jstor.org.ntnproxy.minlib.net/stable/40984617

Turner, M. A., Edelman, P. E., Poethig, E., & Aron, L. (2014). *Tackling Persistent Poverty in Ditressed Urban Neighborhoods: History, Principles, and Strategies for Philanthropic Investment* (p. 45). Urban Institute. National Children's Facilities Network (NCFN

Tversky, B. (2019). *Mind in Motion: How Action Shapes Thought*. Basic Books.

Ulrich, R. S. (1984). View through a window may influence recovery from surgery. *Science*, *224*(1984), 420. https://link.gale.com/apps/doc/A3238205/AONE?u=mlin_m_minuteman&sid=bookmark-AONE&xid=c10e5b40

U.S. Department of the Treasury. (2021). *The Economics of Child Care Supply in the United States*. https://home.treasury.gov/system/files/136/The-Economics-of-Childcare-Supply-09-14-final.pdf

Whitebook, M., & Bellm, D. (1999). *Taking on Turnover: An Action Guide for Child Care Center Teachers adn Directors*. Center for the Child Care Workforce.

Whitebread, D., & Sitabkhan, Y. (2022). "Pedagogy and Curricula Content: Building Foundational Skills and Knowledge. In *Quality Early Learning: Nurturing Children's Potential* (p. 279). World Bank Group.

Wicker, A. (2012). Perspectives on Behavior Settings: With Illustrations from Allison's Ethnography of a Japanese Hostess Club. *Environment and Behavior*, *44*(4), 474–492.

Wicker, A. W. (1979). *An Introduction to Ecological Psychology*. Brooks/Cole Publishing Company.

Williams, D. R. (2012). Miles to Go befoer We Sleep: Racial Inequities in Health. *Journal of Health and Social Behavior*, *53*(3), 279–295.

Withagen, R., de Poel, H. J., Araujo, D., & Pepping, G.-J. (2012). Affordances can invite behavior: Reconsidering the relationship between affordances and agency. *New Ideas in Psychology*, *30*(2), 250–258.

Workman, S. (2018). *Where Does Your Child Care Dollar Go?* Center for American Progress. https://www.americanprogress.org/article/child-care-dollar-go/