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DEVELOPING EFFECTIVE AND RESPONSIVE SCHOOLS AND PRACTITIONERS. INSIGHTS FROM THE SCIENCE OF LEARNING AND DEVELOPMENT

DESENVOLVENDO ESCOLAS E PROFISSIONAIS EFICAZES E RESPONSIVOS. PERSPETIVAS DA CIÊNCIA DA APRENDIZAGEM E DO DESENVOLVIMENTO

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Abstract The landscape of 21st century, along with scientific advancements, have significant implications for the way we organize schools and student learning experiences. This conceptual article elevates findings from the science of learning and development (SoLD)—a groundbreaking, interdisciplinary research syntheses—to articulate the bourgeoning scientific knowledge of the ways that young people develop and its concrete implications for the ways that schools can be effectively designed to optimize learning, success, and well-being. It concludes with a discussion of emerging research on effectively professionalization to support SoLD-aligned transformation, noting how targeted, ongoing, and immersive professional learning experiences are essential to enabling teacher and school leaders to bring about sustainable and equitable change.

Keywords science of learning and development, school transformation, educator/leader professionalization

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Resumo O panorama do século 21, juntamente com os avanços científicos, tem tido implicações significativas na maneira como organizamos as escolas e as experiências de aprendizagem dos alunos. Este artigo conceitual apresenta as descobertas da ciência da aprendizagem e do desenvolvimento (SoLD) - uma síntese de investigação interdisciplinar e inovadora - para articular o conhecimento científico emergente sobre os modos de desenvolvimento dos jovens com as suas implicações concretas na forma como as escolas podem ser eficazmente projetadas de modo a otimizar a aprendizagem, o sucesso e o bem-estar. Conclui-se com uma discussão sobre a investigação emergente sobre profissionalização eficaz para apoiar uma transformação alinhada com a SoLD, mostrando-se como experiências de aprendizagem profissional direcionadas, contínuas e imersivas são essenciais para permitir que professores e líderes escolares promovam mudanças sustentáveis e equitativas.

Palavras-chave ciência da aprendizagem e do desenvolvimento, transformação escolar, profissionalização do educador/líder

1. The urgency for educational change

Regardless of geography and background, citizens across the globe have experienced individual and collective challenges spurred by the unprecedented events of recent years. Many have grappled with social-psychological effects brought on by the pandemic-induced physical distance, isolation, and in the cases of over five million global citizens, personal loss of beloved friends and family members. Others, too, have had these challenges exacerbated by acute financial woes, induced by economic recession turn inflation that has come to characterize the global economy. Ongoing instances of racialized and gendered violence around the world also underlay these difficulties, causing many to experience or bear witness to the individual or state-sanctioned discrimination that is perpetuated upon nondominant groups.

These compounding events have exposed and exacerbated the "anatomy of inequality" (Molander, 2016) that has long plagued many countries and communities. This inequality—born of and enabled by policies that create and sustain poverty and segregation (Rothstein, 2017)—have been intensified in the educational arena (García

and Weiss, 2020; Reimers, 2022), as long-standing opportunity gaps propelled by unequal distribution of resources, well-prepared practitioners, and unequal access to rich curriculum and learning experiences (Adamson and Darling-Hammond, 2012; Carter and Welner, 2013; Oakes, 2005) have made it difficult to be responsive to students' holistic needs.

Systems of dysfunctional schools designed over a century ago have also entrenched this inequitable distribution of opportunity. As scientific managers in the early 20th century looked to accommodate the influx of migrant and immigrant students into urban areas, they created school systems to prepare young people for their supposed socioeconomic positions—ideas seeped in racial, ethnic, and cultural prejudice (Tyack, 1974). They designed learning settings that emphasized transmission teaching (i.e., teachers delivering knowledge to students) and batch processing of students in prescribed grade levels and differential course sequences, which minimized personalized support (Tyack and Cuban, 1995). Students were funneled into these sequences (i.e., tracks) with the aid of biased and scientifically flawed assessments (Oakes, 2005; Oakes and Rogers, 2006). This led many from nondominant groups into tracks that prepared them for manual labor, which tended to emphasize rule-following, minimize relationships, and infrequently support the development of higher-order skills (Tyack, 1974).

While many have sought to shed the inequitable underpinnings and impact of these schooling approaches over the years, the fundamental design of schools remains relatively unchanged, and their undergirding logics continue to serve as a potent technical, political, and normative forces (Tyack and Cuban, 1995). Yet, shortcomings of these educational approaches have been increasingly called into question in the evolving 21st century world. Both scholars and practitioners have noted that society and the economy demand a more diverse, complex, and adaptive set of knowledge, skills, and competencies to succeed and thrive than these decades-old approaches are able to systematically nurture (Finegold and Notabartolo, 2016; Mehta and Fine, 2019; Pellegrino and Hilton, 2013). Others, too, have elevated the growing knowledge of human development and learning, which suggests that learning settings need to be fundamentally transformed to support personalized, culturally affirming, and empowering approaches to optimize student growth and well-being (Darling-Hammond et al., 2019; Darling-Hammond and Cook-Harvey, 2018).

The imperative to institute supportive schooling approaches that mitigate equity gaps and enable success and well-being has never been clearer than during the pandemic and the return to in-person, synchronous learning. Practitioners around the world face a monumental challenge: to simultaneously accelerate learning to compensate for the critical loss of instructional time while attending to students' acute social and emotional needs and repairing the relational and social gaps that necessarily emerged after months of global turmoil and decades, if not centuries, of racial, gender, and class divides. The question is: How can this moment of reckoning and reflection compel us to rethink, redesign, and agitate for fundamental, equitable, and sustainable change in schools and education systems? How can we systematically engage in this daunting yet critically important endeavor?

2. The science of learning and development

Recent groundbreaking research syntheses suggest a promising pathway forward—one grounded in bourgeoning scientific knowledge of the ways that young people learn and develop (Cantor et al., 2019; Darling-Hammond et al., 2019; Osher et al., 2018).[3] This research, referred to as the science of learning and development (SoLD), synthesizes findings from neuroscience, developmental science, epigenetics, psychology, sociology, adversity science, resilience science, and the learning sciences, and collectively tells us what all young people are capable of and the contextual factors that drive healthy development.

First and foremost, SoLD tells us that **the brain and its development are malleable**, thus negating the perception that human capacities are fixed (Cantor et al., 2019). SoLD illustrates that development is a lifelong process, thus providing all individuals the ability to learn new skills from birth through adulthood. Yet, SoLD findings underscore that the "development of the brain is an experience-dependent process" (Cantor et al., 2019, p. 5). That is, neural connections that permit new kinds of thinking are optimally activated, rebuilt, and enhanced by positive contextual factors, including but not limited to positive interactions, a sense of physical and psychological safety,

3 These articles, coupled with a related policy and practice report (Darling-Hammond and Cook-Harvey, 2018), are the foundational pieces synthesizing SoLD for their field. Their key findings are primary sources for this article.

and opportunities to exploration. Overall, brain development can occur throughout one's lifetime and is affected by concentric circles of influence, beginning with family and extending to schools, communities, and broader sociopolitical contexts. The nature and character of context directly and indirectly influences one's development can be optimized or stifled.

With the malleability of individual development, SoLD also suggests that **variability in human development is the norm**, rather than exception (Rose et al., 2013; Rose, 2016). While humans develop in somewhat predictable stages, people learn and acquire skills at different rates and in different ways. Because each person's trajectory is unique, there are multiple possible pathways to their healthy learning and development. With this, SoLD cautions against attaching labels to young people or designing learning experiences around a mythical average or norm; instead, it emphasizes the importance of personalized supports that help young people reach their potential.

SoLD also sheds light on the importance of **relationships as catalysts for healthy development and learning** (Osher et al., 2018). Young people's interactions with others and their environments are the primary process through which they develop. Consider children or adolescents in learning settings and the conversations they have with educators and peers. Research suggests that these interactions and conversations, particularly when they are reciprocal, attuned, culturally responsive, and trustful, can serve as a foundation for learning as they enable students to grow more cognitively capable and increase engagement. Supportive, responsive relationships in childhood and adolescence also have an important protective effect, especially among youth experiencing poverty and discrimination, as they can provide emotional security, consistency, empathetic communication, and the ability for adults to accurately perceive and respond to a young person's needs. (Osher and Kendziora, 2010).

The protective character of positive relationships points to another key SoLD finding—**adversity affects learning** (Cantor et al., 2019). Stress is a normal part of life, but when stress is severe or left unmitigated, the body adapts and goes into a continual state of "high alert" that has physical and psychological effects. The continual activation of the body's stress response system produces excessive levels of cortisol that flood the brain and other vital organs, disrupting their normal functioning. The stress response system increases heart rate, blood pressure, inflammation, and blood sugar levels—explaining

why serious adversity is associated with so many poor health outcome (e.g., obesity, heart disease, diabetes). Traumatic or strongly emotional events can simultaneously influence the regulation of affect (e.g., depression, anxiety) and disrupt one's memory, cognition, and attention span. Overall, SoLD elevates the fact that adversity is not just something happening *to* individuals; instead, it is happening *inside* their brains and bodies with tangible effects. While adversity happens in all communities, growing inequality puts young people affected by poverty and discrimination at increased risk and makes the experience of chronic stress more likely.

This scientific knowledge also sheds light on the fact that **learning is social, emotional, and academic** (Cantor et al., 2019). SoLD suggests that parts of the brain are cross-wired and functionally interconnected. As a function of experiences, the brain and human capacities grow over the course of the entire developmental continuum and across the developmental spectrum (physical, cognitive, affective) in interactive ways. What happens in one domain influences what happens in others, and one's ability to learn is enhanced as one develops physical, cognitive, social, and emotional capacities simultaneously (Osher et al., 2016). To illustrate, emotions can trigger or block learning (Immordino-Yang and Damasio, 2007; Meyer and Turner, 2006). Positive relationships, including trust in the teacher and peers, and positive emotions, such as interest and excitement, open up the mind to learning. Negative emotions, such as fear of failure, anxiety, and self- doubt, reduce the capacity of the brain to process information and to learn. In addition, children's abilities to manage their emotions influence learning. For example, learning to regulate one's own behaviors and focus attention provide the ability to persist with hard tasks and to pursue interests over a longer period of time.

Finally, SoLD suggests that **young people actively construct knowledge based on their experiences, relationships, and social contexts** (Cantor et al., 2019; Darling-Hammond et al., 2019). Students compare new information to what they already know, creating mental models that enable them to connect information to their experiences and to draw inferences about new situations (Ambrose and Lovett, 2014). This process works best when students have multiple and intentional opportunities to connect concepts and knowledge to personally and culturally relevant topics and lived experiences (C. D. Lee, 2007). Thus, research suggests that the archetypical conception of educators imparting information unto students is outdated. Instead, SoLD emphasizes that effective

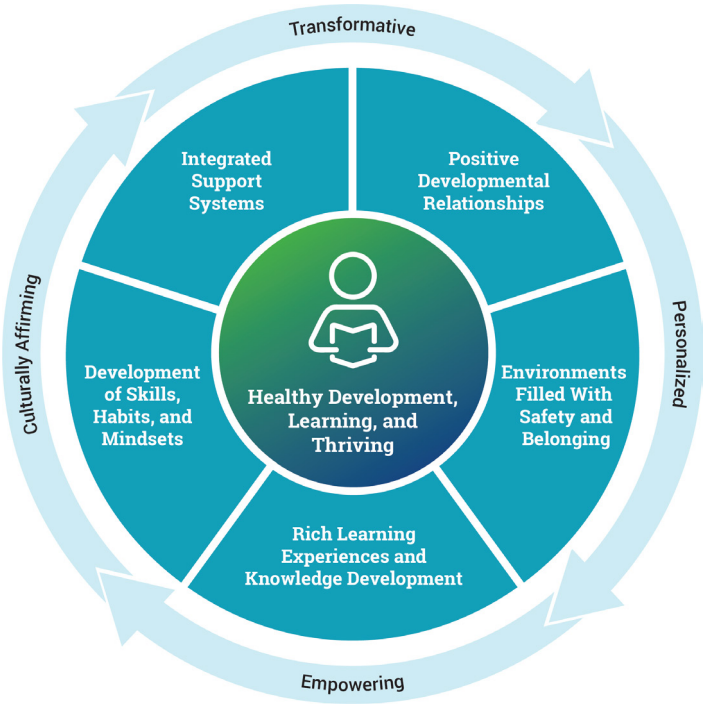
educators act as mentors: setting tasks, watching and guiding young people's efforts, and offering feedback. They also enact learning experiences that build on students' knowledge, experiences, and identities; connect those to disciplinary knowledge and skills; and design tasks that are relevant and engaging to invite students into learning as active participants.

3. Building cchools with SoLD at their foundation

Through its findings, SoLD provides key insights into how individuals optimally learn and develop. In doing so, it underscores the imperative to redesign inequitable and outdated approaches to schooling that plague so many communities and systems. In its stead, SoLD suggests that practitioners and policymakers can use this knowledge to build schools in which all individuals are able to take advantage of high-quality and transformative learning opportunities. Rather than advancing broad scientific findings to inform this endeavor, SoLD also provides concrete guidance on how education officials can create powerful and supportive learning settings (Darling-Hammond et al., 2019; Darling-Hammond and Cook-Harvey, 2018).

Through a framework—Guiding Principles for Equitable Whole Child Design—and a recently published playbook to guide practitioner efforts (Learning Policy Institute and Turnaround for Children, 2021), SoLD demonstrates that schools that optimally enable healthy development, learning, and success, integrate structures and practices that foster: 1) positive developmental relationships; 2) environments filled with safety and belonging; 3) rich learning experiences and knowledge development; 4) the development of skills, habits, and mindsets; and 5) integrated support systems. (See Figure 1.) It not only articulates how attention to these areas of practice align with SoLD findings, but also points to a range of structures and approaches that schools can adopt to support learners in their unique contexts. The sections that follow summarize the key SoLD guidance for school transformation articulated in this recent effort.

Figure 1. The Guiding Principles for Equitable Whole Child Design



3.1. Positive developmental relationships

In articulating the centrality of relationships in supporting learning, SoLD suggests that effective schools are those that incorporate approaches that allow for care and connection among school actors. Ecological structures that create opportunities for stronger relationships among adults and students can produce stronger contexts for learning. When young people feel known, respected, and validated, they can grow their agency and confidence and become more able to learn skills, perform tasks, and take on productive challenges. Furthermore, a strong web of mutually supportive relationships between and among students, families, and faculty helps all members of the community thrive and can mitigate the impact of stress to support learning and well-being (Darling-Hammond et al., 2019).

To create a relationship-centered school, schools should incorporate personalizing structures that enable connections characterized by continuity, trust, and respect between educators and students. Effective structures include the creation of small schools or small learning communities within large school buildings, which have been consistently found to benefit students and to have strong effects on students with the

greatest socioeconomic and academic needs (Darling-Hammond et al., 2006; Lee et al., 1993; Wasley et al., 2000). While small learning settings can provide opportunities for students to be known well and to build healthy attachments, small size alone does not equate to a relationship-centered environment. Schools can incorporate additional personalizing structures—such as advisory systems where young people connect with an adult or a small group of classmates consistently throughout the year, teaching teams that share students, or looping with the same teacher over multiple years—which provide additional ways for young people to remain connected and have been found to improve achievement, attendance, attitudes toward school, behavior, motivation, and graduation rates (Bloom and Unterman, 2014; Darling-Hammond et al., 2006; Felner et al., 2007).

Relationship-building among adult actors in school settings is also critical for learning and development. For example, with educators, SoLD tells us that consistent collaboration time, particularly among faculty who share a group of students, creates opportunities for community building among adults while giving practitioners the opportunity to plan curriculum, address problems of practice, and ensure student needs are identified and addressed. Relationships among staff can also be nurtured as school leaders engage teachers in school improvement efforts, asset-based professional development, and distributed leadership. Notably, schools with these practices have also been found to contribute to staff stability and to increase teaching effectiveness and gains in student achievement (Podolsky et al., 2016).

Structures that build connections with families and engage them as partners in learning and development are also central to the relationship-centered fabric of a learning setting. Family engagement provides opportunities for deeper knowledge of youth and greater alignment between home and school, increasing academic outcomes for students across all grade levels (Henderson and Mapp, 2002; Jeynes, 2005). Schools can cultivate these partnerships by employing approaches, such as systems for positive, regular communication with families, consistent student-teacher-family conferences, and home visits, as part of their core approach to schooling. Schools that succeed in engaging families—particularly those from diverse backgrounds—have also been found to embrace share responsibility and culturally responsive orientations that communicate care, respect, and the importance of family expertise.

3.2. Environments filled with safety and belonging

In addition to relationships, SoLD illustrates that the environments have a powerful impact on learning. Science demonstrates that contexts send messages about the value placed on students and staff. What is important or unimportant, what is rewarded or sanctioned, who is powerful or powerless, and who is viewed as trustworthy or untrustworthy are all communicated by the environment. Young people are more able to learn and take risks when they feel not only physically safe with routines and order, but also emotionally and identity safe, such that they and their culture are a valued part of the community (Darling-Hammond and Cook-Harvey, 2018).

With this, the SoLD framework elevates approaches that can build environments that nurture a sense of physical, emotional, and psychological safety. Among these is the creation of shared values, norms, and routines, particularly those co-developed with students and emphasizing student agency and communal responsibility. The use of restorative practices (Klevan, 2021) also fosters positive school environments, as they proactively support healthy relationships, promote self-awareness, and address conflict and wrongdoing in educative ways. In doing so, restorative practices have been shown to improve outcomes. Research suggests that these approaches not only decrease the use of excessive and punitive discipline, which has disproportionately been inflicted on nondominant groups (Gregory et al., 2010; Krezmien et al., 2006), but also lead to improved school climate, higher quality teacher-student relationships, and improved academic achievement across elementary and secondary classrooms (Fronius et al., 2016; Gregory et al., 2016).

Identity safe environments—wherein students' experiences and backgrounds are intentionally brought into learning—also enable a sense of belonging and healthy attachment. To do this, schools can incorporate structures and practices, ranging from the use of culturally affirming activities that communicate value and respect to the elimination of stigmatizing practices like tracking that can signal differential worth and ability. Within these approaches, practices should seek to dismantle stereotype threats that undermine performance (Steele, 2011). Such threats result from anxieties students may carry about how they are viewed when they are members of groups stigmatized by society on the basis of race, income, language or immigration status, sexual orientation, or other characteristics. In identity-safe and affirming classrooms, teachers

avoid labeling students in ways that implicitly categorize some as worthy and others as unseen or problematic, and they find many ways to provide positive affirmations about individual and group competence.

3.3. Rich learning experiences and knowledge development

Upon the foundation of relationships and a supportive environment, the SoLD framework denotes that practitioners can implement rich, pedagogical approaches to deepen students' disciplinary knowledge and to support knowledge transfer to new contexts. SoLD suggests that learning is a function both of teaching—what is taught and how it is taught—and of student perceptions about the material being taught and about themselves as learners. Students learn best when they are engaged in activities that build on students' cultures, prior knowledge, and experiences and are collaboratively working with peers to accomplish meaningful tasks. Moreover, because learning is highly individual, teachers need opportunities to accommodate students' interests and to differentiate instruction to leverage learners' strengths and to address areas for growth (Darling-Hammond et al., 2019).

To do this, practitioners can implement a range of personalized learning strategies to support students' individual academic trajectories. This includes the use of varied teaching and learning modalities that allow students to use multiple tools, forms of engagement, and modes of expression to demonstrate learning. In addition, learning scaffolds, or cognitive supports that provide students with the guidance to more readily master increasingly complex skills and achieve conceptual understanding, are critical. Effective scaffolds include those that reduce larger learning goals into smaller units (i.e., "chunking), which make information and skill development manageable and incremental, and strategic opportunities for students to receive feedback that can be used to improve and revise their work. Learning tools, such as assistive technologies, memory assists, and classroom artifacts that remind students of facts and processes they have learned, are also effective scaffolds that minimize cognitive load and free the mind's attention to enable higher-order thinking.

In addition to these personalization strategies, SoLD suggests that rich learning occurs as students build disciplinary knowledge and skills in relevant and engaging ways. One way this can be fostered is through culturally responsive pedagogy, which makes explicit

connections between students' prior knowledge and cultural experiences and the content under study to get students "ready for rigor" (Hammond, 2014). For example, curriculum that incorporates community-based projects and/or multicultural materials both validate the diverse backgrounds students bring and build upon their unique knowledge to propel critical thinking. This teaching supports students in transferring knowledge and skills to new situations, and, ultimately, improves achievement and leads to greater competence, sense of belonging, and engagement in learning (Dee and Penner, 2017; López, 2016).

Pedagogical approaches that emphasize student agency also optimize learning and development. SoLD points to inquiry-based learning as one powerful approach that does just that. This approach—which can structure a single day's lesson or a multi-week project—allows students to seek answers to meaningful questions, take an active role in constructing knowledge, engage in authentic or hands-on tasks, and ultimately "learn to learn." Performance assessments are often a key element of inquiry-based tasks, which also emphasize and cultivate student agency. These assessments ask students to apply their knowledge and skills by creating a product, presentation, and/or demonstration that is then assembled into a systematic work collection to demonstrate growth and achievement over time. Performance assessments encourage higher-order thinking, evaluation, synthesis, and deductive and inductive reasoning while empowering young people to actively reflect on and articulate their growth (Darling-Hammond and Adamson, 2014). These inquiry-based approaches are most effective when they are carefully scaffolded and supported by educators with direct instruction, structures for group work, and opportunities for feedback and revision.

3.4. Development of skills, habits, and mindsets

with the interconnectedness of the brain's domains, SoLD suggests that educators need to develop students' cognitive, social, and emotional skills, as they serve as the building blocks for academic learning (Stafford-Bizard, 2016). When valued skills are practiced sufficiently to become habits, they develop engaged and productive learners who harbor the abilities and mindsets to be resourceful in new situations and understand how to contribute positively to their communities.

SoLD points to several structures and practices that schools can adopt to develop students' valued skills, habits, and mindsets. Primary among these is the integration of cognitive, social, and emotional learning into the school day. Dedicated and consistent time for skill development in classrooms can be effective, particularly when guided by formal programs and curricula that help students learn and practice skills and habits in active, well-sequenced ways (Durlak et al., 2011). Research demonstrates that formal skill development programs have shown considerable success, finding that participating students show greater improvements in their social and emotional skills; attitudes about themselves, others, and school; social and classroom behavior; test scores and school grades than students who are not immersed in this programming (Durlak et al., 2011; Taylor et al., 2017). These outcomes can also be enhanced when skill and habit development is embedded throughout the school day and integrated into other subject matter, as it provides more opportunities to reinforce and apply skills in authentic contexts (Jones and Bouffard, 2012).

SoLD also sheds light on the cognitive, social, and emotional skills that are particularly important in propelling learning. It demonstrates that executive function, growth mindset, personal and social awareness, interpersonal skills, resilience and perseverance, metacognition, and self-direction are particularly relevant for rich learning. For example, executive function, which cultivates students' attention, cognitive flexibility, information processing, and goal setting abilities, is important for success as it helps young people self-manage, focus on tasks, and make adjustments when necessary to support learning (Anderson, 2002). Productive mindsets that enable perseverance and resilience among students (e.g., growth mindset) are also critical for learning. Believing that skills and knowledge can be developed with effort—rather than being innately bestowed—changes students' perspective on learning and has been found to foster greater achievement and well-being across academic, emotional, and social domains (Dweck, 2000, 2017). SoLD suggests that schools should take strides to ensure that there are opportunities for these valued skills, habits, and mindsets to be explicitly taught, modeled, and practiced throughout the school day and during academic instruction.

3.5. Integrated support systems

SoLD unequivocally points to the fact that a healthy context for learning and development requires attention to young people's safety, physical and mental health, social, emotional, and cognitive development, academic skills, and identities. Schools with integrated support systems create a coordinated web of structures that readily meet students' holistic needs. They buffer excessive stress with secure relationships coupled with academic, health, mental health, and social service interventions. They also provide opportunities to extend learning, build on interests and passions, and create ongoing opportunities for exploration, enrichment, and discovery. Research suggests that learning environment with integrated support systems generate positive effects on student attendance, retention, mathematics and reading achievement, and grades (Moore, 2014).

All students will experience different needs at different times. It is therefore helpful to create multi-tiered systems of support (MTSS) with a responsive continuum of interventions to help remove barriers and advance student learning and well-being—a continuum best operationalized in collaborative, coherent, and non-stigmatizing ways to make supports readily accessible and personalized (Adelman and Taylor, 2008). To institute MTSS with these features, schools need data processes that allow them to understand students' individual and collective strengths and struggles and the school and community resources that should be accessed to meet individual and collective needs for programs and services.

With data like these, practitioners can build and sustain integrated systems that provide universal supports to all students. These universal interventions include site-based collaboration structures and relationship-centered practices, which make the core work of school supportive and allow for faculty to identify and address student needs. With universal supports in place, practitioners can then identify the supplemental and intensive interventions needed for students' academic, social, emotional, and cognitive development. These interventions can include dedicated personnel (e.g., counselors, learning specialists) that provide students with additional support and access to high-quality tutoring and extended day learning opportunities. SoLD underscores the importance of having systems and personnel for orchestrating access to supplemental and intensive supports, which can help to ensure that interventions are coordinated, data-informed, and responsive to student and community needs.

3.6. Integrating the principles of whole child design

The Guiding Principles for Equitable Whole Child Design provides concrete guidance to practitioners on how they can design or redesign learning settings to be scientifically grounded and equity-oriented—characteristics that have remained elusive in many schooling systems and communities. While each element of the framework is critical to supporting youth learning and development, their impact is deeply felt and most effective when practitioners integrate all five in coherent and continuously ways. There is no one way to integrate SoLD-aligned practices and structures in a learning setting. All learning is variable and the approaches to design, curricula, educator development should embrace variation that are needed and aligned to contexts and student needs.

4. Preparing practitioners for SoLD-aligned practice

Once practitioners and education officials understand that environments, experiences, and relationships drive the wiring of our brains, the task becomes clear: to design settings for optimal development and learning of the whole child. Yet, the school transformation proposed above does not occur in a vacuum, nor is it sustainable without attention to contextual factors and system features that, too, have to be amended to enable equitable and SoLD-aligned change.

For example, developing and sustaining SoLD-aligned schools will undoubtedly require intentional efforts to transform local and national policy infrastructures that govern schools. There are policies in place at all levels of the educational systems across the globe that inhibit SoLD-aligned learning to take hold. For example, in the U.S., many schools continue the practice of tracking or ability grouping, which inhibits access to rich learning experiences (Anyon, 1995; Oakes, 2005). The harms caused by outdated structures that sort and segregate learners are exacerbated by other policies that implicitly encourage teacher-centered pedagogy (Mehta and Fine, 2019); curricula that neglect the cultures of most groups (Steele and Cohn-Vargas, 2013); and punitive discipline practices that exclude students from school (Gregory et al., 2010).

These inequitable and ineffective approaches to learning—among others that sustain the anatomy of inequality in schools (e.g., funding disparities, narrow assessment parameters, inconsistent access to integrated supports)—are influenced or codified by policies that will need to be fundamentally altered to enable, support, and scale

shifts toward whole child, personalized learning and development that SoLD identifies. For instance, SoLD will require policies that help practitioners redesign schools to encourage stronger, longer relationships with both children and families; curriculum, instruction, and assessment focused on the development of higher order skills and cognitive capacities; and resource allocation that is equitable and focused on ensuring strong teaching.

Policies and structures governing the development of educators and school leaders must also be refashioned to ensure that practitioners have the relevant skills and orientations to support SoLD-aligned schooling. The SoLD-aligned school and classroom demand highly sophisticated teaching skills, which are not always widely cultivated among practitioner workforces. For schools with SoLD and equity at their foundation to be built and sustained, they require an "infinitely skilled workforce" that is recruited, developed, and sustained in systematic ways (Cremin, 1961).

4.1. Improving professional learning to support SoLD

Putting into place the structures and practices that support SoLD-aligned schools requires robust and embedded systems of professional learning for both teachers and education leaders. Historically, most preparation programs and ongoing professional development opportunities have neither effectively built practitioners' knowledge of the elements of equitable whole child design nor built their capacity to integrate them into school practice. Fortunately, research has surfaced insights into how preservice and in-service professional learning opportunities can be restructured to build practitioner knowledge, skill, and investment in these schooling approaches (Darling-Hammond et al., 2017; Darling-Hammond and Oakes, 2019).

Studies suggest that educator and leader development for enacting SoLD require an examination of the content and programming of practitioner preparation and development. Among the competencies needed for SoLD-adept educators include deep understandings of:

- Child and adolescent development and how it is shaped by context
- Inquiry-based pedagogy
- Differentiation and scaffolding

- Social, emotional, and cognitive skill building in academic instruction
- Cultural responsive pedagogy
- Interpersonal competence to build positive relationships with students and families

School leaders, too, need these competencies and pedagogical and scientific grounding as well as additional knowledge to enact this schooling approach. For example, leaders need the skills to be effective instructional leaders who enact appropriate staff supports and facilitate professional development that meets the needs of both engaged and reluctant educators. In addition, leaders need to maintain systems views—not only to enact whole child learning in their policy context but also to integrate and continuously improve the elements of whole child design in collaborative ways. Those seeking SoLD-aligned transformation need to examine practitioner preparation programs to ensure their courses and clinical placements cohere and reinforce SoLD and whole child learning so that they intentionally develop these essential skill sets and orientations.

In addition to assessing the content of preparation programs, SoLD advocates must examine the strategies used to support practitioners in developing their ability to enact and integrate whole child approaches. Recent studies suggest that effective pre-service programs and in-service professional development opportunities teach and support candidates in the same ways they want the candidates to teach and support children. That is, effective developers and programs engage teachers and school leaders in learning experiences that mirror SoLD pedagogy to understand their complexity, power, and cognitive, social, and emotional demands. For example, practitioners that are preparing to implement project-based or real-world learning are effectively supported when they engage in similar learning modules as means of enhancing their pedagogical knowledge (Hernández et al., 2019).

Similarly, practitioners may participate in their own advisories or professional learning communities that simulate effective relationship-building structures and dialogical exchanges to grapple with problems of practice to prepare them to implement SoLD-aligned practice. Finally, professional development requires effective modeling and feedback structures, wherein practitioners have opportunities to learn from seasoned experts and receive personalized input on their practice as they enact whole child

pedagogy or support it in a leadership capacity. Overall, research suggests that effective pre-service and in-service professionalization to enact SoLD-aligned practice should immerse practitioners in applied learning opportunities to enhance their development. While research tells us that effective professionalization is supported with these approaches, redesigning pre-service and in-service learning opportunities for educators and school leaders is no small undertaking. It also requires policy shifts that codify high-quality and SoLD-aligned practice. This can be done by establishing licensure standards for teachers and leaders that emphasize their ability to be proficient in understanding and enacting whole child approaches and institutional accreditation criteria that do the same. Policy can also enable institutional supports and resource allocations to ensure that practitioners have opportunities to engage in immersive residences and apprenticeships as an essential part of their development. Finally, policies that enable practitioner recruitment and retention, including government allocations that can underwrite educator and leader training so that all candidates—particularly those from diverse backgrounds—are also critical as they can support the highest quality preparation the development of strong career ladders.

5. Conclusion

The core message from SoLD is clear: The range of students' academic skills and knowledge—and, ultimately, students' potential as human beings—can be significantly influenced through exposure to highly favorable conditions. These conditions include learning environments and experiences that are intentionally designed to optimize whole child development. SoLD provides an optimistic path forward—one that not only helps practitioners identify what schooling approaches are not working, but also raises what might be put in their stead to enable rich learning and development.

Redesigning schools to support the scientifically identified dimensions of optimal learning and development has implications for all levels of the ecosystem, from the classroom to the school, district, and larger macrosystems. These overlapping spheres must coalesce to produce an intentionally integrated, comprehensive developmental enterprise. While the road to transformation is likely long and wrought with technical, political, and normative challenges, the moral imperative to reimagine schooling systems remains. Building better conditions for learning and development can yield the

equity and opportunity that has remained elusive in education—equity that has been needed to create just and equitable societies for decades, if not centuries, and one that is acutely needed in these tumultuous times.

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