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Science, Policy, and Practice: Three Cultures in Search of a Shared Mission

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Research on child development, the design of social policies, and the delivery of human services for children and families reflect three related yet separate cultures. The capacity to navigate across their borders, to understand their different rules of evidence, to speak their distinctive languages, and to achieve credibility in all three worlds while maintaining a sense of intellectual integrity in each, requires respect for their differences and a commitment to their shared mission. The transmission of knowledge from the academy to the domains of social policy and practice is a formidable task. This challenge could be facilitated by a simple taxonomy that differentiates established knowledge from both reasonable hypotheses and unwarranted or irresponsible assertions that are made in the name of science. An investment in effective "cross-cultural" translation offers a potent strategy for enhancing both the generation of new research and the application of cutting-edge knowledge to make a difference in the lives of children and their families.

INTRODUCTION

Research on child development, the design of social policies, and the delivery of services for children and families reflect three related yet distinct cultures. At a time of unprecedented economic prosperity in the United States, with the gap increasing between the "haves" and the "have-nots" and children comprising a disproportionate percentage of the population living in poverty, each of these cultures offers a critical perspective. The task for those who are engaged in both the generation and application of knowledge to promote healthy child development is to understand the underlying differences among these three worlds, and to construct sturdy bridges across them in the service of building a shared agenda.

THREE CULTURES

Science

Scientists construct theories, test hypotheses, and refine conceptual models over time. As individuals, they are temperamentally tentative and natural skeptics. They are engaged in a quest for knowledge, understanding full well that their journey is never fully completed. They are trained to acknowledge the limitations of their data and to emphasize how much always remains unknown. Their findings are tempered by levels of significance and confidence intervals, which serve as constant reminders of the possibility that any study result could be the product of chance or be explained by an alternative and equally plausible interpretation. Serious investigators often pay as much (or more) attention to how data are collected and analyzed than to what specifically is found. A rigorous scientist who focuses on the study of child development must be comfortable with complexity, ambiguity, and uncertainty. In fact, the inevitable variance left unexplained may be the key attraction for many who pursue this compelling area of investigation.

Policy

In the world of social policy, science is just one point of view, and frequently it is not the most influential. That is not to say that there is no place for knowledge in the policy arena, but it is essential to understand that science is not the only (or even the preferred) source of guidance. Policymakers and analysts are not moved primarily by theory or empirical data. They are driven by political, economic, and social forces that reflect the society in which they live. Whereas researchers and practitioners are guided by a cumulative knowledge base that is subjected to ongoing scrutiny, policymakers are persuaded by compelling stories and the selective use of evidence. Scientists generate data to advance knowledge. Policymakers mobilize information to support an agenda. In the world of social policy, science competes with values and "common sense," and decisions are made through a process of negotiation and compromise among competing interests.

Practice

In the domain of human services, policy determines how much you have to work with and science can provide guidance on how to use limited resources wisely. To a large extent, much of the knowledge that informs service delivery is empirical in the literal

sense of the word. As such, it is influenced by what service providers learn from practice, which may not necessarily be grounded in systematic data collection and analysis. This important source of wisdom is referred to as "clinical judgment" or "professional experience." Its value is determined by the quality of the messenger. Its utility is most apparent when scientific investigation is constrained by significant methodological limitations. When all of the answers are not in, the scientist's job is to design the next study. The service provider, in contrast, does not have the option of waiting for more data. Like researchers, practitioners are grounded in state-of-the-art knowledge and the basic principles of scientific inquiry. Unlike scholars, however, they must respond to concrete human needs and make decisions in the face of inadequate information.

Tensions among researchers, policymakers, and practitioners are inevitable. Science is focused on *what we do not know.* Social policy and the delivery of health and human services are focused on *what we should do.* Scientists are interested in questions. Policymakers and practitioners are interested in answers. Scholars embrace complexity. Policymakers demand simplicity. Scientists suggest that we stop and reflect. Service providers are expected to act. Few researchers have the temperamental fortitude for the messy, action-oriented world of social and political activism. It is a rare practitioner who has the patience or the caution of a meticulous scientist. The intersections among these three domains represent a true cross-cultural experience. The capacity to navigate across their borders, to speak and understand their distinctive languages, and to achieve credibility in all three worlds while maintaining a sense of intellectual integrity in each, requires respect for their differences as well as a commitment to their shared mission.

CROSS-CUTTING THEMES

Competence at the interface of science, policy, and practice is desperately needed yet difficult to achieve. Success in this area is rooted in the mastery of three cross-cutting challenges.

Understanding the Rules of Evidence

Jurors who weigh testimony and judges who decide whether information is admissible in court are guided in their deliberations by carefully constructed rules of evidence. In civil cases, a final judgment is determined by the preponderance of that evidence. In criminal cases, the verdict must be affirmed beyond a reasonable doubt. Effective advocacy in a court of law requires mastery of all available information and a clear understanding of the criteria by which it will be judged both truthful and relevant.

Successful interaction among scientists, policymakers, and service providers demands a comparable understanding of the different rules of evidence that govern their distinctive worlds. In the realm of child development research, the gold standard is embodied in the principles of rigorous scientific inquiry. In the domains of health and human services, knowledge is embedded in a well-articulated theory of change that is derived from a mix of empirical data and experientially based wisdom. In the arena of social policy, evidence is filtered through a set of political values, science is viewed as only one of several ways of knowing, and knowledge is mobilized selectively in a process of continuous negotiation.

Understanding the Influence of Ideology and Values

The central role of ideology in the policy arena is widely understood and generally accepted. Fundamental value conflicts in the formulation and implementation of child and family policy include disagreements about the balance between individual responsibility and public responsibility for the well-being of children, competing notions of equality and equity regarding the distribution of material resources, different perspectives on defining the "best interests of the child," and complex conflicts between children's and parents' rights.

The influence of values on child development research and the delivery of health and human services is less appreciated but equally important to acknowledge. That is to say, cultural distinctions and the ideological differences listed above produce a high stakes context for both the funding and the nature of research on the development and behavior of children. As such, they can have a potent impact on the kinds of questions that are asked, the nature of the hypotheses that are tested, the research designs that are employed, and the ways empirical findings are interpreted and disseminated. In the service delivery setting, contrasting values related to maternal employment, methods of child discipline, and cultural variations in childrearing philosophies, among others, may affect the focus and content of counseling, the types of services offered, and the core nature of the professional–family–child relationship. Value-free social science and human service delivery are an illusion. Does anyone really believe that attitudes about the salience of race, ethnicity, and social class are neutral issues in child development research, or that investigators who study maternal employment and

nonparental child care do not bring a personal perspective to their work? Eliminating the influence of values is unrealistic; examining the role that they play is essential.

Understanding the Importance of Professional Respect and Security

At the cusp of a new millennium, concepts of work and professional status are undergoing dramatic change and confronting considerable uncertainty. Whether one considers the manufacture and sale of consumer goods, the delivery of health and human services, the creation of new information technology, or the generation of knowledge in child development, the contemporary workplace is demanding higher productivity, greater efficiency, and increased attention to the containment of costs.

Within the span of less than a decade, the push toward privatization of human services in the United States has increased, and the delivery of health care has undergone a business-focused revolution dominated by mergers, acquisitions, and the ascendance of a market-driven approach to problem solving. Concurrently, the world of education is facing a formidable set of challenges that bear a striking resemblance to those that have transformed the practice of medicine. Elementary and secondary schools are under siege, the costs of both undergraduate and graduate degrees continue to increase at a rate that exceeds inflation, and there are growing questions about the productivity and efficiency of the entire university enterprise.

Within this political and economic context, employment prospects and professional recognition in the child development community, broadly defined, loom as areas of considerable concern. Although the commitment to public investment in research remains strong, support for the social sciences is always vulnerable. With increasing interest in public education reform, schools (in general) and teachers (in particular) have become scapegoats for a wide range of societal problems, many of which are beyond their power to address alone. Clinical opportunities in health care continue to grow, but are saddled with complex employment arrangements that tie financial compensation to the utilization of services and the control of costs. Perhaps most troubling for the well-being of young children, the low pay and diminished professional status of child-care providers continue to thwart efforts to improve service quality in a political environment that views child-care policy primarily as a reactive response to maternal employment rather than a proactive opportunity to promote child health and development. The common result of these diverse tensions is a society that undermines the professional status of those whose work focuses on children and families. In the face of this shared threat, it is important to heed the wisdom of Benjamin Franklin's warning that we must all hang together or we are sure to hang separately.

A FRAMEWORK FOR APPLYING SCIENCE TO POLICY AND PRACTICE

The transmission of knowledge from the academy to the worlds of social policy and human service delivery is a formidable challenge. To a large extent, this difficulty is related to the cultural differences and cross-cutting themes described above. The unavoidable distance between hard science and the data needs of conscientious policymakers and practitioners requires workable criteria for the responsible translation and application of what we know about the development of children. This task could be facilitated by a simple taxonomy that differentiates three categories of child development information: established knowledge, reasonable hypotheses, and unwarranted or irresponsible assertions.

Established knowledge is defined by the scientific community. It is embedded in an ongoing, reciprocal interaction between theoretical formulation and empirical validation. It is governed by strict rules of evidence and monitored by a rigorous process of peer review. Its volume is relatively limited, its boundaries are tightly enforced, and its cutting edge evolves over time.

Reasonable hypotheses may be generated by scientists, policymakers, or practitioners. They are anchored to established knowledge but have the flexibility to move beyond the limits of what we know. In the world of science, they are the engines of new learning. In the worlds of policy and practice, they embody the essence of responsible action based on incomplete information. In contrast to established knowledge, the volume of reasonable hypotheses is expansive and theoretically limitless. Most important, the critical defining feature of any single hypothesis is the understanding that it may be correct or it may be false.

Unwarranted assertions can be propagated by anyone. Their defining feature is their marked distance from the boundaries of established knowledge or their blatant distortion or misrepresentation of state-of-the-art science. Unlike reasonable hypotheses, they neither advance knowledge nor guide responsible policymaking or service delivery. Their greatest threat is the extent to which they masquerade as science and therefore undermine its credibility in the eyes of the general public.

CASE EXAMPLES

Those who seek constructive "cultural exchanges" among scientists, policymakers, and practitioners confront an array of complex challenges. The utility of the proposed three-category taxonomy of knowledge is illustrated in the following two examples.

Developmental Neurobiology and Children's Exposure to Violence: A Shotgun Marriage

At the dawn of the twenty-first century, increasing attention is being focused on the convergence of two scientific disciplines that have grown significantly in recent decades but have evolved largely in mutual isolation—child development and developmental neurobiology. In the realm of scientific inquiry, efforts to promote greater cross-fertilization are generating an explosion of intellectual creativity at the interface of these two areas of investigation. In the domains of public education and social policy, however, the translation of this "new" knowledge is creating both promising dialogue and misleading deception. Responsible and credible cross-cultural communication in this area presents a critical challenge to the child development community. Distinguishing among the three categories of knowledge that are being transmitted can be an informative and useful strategy.

Established knowledge. Basic research on the development of the brain is a rapidly moving frontier. The sequential phenomena of neuronal cell growth and migration, followed by synaptic proliferation and pruning, have been well documented. The same can be said for the convincing evidence that these processes are affected by dynamic transactions among both genetic and environmental influences. Nevertheless, although it is not unreasonable to advocate the exposure of infants and toddlers to Mozart and Dr. Seuss, there are no existing data to support (or refute) the assertion that such experiences increase the number of synapses or affect neurotransmitter secretion in the immature human brain.

Established knowledge in human developmental neurobiology that has direct application for parent education, service delivery, or social policy is extraordinarily slim. The reasons for these limitations include two fundamental characteristics of the nature of the research in this area. First, existing knowledge of early brain development is based largely on studies of nonhuman animals, primarily primates and rodents. Second, much of our understanding of the influence of experience (including both stimulation and deprivation) on brain structure and function is derived from investigations of sensory systems. Therefore, the extent to which these findings apply to emotional and cognitive development in humans is purely speculative (Nelson & Bloom, 1997).

Reasonable hypotheses. In contrast to the paucity of what might credibly be designated as established knowledge, there is considerable validity (and great need) for the constructive articulation of reasonable hypotheses regarding the link between brain development and human behavior. Indeed, decades of sophisticated child development research provide voluminous data that could generate a rich investigative agenda for the neurosciences.

For example, the central importance of nurturing, responsive, and stable relationships for healthy emotional and cognitive development in the early years is well established. Although virtually nothing is known about the neurological substrate (either structure or function) for this fundamental aspect of human development, there is no question that something important is happening in the brains of infants who are well cared for that is different from what is going on in the brains of infants who are abused or neglected. Stated simply, documented differences in the behavior and development of children with markedly discrepant experiences provide clear evidence of differential brain effects (i.e., it's not happening in their lungs or kidneys). Thus, it is perfectly reasonable to hypothesize that early exposure to violence overactivates neural pathways that control the fear response in an immature brain. It is also conceivable that these proposed overactivated pathways lead to a "high alert" setting that results in a developing brain that is more likely to interpret others' actions as threatening and quicker to respond aggressively in its own defense. In fact, one might even postulate that the symptoms of posttraumatic stress disorder that are observed in children who are repeatedly exposed to significant violence are behavioral manifestations of structural or functional differences in their brains. It is important to note, however, that none of these hypotheses has yet been tested. Moreover, there are absolutely no data that even begin to address questions regarding differential brain effects related to the timing of an adverse experience, nor is there any neuroscientific evidence regarding the reversibility of such hypothetical insults (Zeanah & Scheeringa, 1997).

Unwarranted assertions. Translations of science that go far beyond what is known, or that distort existing data, represent significant threats to its credibility in the arenas of both public education and social policy. One egregious example is the conclusion that young children who are abused or who witness violence to others sustain irreversible changes in their developing brains that result in permanent emotional damage

and inevitable violent behavior themselves later in life. The irresponsibility of this overly deterministic pronouncement is important for three reasons. First, there is absolutely no evidence to support it. Second, the statement creates an unwarranted nihilistic attitude about the potential efficacy of interventions that are initiated after the preschool years, based on the undocumented assumption that "the die has already been cast." Third, its gross exaggeration, and the backlash it elicits from the scientific community, serves to undermine the very important fact that the early years of life are formative, that they do serve as a foundational period for later development, and that there are undoubtedly many important things happening in the brains of young children who are exposed to significant violence over time. Conversely, it would be equally unwarranted to assert that passive exposure to violence has little impact on infants and toddlers because they are too young to understand and are unlikely to remember what they have witnessed.

The search for a responsible message. Abundant evidence indicates that brain development begins long before birth and continues well into the adult years. In contrast to the popular misconception that no new cells are formed in the central nervous system after birth, neurogenesis has been documented in the adult hippocampal formation of mice, rats, tree-shrews, marmosets, and macaque monkeys, as well as in humans. Moreover, increased glucocorticoids, stress, and aging have been associated with suppressed cell production and diminished performance on hippocampus-dependent tasks, and increased maintenance of hippocampal granule neurons has been demonstrated in mice living in an "enriched environment" compared to those living in laboratory cages (Gould, Tanapat, Hastings, & Shors, 1999). Because the functional significance of adult neuron production is not well understood, the need for caution regarding the interpretation of these findings cannot be overstated. Moreover, the generalizability of animal studies to humans, and their implications for early childhood development, are purely speculative.

The complex relation between behavioral and neurobiological research highlights the difference between two legitimate uses of science—to further knowledge and to support advocacy. Both missions are critical, but the distinction between them is essential. Both agendas are best served when they are clear about the boundaries that separate knowledge and hypothesis from distortion or frank misrepresentation. Within this framework, it is possible to generate reasonable inferences to guide policy and practice in the face of incomplete information. For example, a responsible message regarding the highly charged issue of early maltreatment and exposure to violence would communicate that prevention is better than treatment, earlier is better than later, and it's never too late to make a difference.

Child Development Research and Early Intervention Services: A Strained Courtship

Early childhood intervention policies and programs provide a powerful vehicle for collaboration among researchers, policymakers, practitioners, and service recipients. Their theoretical foundation is grounded in state-of-the-art knowledge about child development, their impacts have been studied extensively, and both the policies and the service delivery models have matured over a period of more than three decades (Meisels & Shonkoff, 2000).

Head Start offers a prototypic example for critical examination. On the one hand, its capacity to enhance the health and development of children living in poverty has been well documented. On the other, the implementation of this artfully constructed "cross-cultural" partnership has been uneven and undisciplined, and consequently it has not always lived up to its promise. Stated simply, Head Start provides a striking illustration of the difference between formulating a policy and making it work. That is to say, creative ideas can be enacted into law, but their ultimate impact depends on the extent to which they are implemented effectively and polished over time.

Inconsistent implementation and variable quality control threaten any enterprise, regardless of its goals and demonstrated efficacy. The history of early childhood intervention policies and programs is heavily burdened by this reality. Within this context, the continuous refinement of theories of change and the ongoing assessment of service impacts provide an important converging agenda for science, policy, and practice—and a useful testing ground for demonstrating the importance of differentiating established knowledge from both reasonable hypotheses and unwarranted or irresponsible assertions.

Established knowledge. The importance of the early caregiver–child relationship as a foundation for healthy emotional, social, and cognitive development later in life has been documented extensively. The same can be said for the extent to which characteristics of the family and the home environment have a measurable impact on the emergence of child skills and behavior. There is also considerable evidence in the program evaluation literature to support the conclusion that specific child-focused interventions can promote enhanced performance on standardized developmental measures during the preschool years (Farran, 2000).

Reasonable hypotheses. Notwithstanding the substantial body of established knowledge that supports the conceptual foundation of contemporary early childhood policies and services, the theories of change that guide many intervention efforts remain hypothetical and incompletely tested. Explanations for long-term, so-called "sleeper effects" (i.e., experimental–control differences in special education placement, grade retention, and high school completion rates for graduates of preschool interventions) fall within this category. For example, several investigators have offered the entirely reasonable hypothesis that observed gains in school performance during middle childhood, which persist long after IQ differences fade out, are mediated by enhanced child and family expectations, motivation, and self-esteem that are promoted by an enriched early childhood experience. Others have attributed less successful long-term outcomes to the inability of early intervention programs to "inoculate" vulnerable children against the adverse impacts of subsequent poor quality school experiences. The extent to which any of these hypotheses is true awaits confirmation. Indeed, much of our current understanding of how and why effective services influence differential outcomes requires further study (Brooks-Gunn, Berlin, & Fuligni, 2000; Farran, 2000).

Unwarranted assertions. This third category brings us into the realm of early childhood advocacy, which is typically well intentioned, often helpful, but occasionally destructive. It includes a long legacy of exaggerated claims and unrealistic promises that impose a significant burden on early childhood policies and service systems. One important category of unwarranted assertions includes the use of outcome data documenting the impacts of one type of intervention (e.g., center-based education for preschoolers from low-income families) to demonstrate the effectiveness of a completely different service scenario (e.g., a home-based support program for low-income mothers with documented substance abuse problems). Another example is the claim that a successful intervention program for serious mental health problems, such as posttraumatic stress disorder in young children or maternal depression, can replace highly skilled professionals with minimally trained and poorly compensated community workers, and produce the same results. Finally, the history of early intervention for children with disabilities includes many irresponsible promises of "cures" based on pseudoscience, often accompanied by nonindependent, nonreplicated, unpublished evaluations of their alleged efficacy. Patterning and megavitamin therapy for the treatment of mental retardation and cerebral palsy are notable examples.

The challenge of evaluating impacts. Central to the interface among science, policy, and practice in the early childhood arena is the assessment of intervention effects. Two problems are particularly prominent in this regard. First is the persistent dilemma of measurement (i.e., the marked lack of congruence between the variables of interest and the instruments available to measure them). Head Start, for example, was designed to enhance children's health, school readiness, and overall social competence, not primarily to raise their IQ scores. Nevertheless, program effectiveness has been assessed most frequently by standardized IQ measures, largely because of their strong psychometric properties and their salience in the political arena. The consequence for policy and service delivery is that a multitude of relatively unproductive outcome evaluations have been conducted and an excessive amount of time has been spent explaining the limitations of the study findings because they have not measured what the program was designed to accomplish. The obvious question that must be addressed is: "Why did we measure the wrong outcomes and why do we continue to do so?"

The second evaluation challenge relates to our overall approach to accountability in human services, particularly in the way questions are framed. The fundamental query regarding early childhood policy and service delivery should not be simply whether programs work. Rather, the important questions are: What do we mean by "work"? How does a program have a measurable impact? and For whom is it most effective? Much of the intervention effectiveness literature focuses largely on the front end of the evaluation process (i.e., setting criteria for enrollment, recruiting participants, and collecting voluminous baseline data), the back end (i.e., extensive testing at successive intervals), and the measurement of statistically significant, between-group differences in outcomes. What is desperately needed is to learn more about *how* specific services influence outcomes, and *why* some children and families do better than others.

Some programs have documented major beneficial effects on both children and families. Others are overwhelmed by a multiplicity of adverse influences that they are not equipped to address adequately, and thus show little impact. The heterogeneity of service recipients, intervention models, and desired outcomes calls for greater specificity in the evaluation literature, and an increased recognition of the extent to which interventions are embedded in a complex, multidimensional context. The wisdom of service providers, the concerns of policymakers, and the experiences of service recipients can be instrumental in framing compelling questions. The expertise of researchers can be mobilized to design rigorous studies to answer them.

Stated simply, many effective interventions work better for some individuals than for others. Therefore, shouldn't program evaluators, policymakers, and service providers move beyond global statements about efficacy and focus on the types of vulnerabilities for which we have successful methods of intervention, as well as on those that are resistant to current practices and demand creative new thinking? Where effective approaches are well documented, it is essential that services be provided for all eligible children and families who can reap their benefits. It is equally important, however, that those whose needs exceed the capacities of conventional programs be identified, not hidden. The inadequacies of routine interventions must be underscored, and the best minds in the domains of science, policy, and practice must work together to design, implement, and evaluate alternative strategies until we "get it right" for everyone.

CONCLUDING THOUGHTS

So where do we go from here? First, we must acknowledge that science, policy, and practice reflect different ways of thinking about child development. Second, if we are serious in our wish to enhance the well-being of all children and their families, we must recognize the imperative of combining the best of these three perspectives. It is not a question of the relative value of reflective thinking versus an action orientation. It is not a matter of assigning greater weight to empirical data versus professional judgment. The challenge is to develop creative ways of blending all three cultures—to be open to different ways of thinking about the needs of children and families as well as alternative strategies for mobilizing knowledge on their behalf.

The allocation of public resources for children is always difficult to secure. One consequence of this reality is the pressure to promise dramatic dividends in return for modest investments. The politics of glamorous research (like the neurosciences) and popular programs (like Head Start) provide important examples of both the benefits (mostly short-term) and the liabilities (often long-term) of overstatement. When pronouncements go beyond the knowledge base, or when unrealistically ambitious impacts are predicted, accountability becomes a high stakes enterprise. Achievable promises and a nondefensive acknowledgment of the limits of science are critical safeguards that preserve credibility, strengthen the quest for greater understanding, and ultimately strengthen our ability to enhance human health and well-being.

Knowledge is a moving target. When it survives critical scrutiny, it affirms contemporary thinking and efforts. When it does not stand up to honest challenge, the search for better understanding is intensified. Rigorous child development research, constructive parenting education, sound social policy, and effective service delivery on behalf of children and families are best addressed as continuous works in progress. In the final analysis, each is informed by both established knowledge and reasonable hypotheses, and each is threatened by unwarranted or irresponsible assertions. Whether one is most comfortable in the world of science, policy, or practice, much can be gained from a better understanding of how each addresses these distinctions. Thus, a commitment to "cross-cultural" translation offers a potent strategy for enhancing both the generation of new research on child development and the application of cutting-edge knowledge to make a difference in the lives of children and their families.

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