

Chapter 4

Integrating Research on How People Learn and Learning Across Settings as a Window of Opportunity to Address Inequality in Educational Processes and Outcomes

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This chapter addresses how fundamental principles regarding how people learn in the last decade open up possibilities for conceptualizing a broad ecological culturally rooted framework for the design of robust learning environments in a variety of settings, especially schools. These cross-disciplinary principles emerging from across relevant disciplines run against the persistent metanarratives warranting inequitable educational and life course outcomes for youth in minoritized nondominant communities and those living in persistent poverty in deficit claims. This chapter synthesizes research findings from across cognition, human development, the neurosciences, and learning in academic disciplines to document emerging consensus around generative principles that can inform the design of robust learning environments.

Inequality in educational outcomes associated with race, ethnicity, and class have been a persistent challenge in the United States (National Center for Education Statistics, 2013). It is evident that such inequalities are outgrowths of many contributing factors: structurally the ways that resources are inequitably allocated for

- Schools—funding levels, teacher quality, curriculum quality, access to early childhood education (Darling-Hammond, 2004, 2010)
- Neighborhood resources with regard to housing, transportation options (Tate, 2008)
- Health care

The structural factors are historical and can be understood as embodiments of ideological belief systems with regard to race, ethnicity, and class (Mills, 1997).

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We do not need to infer such ideological beliefs as they have been directly articulated in official documents and pronouncements (see Lee, 2009, for a review). Whether from the founding of the United States when Blacks were calculated as three fifths of a human being to the Dred Scott Supreme Court decision of 1857, which stated Blacks were “beings of an inferior order, and altogether unfit to associate with the White race, either in social or political relations, and so far inferior that they had no rights which the White man was bound to respect” or the presumed scientific basis of the eugenics movement of the early part of the 20th century (note that the founders of the American Psychological Association were eugenicists; Gould, 1981). These assumptions of inherent deficits attributed to particular communities of people have been transformed in many ways in both practice and the academy. These deficit assumptions have moved from arguments of biological determinism to arguments of environmental deficits—deficits in language (Bereiter & Engelmann, 1966), in family socialization practices (Coleman, 1988), and most recently in psychological attributes associated with emotional self-regulation and executive self-control (Heckman, 2012). Mills (1997) argues that the persistence of these belief systems is rooted in what he calls “the racial contract,” an ideology that structures hierarchies across human communities, with those designated as “White” at the top of the hierarchy. However, it is interesting to note, in the United States, that who gets to be White and non-White has shifted historically, but where Blacks remain at the bottom (Ignatiev, 1996; Williamson, Rhodes, & Dunson, 2007).

In the period post *Brown v. Board of Education* and the passage of civil rights legislation since 1965, such warrants are more likely to be couched in indirection. We know how such ideological beliefs have been warranted by biological, psychological, and social sciences (e.g., various fields of psychology, measurement, assessment theory, sociology, linguistics; Gould, 1981; Hernstein & Murray, 1994; Hilliard, 1996; Lee, 2009). Such deficit warranting across these fields has been documented in detail. Of concern here is a focus on the emerging opportunities that recent findings about how people learn and develop over time and across space open up opportunities to move beyond metanarratives about deficit (Lee, 2008, 2010). I am not arguing that the availability of such knowledge will lead to changes in policies that structure opportunities, but rather that fields that seek to understand the complexities of human learning and development can open up new conceptual space. Specifically, I will focus on emergent findings from studies of cognition, human development, ecological systems theory, dynamic systems, and the neurosciences. The synthesis for each field will be brief and in no way intended to be exhaustive. For each field, I will highlight the conundrums inherent in how fundamental propositions have been taken up in terms of implications for education. I will then synthesize patterns that emerge across these fields and discuss the implications of these patterns for the design of robust learning environments, and how attention to these big ideas relate to our expanded conceptions of what students need to learn and be able to do in academic disciplines in middle and high school.

OPPORTUNITIES FROM THEORY

Cognition

How People Learn (HPL) (Bransford, Brown, & Cocking, 1999) represented a synthesis of core constructs around human learning through 1999. HPL is currently being updated and we expect greater attention to findings from the neurosciences. The Research Advisory Council of the National Academy of Education has made recommendations about new findings that should be incorporated in syntheses around understandings of how people learn. This brief synthesis will include both findings from HPL and recommendations from the National Academy.

For decades, cognition has been viewed as individual brain functioning. Through evolution, the human brain operates efficiently by structuring knowledge as patterns or structures inferred from experience in the world as schema held in long-term memory (Quartz & Sejnowski, 2002; Rumelhart, 1980). Such schema then serve as frameworks through which we make sense of new experiences (Anderson, 1984). New learning may involve top-down processes of schema activation (e.g., using our prior knowledge to expand our current understandings) or bottom-up processes of restructuring existing schema or building new knowledge structures (Rumelhart, 1980). In both cases, prior knowledge is a powerful resource for new learning. Young children from birth make observations of the natural and social world and infer patterns (Carey, 1985; DiSessa, 1982; Mintzes, 1984). For example, young children come to recognize that if you hold an object and let it go, the object will fall. Research on what are called naïve theories document the ways that children construct explanatory models of physical processes, of number, classifications of living forms (e.g., animals with four legs even when they do not recognize the difference between a dog and a cat; distinctions between what animate creatures can do vs. inanimate objects; of human intentionality; Baillargeon, 1995; Carey & Gelman, 1991; Massey & Gelman, 1988; Starkey & Gelman, 1982). One of the challenges of formal learning, particularly in mathematics and the sciences, is wrestling with tensions between informal naïve understandings inferred from experience in the natural and social world from formal operations in disciplines that may be counterintuitive (Clement, 1982; DiSessa, 1982). This challenge is sometimes conceptualized as conceptual change where the question is what features of learning environments are most robust at helping learners reorganize existing schema (DiSessa & Sherin, 1998; Schwartz, Varma, & Martin, 2008). The broad takeaway is that learners must explicitly examine the tensions or oppositions between one's current state of understanding of say, a model or process, and the targeted formal understanding. These fundamentally cognitive foci on schema activation and transformations, the role of prior knowledge, and the demands of conceptual change have been taken up in deficit explanations for the persistent gap in academic achievement with the idea that the range of prior knowledge that youth from particular backgrounds bring to learning in school somehow is not a resource for new learning, in fact a detractor (Brottman, 1968; Jensen, 1969; Orr, 1987; see Box 1).

BOX 1

“In an attempt to discover the underlying cause or causes of the poor reading performance of black inner-city children, several explanations have been suggested. Some have argued that these children show a cultural, cognitive, and/or linguistic deficit resulting from either genetic pathology (Jensen, 1969) or from an impoverished environment (Bereiter & Engelmann, 1966; Bernstein, 1961; Blank & Solomon, 1968; Clark & Richards, 1966; Deutsch, Brown, Deutsch, Goldstein, John, Katz, Levinson, Peisach, & Witeman, 1967). Regardless of the etiology, many educators and psychologists have held that many black children come to school with a deficient language system that militates against making progress in academic subjects, especially reading. Intensive language remediation is therefore considered a prerequisite to the task of learning to read. Language programs such as DISTAR (Engelmann & Osborn, 1970) reflect this perspective.”

Reported in Harber and Bryen (1976). Black English and the task of reading. *Review of Educational Research*, 46, 387–405.

Another dimension of cognition that is receiving increased attention is the role of epistemology as a category of knowledge that is important in how people conceptualize tasks to be learned (DiSessa, 1993; F. E. Hart, 2001; Hofer, 2000; Lee, Goldman, Levine, & Magliano, 2016). Traditional studies of schema including the role of prior knowledge have attended to the structure of concepts. Epistemology, on the other hand, addresses questions around the criteria we use in determining whether something is indeed knowable and what criteria are invoked to assess the truth value of knowledge claims, how do we justify claims, and what counts as evidence. Hofer and Pintrich (1997) focused on two important dimensions of people’s epistemological beliefs: simplicity versus complexity and certainty versus uncertainty. It is interesting to consider how these personal orientations may play out in everyday contexts, for example, as citizens evaluate public policy positions with regard to issues like climate change, immigration, addressing poverty (Gutmann, 1993; Suad Nasir & Kirshner, 2003). It is equally interesting to consider what may be epistemological orientations or dispositions reflected in claims made within the research community—now and historically—and within communities of educational practice (e.g., publications and pronouncements made by educational consultants, educational publications meant for a practice audience) with regard to these two dimensions. I would argue the field—both in research and practice—have tended to assert deficit claims about learning trajectories for particular populations in ways that reflect a disposition toward simplicity and certainty. One goal of this chapter is to suggest that inferences across disciplines now strongly suggest the phenomena in question are more likely to be complex and our claims likely need to be tentative and contextual (see Box 2).

Chinn, Buckland, and Samarapungavan (2011) have expanded studies of the role of epistemology in learning to zero in on what they call epistemic cognition. They argue for five dimensions of epistemic cognition:

BOX 2

“Poverty holds a seemingly unbreakable grip on families, neighborhoods, cities, and entire countries. It stretches from one generation to the next, trapping individuals in a socioeconomic pit that is nearly impossible to ascend. Part of the fuel for poverty’s unending cycle is its suppressing effects on individuals’ cognitive development, executive functioning, and attention, as four scientists demonstrated during the inaugural International Convention of Psychological Science, held March 12–14 in Amsterdam, the Netherlands.”

Retrieved from <http://www.psychologicalscience.org/index.php/publications/observer/2015/september-15/how-poverty-affects-the-brain-and-behavior.html>

(a) Epistemic aims and epistemic value; (b) the structure of knowledge and other epistemic achievements; (c) the sources and justification of knowledge and other epistemic achievements, and the related epistemic stances; (d) epistemic virtues and vices; and (e) reliable and unreliable processes for achieving epistemic aims. We further argue for a fine-grained, context-specific analysis of cognitions within the five components. (p. 141)

The relevance of these five dimensions will become clearer when I discuss the implications of more recent findings across the multiple domains addressed in this chapter as they provide resources for thinking about the demands of learning in particular academic content areas. These dimensions of how youth perceive what it means to validly know something is in no way limited to academics. And as a consequence, the opportunities for recruiting such epistemological knowledge and dispositions as resources for navigating new spaces for learning, particularly in formal contexts, is an important opportunity window that I argue is not sufficiently explored to address the persistent gaps in academic and life course outcomes associated with race, ethnicity, class, and gender.

Many empirical studies have validated the proposition that epistemological knowledge and dispositions contribute to robust learning around conceptual understanding, text comprehension, analyses of complex issues, among others (Conley, Pintrich, Vekiri, & Harrison, 2004; Hofer, 2004; Kardash & Scholes, 1996; Mason & Boscolo, 2004; Sinatra, Southerland, McConaughy, & Demastes, 2003).

Thus, from a cognitive perspective, the structure of conceptual and categorical knowledge (existing schema, relations across schema, their relations with new targets of learning) as well as dispositions toward what counts as knowledge and what counts as reliable justifications for claims and whether one views such knowledge as simple or complex, as subject to certainty or uncertainty, all matter for what and how people learn. And as a consequence, these need to be considerations in how we conceptualize addressing the challenges in gaps in opportunity to learn, particularly in the context of schooling.

Becoming more prominent in studies of cognition is attention that goes beyond internal cognitive structures to include the role of affect. In prior purely cognitive studies, affect was not considered as a factor in cognitive processing. There are at least

two perspectives from which affect and cognition are considered. One is the question of whether affect or emotions themselves are cognitive (Ortony, 1979). The other examines how affective states influence cognition (Dalglish & Powers, 1999; Zajonc & Marcus, 1984). Clore and Ortony (2000) argue human emotions entail four components: “a cognitive component, a motivational-behavioral component, a somatic component, and a subjective-experiential component” (p. 24). They define the cognitive component as “the representation of the emotional meaning or personal significance of some emotionally relevant aspect(s) of the person’s perceived world . . . [that] may be conscious or nonconscious” (p. 24). The motivational-behavioral component involves the disposition to act on the emotional valence we attribute to experience. The somatic component involves the physiological changes that unfold in our bodies (e.g., chemical release of cortisol, adrenaline, and norepinephrine) that are embodied across multiple systems in our bodies (e.g., cardiovascular, nervous, endocrine). And the subjective-experiential component is the holistic way in which we feel and experience the affect. According to Damasio, “The full range of the phenomenon of emotion, in its most traditional sense, . . . includes 1) evaluation, 2) dispositions to respond, and 3) feelings” (p. 20).

Damasio explains the physiological processes embodied in the experience of emotion as such experiences are processed through multiple regions of the brain as well as other body systems:

The body state changes specific to emotions are enacted by neural signals (e.g. autonomic, musculoskeletal) and chemical signals (e.g. endocrine). The brain state changes are enacted by neural signals toward neurotransmitter and neuromodulator nuclei in the thalamus, the brain stem, and the basal forebrain, as well as toward some sectors of the basal ganglia (such as the ventral striatum), which in turn send signals to a variety of neural sites, e.g. cerebral cortex. Direct chemical signaling from the body proper also affects the operation of brain networks. The changes in cognitive mode I mentioned above are the result of these brain state changes. (p. 21)

My point here is not to delve into the details of how we process emotions but to argue the breadth of evidence that emotional states, excited by perceptions that learners bring are essential to human learning and development. As a consequence, the design of robust learning environments (whether in families, in schools, in informal community-based settings) ignore the perceptions and as a consequence, the emotional experience of learners at their peril. Attention in recent years to socioemotional learning in schools is certainly influenced by our understandings about the centrality of emotions (Farrington et al., 2012). However, both the emerging work in socioemotional learning in schools as well as discussions of implications for the neurobiology of emotions typically do not consider how perceptions of experience are deeply influenced by perceptions with regard to race, ethnicity, class, gender, and other categorical variations in human experience such as conceptions of disability (Sellers, Caldwell, Schmeelk-Cone, & Zimmerman, 2003; Sellers, Copeland-Linder, Martin, & Lewis, 2006; Spencer, 1985; Steele, Spencer, & Aronson, 2002).

Human Development

One of my overall concerns in this review is to point out the ways that these disciplines so central to understanding how humans learn and develop typically do not talk with one another. Each focuses on a slice or silo of human functioning. Among the arguments I am proposing in this review are the opportunities that developing conceptual frameworks that encompass big ideas from across relevant disciplines may make possible for us to interrogate more deeply and in more complex ways the phenomenon that are human communities.

My personal focus on human development grows from the opportunity I had for 10 years to coteach a seminar with colleagues from Northwestern University's Human Development and Social Policy Program. That seminar sought to help PhD students explore intersections between the Learning Sciences focus on cognition and the foci in Human Development on identity, motivation, development over the life course, risk, and resiliency as these are socialized in contexts. I have constrained my focus in human development to issues around the role of identity in the context of child and adolescent development, and how issues of motivation are interconnected with identity in the context of life course development. In particular, I am focusing on these issues from a risk–resiliency framework; that is, understanding how life course outcomes are an outgrowth of relationships between the nature of risks faced and supports available (Spencer, 2006). Because this review aims to articulate big ideas in and across relevant disciplines that can help us think in conceptually rich ways about what is entailed in expanding opportunity to learn, particularly in the context of schooling, this human development discussion is framed around understanding what we know about how identity development, at particular life course transition points, intersects with motivation to offer sources of risk and/or sources of support that can influence resilience in the face of difficult life circumstances associated with the experiences of race, ethnicity, class, and gender.

I want to start by framing human development as the unfolding of dynamic relationships among characteristics of the individual as these interact with—shape and are shaped by—features of the social spaces in which the individual operates (e.g., nuclear family, extended family, social networks of peers and adults, socially organized settings outside the home such as church, school, community settings, etc.). Characteristics of the individual include attributes that themselves are an outgrowth of biological factors and the organization of social spaces in which the individual routinely participates (McAdams & Pals, 2006). In terms of the focus of this review around issues of educational equity, some may be concerned about invoking biological factors considering the history of how biological explanations have historically been used in psychology and by extension in popular metanarratives to categorize particular groups of humans as lacking, as less than (e.g., the eugenics movement, assumptions around the construct of IQ; Gould, 1981). However, one of the main goals of this review is to invoke more recent findings around the complex and dynamic relations between the biological and social worlds of human development to make exactly the opposite argument (Wilson, 1998): namely, the human species

survives over ecological time precisely because of its variation, and as a consequence, a core scientific enterprise is to understand the functionality of that variation and use such understandings for conceptualizing resources rather than deficits. This proposition, for example, is evident in more recent developments in the deaf community of not viewing deafness as a disability, but simply as a difference that offers other affordances for navigating the social world. This framing of development as the outgrowth of dynamic relations among the biological and the social, between the individual and others—other people, across multiple settings, across people, and artifacts that may be physical and/or ideational (e.g., conceptual systems about number and space)—is a core and central tenet through which the fields of human development, cognition, and the neurosciences now understand how people learn and navigate across time and space. This relational framing is central to conceptualizing what promotes resilience in the face of risks; that is, resilience is an outgrowth of ecological relations and not simply features or characteristics of individuals. Articulating the new focus as developmental science, Damon and Lerner (2008) offer the following as the key contemporary themes (p. 12):

1. Focus on developmental systems theories
2. Role of context in human development
3. Individual differences—diversity
4. Importance of a multidisciplinary approach
5. Study of biological development and of developmental neuroscience
6. Diverse methodologies
7. Application of developmental science
8. Promotion of positive child and adolescent development

Another important grounding has to do with how we understand culture (Cole, 1996; Rogoff, 2003). Conceptions of culture are important here because this intertwining of the biological and the social itself entails participation in cultural practices (Lee, 2010). One illustration may be informative from work in the area of epigenesis (Cloud, 2010; Russo, Martienssen, & Riggs, 1996)—the study of how gene expression can change as a function of environmental stimuli.¹ Researchers have documented transformation of genetic markers of irritability in a litter of mice based on shifts in their experiences in the social world (Francis, Diorio, Liu, & Meaney, 1999; Szyf, Weaver, & Meaney, 2007). With a rat mother who was not nurturing, the mice exhibited erratic behavior under conditions of stress. When transferred to a rat mother who was nurturing—licking them for comfort when they were under stress—the mice not only ceased to exhibit the erratic behavior under conditions of stress (e.g., the expression of a genetic marker), but the moderation of the gene expression passed on to the next generation. The idea here is that the genetic marker is not deterministic, but rather its expression can be modulated by experience. We must be cautious not to read these findings to reinforce claims that particular experiences, particularly associated with poverty, are somehow inherently deficit. Rather, I read

these findings as evidence of human adaptability and variation within human cultural communities.

In this framing, cultural experiences entail shared cultural practices (e.g., here mice living in a nurturing environment where positive stimulation is the norm of practice), norms, and belief systems. In human cultural communities, these shared practices, norms, and belief systems are often sustained across generations. Such cultural communities can range from micro-level practices in family socialization practices or practices in youth video clubs to more macro-level practices shared within religious communities, nation states, ethnic enclaves within and across nations (e.g., shared diaspora cultural practices). This conception of membership in cultural communities is important because it makes clear that people never belong to single cultural communities (Gutierrez & Rogoff, 2003). In addition, it is important to understand that cultural communities are complex, being both homogenous and heterogeneous, being both stable and changing. While this is a complex construct to think about, we can easily understand these dimensions in terms of membership in our families. There are practices that we experience in our family life growing up that we know are not the same across all families. Some of those practices are ones that we know our parents experienced in their childhood, but we can see how they may have been adapted from our grandparents' generation to our parent's generation. At the same time, we know that there are certain things that the members of our immediate family share, but also know that each member of the family is also distinct, different. Thus in family life, we can see stability and change, homogeneity and heterogeneity all operating simultaneously. This idea then that people participate in multiple cultural communities, each of which has these complex dimensions suggests that studying and examining the influences of culture on learning and development needs to push beyond the boundaries typically invoked in research on learning and development. Currently and historically, such research has tended to either sample particular populations as the norm for comparisons around normative expectations (e.g., White middle-class samples; Graham, 1992) or to sample within social categories (e.g., race, ethnicity, class) as though these categories are homogenous and somehow deterministic (Orellana & Bowman, 2003). Such research also has tended to study learning and development in one setting (e.g., school, in family life, in informal settings) without considering people's navigation across settings.

Such navigations clearly provide the contexts that influence development. We need then to understand the demands for participation within particular settings, such as schools, examine whether the presumed normative demands for participation are actually necessary for developing competence, and examine the resources that such navigations make available, with the likelihood that such resources likely entail both affordances and constraints. I offer these considerations in light of the ways in which so much research addressing opportunity to learn for particular populations often propose deterministic explanations (e.g., what poverty does to the brain, limits of language resources among children growing up in poverty, lack of executive control among youth living in poverty—where poverty has become the synonym for race). The takeaway is human adaptability.

In this multidimensional framing, from a developmental science perspective, identity is not singular. We have identities in terms of personality, as members of families, as members of other kinds of communities of practice (e.g., basketball player, rapper, video gamer), in terms of gender and sexual orientation, and so on. And identity is contextual. That means that particular features of how we self-identify and what values we place on such self-identifications may shift over time—for example, from childhood to adolescence to adulthood to elderhood—and in different contexts one aspect of our identity repertoires may surface as more salient. This contextualization of identity repertoires is not merely an attribute of the individual, but rather an outgrowth of intersections between the ways that social/cultural settings are organized—who is there, what are the tasks to be accomplished, what is available to accomplish the tasks—and particular attributes of the person. And these relationships are bidirectional.

Research on racial identity has documented the multiple ways that people of African descent—at least in the context of the United States—may view race as salient or not, may view race as personally meaningful or not, may have different conceptions of how others view race (Cross, 1991; Sellers, Smith, Shelton, Rowley, & Chavous, 1998). Other researchers have conceptualized racial identity from a developmental perspective, arguing that people of African descent in the United States may go through ideological stages, depending on experience (Cross, 1979). An array of instruments have been constructed and validated to measure these dimensions of racial identity and used in correlational and longitudinal studies to examine how different kinds of racial identity may be connected to particular life course outcomes—for example, grades, college attendance, healthy psychological development, resilience (Bowman & Howard, 1985; Chavous et al., 2003; Mandara, 2006; O'Connor, 1999; Perry, 1993; Spencer, Noll, Stoltzfus, & Harpalani, 2001).

A related body of research has examined ethnic identity. I argue that understanding intersections between race and ethnicity is important. Race is a political construct that creates particular challenges because of the pervasiveness of racism as an ideology. Race is defined on the basis of questionable physiognomy. The skin color spectrum represented among people of African descent (e.g., Black people) is diverse. However, I argue that people of African descent in the United States and diaspora must also be understood in terms of ethnicity, recognizing the many cultural practices and belief systems that have been sustained from their African roots (Asante, 1990; Asante & Asante, 1990; DuBois, 1996). Ethnic identity research has also addressed the complex and diverse ways in which such identities develop—exploration and consolidation, differences in salience, multiethnic identities (Phinney, 1990; Portes, 1995). Studies have also documented relationships between positive ethnic identity and a number of outcomes from self-esteem, lack of substance abuse, academic self-efficacy, and grades (Phinney, Cantu, & Kurtz, 1997).

One important takeaway from the research on racial and ethnic identity is that wrestling with positioning with regard to race and ethnicity constitute developmental tasks across the life course, but especially during adolescence. This is, in part, because

it becomes integrated into the normative challenges of adolescence—beginning consolidation of self-construals connected to the health of the ego (Erikson, 1959; Marcia, Waterman, Matteson, Archer, & Orlofsky, 2012). Adolescence is a key transition point in the life course. It is complicated by enhanced social cognition (Flavell & Miller, 1998; e.g., nuances in the ability to read the internal states of others, including the salience of social comparisons), the emergence of sexual arousal, the importance of peer relationships, the anticipation of future adult roles and responsibilities, all heightened by immense physiological changes occurring, much of which are embodied in development as a sexual being. These normative challenges of adolescence are now complicated by identity wrestling with regard to ethnicity and race in societies such as the United States where there are ubiquitous structures that heighten the salience of racial and ethnic identity (Spencer, 2006). They are further complicated by the nature of the academic and social demands of high school—where subject matters tend to become further removed from the everyday, where youth must learn to navigate multiple adults who play consequential roles in how and whether they experience success, and where they already bring well established perceptions about schooling from 8 years of elementary education.

Issues of identity and motivation then come into play in terms of the perceptions people bring to settings and the ways that settings are organized to also influence perceptions. For example, if I come into a setting with certain preconceived stereotypes about what participation will be like, what it will require in relation to my own ego-related needs, it is possible that what people do, say, how they act, what is available in the setting may stimulate me to rethink my stereotypes, and change my perceptions. Eccles, Wigfield, and Schiefele (1998) offer a multidimensional framework for academic motivation that is fundamentally ecological in its scope. It includes the cultural milieu with regard to cultural stereotypes about people (e.g., girls are not good at math) as well as subject matter (e.g., math is about right answers); the beliefs and behaviors of those seeking to socialize the child (e.g., teachers, parents), the aptitudes of the child and his or her previous experiences with schooling; the child's perceptions of those seeking to socialize him or her and the stereotypes in the air to use Steele's (2004) term with regard to categories of people (likely those that can be attributed to the child) and the academic tasks; to what the child attributes his or her perceptions (e.g., ability, effort, in my control, not in my control); the array of relevant schemata the child brings to the enterprise, expectations for success, and perceptions of the tasks to be mastered; the child's affective memories around similar experiences, and what they call the subject task value in terms of interests, utility and what costs the child must weigh in putting forth effort. They articulate these factors as situated inside a set of dynamic relationships that together influence what they call achievement-related choices. The framework has been subject to empirical measures. Important caveats that Eccles introduces that are relevant to the focus of this review include how ego-related choices may differ by cultural communities and within cultural communities by gender. For example, research has documented broad cultural orientations distinguishing historical

cultural communities that favor interdependence over independence, emphasizing collectivism and family obligation (Markus & Kitayama, 1991). In such societies, for example, stereotypes will differ, causal attributions for choices will likely differ, and the influences on subject task value will differ (Stigler & Baranes, 1989). The Eccles framework is further bolstered by longstanding research around the importance of a sense of self-efficacy (Pintrich & Schrauben, 1992; Zimmerman, Bandura, & Martinez-Pons, 1992); and also Oyserman and colleagues' work (Oyserman, Bybee, & Terry, 2006; Oyserman & Destin, 2010) on the role of perceptions of future selves (who and what can I become) in influencing effort toward a goal and persistence in such efforts in the face of challenge, or what they now refer to as identity-based motivation.

Thus, relevant perceptions include the following:

- What am I being asked to do?
- Am I capable of tackling these tasks?
- Is this task meaningful to me?
- What supports are available to me to wrestle with this task?
- Do I feel safe in attempting to wrestle with this task?
- How do I weigh any risks or competing goals?

This framing of motivation in terms of what is entailed in decisions by learners to put forth effort to learn, particularly in the contexts of schooling, integrates in many ways what has been articulated in cognitive studies with regard to knowledge structures (now to include knowledge of cultural worlds and knowledge of self), the role of emotions and the salience of perceptions (Erickson et al., 2007).

There are a number of salient issues in regard to what these propositions mean for how we understand the challenges entailed in inequities in opportunity to learn and educational outcomes associated with race, ethnicity, class and gender. I will illustrate issues in terms of race, in part because race and ethnicity are so intertwined in the social and ideological spaces within the United States. As discussed earlier, particularly at the critical transitions of adolescence, one aspect of identity that must be wrestled with is how youth come to understand the meaning of race in terms of navigating the world beyond their immediate families. Margaret Beale Spencer examined and replicated the famous doll experiment conducted by Kenneth and Mamie Clark, evidence from which was used in the 1954 *Brown v. Board of Education* Supreme Court Case. The Clarks argued that Black children choosing the white doll as beautiful was evidence of the detrimental effects of segregation on the sense of self-worth of Black children. Drawing on well-established research regarding the egocentrism of very young children (Piaget, 1926), Spencer argued that the choice by young children of the white doll was simply evidence of their recognition that negative stereotypes around Black physiognomy was "in the air," but because of their essential egocentrism did not make such negative attributions to themselves. When Spencer then repeated the experiment with older children, she found them clearly emotionally

burdened in making the decision because at this point in terms of their more advanced social cognition, they realized the negative attributions could now be applied to them (Spencer, 2008). On the other hand, Spencer also repeated the same experiment with young children enrolled in an African-centered preschool, where issues of positive Black identity were centrally socialized, these young children eagerly pointed to the black doll as beautiful, as the smart doll. This replication demonstrates the role of socialization around the meaning and salience of race matters. These implications are also reinforced by the extensive body of research on positive racial socialization (referenced earlier) as a resource for resilience in the face of challenge.

Returning to Spencer's phenomenological variant of ecological systems theory model, the research indicates that Black, Brown, and youth living in persistent intergenerational poverty must learn to engage the normative challenges of development at particular points in the life course (early childhood, middle childhood, adolescence, young adulthood)—learning language, learning to manage one's body, learning to read the internal states of others, regulating emotions, setting goals, interpreting ego-related needs, establishing and maintaining attachments, constructing knowledge that allows one to engage in meaningful new tasks—as well as the complications and ego-related challenges that emerge in the risks that racism, gender bias, ethnocentrism, and homophobia structurally pose. These structural risks include exposure to violence, facing a culture of low expectations in schools, living in food deserts, lack of green space, inadequate housing, insufficient community based spaces for youth development, inadequate health care. These are structural risks because they do not emerge randomly but systematically, structured into public policies and institutional configurations. And they are particularly pernicious psychologically as embodied in metanarratives of deficit, of being less than, and as a consequence pose significant threats to the ego. We know from decades of research on identity that the ego drives self-concept, drives engagement, as ego defines what we think we need to be centered, to be whole (Maslow, 1943).

These propositions, empirically supported, from the field of human development suggest that efforts to transform schools into places where Black, Brown, and youth living in persistent intergenerational poverty thrive must explicitly address the ways that racism, ethnocentrism, gender bias, homophobia, and stereotypes around the experience of poverty are enacted in the lives of young people and in the practices and organization of schooling. Schools must develop tools that allow teachers and administrators to understand how perceptions of ability and of resources for coping are enacted even in the ways that curriculum content and instruction are structured. Such orientations can help us move away from the tendency to “blame the victim” rather than to examine the ways that ecologies of learning can address the fundamental human development needs that all youth face.

The Neurosciences

I want to close this review of findings from disciplines in the social and biological sciences that can expand how we conceptualize the challenges and opportunities of

addressing the persistent achievement gap associated with race, ethnicity, and class with a brief review of big findings from the neurosciences. Just as early work in cognition focused on individual mental functioning, so early work in neuroscience focused on cognitive activity within the individual brain. In more recent years, however, the field has expanded into a number of specializations—cultural neuroscience, social neuroscience, developmental neuroscience, among others. It is not the intent of this review to provide a detailed synthesis of research in these subdisciplines (Cacioppo & Berntson, 2004; Chiao, Cheon, Pornpattananankul, Mrazek, & Blizinsky, 2013; Han et al., 2013; Organization for Economic Co-operation and Development, 2007). However, my goal is to extrapolate big ideas emerging that converge with findings in cognition and human development that open up broader conceptions of human learning and development. These central propositions include (a) dynamic relations between biological and cultural resources, (b) the inherent plasticity of human development, (c) the centrality of culture in human development, (d) how human learning and development unfold within and across ecological spaces and time, and (e) the ways that human thinking and development are connected to contexts.

These particular subfields of cultural, social, and developmental neuroscience converge around the framing of human development unfolding within and across ecological spaces, and not merely as deterministic biologically driven trajectories. Cultural and social neurosciences in particular stress the fundamental interdependence of the biologic and the cultural. Chiao and Ambady (2007) define cultural neuroscience as “a theoretical and empirical approach to investigate and characterize the mechanisms by which [the] hypothesized bidirectional, mutual constitution of culture, brain, and genes occurs” (p. 238). Han et al. (2013) go on to say,

CN research does not study culture as a set of biologically determined predispositions/constraints that can be used to rigidly categorize collections of people. Instead, the CN approach emphasizes the flexibility of the human brain that enables humans to adapt to sociocultural environments. (p. 351)

This is important considering the history of attributing particular cultural practices as determining and fixed. An important emerging consensus argues for the inherent neoplasticity of the brain. In addition to empirical studies (Starlinger & Niemeyer, 1981), we know from everyday experience the ways that blind persons develop enhanced auditory acuity. Cultural neuroscience works from propositions shared in fields of cultural psychology and anthropology that culture consists of shared belief systems embedded in routine cultural practices. Sampling from cross-cultural studies examining how neural processing of culturally congruent and culturally incongruent stimuli differ have shown that categorizing people by pan ethnic identities (e.g., Chinese Americans and Chinese from the Mainland) does not account for differences in processing, suggesting rather it is the actual participation in routine practices over time that counts (Han et al., 2013).

IMPLICATIONS FOR RECONCEPTUALIZING HOW WE STUDY AND DESIGN FOR DIVERSITY

I want now to contrast these empirically supported propositions running across studies of cognition, of human development, and of neural processing through the various new fields in the neurosciences with the implied propositions currently dominant around how to address the persistent achievement and opportunity gap associated with race, ethnicity, and class. I in no way intend to impute the good intentions of any of the people involved in the examples I share. The examples are only intended to be illustrative. Rather, I suggest we may be at a kind of Kuhnian revolution transition point (Kuhn, 1970) where tensions between older and new sets of propositions are emerging.

Originally in 2000, the National Research Council authorized a study of policies with regard to early childhood development and poverty titled *From Neurons to Neighborhoods: The Science of Early Childhood Development* (Shonkoff & Phillips, 2000). More recently, in 2012, the National Research Council published an updated report on a commemorative workshop held in 2011 (Institute of Medicine and National Research Council, 2012). It is important to note that both the earlier and the more recent workshop actually sought to integrate findings from cognition, human development, and the neurosciences. Several propositions put forward I think are worthy of interrogating. In the updated report, summarizing a presentation by Bruce McEwen of Rockefeller University, the following assertion is made: “Low socioeconomic status is associated with poor language skills, poor executive function, and other effects on learning ability” (Institute of Medicine and National Research Council, 2012, p. 16). In the updated workshop summary, McEwen makes a compelling case for the relevance of understanding neurological and other physiological processes entailed in the experience of stress. Even though in the workshop summary he references brain plasticity, sources of resilience in the face of stress are discussed in general, but not in relation to resources internal to populations living in poverty. He makes an important contribution in stating that “policies and health interventions need to work in tandem” (p. 17) and cites examples of effective early childhood collaborations such as the Perry Preschool Project and the Abecedarian Project. The report goes on to summarize Deborah Stipek’s of Stanford University workshop presentation on learning and focused on challenges associated with verbal skills, social skills, mathematical skills, and executive control functions. These have become the most widely cited areas of deficit functioning among children living in poverty and are routinely argued to predict low functioning in schools. I want to reexamine these arguments from the perspectives I have been articulating as a cultural and ecological framework on human learning and development, and to consider some of the methodological and conceptual conundrums entailed in current metanarratives on opportunity to learn exemplified in some aspects of the *Neurons to Neighborhoods* reports.

First, while I applaud the focus on the need for ecological supports—such as partnerships between schools and health initiatives—the problem space is more complex.

The array of initiatives proposed and cited are fundamentally programs intended to fix poor children and their families. They presume these children embody deficits that good school programs—in this case early childhood programs—can fix. The measures typically used in studies of language competencies and executive control, for example, themselves only capture a slice of what such competencies entail. Many of the warrants for language deficits come from the B. Hart and Risley (1995) study of 42 families from middle-income and low-income communities. B. Hart and Risley (1995) argued that middle-class children come to school knowing 30 million more words than poor children and as a consequence are ill prepared to learn to read. In a similar vein, decades earlier some had argued that children who spoke African American English did not possess a full linguistic repertoire and therefore had difficulties with reading (Baratz, 1969; Bereiter & Engelmann, 1966). The sociolinguistic community (Smitherman, 1999, 2003), anchored initially by Labov's (1972) response, argued quite the contrary. Many studies of language competence use the Peabody Vocabulary test without acknowledging its possible middle-class biases (Stockman, 2000). Although Washington and Craig (1999) have argued for the validity of the Peabody Vocabulary Test III with African American children, Peña (2000) has argued for the use of more ecologically valid methods for eliciting the range of semantic knowledge that children from culturally and linguistically diverse have. Just in terms of learning to read, there are an array of linguistic competencies that contribute to comprehension beyond vocabulary (which is unquestionably important), including metalinguistic knowledge of indirection, of figuration, of point of view; for comprehending narratives, repertoires for inferring the internal states of psychologically complex characters (Champion, Seymour, & Camarata, 1995; Gee, 1989).

With regard to social functioning and executive control, studies on children and youth living in poverty typically assume that these competencies are independent of context. While using existing measures, it is likely that many of the bankers whose decision making led to the most recent economic depression would have scored well on measures of executive control, and it is likely there are many areas of their lives where they do/did exert self-control, it is clear professionally they did not. We all know cases of children who will push the boundaries with their parents but will exert self-control with their grandparents; or adolescents who will exert self-control in one teacher's class and act out in another. This construct of self-control, conceptually related to my earlier discussion of motivation, is multidimensional—including perceptions of ability, utility, relevance, weighing against competing aims, perceptions of what is available to help one navigate. The focus and structure of most programs aimed at helping poor children and adolescents develop self-control or some generic sense of executive control do not design for these multiple dimensions, and especially how these dimensions are affected by the experience of race and the experience of poverty. Just as the conceptualizations of racial identity take into account the range of differences in how racialized persons view the meaning, value and salience of race, so too the experience of poverty is not homogeneous. And certainly if we take an international perspective, there are many countries where the absolute measure of poverty is moderated by the ubiquitous availability of social supports provided by governments. In the United States, we have many

traditional ways of measuring class status—income, mother’s education, neighborhood residence. However, these markers do not account for variation based, for example, on the availability of social networks—extended family members as caretakers, church communities, peer extended social networks, and so on.

The issue raised by Stipek around mathematical skills provides an opportunity to interrogate the question from within the knowledge base regarding the content area. Stipek notes evidence that math skills at kindergarten are better predictors of math and reading skills at the third grade. One of the reasons Stipek may see longer term effects of early skills in mathematics than measured skills in language is that in terms of teaching and learning, the domain of mathematics articulates what children need to know and be able to do in ways that in terms of disciplinary knowledge are more well specified. In addition, mathematics standards, educators in mathematics education, and those studying the cognitive dimensions of mathematical understanding stress the importance of diversity in approaches to representing mathematical problems and the fruitfulness of pursuing multiple solution paths, and the importance of the ability to warrant one’s claims based on the science of the mathematics (Schoenfeld, 1985). In teaching reading comprehension, we typically ask students to produce outcomes of comprehension without specifying pathways, including multiple pathways for addressing problems of comprehension. In the field, when we do talk about strategies, they are often broad abstractions like—ask questions, reread, read ahead, make predictions, and monitor when you do not understand. These metacognitive moves are certainly important, but once you get stuck, if you do not have a much more fined-tuned repertoire of kinds of knowledge on which you can draw, knowing you are stuck is not much help. National Assessment of Educational Progress data trends over the past four decades show a trajectory of growth in mathematics across grades, while trends in reading not only remain relatively flat, they also worsen as youth proceed across the grades (Lee, 2014; National Center for Education Statistics, 2013). If indeed we have challenges in terms of our conceptualization of the demands of using language skills to learn to read, and we see patterns of lack of growth across grades and historical time, it may be that the problem lies not so much with what children living in poverty bring or do not bring, but more so with what the relevant fields—for example, research in reading comprehension, teacher training, organizational learning in schools, tools used for assessment and what we assess—make available.

And my argument is that how we as research communities focusing on education and the enhancement of life course outcomes, especially for those who face some of the greatest challenges due to racism, poverty, gender bias, homophobia, and so on, conceptualize the problem space we seek to understand matters: Do we think the problem space can be understood by single silos of inquiry; Do we believe in the fundamental proposition with regard to human plasticity, indeed across the life course, and take the challenge as not one constrained within the individual but rather a challenge to how we conceptualize the nature of risks and the diversity in the range of repertoires that may be available to wrestle with the problem(s); Do we believe that institutionalized metanarratives matter for the perceptions that all players bring to the inquiry and teaching enterprise; Do we believe that diversity is actually a real strength

of humanity and not merely a politically correct aphorism, and as a consequence, how do we imagine recruiting diversity as a resource. Recruiting diversity as a resource means rethinking the range of prior knowledge, dispositions, epistemologies that may be relevant to our targets of learning, since from long-term studies of cognition, we know that prior knowledge matters, but we also know that people are constantly inferring from experience to construct mental representations that when meaningful will most likely be stored in long-term memory. If we accept that identity is multidimensional, influenced by context, shifts in some ways across ontogenetic time, and whether focused on independence or interdependence is always driven by the need for ego fulfillment, might not understanding identity unfolding within and across contexts be useful for thinking about how schooling might recruit different dimensions of identity as resources for learning.

I argue that these fundamental propositions undergird all of human functioning, that these intersections between the biological and the social or cultural are driven as essential propellants of human functioning derived from our evolutionary history as a species. Perceptions matter. Feelings or emotions matter. Attachments matter. Mental representations of phenomenon in the world matter. Beliefs in self-efficacy and effort matter. These fundamental underpinnings of human learning and development are ubiquitous to the species. Designed environments—such as schools—will be most robust and generative when they take these fundamental underpinnings of human learning and development as starting points.

In the end, my recommendations for schooling will not differ much from those who argue from multiculturalism, sociocultural theory, particular political or ideological positions. I agree with warrants from all these frames. I simply want to argue that science—the biological, psychological and social sciences—also are now converging on big propositions supported by empirical studies that diversity, human plasticity, the centrality of culture, understanding the diverse pathways through which humans at each stage of the life course learn to navigate—sometimes in ways that are resilient and sometimes in ways that are maladaptive—are central foundations for human learning and development. And understanding that within all communities, we will find people who succumb to risks and others who are resilient in face of those risks. We need to better understand those sources of resiliency within and across communities and to accept—as my friend Margaret Beale Spencer always asserts—to be human is to be at risk.

NOTE

¹“At its most basic, epigenetics is the study of changes in gene activity that do not involve alterations to the genetic code but still get passed down to at least one successive generation. These patterns of gene expression are governed by the cellular material—the epigenome—that sits on top of the genome, just outside it (hence the prefix *epi-*, which means above). It is these epigenetic ‘marks’ that tell your genes to switch on or off, to speak loudly or whisper. It is through epigenetic marks that environmental factors like diet, stress and prenatal nutrition can make an imprint on genes that is passed from one generation to the next” (Cloud, 2010).

REFERENCES

- Anderson, R. (1984). Reflections on the acquisition of knowledge. *Educational Researcher, 13*(9), 5–10.
- Asante, M. K. (1990). The African essence in African-American language. In M. K. Asante & K. Welsh-Asante (Eds.), *African culture: The rhythms of unity* (pp. 233–252). Trenton, NJ: Africa World Press.
- Asante, M. K., & Asante, K. W. (1990). *African culture: The rhythms of unity*. Trenton, NJ: Africa World Press.
- Baillargeon, R. (1995). Physical reasoning in infancy. In M. S. Gazzaniga (Ed.), *The cognitive neurosciences* (pp. 181–204). Cambridge: MIT Press.
- Baratz, J. C. (1969). Linguistic and cultural factors in teaching reading to ghetto children. *Elementary English, 46*, 199–203.
- Bereiter, C., & Engelmann, S. (1966). *Teaching disadvantaged children in pre-school*. Englewood Cliffs, NJ: Prentice Hall.
- Bowman, P., & Howard, C. (1985). Race related socialization, motivation and academic achievement: A study of black youths in three generation families. *Journal of American Academy of Child Psychiatry, 24*, 134–141.
- Bransford, J., Brown, A., & Cocking, R. (1999). *How people learn: Brain, mind, experience and school*. Washington, DC: National Academies Press.
- Brottman, M. A. (1968). *Language remediation for the disadvantaged preschool child*. Chicago, IL: University of Chicago.
- Cacioppo, J. T., & Berntson, G. (2004). *Social neuroscience: Key readings*. London, England: Psychology Press.
- Carey, S. (1985). *Conceptual change in childhood*. Cambridge, MA: Bradford Books.
- Carey, S., & Gelman, R. (1991). *The epigenesis of mind*. Hillsdale, NJ: Psychology Press.
- Champion, T., Seymour, H., & Camarata, S. (1995). Narrative discourse among African American children. *Journal of Narrative and Life History, 5*, 333–352.
- Chavous, T. M., Bernat, D. H., Schmeelk-Cone, K., Caldwell, C. H., Kohn-Wood, L., & Zimmerman, M. A. (2003). Racial identity and academic attainment among African American adolescents. *Child Development, 74*, 1076–1090.
- Chiao, J. Y., & Ambady, N. (2007). Cultural neuroscience: Parsing universality and diversity across levels of analysis. In S. Kitayama & D. Cohen (Eds.), *Handbook of cultural psychology* (pp. 237–254). New York, NY: Guilford.
- Chiao, J. Y., Cheon, B., Pornpattananangkul, N., Mrazek, A., & Blizinsky, K. (2013). Cultural neuroscience. *Advances in Culture & Psychology, 4*(1). doi:10.1093/acprof:osobl/9780199336715.003.0001
- Chinn, C. A., Buckland, L. A., & Samarapungavan, A. L. A. (2011). Expanding the dimensions of epistemic cognition: Arguments from philosophy and psychology. *Educational Psychologist, 46*, 141–167.
- Clement, J. (1982). Student preconceptions of introductory mechanics. *American Journal of Physics, 50*, 66–71.
- Clore, G. L., & Ortony, A. (2000). Cognition in emotion: Always, sometimes, or never? In L. Nadel, R. Lane, & G. L. Ahern (Eds.), *The cognitive neuroscience of emotion* (pp. 24–61). New York, NY: Oxford University Press.
- Cloud, J. (2010, January 6). Why your DNA isn't your destiny. *Time*. Retrieved from <http://content.time.com/time/subscriber/article/0,33009,1952313-2,00.html>
- Cole, M. (1996). *Cultural psychology, a once and future discipline*. Cambridge, MA: Belknap Press of Harvard University Press.
- Coleman, J. (1988). Social capital in the creation of human capital. *American Journal of Sociology, 94*(Suppl.), S95-S120.
- Conley, A. M., Pintrich, P. R., Vekiri, I., & Harrison, D. (2004). Changes in epistemological beliefs in elementary science students. *Contemporary Educational Psychology, 29*, 186–204.

- Cross, W. (1979). Empirical analysis of the negro-to-black conversion experience. In A. W. Boykin, A. J. Anderson, & J. Yates (Eds.), *Research directions of black psychologists* (pp. 107–130). New York, NY: Russell Sage Foundation.
- Cross, W. (1991). *Shades of black: Diversity in African American identity*. Philadelphia, PA: Temple University Press.
- Dalgleish, T., & Powers, M. (Eds.). (1999). *Handbook of cognition and emotion*. Sussex, England: Wiley.
- Damasio, A. (1995). Toward a neurobiology of emotion and feeling: Operational concepts and hypotheses. *Neuroscientist*, *1*, 19–25.
- Damon, W., & Lerner, R. M. (2008). The scientific study of child and adolescent development: Important issues in the field today. In W. Damon & R. M. Lerner (Eds.), *Child and adolescent development an advanced course* (pp. 3–13). Hoboken, NJ: Wiley.
- Darling-Hammond, L. (2004). The color line in American education: Race, resources, and student achievement. *Du Bois Review*, *1*, 213–246.
- Darling-Hammond, L. (2010). *The flat world and education: How America's commitment to equity will determine our future*. New York, NY: Teachers College Press.
- DiSessa, A. A. (1982). Unlearning Aristotelian physics: A study of knowledge-base learning. *Cognitive Science*, *6*, 37–75.
- DiSessa, A. A. (1993). Toward an epistemology of physics. *Cognition and Instruction*, *10*, 105–225.
- DiSessa, A. A., & Sherin, B. L. (1998). What changes in conceptual change? *International Journal of Science Education*, *20*, 1155–1191.
- DuBois, W. E. B. (1996). The concept of race. In M. K. Asante & A. S. Abarry (Eds.), *African intellectual heritage: A book of sources* (pp. 409–417). Philadelphia, PA: Temple University Press.
- Eccles, J., Wigfield, A., & Schiefele, U. (1998). Motivation to succeed. In W. Damon & N. Eisenberg (Eds.), *Handbook of child psychology* (Vol. 3, 5th ed.). New York, NY: Wiley.
- Erikson, E. H. (1959). *Identity and the life cycle: Selected papers*. New York, NY: International Universities Press.
- Erickson, F., Cook-Sather, A., Espinoza, M., Jurow, S., Shultz, J. J., & Spencer, J. (2007). Students' experience of school curriculum: The everyday circumstances of granting and withholding assent to learn. In M. Connelly, M. F. He, & J. Phillion (Eds.), *The Sage handbook of curriculum and instruction* (pp. 198–218). Thousand Oaks, CA: Sage.
- Farrington, C. A., Roderick, M., Allensworth, E., Nagaoka, J., Keyes, T. S., Johnson, D. W., & Beechum, N. O. (2012). *Teaching adolescents to become learners. The role of noncognitive factors in shaping school performance: A critical literature review*. Retrieved from <https://consortium.uchicago.edu/sites/default/files/publications/Noncognitive%20Report.pdf>
- Flavell, J. H., & Miller, P. H. (1998). Social cognition. In D. Kuhn & R. Siegler (Eds.), *Handbook of child psychology* (Vol. 2, 5th ed., pp. 851–898). New York, NY: Wiley.
- Francis, D., Diorio, J., Liu, D., & Meaney, M. J. (1999). Nongenomic transmission across generations of maternal behavior and stress responses in the rat. *Science*, *286*, 1155–1158.
- Gee, J. P. (1989). The narrativization of experience in the oral style. *Journal of Education*, *171*(1), 75–96.
- Gould, S. J. (1981). *The mismeasure of man*. New York, NY: Norton.
- Graham, S. (1992). “Most of the subjects were white and middle class”: Trends in published research on African Americans in selected APA journals, 1970–1989. *American Psychologist*, *47*, 629–639.
- Gutierrez, K., & Rogoff, B. (2003). Cultural ways of learning: Individual traits or repertoires of practice. *Educational Researcher*, *32*(5), 19–25.
- Gutmann, A. (1993). Democracy & democratic education. *Studies in Philosophy and Education*, *12*(1), 1–9.

- Han, S., Northoff, G., Vogeley, K., Wexler, B. E., Kitayama, S., & Varnum, M. E. (2013). A cultural neuroscience approach to the biosocial nature of the human brain. *Annual Review of Psychology, 64*, 335–359.
- Harber, J. R., & Bryen, D. N. (1976). Black English and the task of reading. *Review of Educational Research, 46*, 387–405.
- Hart, B., & Risley, R. T. (1995). *Meaningful differences in the everyday experience of young American children*. Baltimore, MD: Paul H. Brookes.
- Hart, F. E. (2001). The epistemology of cognitive literary studies. *Philosophy and Literature, 25*, 314–334.
- Heckman, J. J. (2012). An effective strategy for promoting social mobility. *Boston Review, 103*, 10155–10162.
- Hernstein, R., & Murray, C. (1994). *The bell curve: Intelligence and class structure in American life*. New York, NY: Free Press.
- Hilliard, A. G. (1996). Either a paradigm shift or no mental measurement: The non-science and nonsense of the bell curve. *Cultural Diversity and Mental Health Journal, 2*(1), 1–20.
- Hofer, B. (2000). Dimensionality and disciplinary differences in personal epistemology. *Contemporary Educational Psychology, 25*, 378–405.
- Hofer, B. (2004). Exploring the dimensions of personal epistemology in differing classroom contexts: Student interpretations during the first year of college. *Contemporary Educational Psychology, 29*, 129–163.
- Hofer, B., & Pintrich, P. (1997). The development of epistemological theories: Beliefs about knowledge and knowing and their relation to learning. *Review of Educational Research, 67*, 88–140.
- Ignatiev, N. (1996). *How the Irish became White*. New York, NY: Routledge.
- Institute of Medicine and National Research Council. (2012). *From neurons to neighborhoods: An update: Workshop summary*. Washington, DC: National Academies Press.
- Jensen, A. (1969). How much can we boost IQ and scholastic achievement. *Harvard Educational Review, 39*, 1–123.
- Kardash, C. M., & Scholes, R. J. (1996). Effects of preexisting beliefs, epistemological beliefs, and need for cognition on interpretation of controversial issues. *Journal of Educational Psychology, 88*, 260–271.
- Kuhn, T. S. (1970). *The structure of scientific revolutions*. Chicago, IL: University of Chicago Press.
- Labov, W. (1972). *Language in the inner city: Studies in the black English vernacular*. Philadelphia: University of Pennsylvania Press.
- Lee, C. D. (2008). The centrality of culture to the scientific study of learning and development: How an ecological framework in educational research facilitates civic responsibility. *Educational Researcher, 37*, 267–279.
- Lee, C. D. (2009). Historical evolution of risk and equity: Interdisciplinary issues and critiques. *Review of Research in Education, 33*, 63–100.
- Lee, C. D. (2010). Soaring above the clouds, delving the ocean's depths: Understanding the ecologies of human learning and the challenge for education science. *Educational Researcher, 39*, 643–655.
- Lee, C. D. (2014). Reading gaps and complications of scientific studies of learning. In S. Harper (Ed.), *The elusive quest for civil rights in education: Evidence-based perspectives from leading scholars on the 50th anniversary of the Civil Rights Act*. Philadelphia: Center for the Study of Race and Equity in Education, University of Pennsylvania.
- Lee, C. D., Goldman, S. R., Levine, S., & Magliano, J. P. (2016). Epistemic cognition in literary reasoning. In J. Green, W. Sandoval, & I. Bråten (Eds.), *Handbook of epistemic cognition* (pp. 165–183). New York, NY: Taylor & Francis.
- Mandara, J. (2006). The impact of family functioning on African American males' academic achievement: A review and clarification of the empirical literature. *Teachers College Record, 108*, 206–223.

- Marcia, J. E., Waterman, A. S., Matteson, D. R., Archer, S. L., & Orlofsky, J. L. (2012). *Ego identity: A handbook for psychosocial research*. Berlin, Germany: Springer Science + Business Media.
- Markus, H., & Kitayama, S. (1991). Culture and the self: Implications for cognition, emotion, and motivation. *Psychological Review*, *98*, 224–253.
- Maslow, A. H. (1943). A theory of human motivation. *Psychological Review*, *50*, 370–396.
- Mason, L., & Boscolo, P. (2004). Role of epistemological understanding and interest in interpreting a controversy and in topic-specific belief change. *Contemporary Educational Psychology*, *29*, 103–128.
- Massey, C. M., & Gelman, R. (1988). Preschoolers decide whether pictured unfamiliar objects can move themselves. *Developmental Psychology*, *24*, 307–317.
- McAdams, D. P., & Pals, J. L. (2006). A new big five: Fundamental principles for an integrative science of personality. *American Psychologist*, *61*, 204–217.
- Mills, C. W. (1997). *The racial contract*. Ithaca, NY: Cornell University Press.
- Mintzes, J. J. (1984). Naive theories in biology: Children's concepts of the human body. *School Science and Mathematics*, *84*, 548–555.
- National Center for Education Statistics. (2013). *The nation's report card: Trends in academic progress* (NCES 2013 456). Washington, DC: Author.
- O'Connor, C. (1999). Race, class, and gender in America: Narratives of opportunity among low-income African American youths. *Sociology of Education*, *72*, 137–157.
- Orellana, M., & Bowman, P. (2003). Cultural diversity: Research on learning and development: Conceptual, methodological and strategic considerations. *Educational Researcher*, *32*(5), 26–32.
- Organization for Economic Co-operation and Development. (2007). *Understanding the brain: The birth of a learning science*. Paris, France: Author.
- Orr, E. W. (1987). *Twice as less: Black English and the performance of Black students in mathematics and science*. New York, NY: Norton.
- Ortony, A. (1979). *The cognitive structure of emotions*. New York, NY: Cambridge University Press.
- Oyserman, D., Bybee, D., & Terry, K. (2006). Possible selves and academic outcomes: How and when possible selves impel action. *Journal of Personality and Social Psychology*, *91*, 188–204.
- Oyserman, D., & Destin, M. (2010). Identity-based motivation: Implications for intervention. *The Counseling Psychologist*, *38*, 1001–1043.
- Peña, E. D. (2000). Assessment of semantic knowledge: Use of feedback and clinical interviewing. *Seminars in Speech and Language*, *22*(1), 51–62.
- Perry, T. (1993). *Toward a theory of African American school achievement*. Retrieved from <http://eric.ed.gov/?id=ED366418>
- Phinney, J. S. (1990). Ethnic identity in adolescents and adults: Review of research. *Psychological Bulletin*, *108*, 499–514.
- Phinney, J. S., Cantu, C. L., & Kurtz, D. A. (1997). Ethnic and American identity as predictors of self-esteem among African American, Latino, and White adolescents. *Journal of Youth and Adolescence*, *26*, 165–185.
- Piaget, J. (1926). *The language and thought of the child*. New York, NY: Harcourt Brace.
- Pintrich, P. R., & Schrauben, B. (1992). Students' motivational beliefs and their cognitive engagement in classroom academic tasks. In D. Schunk & J. Meece (Eds.), *Student perceptions in the classroom: Causes and consequences* (pp. 149–183). Hillsdale, NJ: Erlbaum.
- Portes, A. (1995). Segmented assimilation among new immigrant youth: A conceptual framework. In R. G. Rumbaur & W. A. Cornelius (Eds.), *California's immigrant children* (pp. 71–76). San Diego, CA: Center for U.S.-Mexican Studies.
- Quartz, S. R., & Sejnowski, T. J. (2002). *Liars, lovers, and heroes: What the new brain science reveals about how we become who we are*. New York, NY: William Morrow.

- Rogoff, B. (2003). *The cultural nature of human development*. New York, NY: Oxford University Press.
- Rumelhart, D. (1980). Schemata: The building blocks of cognition. In R. Spiro, B. Bruce, & W. Brewer (Eds.), *Theoretical issues in reading comprehension: Perspectives from cognitive psychology, linguistics, artificial intelligence and education* (pp. 33–58). Hillsdale, NJ: Erlbaum.
- Russo, E. A., Martienssen, R. A., & Riggs, A. D. (Eds.). (1996). *Epigenetic mechanisms of gene regulation*. Plainview, NY: Cold Spring Harbor Laboratory Press.
- Schoenfeld, A. H. (1985). *Mathematical problem solving*. Orlando, FL: Academic Press.
- Schwartz, D. L., Varma, S., & Martin, L. (2008). Dynamic transfer and innovation. In S. Vosniadou (Ed.), *International handbook of research on conceptual change* (pp. 479–506). New York, NY: Routledge.
- Sellers, R. M., Caldwell, C. H., Schmeelk-Cone, K. H., & Zimmerman, M. A. (2003). Racial identity, racial discrimination, perceived stress, and psychological distress among African American young adults. *Journal of Health and Social Behavior, 44*, 302–317.
- Sellers, R. M., Copeland-Linder, N., Martin, P. P., & Lewis, R. H. (2006). Racial identity matters: The relationship between racial discrimination and psychological functioning in African American adolescents. *Journal of Research on Adolescence, 16*, 187–216.
- Sellers, R. M., Smith, M. A., Shelton, J. N., Rowley, S. A., & Chavous, T. M. (1998). Multidimensional model of racial identity: A reconceptualization of African American racial identity. *Personality and Social Psychology Review, 2*(1), 18–39.
- Shonkoff, J. P., & Phillips, D. A. (Eds.). (2000). *From neurons to neighborhoods: The science of early childhood development*. Washington, DC: National Academies Press.
- Sinatra, G. M., Southerland, S. A., McConaughy, F., & Demastes, J. W. (2003). Intentions and beliefs in students' understanding and acceptance of biological evolution. *Journal of Research in Science Teaching, 40*, 510–528.
- Smitherman, G. (1999). CCCC's role in the struggle for language rights. *College Composition and Communication, 50*, 349–376.
- Smitherman, G. (2003). The historical struggle for language rights in CCCC. In G. Smitherman & V. Villanueva (Eds.), *Language diversity in the classroom: From intention to practice* (pp. 7–39). Carbondale, IL: Southern University Press.
- Spencer, M. B. (1985). Cultural cognition and social cognition as identity factors in black children's personal-social growth. In M. Spencer, G. K. Brookins, & W. Allen (Eds.), *Beginnings: The social and affective development of black children* (pp. 59–72). Hillsdale, NJ: Erlbaum.
- Spencer, M. B. (2006). Phenomenology and ecological systems theory: Development of diverse groups. In W. Damon & R. M. Lerner (Eds.), *Handbook of child psychology* (Vol. 1, 6th ed., pp. 829–893). New York, NY: Wiley.
- Spencer, M. B. (2008). Lessons learned and opportunities ignored since Brown v. Board of education: Youth development and the myth of a color-blind society. *Educational Researcher, 37*, 253–266.
- Spencer, M. B., Noll, E., Stoltzfus, J., & Harpalani, V. (2001). Identity and school adjustment: Revisiting the "acting white" assumption. *Educational Psychologist, 36*(1), 21–30.
- Starkey, P., & Gelman, R. (1982). The development of addition and subtraction abilities prior to formal schooling. In T. Carpenter, J. M. Moser, & T. Romberg (Eds.), *Addition and subtraction: A developmental perspective* (pp. 99–116). Hillsdale, NJ: Erlbaum.
- Starlinger, I., & Niemeyer, W. (1981). Do the blind hear better? Investigations on auditory processing in congenital or early acquired blindness I. Peripheral functions. *Audiology, 20*, 503–509.
- Steele, C. M. (2004). A threat in the air: How stereotypes shape intellectual identity and performance. In J. Banks & C. Banks (Eds.), *Handbook of research on multicultural education* (2nd ed., pp. 682–698). San Francisco, CA: Jossey-Bass.

- Steele, C. M., Spencer, S. J., & Aronson, J. (2002). Contending with group image: The psychology of stereotype and social identity threat. *Advances in Experimental Social Psychology*, 34, 379–440.
- Stigler, J., & Baranes, R. (1989). Culture and mathematics learning. In E. Z. Rothkopf (Ed.), *Review of research in education* (Vol. 15, pp. 253–307). Washington, DC: American Educational Research Association.
- Stockman, I. J. (2000). The new Peabody Picture Vocabulary Test-III: An illusion of unbiased assessment? *Language, Speech, and Hearing Services in Schools*, 31, 340–353.
- Suad Nasir, N. I., & Kirshner, B. (2003). The cultural construction of moral and civic identities. *Applied Developmental Science*, 7, 138–147.
- Szyf, M., Weaver, I., & Meaney, M. (2007). Maternal care, the epigenome and phenotypic differences in behavior. *Reproductive Toxicology*, 24(1), 9–19.
- Tate, W. (2008). “Geography of opportunity”: Poverty, place, and educational outcomes. *Educational Researcher*, 37, 397–411.
- Washington, J. A., & Craig, H. K. (1999). Performances of at-risk, African American preschoolers on the Peabody Picture Vocabulary Test-III. *Language, Speech, and Hearing Services in Schools*, 30(1), 75–82.
- Williamson, J. A., Rhodes, L., & Dunson, M. (2007). A selected history of social justice in education. *Review of Research in Education*, 31, 195–224.
- Wilson, E. O. (1998). *Consilience: The unity of knowledge*. New York, NY: Knopf.
- Zajonc, R. B., & Marcus, H. (1984). Affect and cognition. In C. E. Izard, J. Kagan, & R. B. Zajonc (Eds.), *Emotions, cognition and behavior* (pp. 73–102). Cambridge, England: Cambridge University Press.
- Zimmerman, B. J., Bandura, A., & Martinez-Pons, M. (1992). Self-motivation for academic attainment: The role of self-efficacy beliefs and personal goal setting. *American Educational Research Journal*, 29, 663–676.