Chapter XX

Putting the Radical Notion of Equality in the Service of Disrupting Inequality in Education: Research Findings and Conceptual Advances on the Infinity of Human Potential

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Research on disrupting inequality in education can benefit from situating it within the debates on varying and often conflicting meanings of equality and its perils and promises. Especially in the wake of achievement testing and resurgent biological determinism, researchers continue to equivocate between commitment to the idea that all humans are equal in their core capacities versus the tendency to attribute developmental outcomes to differences in “natural” inborn talents and endowments. This chapter examines contemporary research and theorizing to address the tenet of fundamental equality to counter biological determinism laden with mythic racial, gender, and other types of unproven assumptions and biases. Drawing on a wide range of emerging positions and evidence across neurosciences, epigenetics, developmental systems perspective, and cultural-historical framework, the core argument is that all persons have infinite potential - incalculable in advance, unlimited, and not predefined in terms of any putatively inborn “endowments.” This potential is realized in the course of activity-dependent generation of open-ended, dynamic, and situated developmental processes that are critically reliant upon sociocultural supports, tools, mediations, and access to requisite resources, especially through education. An educational policy along these lines would be centrally premised on the imperative to remedy the effects of discrimination and marginalization.

Justice—this is undeniable—is impossible (perhaps justice is the “impossible”) and therefore it is necessary to make justice possible in countless ways.

—Jacques Derrida, quoted in Lawlor (2014)
In 1967, Martin Luther King, Jr. delivered the Invited Distinguished Address at American Psychological Association’s Annual Convention. In it, he passionately called on social scientists to “tell it like it is” and to rise to the challenge of changing society “poisoned to its soul by racism.” In further referencing words “that all men are created equal,” he described these words as truth “lifted to cosmic proportions” (see King, 1968). This call and these words went against discourses, practices, and ideologies, still dominant today, that rationalize inequities of social order, including in education, by appealing to innate, unequal, and largely unalterable individual traits, predispositions, and capacities.

The concept of equality has been employed in education in many ways with apparently infinite quandaries brought up by the question of how to address and conceptualize, let alone achieve equality. Equality is multifaceted, includes multiple overlapping dimensions, and is open to varying interpretations. The complex history of equality as a political ideal and a dimension of social practices infused with struggles for power and access to resources (Anderson, 2007), the ties between educational equality and justice, its implications for protection from discrimination, the relationship between equality and egalitarianism—all of these topics continue to be discussed by philosophers, scholars, policymakers, and educators. Notions that figure prominently in discussions of equality—such as difference, opportunity, privilege, worth, multiculturalism, citizenship, and human rights—add further layers of complexity to these discussions.

The principle of equality cannot be easily reduced to some straightforward formula. For example, stated as an apparently simple idea that learners should receive an equally good education, this principle brings up concerns of whether fairness and respect for diversity are addressed so that the equalization of differences within the present status quo is avoided. It has been noted that any vision of equality defined in merely one dimension might inadvertently create inequalities in other dimensions (e.g., Sen, 1999), and therefore extreme care is necessary in addressing this topic, including avoiding uncomplicated views on parity of opportunities and outcomes. The notion of equality in education is embedded in no less than the perennial problems of how to define the aims of a just society, the mission of education in achieving such aims, and the contingency of these projects on understandings of human development and diversity. It is a social, political, ethical, and economic question at once, and it cannot be addressed outside considerations about the current dynamics, developments, and contradictions in society.

The notion of equality has been somewhat sidestepped in recent educational scholarship. According to Oakes (2005),

> Educational equality is an idea that has fallen from favor. In the eighties we have decided that excellence is what we want and that somehow excellence and equality are incompatible. . . . We got bogged down in conceptualizing what educational equality really meant. (p. xv)

In surveying the topic of equality in education, Nash (2004, p. 375) observed that “the very word ‘equality’ has been all but expunged from contemporary educational policy (with its lexicon of ‘excellence’, ‘choice’, ‘standards’, and ‘efficiency’).” This
view is echoed by Orfield (2014, p. 274), who states that “our central approach in recent years . . . has been to quietly accept segregation and inequality and to try to figure out some things to ameliorate it—money, tests, sanctions, and charters.” He continues to say that this is happening “without [us] really admitting to ourselves that we are now several decades into a process of dismantling civil rights, even as the country changes and the need becomes much more urgent” (Orfield, 2014, p. 274). The ramifications of these gaps in addressing inequality have been drastic (see Kucsera & Orfield, 2014), including that “our children are being reared in contexts that may lead them to believe that social inequality and social divisions are the natural order of things” (Carter & Reardon, 2014).

Many critical and sociocultural scholars who passionately pursue agendas of social justice in education and beyond recently do not favor the discourse of equality as they justly insist on putting a premium on difference and diversity. For example, as Chávez, Nair, and Conrad (2015, p. 275) note in reflecting on what they see as a conundrum of equality, “No matter how it is framed, it is bound to not only exclude people but actively create strategies with which to exclude specific groups of people.” Scholars working in Critical Race Theory have been explicit on this topic, stating that “‘color-blind, or ‘formal,’ conceptions of equality, expressed in rules that insist only on treatment that is the same across the board, can thus remedy only the most blatant forms of discrimination” (Delgado & Stefancic, 2012, p. 8). This work has drawn attention to associations between certain connotations of equality, on one hand, and colorblind racism and denial of White privilege, on the other. In many cases, “an ideological assertion of the fundamental equality of all racial groups—not only in terms of rights, but also in terms of experiences . . . asserts that race-based programs and policies only serve to further solidify racial divisions” (McDermott & Samson, 2005, p. 248; see also Doane & Bonilla-Silva, 2003).

Summarizing these and similar trends, Nash (2004) states that

“critical” sociology of education has abandoned equality of educational opportunity as an imperfect objective, recognising it as one fully compatible with the competitive ideology of liberalism and, in as much as it is not even realised, one that serves principally to sustain the myth of equality in an unequal society. (p. 361)

Indeed, as Sefa Dei, Mazzuca, McIsaac, and Zine (1997, p. 124) have argued, traditional approaches that frame equality based in meritocratic principles “cannot be applied in a society where racial disparities exist, as they are in effect corrupted by social and cultural biases.” Engaging with issues of equality appears to be fraught with contradictions. Darling-Hammond (2007a) aptly observes that

while we bemoan the dramatically unequal educational outcomes announced each year in reports focused on the achievement gap, as a nation we often behave as though we were unaware of—or insensitive to—the equally substantial inequalities in access to educational opportunity . . . (p. 318)

A similar paradox is recorded by Orfield (2014, p. 274), who writes that “although it is very clear that educational success is related to family resources, peers, and teacher
experience and skills, and all of those are related to race, those issues have been largely ignored.”

However, there is a risk in dismissing the discourses and the matters of equality including through associating them with meritocratic conceptions only. Ideals of equality have stood for social justice, fairness, and antiracism in moral, political, and economic terms, especially since the Civil Rights movement. These ideals and ideas might turn out to be useful especially in the present climate of growing racial and class-based disparities, divisions, and inequalities. Indeed, issues of segregation and inequality are now more prominently back on the cultural and policy agendas after a protracted period of neglect. This dynamic is reflected in major policy documents such as the World Economic Forum Report aptly titled “Why inequality is 2015’s most worrying trend” (Mohammed, 2014). As stated in the recent symposium at the American Educational Research Association meeting (Eaton & Black 2016), “After decades of near silence, high-impact media reports have shone new light on racial segregation in schools and neighborhoods as a driver of inequality and social division.” In the changing political and socioeconomical situation, it is important to revive discussions on what equality is, what it stands for now and could stand for in the future.

Moreover, a renewed focus on the topic of equality is warranted because rather than ameliorating background inequalities, the U.S. educational system may be exacerbating them in reversing previous gains through policies that disenfranchise populations of color and the poor (Darling-Hammond, 2007a; Orfield, 2014). There is a pressing need for the new, concerted efforts at disrupting inequality including through novel and bold approaches to conceptualizing equality. As Gary Orfield (2014) has powerfully argued,

We need a new civil rights agenda. . . . Our challenge now is to create a vision appropriate to our society in this century. This is the work of this generation, and it will involve creating new understandings of the forces that create and sustain unequal opportunity and expanding the definition of basic rights so that it works in transformed context. (p. 276; italics added)

The purpose of this chapter is to join in with the efforts currently underway to renew the hard work involved in the ongoing struggles for radical democracy including efforts to understand how ideals of equality might be implicated in disrupting inequalities in public debates, policies, research, and practices in education. This social justice work can only be done in combination with a recognition and respect for difference and plurality and an acknowledgment of systemic inequalities, power differentials, and persistent effects of structural discrimination. Such an approach would avoid connecting equality with traditional universal discourses that homogenize differences and hide inequality by taking the current status of groups and individuals as a measure of where they somehow should be. Instead, the topic of equality has to be placed alongside discourses of social justice, struggles against discrimination, and respect for diversity.

One of the layers of this work, as suggested in this chapter, is to contest the still prevalent and deeply entrenched, biologically reductionist beliefs in presumably fixed
and rigidly defined (“hardwired”) “natural endowments.” These “natural endowments” are understood to be somehow conferred on people from birth and to have the power to unidirectionally shape and limit prospects for performance, achievement, and even future roles and status in society. These beliefs have historically emerged from and continue to support discriminatory and racialized practices, discourses, and policies and thus, represent a serious obstacle to disrupting inequality across all of these layers. As will be discussed in the next section, even though the attribution of differential capabilities, achievement potentials, and natural talents across social groups has been thoroughly discredited, and attempts to find a gene or a set of biological markers implicated in developmental outcomes have failed, appeals to natural endowments and differential talents as explanations of inequality continue to persist. These biologically reductionist views continue to make “nature herself” a de facto accomplice in the crime of political inequality (see Gould, 1996). Increasingly influential, they have been in part spurred by progress in genetic and brain research which is often applied uncritically to interpret human behavior and social inequalities (examples to be reviewed in the next sections). This trend, at least in part akin to a resurgence of eugenics according to some estimates, needs to be resolutely contested and disrupted as part of the struggle for equality and social justice. Doing so is one of the ways to support the work of those scholars in education who advocate broad causes of equality and social justice yet often lack expertise in human development (including biology, genetics, neurophysiology, and neuropsychology; see Lickliter & Honeycutt, 2003a) to resolutely break with the biological reductionism that stands in the way of radically disrupting inequalities.

The main message to be developed in this chapter is that given the recent progress in developmental sciences amounting to no less than a conceptual revolution (e.g., Lickliter & Honeycutt, 2003a) that has “swept away old ways of thinking” (Thelen, 1995, p. 80), there is a need and a possibility for a renewed emphasis on equality as a fundamental feature of human development. The advances across a number of disciplines applicable to the problematic of equality (surveyed in the next sections) have to do with a growing acknowledgment that human development is not rigidly constrained from the outset by any biologically determined factors. Instead, development is a transactional, nonlinear, historical, contingent, and dynamic process in which patterns and phenomena (including any and all capabilities and “talents”) are dynamically generated rather than evolved according to some inherited programs or blueprints. In this process, there are no programs or instructions determining development and no “biological givens” (such as genes or brain structures) that could unfold or mature, on their own and outside of the context and the process of development, to produce developmental outcomes. This position implicates understanding human capabilities to be the emergent results of an open-ended, nonlinear, contingent, and de facto limitless (i.e., unidentifiable in advance) process of development rather than these capabilities being contained in any biological “givens” existing prior to development.

In drawing on this conceptual revolution and expanding its achievements to the topic of equality, the implication can be drawn that all students have unlimited
potential (in the sense that it is not inherently limited from the outset and cannot be calculated or defined in advance) to learn with no rigidly preimposed "natural" constraints or ceiling. Therefore, although each student is individually unique and her or his development requires varied interactive supports and mediations, including access to requisite educational resources and tools, students are equal precisely in the incalculable and immeasurable infinity of their potential.

TRADITIONAL APPROACHES: THE PERSISTENT DANGERS OF BIOLOGICAL DETERMINISM

Many researchers in education have been critical about biologically reductionist explanations of development and achievement outcomes, especially those with racist implications (e.g., as in the infamous book by Herrnstein & Murray, 1994; for a critique, see e.g., Darling-Hammond, 2007b). For example, a strong contribution to this critique has been made by scholars in the fields of disability and special education advancing egalitarian, inclusive, and social justice–based approaches (e.g., Gabel & Danforth, 2008; Smagorinsky, 2016). In dispelling these views, many critical and sociocultural scholars in education and beyond accept what has been termed "an interactionist view" (see details in the next section)—namely, that it is both biology and culture (nature and nurture) that play a role in development and learning. Yet believing that a wide consensus has been reached on this topic is at best premature because this interactionist view in fact hides many nuances and conundrums, including a residual reliance on taken-for-granted assumptions about fixed and inert biological bases for academic achievement, intelligence, talent, potential for learning, and other capabilities relevant to schooling. These assumptions have played a major role in psychology and continue to thrive despite their troubled history, the myriad of conceptual, methodological, and analytical conundrums they entail and their sociopolitical, legal, ethical, and policy implications. For example, as Lynch and Lodge (2002) observe,

Even a cursory analysis of psychological research on education indicates that what constitutes ‘ability’ is a hotly contested subject. . . . While the IQ-generated view of ability [with biologically-based assumptions prominent in such a view] has been largely discredited by developmental psychologists, . . . the concept of fixed and immutable intelligence has a strong hold in public consciousness, including that of teachers. (p. 64)

The power of biologically reductionist concepts is evident in the pervasiveness of so-called “ability” groupings and tracking in schools based in presumably inborn and immutable talents and achievement potentials (see Oakes, 2005). It is directly present in that “recurring explanations of educational inequality among pundits, policy makers, and everyday people typically blame children and their families for lack of effort, poor child rearing, a ‘culture of poverty,’ or inadequate genes” (Darling-Hammond, 2007a, p. 320).

The biologically based explanations have become prevalent in recent decades when neuroscience has experienced rapid growth, especially since the 1990s (designated as “The Decade of the Brain”) and the arrival of neuroimaging techniques (e.g., Varma,
McCandliss, & Schwartz, 2008; Willingham & Dunn, 2003). Practically during the same period of time, progress in mapping the human genome has reawakened interest in using genetic technology to examine differences in complex outcomes such as health and intelligence across demographic groups and populations (Anderson & Nickerson, 2005). The mapping of the human genome, including efforts to define human genetic diversity, has even reawakened the debates of whether genetics can be used to define race (Collins, 2004). These parallel developments have led to increased financial support and prioritized funding for brain and genome research, propelling efforts to explore genes, neurons, and brain regions as often the ultimate and the only level to explain human development and learning. As many scholars have observed,

There is a growing trend among behavioral scientists (particularly psychologists) to view more and more of human behavior as in large measure attributable to our genes. In the old debate of “nature versus nurture,” nature now seems to have regained the ascendancy. (Charney, 2008, p. 299)

These effects extend far beyond the confines of science so that “there is growing consensus in popular culture that by understanding genes [or brain] . . . it is possible to understand all of life, including human nature” (Lickliter & Honeycutt, 2003a, p. 819).

However, given the recency of advances in both human genome research and neuroscience, which are actually both still in their infancy (or in adolescence, according to Miller, 2008), much remains to be figured out in terms of how to interpret findings from these fields while unpacking the many philosophical, theoretical, ethical, and conceptual conundrums they entail and are based in. Often there is a tendency to jump to unwarranted conclusions (Reardon, 2015) and sensationalist reporting. The public is often presented with the neuroimaging findings without explanations of the limitations, contingencies, and complexities of research behind these findings, which leads to misinterpretations (see Racine, Bar-Ilan, & Illes, 2005). What remains invisible, for example, is the growing concern among neuroscientists themselves that this field needs to confront many problems, including its core methodological limitations, in order to increase its scientific rigor (Miller, 2008). For example, Shifferman (2015) surveys a vast body of literature suggesting that much research is still needed on both a consensual framework for studying cognition and on a unified theory of how the brain works.

Misinterpretations include notions such as that students are hardwired for achievement, that they have genes for certain types of performance (e.g., in mathematics), and certain levels of intelligence and talent that are somehow biologically and genetically determined from birth. The underlying belief is that quantities definable as “intelligence” or “talent” exist and that they can be reliably measured such as with “IQ tests.” As Cooper (2005) observes, this erroneous assumption is combined with beliefs that molecular genetics can (or will) make it possible to define the architecture of complex traits in terms of “genes for X or Y” (including “genes for intelligence”) and that significant variation in polymorphisms in those genes overlap with the traditional demographic categories. This assumption is sometimes further combined
with equally erroneous beliefs that human population can be divided into demographic groups known as “races” as discrete categories on the basis of genetically determined traits, even though this position that has been repeatedly debunked (e.g., Graves, 2001).

Similar beliefs that the brain research can explain all of life including learning potential and achievement also prevail and extend beyond common culture into education research and public policies due to their strong intuitive appeal (see McCabe & Castel, 2008; Weisberg, Keil, Goodstein, Rawson, & Gray, 2008). It is quite telling that the term “neuromythologies” has been coined to describe “a misunderstanding, a misreading, and in some cases a deliberate warping of the scientifically established facts to make a relevant case for education or for other purposes” (Organization for Economic Cooperation and Development, 2002, p. 71; see also Fischer, Goswami, & Geake, 2010). Common neuromythologies include sweeping statements such as about “10% brain usage,” “left- and right-brained thinking,” and “female versus male brains.”

The biologically determinist beliefs fly in the face of a lack of evidence for neuronal or genetic bases for any complex behaviors and psychological processes. For example, MacLeod (2010) sums up evidence about how not even elementary processes such as color perception are presently understood in their neural foundations. Remarkably, even the perception of a continuous vertical line is a mystery that neurology has not yet solved (see Mausfeld, 2012). Furthermore, no gene has yet been conclusively linked to intelligence or any other complex ability, and no findings of this sort are even on the horizon. At the present time, very little is known even about the genetic component of diseases of complex causation and the genetic variants that predispose persons to common chronic diseases, let alone complex behaviors, mental processes, and psychological traits (e.g., Kaufman & Cooper, 2001).

Importantly, intelligence and other constructs such as talent do not stand for discrete entities and at best refer to multiple types of cognitive functioning that are manifested differently depending on a myriad of circumstances (for a recent discussion, see Howe, 2015). Drawing on Anastasi (1984), Howe reminds that there is no effective way to isolate developed cognitive capacities from access to opportunities and other factors influencing human development, and no educational test can measure natural or innate talent. The conclusions reached by Gould (1996, p. 60)—“that determinist arguments for ranking people according to a single scale of intelligence, no matter now numerically sophisticated, have recorded little more than social prejudice”—still stands out in force.

Relevant in this context is also that the widely reported estimates of heritability of intelligence and other complex social behaviors drawn from behavioral genetics often obscure the degree to which these estimates may encompass environmental mediation (e.g., Stenberg, 2013). The field of behavior genetics that produces heritability estimates based in adoption design is fraught with conceptual and methodological flaws in its core procedures (e.g., Burt & Simons, 2015; Charney, 2012; Joseph, 2010; Richardson & Norgate, 2005). Moreover, although the term “heritability” evokes a connection through transmission of genes between parent and offspring, its technical meaning involves no reference to measurable genetic factors (Taylor, 2007).
and “the only practical application of a heritability coefficient is to predict the results of a program of selective breeding” (Wahlsten, quoted in Joseph, 2010, p. 558).

In this light, the persistent attempts to find a neuronal or genetic foundation of intelligence and talent and especially to link them and other complex processes to race are not only not feasible (Sternberg, Grigorenko, & Kidd, 2005) but based on such a mix of untested and improbable assumptions that they should be considered misguided and misleading at best. Most critically, such research dismisses the role of institutionalized racism and other forms of discrimination in shaping the structural constraints affecting development (Cooper, 2005). The same argument can be made about brain research into presumed gender-related differentials in achievement, intelligence, talent, and other capacities.

Many scholars including neuroscientists and genetics researchers have sounded alarm about overinterpreting and exaggerating implications of brain and genetic research for education research, policies, and practices (for an overview, see Shifferman, 2015; Varma et al., 2008). A number of leading scholars who signed the Santiago Declaration (Hirsh-Pasek et al., 2007) have cautioned against careless claims both within scholarly debates and in the political discourses echoed in the public media coupled with irrational exuberance regarding immediate relevance of neuroscience to education. As Lee (2010) observes, “One worrisome development is the current tendency to use studies of brain imaging and structural functioning to cast children and adolescents from low-income backgrounds as having deficits” (p. 646).

Yet despite all cautionary comments and warnings, the consolidation of the biologically determinist views continues in “a growing trend among behavioral scientists . . . to view more and more of human behavior as in large measure attributable to our genes” (Charney, 2008, p. 299) or to brain processes. This trend recently amounts to a powerful new “grand synthesis” (Stetsenko, 2008) implemented and often imposed across a wide spectrum of social practices, policies, and discourses including in education. This dominant research orientation has been characterized as the “resurgence of extremist biological determinism laden with mythic gender [and other types of] assumptions” (Morawski, 2005, p. 411). Such an unequivocally condemnatory assessment is justified in view of a long and troublesome history of biologically based research, especially on genetically based racial and ethnic group differences (Guthrie, 1998; Tobach & Rosoff, 1994; Winston, 2004; see also Anderson & Nickerson, 2005) that continues under old and new guises till today. As Winston (2004) writes,

Even after a century of severe criticism, discussions of the size of Black versus White brains still appear in psychology journals, race is still treated as a set of distinct biological categories, and racial comparisons of intelligence test scores are still presented as meaningful scientific questions. (p. 3)

According to Allen (2001), we are presently facing no less than a return of eugenics as a means of social control. The term “eugenics” was introduced in the 19th century by Francis Galton to describe a program of selective breeding which, in his view, was “supported” by “experiments” on testing for a racial hierarchy of human capacities (Winston, 2004). Galton sought to demonstrate that Africans were of
“lower intelligence” than European Whites. Both in the United States and Europe, eugenics thrived on the fears fueled by racist associations, dramatically influencing discriminatory policies on education, immigration, and mental health (Tucker, 1994). Alarmingly in the extreme, some of the recent developments in research on biological bases of human development bear similarity to what was happening in the 1920s and against the same background of deep economic crisis, bitter anti-immigration sentiment, and social upheaval (Allen, 2001). Other authors echo this assessment in exposing the rise of eugenics across history, again in evidence today, reflecting the power of persistent genetic essentialist biases in sciences and societies (Darnimrod & Heine, 2011). For example, as Smedley and Smedley (2005) state,

Recent advances in the sequencing of the human genome and in an understanding of biological correlates of behavior have fueled racialized science, despite evidence that racial groups are not genetically discrete, reliably measured, or scientifically meaningful. (p. 16, italics added)

Appeals to unalterable biological underpinnings of human attributes have grave social consequences and negative policy implications for how people are treated and how social resources are distributed. As aptly summarized by Haslam (2011), the common thread of both neurological and genetic essentialisms is the tendency to deepen social divisions and promote forms of social segregation, “making differences appear large, unbridgeable, inevitable, unchangeable, and ordained by nature” (p. 819). Essentialist thinking attaches, he argues, to the same social distinctions that are the focus of the most troubling forms of prejudice and discrimination along the dimensions of race, gender, sexuality, and what is defined as mental disorder or disability. The most pernicious applications include the rationalization of unequal treatment of different groups and segregation of minorities.

There is a need to be extremely vigilant about assumptions concerning the role of biological dimensions in human development, such as genetics and neuronal processes, that might lead to conclusions that some humans or even ethnic groups are somehow superior to others in skills, talents, intellectual capacities, or moral worth. Extreme caution is necessary because, as Cooper (2005) sums up is stark and uncompromising terms,

For the last four centuries Western science has been obsessed with the need to justify White privilege and in so doing has provided crucial support for racist ideas in society at large. To use the rhetoric of science to sell the idea that historical inequity should be embraced as biological inevitability is an insult to those who value a common humanity. (p. 75)

MOVING BEYOND THE “INTERACTIONIST CONSENSUS”: IMPLICATIONS FOR DISRUPTING INEQUALITIES IN EDUCATION

The serious flaws and risks associated with biologically based explanations of developmental outcomes bear direct implications for research on and theorizing of equality with the goal of disrupting inequalities in education. Speculations about biological
and largely innate (inherited) bases of human development and differential capacities are almost always recruited to provide a justification for social and educational inequalities within the status quo, including existing privileges for certain groups according to race, class, and sex. Biological idioms have been recruited to reify social constructs of race, gender, and class as immutable natural phenomena, and to warrant the acceptance of disparities including in education on these bases as if they were somehow natural (e.g., Eisenberg, 1995; Hruby, 2012). Such approaches consistently stifle diversity in disadvantaging poor and minority students (e.g., Darling-Hammond, 2007a) and legitimizing their purported “deficiency” (e.g., Ladson-Billings, 2006).

To continue with appeals to differentials according to “human nature” as somehow a rationale for inequality is unsustainable and unethical. Even Charles Darwin—under the limits of his era and his elitist social status—was prescient enough to make a conjecture that “if the misery of the poor be caused not by the laws of nature, but by our institutions, great is our sin” (quoted in Gould, 1996, p. 19). Early in the 20th century, Walter Whitman challenged what he described as “aristocratic tradition which tends to rationalize inequities of our social order by appealing to innate and unalterable psychological strata” (cited in Danforth, 2008, p. 47). Today, on the grounds of new advances in developmental sciences, to be reviewed in this section, it is well past time to unequivocally acknowledge, in the face of the obvious, that indeed poverty and inequality are not the results of nature and, even more importantly, that our sins as society are indeed truly great.

The recent advances in biological and developmental sciences, including psychology, can be recruited to resolutely dispel the harmful stereotypes, mythologies, and misguided generalizations about genetic and brain determinism in application to the problematics of disrupting inequality in education. Although not much research has yet endeavored to connect these advances to matters of equality in education, the time is ripe for such efforts. Recent attempts, albeit from differing positions, include works by Howe (2010, 2015) and by Ceci and his colleagues (e.g., Ceci & Papierno, 2005; Ceci & Williams, 2010). Both lines of works recruit recent advances in developmental sciences to explore and interrogate conceptions of equality in education especially in their connection to the concept of talent. In the second line of these works, however, the assumption about “natural talents” is not challenged even though the authors admit that their “evidence of innate talent is purely theoretical” (Papierno, Ceci, Makel, & Williams, 2005). The works by Howe are more radical in that they do challenge the dogma of natural talents specifically in the context of discussing equality in education.

As Howe (2015) demonstrates, the dominant conceptions of educational equality continue to rely on individual “natural” talents as if these talents were well defined, could be taken for granted and even measured or otherwise used in predicting and explaining educational outcomes. Furthermore, the meritocratic conceptions presuppose that “natural talent” can be isolated from structural factors related to ethnicity, gender, and social class along the lines of existing privileges. The idea of natural talents is fundamental to the meritocratic conceptions because differences in natural talents are believed to explain and justify inequalities, although no support for defining
natural talents exists or is even on the horizon. Howe (2015) has challenged appeals to natural talent to explain differential performance in relying on suggestions and evidence that “nurture does much, much more to explain differences in performance than nature does, including in cases of individuals whose performance is so extraordinary that intuition strongly supports recourse to natural talent as the explanation” (p. 185). Quite boldly, he argued that “as such, natural talent is a myth working hand in glove with an ideology in Mills’s sense of a ‘set of group ideas that reflect, and contribute to perpetuating, illicit group privilege’” (p. 183).

Howe (2015) does not aim to establish the strong claim that natural talents do not exist. Instead his claim is that

to the extent that natural talents exist, they can manifest themselves only under conditions favorable to their development. Thus, to the extent that they do exist, over time they become thoroughly melded with nurture—which, we now know, begins in the womb. (p. 186)

His related conjecture is that the distribution of measured levels of natural talents so overlaps with the distribution of measured levels of performance that “no credible inference can be made in individual cases from a given level of natural talent to a corresponding level of performance” (p. 186).

In sharing the main thrust of Howe’s arguments, there are ways to further expand critique of the myths about “natural talents” based in works in biological and developmental sciences that are moving, in truly radical ways, beyond many traditional assumptions in opening new horizons in research and theorizing about human development. In particular, one line of recent research shows that contrary to the long-standing stereotypes, brain structures are neither rigidly preformed (“wired”), nor unidirectionally driven by maturation. Instead, brain structures and patterns of neural activation are constructed within development dynamics and in relation to individual experiences and learning (e.g., Gottlieb, 2003). In a related vein, many researchers recently caution that the brain is not a separate organ but is part and parcel in activities of organisms as a whole (e.g., Fox, Levitt, & Nelson, 2010; Nelson & Luciana, 2001). Neural plasticity, in particular, is used to refer to processes that involve major connectional changes of the nervous system in response to experience (e.g., Huttenlocher, 2002; Kolb & Gibb, 2011; Li, 2009, 2013). The dominant view throughout the 20th century (with few exceptions such as Luria’s works) was that the adult human brain is organized in fixed and immutable function-specific neural circuits. The discovery of the profound plasticity of the brain in the late 1990s has overturned this canon (cf. Li, 2009; Rees, 2010; Stetsenko, 2003).

This work highlights the property of neural circuits to potentially acquire nearly any function depending on the vicissitudes of individual ontogenetic development. This approach is further aligned with the notions of neuroconstructivism or “interactive brain specialization” that highlight activity-dependent nature of brain development (Johnson, Grossmann, & Cohen-Kadosh, 2009). Thus, neuroscience is moving in the direction of revealing how pliable something as presumably genetic as intelligence can be (e.g., Hruby, 2012). Findings pertaining to brain plasticity (likely linked
to an evolved under-specialization of brain circuits in humans at birth; see Moss, 2006) suggest that there are no predetermined ties of these circuits to specific sensory or motor functions. As a result, the brain is able to acquire a wide range of noninnate skills, including those linked to the use of cultural tools such as language while interacting with and learning from others (see works that use the Tools of the Mind approach by Bodrova & Leong, 2007; e.g., Diamond, Barnett, Thomas, & Munro, 2007). Importantly, these processes occur long past the supposedly critical first years of life. The idea of brain plasticity and the premise that the growth of neural connections across the life span is highly contingent on individual experiences, cultural mediation, social exchanges, and teaching–learning was the singularly most important hallmark of Luria’s (1973) approach. In summary, current evidence indicates that, in response to different types and aspects of experiences (e.g., activity, learning, or task demands), the brain develops and exhibits multiple forms of plasticity, allowing for it to adapt to various forms of experiential tunings (see Li, 2013).

These significant shifts in neuroscience parallel developments in genetics that are now also moving past the impasses of biological reductionism. As recently expressed by Charney (2012), for example,

[T]he science of genetics is undergoing a paradigm shift. Recent discoveries . . . are challenging a series of dogmas concerning the nature of the genome and the relationship between genotype and phenotype. According to three widely held dogmas, DNA is the unchanging template of heredity, is identical in all the cells and tissues of the body, and is the sole agent of inheritance. (p. 331; italics added)

In dispelling these long-standing stereotypes, Charney (2012) draws on a vast literature to show how

[r]ather than being an unchanging template, DNA appears subject to a good deal of environmentally induced change. Instead of identical DNA in all the cells of the body, somatic mosaicism appears to be the normal human condition. And DNA can no longer be considered the sole agent of inheritance. (p. 311)

These and similar discoveries in molecular biology and its branch known as epigenetics have spurred much research and theoretical developments, influential especially since the 1990s, including evolutionary developmental biology (known as “evo-devo”) and development systems perspective (known as DSP; see, e.g., Lerner, 2006). The latter perspective (of more relevance for the present discussions), furthermore, is composed of various strands of approaches often described as the developmental systems theory and dynamic systems theory (for recent overviews, see Lickliter & Honeycutt, 2015; Witherington, 2007). Some differences among them notwithstanding, all of these approaches are united in emphasizing the complex systemic relations among multiple levels (both internal and external to the organism) that give rise to behavioral and biological traits (Gottlieb, 2003; Oyama, 2000). That is, the core idea shared by the various forms of DSP is that all biological and behavioral traits emerge from the interactions of a large number of factors that together constitute a developmental system and cannot be regarded in isolation (Oyama, Griffiths,
& Gray, 2001). Thus, a wide range of epigenetic processes (i.e., those above the level of genes) contribute to individual development and therefore, no prediction of outcomes is possible before the actual development of the organism runs its course. This approach is focused on process and developmental character of the links among genes, behavior, and the multiple levels of the extra-organism context, the social and physical ecology of development (e.g., Keller, 2010).

The special privileges assigned to genetic factors as if genes could mechanically encode programs or instructions that predetermine (from the start of life on) the development of traits and behaviors are thus rejected. Instead, the conjecture is that all levels of developmental system reciprocally influence each other and there is a multidirectional and probabilistic causation that is top-down as well as bottom up (e.g., Robert, 2004). As Lickliter and Honeycutt (2013, p. 186) summarize, “Combinations of genetic, hormonal, neural, physiological, behavioral, and social mechanisms act synergistically as a system from which behaviors emerge and are maintained within and across generations.” A number of frameworks such as bioecological model (Bronfenbrenner & Ceci, 1994), developmental contextualism (Lerner, 2006), developmental psychobiological systems view (Gottlieb, 2003), relational metatheoretical framework (Overton, 2006), and models based in multiplier effect (Dickens & Flynn, 2001) offer similar or complementary views.

Many of these findings are often interpreted in the sense that it is both biology and culture (nature and nurture) that shape the course of development and its outcomes. However, these broad statements, recently disseminated and praised as the resolution on the topic, still often hide many important distinctions and conceptual specifications that are in fact far from resolved. There are many nuances that have to be carefully disentangled in these approaches in order to avoid the paradox of “consensus” that hides actual tensions and contradictions. In particular, despite the proffered “interactionist consensus” stating that genes and environments interact in the generation of individual traits, reciprocal influences of sociocultural contexts on neurobiological mechanisms are rarely considered (Li, 2009). Moreover, it is not uncommon that alongside statements about gene–environment interactions, debates continue as to the relative power of each of these entities to contribute to developmental outcomes, often falling back into what has been termed “genomania” (Robert, 2004, p. xiii; see also Oyama, 2000).

One of the core conundrums appears to be that nature and nurture continue to be viewed as independent, if even not mutually exclusive, processes and resources of variation and influence on development. That is, “interaction itself is generally conceptualized as two split-off pure entities that function independently in cooperative and/or competitive ways” (Overton, 2006, p. 33). As Overton (2006) further states, relying on works by Anastasi and Lehrman, “despite overt conciliatory declarations to the contrary, the classical which one and how much questions . . . continue as leading divisive frames of inquiry” (p. 33). The consensus that “nature and culture interact” does not do enough to override traditional ways of thinking. As Oyama (2000) commented, it is extremely hard to relinquish
a way of thinking about the role of genes and environment in ontogeny that ensures that we will continue to find ways to carve up the living world into innate and acquired portions, no matter how vociferously we declare the distinction to be obsolete.” (p. 21)

In this light, it is important to continue exploring the radical implications from the DSP and related frameworks including those that question the binary itself between nature and culture, genes and environment, and external and internal processes. One of such implications is a shift away from additive notions of “gene-plus” environmental models that portray development as an unleashing of endowments that are erroneously supposed to be “always already there in the genome” (Robert, 2004, p. 397) to be merely triggered by environment. The works on epigenetic developmental dynamics pioneered by Oyama et al. (2001) emphasize how developmental processes and outcomes are emergent within developmental processes rather than transmitted in advance of development. They call these the “cycles of contingency,” because the ensemble literally creates itself through reiterative activity. What is at stake is a “constructive interactionsim” (Oyama, 2000) that renders impossible any prespecification of traits, characteristics, or behaviors, including psychological processes in even their “skeletal forms.” In this emphasis, genes are placed within a coacting, dynamic system of relations among the multiple levels of organization that comprise the ecology of human development (see Lerner, 2006).

One of the stunning conclusions is that “whatever developmental potential there is resides not in genes or in other developmental resources but rather emerges from their synergistic interaction” (Robert, 2004, p. 397) so that genes do not preexist developmental process and are instead themselves generated by it (p. 74). An eloquent formulation of this position is that “one way of beginning to think about epigenetics is to realize that the genome, as much as the organism, is a process rather than a static thing” (Dupré, 2012, p. 3). A remarkable implication from this position is that any behavior or psychological process is “fully a product of biology and culture” (Lickliter & Honeycutt, 2003b, p. 469) and what counts as “biological” falls entirely within the domain of what counts as “cultural” and vice versa (see Ingold, 2011). This was (almost verbatim) the position spelled out by Vygotsky (1993; for a discussion, see Stetsenko, 2009).

In this light, the gene-centric and nativist explanations currently serve to hinder understanding of developmental outcomes including school-related achievements. As Lickliter and Honeycutt (2013) argue in uncompromising terms, To describe a behavior pattern as innate (or genetically determined) is in fact a statement of ignorance about how that trait actually develops. (p. 185)

Attempts to identify traits that are innate versus acquired are both meaningless and invalid. A belief in innate traits reflects a commitment to preformationism and ultimately, mysticism. (p. 186)

Another remarkable implication currently on the cutting edge of developmental systems perspective is that development is not only nonlinear, transactional, and probabilistic but also, and importantly, a self-organizing process contingent on experiential history and activities of the individuals themselves. The focus on activity- and
experience-dependent character of development is compatible with holistic, ecological frameworks that identify development with the pathways of individuals active engagement in the world (e.g., Ingold, 2008, 2011; Thelen, 2000, 2005). This focus is also in sync with an acknowledgment that because organisms are not passive, the context in which they act has the features it does in part precisely because of these very organisms’ behaviors (e.g., Lewontin, 1995). That is, both individual and environmental characteristics continuously emerge in the life course, while codefining and generating each other in the very process of developmental transactions, rather than them existing independently. This approach builds on important insights from earlier works by Ethel Tobach, Theodor Schneirla and Daniel Lehrman according to whom, “the interaction out of which the organism develops in not one, as is so often said, between heredity and environment. It is between organism and environment!” (Lehrman, 1953, p. 345; emphasis in the original). Esther Thelen (2005) has championed this line of research in developmental psychology suggesting that “development is . . . the product of the child’s everyday and continual efforts to make things happen in the world” (p. 263; italics added), rather than a process that is predetermined and preprogrammed by any initial conditions “set in place” at the start of development.

This line of work can be strengthened by integrating conceptual breakthroughs made in the 20th century by John Dewey, Jean Piaget, and Lev Vygotsky, among others, in developing a relational and activity-based approach. Dubbed “the second psychology,” this broad framework was focused on people in relation to their world in distinction from the “first psychology” concerned with isolated individuals (Cahan & White, 1992). The core of this approach (still to be fully integrated into the DSP, see Stetsenko, in press) is that human beings are understood to be carrying out, right from birth, the ongoing process of relational activities inextricably connecting them with their environment and other people. It is these activities that constitute the irreducible reality of development that supersedes the dualisms of outside and inside influences (Vygotsky, 1997). This relational approach can be interpreted in the sense that not only do genetic and environmental factors (nature and nurture) interact or mesh with each other in contributing to development, but that people themselves play an active role in organizing and orchestrating their own engagements (activities) with the world in thus critically contributing to and generating their own development.

The focus on human beings coactively constructing their own development in interacting with the world including other people was especially prominent in cultural–historical activity theory by Vygotsky (e.g., 1997) and his followers. In integrating this perspective and insights from the DSP, development can be understood as an emerging activity that undergoes constant changes during the life course and gives rise to psychological processes and complex traits (for details, see Stetsenko & Arievitch, 2010). Moreover and quite critically, this is not a solo activity by an isolated organism. Instead, this activity itself is embedded within larger activity systems (i.e., social practices) and critically reliant on interactions with others, mediation by cultural tools, and access to social resources (cf. Gutiérrez & Rogoff, 2003). The difference between this position and the additive approaches is tacit but significant
because the former moves beyond the concept of development as being an additive, hybrid product with a focus on a confluence of factors understood as extraneous to activities, whereby genetic and environmental influences are thought to interact or even mesh together yet are taken to be independent of activities by human beings themselves (see Stetsenko, 2009, 2016).

As an illustration (in expanding on Lickliter & Honeycutt, 2013), explanations of any normative or nonnormative behavior, from alcohol abuse to exceptional abilities (e.g., “talent” in mathematics) can never be reduced to genetics or the brain processes. Instead, these explanations must draw on the whole developmental system including its resources internal and external to the organism that contribute to the emergence of these behaviors and traits. This system includes experiential history of each individual (starting with the prenatal or early postnatal nutrition, exposure to harmful substances, etc.), family histories and practices, and the contextualized and situated activities each human being is included in from the start of life—in the full complexity of their structural organization, relational composition, social norms, cultural affordances, tools, and so on. Importantly (in expanding on the emphasis on resources as such, which is still central in the DSP), this understanding includes analysis into how developmental resources are made use of and enacted by persons themselves in the dynamics of activities they carry out. Attention to how the resources are made use of entails analysis into processes such as meaning making and motivational reasons for engaging or abstaining from particular pursuits (see Leontiev, 1979), with amount of practice the person engages in often serving as the strongest predictor for exceptional abilities (Ericsson, 2014).

The emphasis on joint determination by multiple causes, contextual sensitivity, and contingency, and on development as activity-dependent, emergent co-construction of developmental outcomes by human beings coacting with others (in relying on available cultural resources) undermines any claims that inborn talents, cognitive modules, or even skeletal innate mechanisms preexist individual development and lie dormant awaiting activation under certain conditions. It also provides a complex and contingent model for understanding nature and nurture as one process—that of literally “natureculture” composed of collective social practices that are contextually embedded, culturally mediated, interactively accomplished, and continuously extending through history. Therefore,

Development . . . does not just happen to people—it is a collaborative and creative accomplishment, a process that comes down to work and effort within and through collective social practices and their affordances and mediations, as well as obstacles and contradictions, as these are created by people collaborating [co-acting] in together agentively enacting these very practices. (Stetsenko, 2016, p. 257)

How society provides conditions for or, alternatively, deprives individuals of access to participating in social practices and their resources necessary for their development is therefore of critical significance.

From this point of view, all human beings have infinite potential that is not pre-defined and, therefore, incalculable and unidentifiable in terms of any preconceived
(hardwired) inborn “endowments.” Moreover, this potential is only realized in the course of development which does not happen in a vacuum but instead, is critically reliant upon sociocultural supports, tools, and mediations. This conjecture implies that the requisite cultural mediations and supports (broadly understood to include educational opportunities, incentives, cultural tools, spaces, and other resources), tailored to the needs of each individual, must be made accessible and available to all individuals and communities—including through teaching–learning tailored to their needs and requirements. An educational policy along these lines would be centrally premised on the need and the imperative to remedy effects of discrimination and marginalization especially for students from historically underrepresented groups and to eliminate structural social injustices that lead to such effects.

The premise of fundamental equality does not negate that each person is, at the same time, individually unique. That is, the notion of equality does not imply that we are born as “blank slates,” which is a straw person position that distorts relational and dynamic approaches. Instead, what is implied is that whatever is present at the start of life is present in the form of a dynamic, developmental potential—a process that will undergo continuous transformations with no predetermined outcomes since these outcomes emerge from development itself (including through extended brain–body–behavior networks; see Byrge, Sporns, & Smith, 2014), realized in and through ongoing, interactive, situated, and open-ended activities and interactions. This potential, therefore, needs to be actualized by individuals themselves, as a unique “achievement” (with no connotations of either finality or predetermined norms) of togetherness, while being supported with access to requisite conditions, tools, and interactive resources. Although individual differences exist and are especially pronounced by the time children get to school, these differences result from complex activities within the environment and are thus contingent on what the environment has or has not offered by way of cultural mediation and support. Because development and learning are thoroughly contingent on activities mediated by social interactions and supports provided by society, no biological endowment (natural predispositions) can be evoked to account for, let alone justify, failure or success in development and learning by either groups or individuals. How these notions of individual uniqueness, fundamental equality, and social justice—that is not color-blind and does not ignore structural inequalities and their histories—can be reconciled should be a topic of extended debates.

CONCLUSIONS

As discussed in this chapter, the argument about humans having infinite, and therefore equal, potential at the start of life—not the same as in exactly a replica of each other, but equal precisely in its infinity and its open-ended character—is supported by scientific discoveries and advances of recent years in various research areas, from biology and epigenetics to neuroscience and developmental psychology. These discoveries and advances testify to the malleability of genetics, the practically infinite plasticity of the brain, the vast potential of cultural mediation to propel development
forward, and the “enormous potency” (Nisbett et al., 2012, p. 149), previously unacknowledged, of experience, environment, cultural mediation, and social interactions in development. Given this evidence, Lee (2010) rightfully wonders why we are not doing more to understand the conditions of such plasticity, particularly with regard to those who face biases and obstacles in our society. Reconceptualizing principles of equality on these grounds can be envisioned as a step on the way to promoting education that is based in egalitarian principle that all students, with no exception, can learn and develop without any limits or ceilings automatically imposed by nature, provided that they are given requisite (and individually tailored) access to cultural tools, supports, spaces, and incentives—including, importantly, in remedying structural injustices that have accrued across history and are continuing today—especially for their own agency as actors who contribute to social community practices and coauthor their world and development.

From this perspective, it is imperative to shift major national concerns away from high-stakes testing to instead focus on better and more appropriately distributed learning opportunities (such as cultural tools, spaces, resources, and supports) because these opportunities are inherent parts of development that participate in producing its outcomes. This shift requires strong advocacy for major new programs stretched from preschool through college and a major effort to provide families with access to education and economic opportunities and resources including in education. As Orfield (2014) writes, we already know that high-quality preschool can be a powerful factor in school readiness; yet such preschool is largely limited to middle- and upper-class families. Efforts such as Head Start need to be supported if there is to be a real possibility of disrupting inequalities (see Heckman, 2013). As Orfield (2014) further states,

Recent decades have been wasted on hostile social policy and civil rights changes that have diminished and divided our society, with education policy deeply limited by many disruptive and destructive trends of racial and economic polarization, segregation, and economic disinvestment. These policy and changes are built on many unfounded and untrue assumptions. (p. 289)

These unfounded and untrue assumptions include, as argued throughout this chapter, an outright mythology akin to eugenics about biologically determined, inborn talents and predetermined biological limitations rigidly imposed on developmental outcomes. This mythology urgently needs to be dispelled.

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