

# On the Difference Between Designing Children and Raising Them: Ethics and the Use of Educationally Oriented Biotechnology

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**ABSTRACT**—The use of educationally oriented biotechnology has grown drastically in recent decades and is likely to continue to grow. Advances in both the neurosciences and genetics have opened up important areas of application and industry, from psychopharmacology to gene-chip technologies. This article reviews the current state of educationally oriented biological technologies, eventually focusing on the use of psychiatric drugs with children and adolescents to improve their academic performance. Distinguishing between “good” and “bad” uses of biological technologies is complicated by conflicting theoretical views about human development, the etiology of disability, and the diagnostic categories that structure treatments. To address these issues I introduce a set of ethical concepts, which are based on a biopsychosocial approach to human development. The difference between *designing children* and *raising children* marks an ethically salient difference between approaches that focus on only part of the child (e.g., her brain) and approaches that focus on the full biopsychosocial complexity of the developing child in context. This clarifies the importance of the child’s right to both *autonomy* and *care*. Implications for policy and practice are offered.

This article is an exercise in the philosophy of education. John Dewey (1930) once expressed surprise that more philosophers did not recognize the importance of the issues involved in the process of education, which is, in essence, concerned with setting a trajectory for the future of civilization. Indeed, the issues raised in this article are some of the most unique and important ethical issues facing our complex global civilization as it enters the 21st century (Nussbaum, 2006). To put it simply, advances in biological technology, from psychopharmacology to genomics, are beginning to radically change the way we treat children. And for the first time in history the possibility of *designing children* needs to be considered. This possibility emerges at the interface of biological technology and education, and it could potentially, in the long run, fundamentally alter the self-understanding of the species (Habermas, 2003).

The task of a philosopher concerned about these developments is to gather information about emerging trends while working to articulate a set of relevant ethical principles and concepts that stand in *reflective equilibrium* (Buchanan et al., 2000; Elgin, 1996; Rawls, 1971). This is the method adopted here. What results is a coherent and useful set of ethical distinctions and terms—a “language of strong evaluation” (Taylor, 1985)—that should prove helpful in differentiating between “good” and “bad” uses of educationally oriented biological technologies.

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## Biotechnology and Education

Theorists and philosophers of education have long addressed the relationships between technology and education. In recent decades the focus has been on *communication technologies*, from the printing press, to the radio, to television, and now to the computer and the Internet (Cremin, 1988; Dewey, 1929; Nussbaum, 1998). The broad themes addressed by this tradition can also be found in the works of other theorists who consider the role of technology in sociocultural development and individual socialization (Habermas, 1979; Heidegger, 1954/1982; Marx, 1884/1994). These thinkers all paint a picture in which most technologies are understood as value neutral—there is nothing inherently bad about TVs and computers—but technologies are open to misuse and can engender unacceptable attitudes and behaviors. This article addresses the relationship between *biological technologies* (biotech) and education, and it echoes these cautions. As I explore below, the current state of educationally oriented biotech is complex. There are important and unprecedented trends in the medicalization of educational problems that warrant careful attention (Conrad, 2007)—from the genetics of learning disabilities (Plomin et al., 2007) to the biological bases of adolescent rebellion (Powell, 2006). Here I focus mainly on the use of psychotropic drugs with children and adolescents because these practices exemplify many of the ethical issues involved in the use of educationally oriented biotechnologies (Parens & Johnston, 2008).

I endorse a general biopsychosocial approach to human development (Engel, 1977; Fischer & Bidell, 2006). This means that, when it comes to diagnosing learning problems and understanding individual differences, I think it is almost always preferable to consider biological, psychological, and sociocultural factors. There is great value in the use of biotech to treat a certain set of educationally related problems (Jensen et al., 2001). Many have benefited significantly from these advances, and many stand to benefit from future advances. However, in this article I will argue that biotech engenders practices directed at children that are one sided, focusing almost entirely on biological factors. The biopsychosocial approach endorsed here looks to address this imbalance, explicitly valuing a kind of *comprehensive care* that aims to address all the factors affecting the life of a child.

The ethical distinction that is the centerpiece of this article—the distinction between *designing children* and *raising children*—is elaborated in light of this broad approach. The distinction marks a difference between practices that focus mainly on biological factors and practices that are polyfocal by design and aim to address the complexity of all three factors. As discussed below, *designing children*, on the one hand, can be done entirely from a third-person perspective, without regard for how the child understands his or her experiences or the cultural norms and institutional structures that function as the child's context. It is an instrumental activity, strategic, locating

the child's problem in his or her biology and trying to fix it. As I explain, this is the “magic bullet” model of therapeutics in an educational context. *Raising children*, on the other hand, is about caring for children as opposed to fixing them. It relies on the use of first-, second-, and third-person perspectives, employing shared languages, co-constructed values, and joint-attentional experiences, in addition to respecting the power and usefulness of biotech-based interventions.

The ethical claim is that designing children is an unacceptable practice, violating a set of basic rights to which all children are entitled (Habermas, 1996; Nussbaum, 2006). This does not mean that biotech interventions are always ethically objectionable—not at all. There are important and cogent arguments about the ethical obligations that accompany new biotech discoveries, the therapeutic options they enable, and the fair distribution of these benefits (Buchanan et al., 2000). Instead, the claim is that approaches that *primarily* deploy biotech, or deploy biotech *instead of* rather than in conjunction with psychosocial approaches, will usually be ethically questionable. As discussed further, there are many obvious reasons to be ethically cautious about educationally oriented biotech. There are major concerns having to do with the risks associated with long-term usage (Hyman, 2002). Moreover, the broader social, political, and economic context is one where some of the most powerful and profitable industries in the world (the biotech industries) are affecting the lives of some of the weakest and most vulnerable people (children). With onslaughts of advertising and a blurring of the lines between big business and big science, the specter of an educationally oriented biomedical industrial complex looms large (Healy, 1996).

These are serious concerns, but they form the backdrop against which I articulate a more focused, subtle, and radical ethical argument. This is an argument that is misunderstood in mainstream scientific discussions of the ethical issues surrounding the interface of biotech and education (Singh, 2008). Habermas and others address these issues in terms of basic human rights, such as a child's right to *care* and *autonomy* (Glover, 2006; Habermas, 2003). These are the kinds of evaluative commitments that show up in the Convention on the Rights of the Child (United Nations, 1989) and in related discussions regarding nonrelative values and virtues (Nussbaum & Sen, 1993). Casting issues in these terms can serve to direct attention away from debates about human nature or the treatment-enhancement distinction and toward an analysis of the kinds of *relationships* we have with children—how we treat them in light of *what we owe to them* (Scanlon, 1998; Stein, della Chiesa, Hinton, & Fischer, in press).

In the following sections, I begin by briefly clarifying what it means to take a biopsychosocial approach to human development, thus framing all that follows. This leads to a focus on the interface of education and biotech,

where I offer some important definitions and examples. I then turn to focus on *educational psychopharmacology* and on treatments for Attention Deficit Hyperactivity Disorder (ADHD) in particular. The practices here serve as a foil for the elaboration and justification of the ethical distinction between designing children and raising them. A concluding discussion looks at implications for policy and practice.

#### THE BIOPSYCHOSOCIAL APPROACHES: AMBITIONS OF COMPREHENSIVE CARE

Imagine a young child struggling in school. He is extremely distractible and restless and often does not finish assignments. He seems to be underperforming, given that in conversations with teachers he shows an understanding of the material. He often misbehaves in class, for example, throwing his pen at a friend across the room during silent-reading periods, even after repeatedly being asked not to do so. When talking about his time at school he complains of boredom and anxiety. At home he is emotionally volatile, continuing to throw the kinds of tantrums that other children his age have outgrown. And his behavior seems to be getting worse, with more frequently occurring mood swings and increasingly violent and frenetic outbursts. His parents and teachers are worried. Why is he like this? What can be done to help him? As I will show, mainstream expert opinion on this child would be that he has a genetically based brain dysfunction and that the best way to help him is to give him psychotropic drugs.

Yet think of all the factors that have been neglected when approaching the child's problems this way. Even staying focused on his biology, questions can be asked about his diet, sleeping habits, exercise, and potential exposure to environmental toxins. Beyond biology, it is worth inquiring into his first-person reports of boredom and anxiety. Ask him what he would rather be doing, what parts of school he likes, and what kinds of things he thinks he is good at. And, of course, there are the sociocultural contexts in which he functions, the school and the family, which are nested in broader cultural, political, and economic structures. Look into the parents' everyday interactions with him, their disciplinary practices, the flow and scheduling of the school day, and the pedagogy employed by the teacher. Taking this kind of polyfocal and comprehensive view of the developing child is what is meant by a biopsychosocial approach. The broad idea is actually very simple. When explaining, describing, or trying to help a developing child, *always* inquire into at least three broad areas of relevant information—the biological, psychological, and sociocultural.

Biopsychosocial approaches to human development can be traced historically to James Mark Baldwin (1895, 1911). His model would influence both Piaget (1967, 1971) and

Vygotsky (1978), who with important differences of emphasis would go on to build their own influential biopsychosocial models. The state of the neurosciences and genetics would limit these early attempts, leaving many of the details of biological mechanism unelaborated. But more recent approaches have fully integrated the latest methods and findings from these fields, along with comparable advances in cognitive science, neuroscience, and sociology (Engel, 1977; Mareschal et al., 2007). Some theorists have explicated the guiding principles behind these approaches by building meta-theoretical and philosophical frameworks to justify the epistemological importance of comprehensiveness and of biopsychosocial factors in particular (Overton, 2007; Wilber, 1999).

The biopsychosocial model of human development—known as *Dynamic Skill Theory*—as outlined by Fischer (1980) and Fischer and Bidell (2006) is one of the most sophisticated on the contemporary scene. This model is the result of decades of empirical work synthesizing a wide range of diverse methods. According to this model, human behavior is *always* the result of dynamic interactions between a person's psychological dimensions (e.g., motivation, emotion, thought, action), their enabling and reliably covarying biological substrate (e.g., genes, brain, body), and the sociocultural context in which they function (e.g., relationships, rules, institutions). The developing child is conceived of as building a life, personality, and skill set by actively adapting the affordances of their body and mind to the structures and expectations of the sociocultural environments in which they live. Development is thus a context sensitive affair, with individual differences emerging from the confluence of each child's unique biopsychosocial aspects.

The implications of adopting such a biopsychosocial approach are complex and far reaching. This article is, in part, an attempt to elaborate some of what comes into view when such an approach is used to frame ethical issues at the interface of biotech and education. As I will show, the ideal of *comprehensive care* implicit in a biopsychosocial approach—care that aims to address all relevant biopsychosocial factors—stands in stark contrast to the most prevalent practices involving the use of educationally oriented biotech. Characterizing individual differences and learning difficulties as medical problems which have mainly to do with a child's brain and genes limits therapeutic options because all attention is given to these biological factors. This limitation can lead those interested in the child's well-being to ignore or give little weight to the child's psychological life and the quality of that child's most important relationships. Instead of *working with* the child, they are *worked on*, strategically, and from a third-person perspective. But I cannot fully discuss this—the practice of *designing children*—until after I have discussed the kinds of technologies that enable it.

## EDUCATIONALLY ORIENTED BIOTECH

This section establishes a set of working definitions and ready material for future discussions. Mainly this involves deploying a biopsychosocial approach to clarify the concept of *educationally oriented biotech*. I begin by defining *education* and *medicine* and then proceed to point out the unique structure of practices where medical means are used to affect educational ends. This leads into a brief look at state-of-the-art educationally oriented biological technologies and a thought experiment about what it would mean to have the ability to design a child *from the genes up*.

## Education and Medicine

Lawrence Cremin (1970 p. xi) once defined education as “the deliberate, systematic, and sustained effort to transmit or evoke knowledge, attitudes, values, skills, and sensibilities.” As if that were not broad enough, Dewey (1916) once posited that education is coterminous with communication and that it functions to ensure the continuity and self-renewal of society. These definitions clearly suggest that education is not synonymous with schooling. No doubt, schools serve a unique and important role in the education of many children around the world, but those who do not have the privilege of attending school are educated nonetheless. School is not the only place where there are teachers, students, and things to teach and learn. The family, the media, and religious organizations are also major educative agencies. These kinds of agencies form the unique *educational configurations* that affect each child differently over the course of their life. Along these lines, the development of a child can be characterized as an *educational biography*, an educational life history populated by “educationally significant others,” and overlapping, interrelated, often conflicting educational configurations (Cremin, 1976).

This way of thinking entails that education includes parenting and almost any other efforts that aim to affect the change of children into adults. Education is also a social affair according to this definition, inextricably implicated in the values, practices, and beliefs of specific cultures. The complexity of this phenomenon—the self-conscious intentional transmission of culture—has led some to suggest that education is a species-specific trait unique to *homo sapiens* (Tomasello, 1999). Insofar as education serves such an irreplaceable sociocultural function, it is fruitfully comparable to medicine (Shonkoff, 2003).

But education is distinct from medicine in important ways. The simplest way to understand the differences is to consider their respective goals. While definitions of medicine vary, there is some consensus that it is concerned with the *body*—the biochemical and physical functioning of the human organism. And the goal is typically *health*, a term even more variously

defined than medicine (Conrad et al., 1995). I think that, for the sake of coherence, *health* should be understood as a normative term about preferable states of the *body*. This means that the degree to which psychiatric practices should be considered as medical practices (pursuing “mental health”) depends, in part, on the extent to which they are more or less strictly forms of *biological psychiatry* (Shorter, 1997). Forms of therapy not based on strong assumptions about the biological bases of mental illness—forms not privileging biotech-based therapeutics—look a lot more like educational practices than medical ones. Medicine aims to bring health to the body through biochemical and physiological means.

According to a biopsychosocial approach, medical treatments, should almost always be supplemented with psychosocial interventions. Ambitions of comprehensive care outstrip the techniques of “biomedicine,” even when the problem is mainly a biological one (Engel, 1977). A child with cancer needs a social support network and a positive outlook as much as he or she needs chemotherapy. Thus, as medicine addresses the health of the body, so good hospitals and doctors address the needs of the whole person. Education, on the other hand, is always already intrinsically concerned with the state of the *whole person*, transcending but including concerns about the body. So education is in essence a biopsychosocial endeavor, whereas medicine is a biological endeavor, which can (and should) be supplemented with psychosocial accoutrements.

With the terms set this way, *educationally oriented biotech* can be understood as a unique aspect of certain contemporary educational configurations, where medical methods are used to bring about educational goals. For example, *self-control* is a skill that is generally valued and fostered in educational contexts. It is an educational goal that has historically been accomplished in the context of adult-child relationships through the establishment of boundaries and expectations around shared values and a judicious use of punishments (Schoore, 1999). But studies have shown for decades that the ingestion of appropriate amounts of methylphenidate (Ritalin) or amphetamine (Adderall) reliably results in behavioral patterns considered as signs of self-control, for example, prolonged attention on task, acceptance of delayed gratification, and so on (Jensen et al., 2001; Rasmussen, 2007). Thus, a biomedical intervention can be used to produce something that is ostensibly of value educationally. It is important not to confuse educationally oriented biotech with the kinds of medical treatments all children deserve, regardless of the educational configurations in which they participate. With educationally oriented biotech, the goal is not health per se; it is the deployment of medical means to affect *educational ends*.

If self-control can be achieved through biotech-based alterations of the child’s brain, why should the history of child rearing set any precedence? That is, why not strategically alter the child’s biology to induce self-control, as opposed to

teaching them to control themselves? *Why raise children when they can be designed?* This is a fundamentally new kind of question about the types of relationships we are willing to have with the children who depend on us as educationally significant others. These kinds of questions have emerged only in the last few decades, coming vividly into public awareness in the 1990s (Diller, 1998). And the decades to come will continue to yield advances in biotech that have the potential to change the very structure of intergenerational relationships.

### Educationally Oriented Biotech Markets in the 21st Century

Today, in schools around the world there are millions of children whose lives have been shaped by educationally oriented biotech. Although the numbers vary as a function of socioeconomic conditions (Zito et al., 2005), there is a clear and striking global trend toward the increasing use of educationally oriented biotech, as evidenced, for example, by major growth in the markets for ADHD medications (Scheffler et al., 2007). Parenting and schooling have been transforming as a result (Diller, 2006). The media disseminates direct to consumer advertisements for key products, as biotech companies make huge profits from “child-focused” campaigns (Rasmussen, 2007). And while psychopharmacology is the most common form of educationally oriented biotech, it will soon be joined by practices stemming from advances in the genetics of individual learning differences (Grigorenko, 2003). Given the effects of genetics in medicine, it stands to reason that *educationally oriented genomics* will be a major area for research and development in the coming decades.

Already, many parents can choose to use preimplantation genetic diagnoses to screen for hereditary diseases. Some theorists think it probable that advances in behavioral genetics will alter these practices, increase the choice parents have in preselecting the traits of their children, and expand selection parameters beyond disease avoidance toward enhancement and customization (Fukuyama, 2002; Habermas, 2003). Above and beyond paying attention to genetic markers for Phenylketonuria or Down syndrome, parents will begin looking for markers for dyslexia, ADHD, athletic prowess, or mathematics ability. These are *educational phenotypes*, not medical ones. Yet, these theorists suggest, the ambitions of medical science make it likely that educational phenotypes will be explored as possible targets for genetic engineering. This is a future in which parents approach reproduction as a *design problem*—creating children from ingredients bought at a “genetic supermarket” (Nozick, 1974; Harris, 2009). Research and development efforts along these lines are already well underway, but they do not seem to be producing technologies with the kinds of radical affordances these scenarios anticipate (Grigorenko, 2007). Predicting scientific trends is a speculative endeavor and, as of yet, the possibility of full-blown human

engineering remains beyond even the most sophisticated science (Nussbaum & Sunstein, 1998).

Nevertheless, thinking through the consequences of having the ability to literally design a child from the genes up is worth doing as a way of clarifying the ethical issues involved with designing children (Glover, 2006; Habermas, 2003). Futures scenarios based on legal theory, economics, and health care systems analyses suggest the probable emergence of a capitalistic “soft-eugenics” driven by the biotech industry, consumer choice, and parental advocacy groups (Buchanan et al., 2000). If these trends play out, future generations could be designed from the genes up, not according to the dictates of a centralized political agency, but according to the culturally mediated choices of parents who act as informed consumers of emerging biomedical technologies. This would be a future characterized by unprecedented intergenerational dynamics—and thus unprecedented educational configurations—with parents literally designing their children through the use of genomic technologies.

Clearly, there are some important ethical issues in this scenario—where parents design their children from the genes up. Most people have a strong intuitive aversion to the idea of designing children when it involves these kinds of scientific developments (Glover, 2006). This intuitive aversion is a moral emotion worth interrogating (Nussbaum, 2001), and it is the source of the ethical issues identified by Habermas (2003) in his cautious and critical discussions of biotech futures. Habermas admits as reasonable the “logic of healing” that motivates the development of biomedical technologies. And he suggests that there is a subset of genetically based diseases that warrant preemptive genetic interventions. He sees the importance of biotech development, and genomics in particular. However, he does not go so far as to agree with the claims made by Buchanan et al. (2000), that society has an *obligation* to advance genomics and to counteract the worst effects of the so-called genetic lottery.

In any case, it is not the emerging biotech that worries Habermas, the practices but rather it is likely to engender. In this case, he stresses that the practices involved in designing a child should be seen as radically unique and extremely difficult to reconcile with reproductive and familial practices already in place, practices that are, importantly, at the heart of the life world. The relationship of *designer* and *designed* is difficult to superimpose onto the relationship of *parent* and *child*. Doing so in practice on a large scale would have a significant impact on the basic fabric of intergenerational relationships, to say the least. Moreover, the stronger claim is that viewing this situation in terms of basic ethical principles (Habermas, 1990, 2003) shows subtle but profound injustices in the kinds of relationships involved with the practice of designing children. These injustices are best described as distortions of *care* and *autonomy*; distortions of *what we owe to our children* (Scanlon,

1998). It is worth reiterating that these problems reside in the very structure and quality of the relationships in question. Parents can be reasonably likened to designers whenever they adopt a strategic and instrumental attitude, *working on* the child to get their desired results, as opposed to *working with* the child to achieve co-constructed educational goals.

In the section below, I will show that these same ethical issues are on the table when considering the use of psychotropic drugs with children and adolescents. Regardless of whether genomics *might* someday provide us with the ability to design children, the technologies of contemporary educational psychopharmacology can be used to design children today. Granted, this is not design from the genes up, but it can be thought of as design *from the brain out* (through the mind to behavior). Below I discuss psychopharmacological treatments for ADHD as a case study in the ethics of educationally oriented biotech.

#### EDUCATIONAL PSYCHOPHARMACOLOGY AND ADHD

In this section I discuss how biological psychiatry has addressed the problems facing children and adolescents in educational contexts. I call this rather narrow branch of psychiatry *educational psychopharmacology*. Focusing on the role of the *Diagnostic and Statistical Manual of Mental Disorders (DSM)* and on related recent increases in the prescription of psychotropic drugs to children and adolescents, I argue that we find ourselves in a historically unprecedented situation and facing complex moral issues. Discussing treatments for ADHD in particular, this section highlights the increasingly prominent role that psychotropic drugs play in contemporary educational configurations. These trends in educationally oriented biotech raise the same ethical issues noted above involving the child's basic right to both *care* and *autonomy*. Thus, the practices discussed here set the stage for elaborating and justifying the difference between designing children and raising them.

#### Magic Bullets: From Bacteriology to Educational Psychopharmacology

The way Westerners think about health and the treatment of disease has transformed significantly during the last 150 years (Conrad et al., 1995). As late as the 1870s, there were only humoral models of health and disease, such as the Hippocratic system. According to these ways of thinking, illness was a result of broad imbalances between different vital energies, and treatments (such as bloodletting) were attempts to address the balance of the whole body. Then with the emergence of *bacteriology* in the 1890s, everything changed. For the first time, medicine began to revolve around the idea that specific diseases were the result of specific organic dysfunctions and had specific cures. This way of thinking yielded unprecedented

medical successes, and the pharmaceutical industry grew rapidly into the most profitable industry in the world. Biotech soon became a complex system of international research and development efforts, interanimating the academy, industry, and government in remarkable and unparalleled ways (Chandler, 2005). And all these developments hinged on the idea of the *magic bullet*—specific cures built to target *discrete disease entities* (Liebanua, 1987). The mid-20th century gave us the first medical miracles—the polio vaccine, penicillin, and related antibiotics—all based on this way of thinking about disease, treatment, and biotech research and development.

The scientific acumen supporting the magic bullet medical model was solidified with the introduction of randomized double-blind placebo-controlled clinical trials (RCTs) into both general biomedicine and psychiatry. The importance of this methodological innovation for psychiatry, and psychopharmacology in particular, cannot be overestimated (Healy, 1996, 2002). The marriage of the RCT and the statistical diagnostic category (à la the *DSM*) resulted in the birth of modern evidenced-based biological psychiatry. This would make “the new biological psychiatry” a kind of magic bullet psychiatry, where specific psychological diseases (specified by a diagnostic category) have specific cures (a psychotropic drug), the effects of which are measured via RCTs. These methods bolstered the scientific legitimacy of psychiatric drugs by “proving” their efficacy and thus facilitating the development of a “quality-controlled” pharmaceuticals industry (Liebanua, 1987). They also served to define standards of addiction and legality for powerful psychotropic agents (Rasmussen, 2007) and to affect a major transition away from psychodynamic therapeutics and toward biologically oriented drug-based approaches (Healy, 2002; Shorter, 1997).

Interestingly, some of the first groundbreaking RCTs in psychiatry were conducted in the 1930s on learning-disabled school children taking a forerunner to Ritalin (Rasmussen, 2007)—at that time the diagnostic category in use was a vague catchall for children with behavioral problems, “minimal brain damage.” The effect was marked; stimulant drugs worked to “paradoxically” calm and focus the hyperactive child, to decrease symptoms, and to increase standardized test scores. Yet despite these early studies, histories of psychopharmacology show that it was not until after the third edition of the *DSM* was published in 1980 that children became major targets of pharmaceutical companies' drug development efforts (Healy, 2002; Herzberg, 2009). In fact, the rapid growth of educational psychopharmacology in the last three decades is a testament to the centrality of the *DSM* in contemporary psychiatry and the culture at large. As the *DSM* brought the notion of a “biomedical self” into the forefront of public consciousness, the idea of treating children with psychotropic drugs became less and less objectionable (Healy, 2002).

The number of diagnostic categories in the *DSM* has increased from just over 100 in 1952 to just fewer than 300 in

1994, and the number of categories applicable to children has increased by a comparable ratio (Conrad, 2007). In the *DSM-IV*, ADHD, which has been in the *DSM* under various names since the first edition, is now accompanied by a large set of conduct, anxiety, and mood disorders applicable to children. All of these disorders are characterized as being primarily biological in nature and, increasingly, the most common treatments are psychopharmacological (Olfson et al., 2002). It is important to recognize that *DSM* diagnostic categories are used to demarcate discrete disease entities—the child either does or does not have ADHD. Such discrete categories are instrumental to the institutional structures that support the delivery of therapeutic interventions. They constitute the framework through which drugs are tested using RCTs and through which patients and health care providers build a mutual understanding of patients' symptoms. They are a necessary aspect of current drug prescriptions practices—right down to reimbursement from health insurers (Mayes et al., 2009).

But while these discrete categories enable the magic bullet approach to drug development and therapeutics, they do not reflect or represent clinical realities (Parens & Johnston, 2008). In fact, this categorical approach to psychological disease has been the focal point of criticisms of the *DSM* and its concomitant practices in recent years (Kress, 2005). Psychological functions are best conceived of as dimensional, not categorical (Hyman, 2007). And, as I have already explained, behavior is context sensitive and highly variable as a result of the unique biopsychosocial conditions of each child (Fischer & Bidell, 2006). Although the introduction to the *DSM* pays lip service to these facts, it is nevertheless usually used and understood as a collection of categories demarcating discrete, biological-based disease entities. Questions about how to transition toward a diagnostic system that deploys dimensional variables as opposed to categorical ones are complex, both scientifically and logistically (Parens & Johnston, 2008).

And there is more to worry about with the *DSM*. Some critics have focused on the need to address the variability of children in particular, stressing their unique and developmentally appropriate behavioral dynamisms (Jensen et al., 2006). Others have focused criticisms on the broader magic bullet approach to research and development, questioning the use of the diagnostic categories as outcome measures of drug effectiveness in the first place (Healy, 2002). Along these lines, some have drawn attention to the ineliminable role of values in psychiatric diagnoses (Sadler, 2005) and demonstrated that current practices neglect key psychosocial aspects of children's behavioral problems and their treatment (Diller, 2006).

Also, as I will explore further, there are highly inconsistent rates of diagnosis by those who use the *DSM*, which vary as a function of geographical region and suggest a lack of standardized diagnostic practices despite the use of a common set of diagnostic criteria (Parens & Johnston, 2009). Moreover,

there are other legitimate classifications of psychological disease, such as the International Classification of Diseases (ICD), which set the diagnostic standards for the vast majority of Europe. Comparisons between the ICD and the *DSM* for some diseases (such as ADHD) suggest that at least 3 to 4 times more children are diagnosed using the *DSM* criteria (Santosh et al., 2005). This explains some of the differences in rates of ADHD diagnoses between countries and raises questions about the role of culture in perceptions and treatments of psychological disorders. Indeed, criticisms like these have led some to suggest that mental illnesses—such as ADHD—are merely social construction (Amaral, 2007). But overly simplistic versions of this argument fail to recognize the very real suffering and costs of mental illness (Hinshaw, 1992; Pelham et al., 2007). Indeed, “there is nothing ‘mere’ about social constructions” (Parens & Johnston, 2009), especially when they function the way the diagnostic categories in the *DSM* do—cataloging problematic and painful symptoms, specifying treatment modalities, and affecting healthcare infrastructures. Despite its weaknesses, the *DSM* serves a critical function in a mental healthcare system that provides millions with valuable and effective treatments.

However, from the perspective of a biopsychosocial approach, complex interactions between biological differences and cultural differences are to be expected. All diseases arise at the *interface* of an individual's biology and the sociocultural context in which they reside (Engel, 1977). This is especially true in the case of psychological diseases, where behaviors, thoughts, and moods are the symptoms being addressed—not obvious biological dysfunctions. Again, this does not make psychological illnesses into myths or mere mechanisms of social control, as critics of psychiatry have suggested since the 1960s (Foucault, 1961; Szasz, 1961). Rather, a biopsychosocial approach suggests that the same biologically based individual differences can be understood differently in different sociocultural contexts, resulting in differential impacts on the life of the individual and how they are treated. This is a very important thing to consider with regard to ADHD, in particular.

Given this complex terrain, it is understandable that reasonable voices disagree about the state of the art of educational psychopharmacology (Barondes, 2003; Healy, 1997). But regardless of debates about safety and efficacy, prescription rates are on the rise (Zito et al., 2003). And trends show that psychotropic drugs are being prescribed to treat children at increasingly young ages (Zito et al., 2000) and increasingly in cocktail-like drug combinations. Many of these practices are not supported by clinical research (Zito & Safer, 2005) and the vast majority of research that is done—it must be admitted—is conducted by pharmaceutical companies already found guilty of withholding data, undertaking breathless innovations in direct to consumer advertisements, and enabling the mistreatment of patients (Angell, 2003; Healy, 2002; Whitaker, 2002). All in all, these trends represent an underanalyzed set

of technologically wrought social conditions and educational configurations (Singh, 2008). The case of ADHD in particular is worth inquiring into more carefully because it is such a widely diagnosed disorder that is mainly treated via medical means.

#### ADHD: FACTS, UNCERTAINTIES, AND RISKS IN THE MEDICALIZATION OF EDUCATION

ADHD is a disorder characterized by inattention, hyperactivity, and impulsiveness, and it is a good predictor of negative academic and economic outcomes (Swanson et al., 1998). Teachers are typically the first to suggest the possibility that a child might need an ADHD diagnosis (Sax & Kautz, 2003), and roughly 75% of those diagnosed are male (Schneider & Eisenberg, 2006). Of those diagnosed, more than half are also diagnosed with conduct or oppositional defiant disorder (Jensen et al., 2001). It is family practice doctors—not child psychiatrists—that handle most referrals and issue most diagnoses and treatments (Parens & Johnston, 2009). And, overwhelmingly, the most common treatments involve the prescription of stimulant medications, such as Ritalin and Adderall (Safer, Zito, & Fine, 1996). Although figures vary, it is estimated by the U.S. Centers for Disease Control that roughly 8.4% of children between the ages 6 and 17 will at some point be diagnosed with ADHD—that is about 4.6 million children (Pastor & Reuben, 2008). And the United States appears to be setting a global trend, as numbers reflecting the annual use of ADHD medications show major recent growth worldwide (Scheffler et al., 2007).

But this is where agreements about ADHD end. Facts about the causes of ADHD and the most effective treatments for it are complex, incomplete, and contested (Parens & Johnston, 2009; Singh, 2008). The long-standing dopamine theory of ADHD suggests that executive-function deficits involving the dopamine system are responsible for symptoms (Swanson et al., 2007). However, it is questionable whether problems with executive function alone are necessary and sufficient for a manifestation of the disorder (Sonuga-Barke, 2005). Moreover, genetic research guided by this hypothesis and looking for predictors of ADHD has been inconclusive, finding minimal evidence for the involvement of genes known to be involved with dopamine transporters and receptors (Li et al., 2006). And while neuroimaging work has revealed suggestive anatomical and functional differences in subjects with ADHD when compared to controls, most studies have been conducted using samples that are too small to yield conclusive results and that do not include children and adolescents (Seidman et al., 2005). Some studies do suggest possible environmental causes (Braun et al., 2006), but most research focuses entirely on casual factors within the individual. The most promising avenues for future research focus on multiple etiologies, diverse developmental pathways, and the effects of environmental

factors (Nigg et al., 2004; Sonuga-Barke, 2005). Researchers hope that these avenues might eventually shift diagnostic practices away from symptom identification and toward more complex and dynamic biomarkers of individual differences (Chamberland et al., 2007; Singh & Rose, 2009).

The state of ADHD diagnosis and treatment is comparably complicated. As already mentioned, despite clear trends suggesting that certain common practices are widespread, there are, in fact, very prominent regional differences in rates of diagnosis. These differences have led many to argue that ADHD is *underdiagnosed* in impoverished communities while it is *overdiagnosed* in wealthy and middle-class ones (Diller, 1998). Although the most common treatment for ADHD is stimulant prescription drugs, what studies there are about the efficacy of these treatments do not provide straightforward results (Parens & Johnston, 2009). Studies originally suggesting that drugs worked better than behavioral therapy have been reanalyzed to reveal that, in fact, outcomes resulting from treatments involving drugs alone were less desirable than those that combined drugs with cognitive behavioral interventions, and these outcomes were only minimally superior to behavioral therapies alone (Carey, 2000). In addition, it is not at all clear that drug-induced symptom reductions (as measured using DSM criteria) necessarily lead to the desired improvements in academic achievement (Loe & Feldman, 2007). Moreover, how stimulant drugs work to improve ADHD symptoms is not well understood (Singh, 2008), which is not surprising given the state of the aforementioned brain research.

However, the realities in the trenches of school and family life, where the number of diagnoses and drug treatments continues to rise, do not reflect the tentative and preliminary nature of the state of the science. This has led some to stress that this is, simply and objectively, a dangerous and uncertain situation (Hyman, 2002; Rasmussen, 2007). Nuanced ethical arguments aside, next to nothing is known about long-term usage of stimulants in childhood and adolescence. Although research conducted on adults and animals has demonstrated that these drugs do have a set of undesirable physiological effects when used in large quantities over long periods, effects such as addiction and the stunting of growth (Rasmussen, 2007). It has also been demonstrated that, when those who have found success with drug treatment discontinue medication, their symptoms return (Parens & Johnston, 2009). This means that, as the first generation of “Ritalin kids” find their way into college and the workforce, they are continuing treatment for symptoms, some having been on the drug for the vast majority of their lives—nearly 20 years. Ritalin and Adderall now rival alcohol and marijuana as the most widely used recreational drugs on college campuses, where they are typically used in higher doses for off-label purposes (Diller, 2006). Billions of pills containing Schedule II substances are in circulation among an age group known for high-risk behavior. And thus the possibility of an

iatrogenic crisis affecting a whole generation of young adults worries many observers (Healy, 2002; Rasmussen, 2007).

Nevertheless, despite these uncertainties and risks, millions of children are diagnosed with ADHD and treated with drugs, and the prevalence of these practices continues to increase. This suggests that trends in diagnoses and treatments for ADHD are more than the result of advances in the science and art of educational psychopharmacology. There is evidence of clandestine and conspiratorial relations between drug companies and the disability advocacy groups (such as Children and Adults with Attention Deficit/Hyperactivity Disorder) that have tirelessly worked at legitimizing ADHD as a widespread disorder amenable to drug treatment (Conrad, 2007; Fukuyama, 2002; Rasmussen, 2007). There are also broad shifts in culture toward “blaming the brain” for what used to be considered moral failures (Elliot, 2003), changes related to the general acceptance of a “biomedical self” in both popular culture and the human sciences (Healy, 2002; Kagan, 2009). These considerations are consistent with views that explain practices surrounding ADHD in terms of more general trends in the medicalization of the human condition (Conrad, 2007; Illich, 1977). These theorists raise concerns about what it means to reframe underperformance and misbehavior as biological dysfunctions, suggesting it amounts to the individuation of social problems and the depoliticization of deviance.

However, a simpler and perhaps less inflammatory explanation is that more and more children are struggling and suffering in the increasingly complex and pressure-filled educational configurations surrounding them, leaving well-meaning parents, teachers, and health care providers scrambling to bring relief to them as quickly as possible (Warner, 2010). Indeed, preliminary research on the beliefs and situations of children and parents caught up in these trends document the suffering experienced and the sense of relief that sets in when symptomatic behaviors decrease as a result of drug treatments (Varner, 2000; Singh, 2007). It is hard to dismiss the urgency and immediacy of a child’s suffering—especially if the child is yours—and it is understandable that many parents and teachers are simply looking for any kind of help they can get.

But in light of a biopsychosocial approach, it is easy to see the *partialness* of most current attempts at helping children with ADHD. They shift attention away from the quality of the educational configurations and toward the biology of the child. Instead of considering that social and cultural factors may be a part of the problem, the problem is located in the child’s biological substrate. Therefore, the child’s brain is to be fixed to fit into available educational configurations, as opposed to fixing these configurations so they are responsive to the individual differences of the child (Olfman, 2006). This approach to treatment is an artifact of the structure of educationally oriented biotech, where medical means are used to affect educational ends. It is how

magic bullet therapeutics appear in educational contexts. As opposed to adopting a polyfocal approach concerned with the interaction of numerous biopsychosocial factors, a specific biological dysfunction is blamed and targeted with a specific biomedical intervention.

So the most common treatments for the most common childhood psychiatric disorder (ADHD) exemplify the unique structure of educationally oriented biotech. And thus they raise a set of ethical questions about the way children are being treated in contemporary educational configurations. As I have shown, there are very real concerns about the risks of giving so many children so many drugs. But these issues are in many respects no different from those that accompany any large-scale biomedical pediatric public health initiatives, such as vaccination campaigns. There are trade-offs between the risks of providing the treatment and the risks of doing nothing (Hyman, 2002). As the science advances, so will knowledge about the safety and efficacy of treatments, but risks will always remain. Likewise, concerns about medicalization as a form of coercive social control draw attention away from the heart of the matter. Education in all its forms is basically about shaping the lives and behaviors of the next generation. So while medical treatments for educational problems can serve as a stark reminder of just how much power adults’ exercise over children, there is nothing unique about them as a form of social control.

As I have been suggesting, the truly unprecedented ethical issues that surround the use of educationally oriented biotech have to do with the kinds of *relationships* these technologies can engender. This is about how we are willing to treat our children. The strong claim is that, even if the drugs are effective and safe, and they are being used to affect unproblematic educational goals, many of the ways they can be put to use are ethically unacceptable. Simply put, no matter how good the intention and how safe the intervention, it is unacceptable to design children by working on their biology, strategically and primarily from a third-person perspective. As I explore below, this does *not* mean that it is unacceptable to use biomedical aids to help affect educational goals. But it does mean that such interventions need to be carried out in the context of a broad biopsychosocial approach aiming at comprehensive care. We owe our children nothing less.

#### ON THE DIFFERENCE BETWEEN DESIGNING CHILDREN AND RAISING CHILDREN

This section brings the whole of the prior discussion into view and explicates the ethical issues that have been implicit and implied all along. I begin by elaborating the distinction between designing children and raising children, relying on a biopsychosocial approach to clarify just what this difference means. Then I clarify just why it is that designing children is unacceptable. Looking to a tradition in moral philosophy that

focuses on the *inviolability* and *intrinsic value* of the individual (Habermas, 1990; Kant, 1788/1996), I argue that it is an injustice when a person's life is shaped *for them* by the actions of another. This leads to the idea that we owe it to our children to care for them in ways that do not violate their autonomy and that leave open the possibility of a future for them that is of their own making.

### The Difference Between Fixing children and Caring for Them

The distinction between *medicine* and *education* I elaborated at the outset is a distinction between two types of practices, involving distinct attitudes, actions, and relationships. In light of a biopsychosocial approach, the difference is intuitive—one focuses on the body, the other on the whole person, but mostly their mind. In everyday life, comparable intuitive distinctions structure the relationships people have with one another and the world. For example, most people's attitudes and actions toward the organic nature of plants and animals differ from their attitudes and actions toward the inorganic, social, and political artifacts made by human beings. Most would agree that people *cultivate* living things, a process involving a respect for the inherent dynamics of their auto-regulated nature, while they *build* artifacts, a process involving the strategic planning of fitting means to an end. It was Aristotle (2002) who first pointed out how these different kinds of basic practices and attitudes constitute everyday human interactions. He showed that there is a difference between the *theoretical* and the *practical*, between the *ethical* and the *political*, and between *healing*, *breeding*, and *building*. More recently, Sellars (2006) and Habermas (1987) have argued for the philosophical importance of these kinds of basic common-sense distinctions.

Importantly, these kinds of distinctions can shift historically. Broad sociocultural transformations can rearrange the basic practices and attitudes that constitute the structure of everyday human interactions. For example, the de-differentiation of the *sacred* and the *profane* is one of the major transformations that followed in the wake of modernization (Taylor, 1989). These kinds of epoch-making shifts in beliefs and practice transform the way humanity understands itself and the world (Habermas, 1984). Today advances in biotech are beginning to rearrange some of the basic distinctions that humans have taken for granted for millennia (Buchanan et al., 2000; Fukuyama, 2002; Habermas, 2003). The difference between *the grown* and *the made* is being transcended by advances in industrial food production involving genetically modified organisms. Likewise, as mentioned above, advances in genetics are beginning to de-differentiate elements of *chance* from elements of *choice* in the structure of reproductive decision making. And, to get to the point, the difference between designing children and raising children is, for the first time, a

distinction that is of great ethical importance (Stein et al., in press).

The distinction between designing and raising—like the distinction noted above between building and cultivating—has a great deal of intuitive validity. It marks a deep-seated distinction between two modes of production, and invokes two distinct semantic networks (Habermas, 2007). Education is usually characterized as akin to cultivation. It is understood to entail a sense of respect for the internal auto-regulative processes of an individual—*working with* the unfolding of an already self-directed life. Thus, raising a child involves co-constructing goals and shared values; inculcating skills and practices; and relying on communication, compromise, and relationships of mutual expectation. Educational processes depend upon affecting the full range of biopsychosocial factors in a child's life. Building a mutual understanding of social norms and the dynamics of authority is essential. This always entails engaging first-, second-, and third-person perspectives with regard to the child's situation. It is also important that *reasons* play a central role in educational configurations, as the goal is to convince and persuade the next generation of what is in their interest. Ideally, raising a child involves shaping behavior through the garnering of consent. Raising a child is a *relationship* with a dialogical structure of relative reciprocity, established in light of the child's input and an awareness of how the child's goals, capabilities, and dispositions do or do not fit with the norms and expectations of the educational configurations surrounding them. Ideally, the child *participates* in the shaping of her life and knows she is doing so.

However, just over a century ago some scientists began to suggest that education could be made akin to building or engineering, thus first suggesting the prospect of designing children (Pavlov, 1927; Skinner, 1938, 1971). This approach entails that the internal dynamics and growth processes of individuals be taken as objects of manipulation—working on the life being shaped, as opposed to working with it. Designing a child is a process in which a third-person perspective is adopted and an instrumental intervention is used to change behaviors, dispositions, and capabilities. In principle, there is no need to make use of relationships built on communication, compromise, or mutual expectation. So this amounts to a unilateral *construction* of who the child will become. Designing a child is a relationship with a monological structure of nonreciprocal imposition, established in light of the designer's goals for the child without input from the child or consideration of the child's goals. The child does *not* participate in shaping her life, but is acted on from the outside. The child experiences behavioral and dispositional changes resulting from processes beyond her control with results she does not consider herself responsible for producing.

This distinction concerns the structure of the educational relationship in question. The line is drawn between

relationships that respect the child's (limited and burgeoning) autonomy and those that override the child's nascent autonomy in the interest of goals to be imposed upon the child. The distinction focuses on the way people intervene in children's lives and actually establishes a continuum applicable in the analysis of any educational relationship. As discussed earlier, biologically focused interventions tend toward design. They make it possible to get results—to change behavior as desired—without establishing the kinds of relationships typically associated with the raising of children. Educationally oriented biotechnologies provide the ability to change the behaviors of children without the establishment of shared goals or a situation of mutual understanding. This is an unprecedented state of affairs.

Punishments—as inappropriate, coercive, and ineffective as they can be in some situations—are typically issued with a communicative intent. They are meant to teach a lesson. Even if a child changes her behavior simply so as not to get punished again, she has made a *choice* in light of an understanding of the norms in play (whether she agrees with them or not). The administration of psychotropic substances, on the other hand, changes behavior in a different way. It goes *around* the judgment and choice of the child, changing her behavioral dispositions by acting on mechanisms behind the scenes, as it were. So the child can be designed to behave, regardless of her consent—regardless even of her understanding of the expectations and norms in question. This is a situation in which the full biopsychosocial complexity of the developing child is not considered and attention is given primarily to biological factors. And yet, of course, the question remains, if it works, why not design children instead of raising them?

### On the Child's Right to Care and Autonomy

The fastest way to the heart of the ethical issues here is to note how the distinction between designing children and raising them relates to Kant's (1788/1996) categorical imperative—that one should treat others always as an end in themselves and never as a mere means to an end. This basic insight at the heart of Kant's moral philosophy has been enriched by recent theorists and rearticulated in terms of a kind of communicative rationality and reciprocity (Habermas, 1990; Scanlon, 1998). According to these more recent views, acceptable interactions are those in which all people who are possibly affected agree to—or could be reasonably expected to agree to—the norms being followed. Ideally the norms that govern interactions should be co-constructed by participants. We should agree on how we want to treat one another. And in cases where those affected cannot be included in decision making—as is often the case with children—then we must act on their behalf. This means we must act in light of a reasonable belief that our action would be justified in their eyes (if they could be granted full knowledge of the situation).

This principle does not rule out disagreement and conflict; it merely suggests that disagreements over actions and norms should be *reasonable* and *considered* ones.

This means that we are obliged *not* to act toward a child in a way that disregards his or her considered acceptance of our actions. We are also obliged *not* to act toward a child such that our actions could be, by our own estimation, reasonably and potentially unjustifiable to the child. Thinking in these terms, it is unacceptable to instrumentally intervene in the life of another—to work *on* them as opposed to *with* them. Actions carried out by engaging mainly third-person perspectives are not performed with a concern for the potential agreement of those affected. The deepest ethical issues surrounding educationally oriented biotech arise from the fact that these technologies make it possible to change behaviors without establishing a context of mutually understood norms and goals.

This is critical because children establish their identities in specific sociocultural contexts and relationships that embody specific preferences and values. Development is a dynamic biopsychosocial process of individuation through socialization; an individual *negotiates* her identity in relation to the desires of significant elders and broad cultural patterns. However, when educationally oriented biotech is used to affect the outcome of identity formation, a child's ability to negotiate her own identity can be lost, as the preferences of parents or prevalent cultural norms are literally *built* into her biology. As noted during the discussion of ADHD, most treatments do not involve questioning the sociocultural contexts in which the child manifests symptoms. Instead, attention is focused on the biology of the child only, and it is not considered whether some of the norms and rules the child is being asked to conform to might be unreasonable. Importantly, educational configurations that work this way effectively instantiate a system of norms that is insensitive to dissent and that relies on an ability to design children who will conform. This is a violation of the child's autonomy—literally disallowing the child's "self-legislative" ability. Thus, parents or cultures that severely constrain the choices available to their children during identity formation are seen as repressive (Nussbaum, 2000). All children have "the right to an open future," in which they can act autonomously and responsibly (Feinberg, 1992). And all children have a right to participate in their own development (United Nations, 1989).

However, given all that has been said, it is extremely important to remember that this is not simply about condemning parents and teachers, who are trying (often desperately) to relieve the suffering of children who are struggling in the educational configurations that surround them. This is about finding a language we can use to distinguish between "good" and "bad" uses of educational psychopharmacology. As already stated, children have as much a right to be cared for as they have a right

to conditions enabling their autonomy. But a program of *comprehensive care* would look for all the possible causes of suffering. In the case of ADHD this would mean seriously considering the possibility that the educational configurations children find themselves in are broken, not their brains. And while we have obligations to do what is necessary now to bring relief to children in need, which at times may require a judicious use of psychotropic medications, there is an equally pressing obligation to ensure that our educational configurations are reasonably arranged. The most basic goals and norms that structure the way children are treated must be justifiable, ultimately *in their eyes*. So while drugs may be effective in helping children find success, children must ultimately be *convinced* that such success is worthy of pursuit—they should make our educational goals their own. Otherwise, we are instrumentally and strategically overriding their right to an open future in order that they might fit into educational configurations that are illegitimate.

### IMPLICATIONS FOR POLICY AND PRACTICE

The discussions and arguments offered above suggest the need for a major reassessment of current practices involving the use of educationally oriented biotech. They also suggest the need to consider the broader trajectory of research and development efforts in the field. There are more implications for policy and practice than I have space to elaborate on here. I can only sketch the contours of what I think it would look like to begin to build the kinds of educational configurations that would enable the comprehensive care each child deserves.

To start, it must be recognized that the social structures capable of promoting comprehensive care are unlike the social structures currently in place in the United States and most of the world (Nussbaum, 2006). This has primarily to do with the legal and institutional policies affecting the distribution of resources. To continue with the example of ADHD, most parents face extremely limited options when their child begins to show signs of distress. There are no federally funded programs to help parents who must care for “disabled” children, state level accommodations vary greatly, and these typically dovetail with health insurance policies that almost universally privilege the kinds of practices that lead to drug treatments. It is very unusual for parents to be in a position to arrange for their child to change schools or to engage in expensive and time-consuming behavioral or family therapies. The goal of comprehensive care must become a political priority if this situation is to change. But mobilizing political action to alter policy depends on being able to show that biotech-based approaches are unacceptable when they are deployed as magic bullets. Arguments demonstrating that such treatment strategies are ineffective and costly have a great deal of weight in these debates (Parens & Johnston, 2008, 2009). Yet the ethical arguments offered here draw attention to the

basic human rights issues involved, suggesting that even if such treatments work they still might be unacceptable.

There should also be a concerted effort to build a broad research and development infrastructure that is integrated with our most important educational configurations (Fischer, 2009). If a biopsychosocial approach is the only acceptable way to frame treatments, then it must also be used to frame research. And this means finding ways to do research in educational contexts, and *in medias res*. Building usable knowledge about the complex factors that determine educational outcomes cannot be done in the laboratory. As Dewey (1929) argued long ago, education should be a focal point for problem-focused interdisciplinary research on a large scale, with the sciences and the humanities both called to task in determining what is possible and preferable for the educational configurations that will shape the future of civilization.

Finally, there is a need to institute international regulatory agencies to oversee the growth of increasingly powerful and profitable multinational biotech industries (Buchanan et al., 2000; Fukuyama, 2002; Habermas, 2003). Right now, market mechanisms are the main determining factor in biotech research and development efforts, as drug development and market development go hand in hand (Healy, 2002). Moreover, with the exception of information and communication technologies, no other technological advances do more to affect the day-to-day lives of individuals than biotech, and especially when they are educationally oriented. It remains to be seen whether sociocultural structures will continue to form *in reaction to* the uncontrolled developments of globalized techno-scientific industrial dynamics or if political will can be mobilized to control and shape these developments for the sake of human welfare (Habermas, 1979).

In this article I have articulated and justified a set of distinctions and concepts: the biopsychosocial approach, the ideal of comprehensive care this approach entails, a related ethical distinction between designing children and raising children, and the basic rights of all children to both care and autonomy. It is my hope that these ideas will be useful to those who are concerned with shaping the future of our educational configurations.

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