# International Perspectives on the Goals of Universal Basic and Secondary Education

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## Art, Science, Love, and the Importance of Binocular Vision

*Joel E. Cohen*

I became concerned with the goals of education through my work in demography and population biology. In my 1995 book, *How Many People Can the Earth Support?,* I observed that panaceas proposed by others for solving demographic, environmental, economic, and cultural (including political) problems fell into three categories: bigger pie, fewer forks, and better manners. "A bigger pie" means amplifying human productive capacities through better technology, including reduced material throughput in production. "Fewer forks" means reducing human demands through voluntary reductions in fertility and consumption. "Better manners" means reducing violence, inequity, corruption, perverse subsidies, and economically and socially irrational barriers to movements of goods, money, and people.

In 1998, I conjectured that giving all children in the world a basic and secondary education of high quality might contribute simultaneously to a bigger pie, fewer forks, and better manners. But whether ten to twelve years of education of high quality for all children would effectively support these three approaches depends on what that education aims to accomplish. Education that does not aim to inspire and enable innovation through instruction in science and technology would not promote a bigger pie. Education that does not give young people an understanding of the operation and maintenance of their own bodies could not promote fewer forks. Education that aims to prepare young men for the workforce but neglects young women, that does not develop empathy, or that fails to encourage respect and affection for people with different points of view, could not promote better manners. Education that does not encourage children and young adults to value the imaginative search for rational, nonviolent, broadly inclusive approaches to solving demographic, environmental, economic, and cultural problems risks diminishing, distorting, or misdirecting the potential benefits of a bigger pie, fewer forks, and better manners.

Thus the goals of education matter crucially. My tentative thoughts here about the goals of universal primary and secondary education are intended in part to be provocative rather than definitive.[1]

For whom are these goals intended? I have visited classrooms of privileged private and public schools in the United States and Singapore and

Australia, as well as poor schools in Burkina Faso and Cambodia and India, among other places. For many children in poor countries, the immediate goals of education are a rudimentary ability to read, write, and do elementary arithmetic. Sometimes the major goal is rote mastery of sacred texts. But even the way these rudimentary skills are taught can serve larger educational goals. The goals I propose in this chapter are intended for children and young adults in both poor and rich countries. The weighting of priorities must depend on the resources available for education.

## SKILLS, KNOWLEDGE, ATTITUDES, AND VALUES

The Organisation for Economic Cooperation and Development and others (Salganik and Provasnik, Chapter 20, this volume) propose that competence rests on skills, knowledge (presumably factual knowledge), attitudes, and values. I use these categories to propose several goals for education.

Skills include the ability to read with understanding, write with clarity, and speak with confidence. This proposal raises the questions: In which language(s) should students learn to read, write, and speak? Who decides which language(s) to use, and how is the decision reached?

Joel Spring (2000) suggested that "all people have the right to an education that teaches [both] their mother tongue [and] the dominant or official language of the nation" (p. 33). The intent of this proposal is to give people "an understanding of their own [culture] and their relation to it [as well as] an understanding of the effect of the world culture and economy on their own culture and economy" (p. 37). When Mauritius, a tiny island nation where fifteen languages are spoken, became a nation, it was necessary to choose a language of instruction for the schools. Although the commonest language is Kreol, a seldom written form of French Creole, the chosen state language was English, an ethnically neutral language that gave all students easy access to the world's economy.

I find Spring's suggestion attractive. I also suggest that children whose native tongue is one of the world-dominant languages, such as English or Chinese, should be required to master at least one other language, preferably not closely related to their native tongue. Speaking two (or more) languages teaches that there are ways of seeing the world and conventions in speaking of the world other than those of the culture into which one happens to be born.

Another necessary skill for basic and secondary education is numeracy, which is the ability to read, understand, and compute quantitative information as required in daily life. In a study of the literacy of United States college students, the American Institutes of Research defined quantitative literacy as "The knowledge and skills required to . . . identify and perform computations, either alone or sequentially, using numbers embedded in printed materials. Quantitative examples include balancing a checkbook,

figuring out a tip, completing an order form, or determining the amount of interest on a loan from an advertisement" (Baer, Cook, and Baldi, 2006, p. 4). This definition is equivalent to numeracy. According to this study, 20 percent of U.S. college students completing four-year degrees and 30 percent of students earning two-year degrees "have only basic quantitative literacy skills, meaning they are unable to estimate if their car has enough gasoline to get to the next gas station or calculate the total cost of ordering office supplies."[2]

I sent an announcement of this study to a professional mathematician and to a professional mathematics educator. Both responded that the problem lies in the inadequate quantitative education offered in primary and secondary schools. The inadequacy arises, they suggested, from an emphasis on reading at the expense of numeration on the part of parents before children get to school, from low expectations of mathematical performance by parents, teachers, schools, and society at large (how many times have you heard someone say, often with pride, "Oh, I was never good in math in school"?), and from inadequate training, supervision, and continuing education of teachers of mathematics in elementary and secondary schools. Not all societies (notably, not the Chinese) have such low expectations and achievements of quantitative literacy. To be innumerate today, to lack quantitative literacy as defined by the American Institutes of Research, is to be half blind, or more than half. No society and no individual can afford to be without numeracy.

Equally necessary are social skills. One social skill is finding peaceful ways to manage and resolve conflicts within and between social groups. Different cultures have totally different ideas about how to do that. Some decide by compromise, others use consensus, some take a majority vote, others appeal to tradition. All are successful in different contexts, and all unfortunately fail in the face of certain conflicts. Other necessary social skills are the ability to analyze and make choices about personal life and work, the ability to be productive, and the ability to find satisfaction in personal life and work.

Knowledge includes knowledge of self, which can be attained through the natural sciences (How does my body work?), the social sciences (Where do I fit in? What traditions and institutions do I inherit?), and the arts and humanities (What is the purpose of my life? What is my responsibility in shaping the direction of my life? What is beauty, and why is it important to me and others?). Knowledge also includes knowledge of others: family, the local community, other communities and cities, the nation, other countries and cultures, and humankind. It includes knowledge of nonhuman entities, including other living species and nonliving components of Earth. It includes knowledge of other times and the sources and limitations of our understanding of past and future. I return to the arts and sciences later in this chapter.

Attitudes permit people to recognize conflicts of competing values without being disabled by those conflicts and to find a personal balance

(changing with time) among the competing values. For example, innovation sometimes conflicts with continuity (How much do we change, and how much do we continue in the norms of the past?); between initiative and obedience (Do I obey the rules even if I think they are harmful, senseless, or counterproductive? How much do I try to get them changed?); between competitiveness and cooperation (How do I respect my own interests while I respect the interests of others and seek collaboration for mutual benefit?); and between skepticism and respect (How do I respect what others have to say, while still asking for the evidence behind it?).

Education also instills values. What those values ought to be is intensely controverted. Bok advocates for "minimalist values most easily recognized across societal and other boundaries: the most basic forms of the positive duties of care and reciprocity; of constraints on violence, deceit, and betrayal; and of norms for procedures and standards of justice" (1995, p. 41). I would advocate that education ought to instill these values, and that each community and each culture needs to discuss publicly the values it wishes to add to Bok's minimal set.

The goals I have sketched here take for granted an adequately nourished learner in good health in a safe environment. In too much of the world, these assumptions are invalid. If universal education contributes as hoped to a bigger pie, fewer forks, and better manners, future generations' learners will enjoy adequate nourishment and good health in a safe environment, and then the educational goals I propose could be relevant to all learners.

## ARTS AND SCIENCES

Elliot Eisner wrote:

> One of the generally neglected resources that promote the development of the whole child is the arts. The arts make it possible in vivid ways to eliminate a distinction between cognition and emotion. For example, creating images requires, on the one hand, a feel for the expressive character of the image and, on the other, forms of thinking that use feelings to make rational choices along the way. In this relationship between feeling and thinking, the two dimensions become unified in a single, inseparable process. Artistic forms of cognition in all kinds of activity, including scientific activities, represent the most complete form of integration that humans are likely to achieve. Schools can promote such opportunities by ensuring that the arts are included in the curriculum and that they have the kind of pedagogical support that enables students to take advantage of their educational possibilities (2005, p. 18).

Eisner listed "ten lessons the arts teach":

1. The arts teach children to make good judgments about qualitative relationships;
2. The arts teach children that problems can have more than one solution and that questions can have more than one answer;
3. The arts celebrate multiple perspectives;
4. The arts teach children that in complex forms of problem solving purposes are seldom fixed;
5. The arts make vivid the fact that neither words in their literal form nor numbers exhaust what we can know;
6. The arts teach students that small differences can have large effects;
7. The arts teach students to think through and within a material;
8. The arts help children learn to say what cannot be said;
9. The arts enable us to have experience we can have from no other source; and
10. The arts' position in the school curriculum symbolizes to the young what adults believe is important. (2002, pp. 70–92)

As a working scientist with a lifelong active interest in music and poetry and an appreciation for other arts, I find compelling Eisner's argument for the broad benefits of education in the arts for all students. A similar argument for education in the sciences seems to me equally valid, though rarely made. However, it seems likely that the benefits of education in the arts and sciences can be attained only when the teaching of each is significantly better than is often available in primary and secondary schools now.

Eisner's ten lessons look like this if arts are replaced by sciences:

1. The sciences teach children to make good judgments about both qualitative and quantitative relationships. In every science, qualitative judgments are required to decide which factors merit inclusion in an experiment, calculation, or theory.
2. Contrary to what is widely believed, the sciences (including mathematics) can teach children that problems can have more than one solution and that questions can have more than one answer. For example, the Pythagorean theorem, widely taught in high school geometry classes, has hundreds of different proofs, and new ones are still being discovered though the theorem is thousands of years old. Multiple proofs shed light on different aspects of a single result. Moreover, alternatives to the Pythagorean theorem hold on surfaces (like a sphere or a saddle) that are not flat.
3. The sciences celebrate multiple perspectives; molecular biology, genetics, cell biology, physiology, epidemiology, clinical medicine, and environmental sciences all make different important contributions to the health of individuals and populations.

4. The sciences teach children that in complex forms of problem solving purposes are seldom fixed; accidental discovery (for example, of penicillin) is a hallmark of an alert scientific investigator.
5. The sciences vividly demonstrate that neither words in their literal form nor numbers exhaust what we can know; scientists regularly admit having no provable answers to many questions of scientific interest and human concern, despite having intuitions about them.
6. The sciences teach students that small differences can have large effects; this lesson is central to the mathematics and sciences of nonlinear and chaotic behaviors.
7. The sciences teach students to think through and within a material; the physicist Richard Feynman was famous for practicing and teaching the art of animating and putting himself into the mathematical and physical systems he was theorizing about. If you want to understand mountains, think like a mountain.
8. The sciences help children learn to say what cannot be said; high school algebra permits students to say what words are inadequate to say (try solving a quadratic equation with nothing but words). The most creative mathematics captures concepts never before reduced to symbols.
9. The sciences enable us to have experiences we can have from no other source; perhaps the only thrill greater than the thrill of thoroughly understanding how something works, even if the discovery is someone else's, is the thrill of discovering or proving something that no other human has known before. Moreover, the instruments of science (microscopes, telescopes, computers) make possible experiences no other sources can provide.
10. The sciences' position in the school curriculum symbolizes to the young what adults believe is important; if the sciences are taught well and generously supported, students understand that adults value facts, rational understanding, and the sustained effort and high creativity required to master science and make it grow.

In addition to these ten lessons, an experience of science as it is practiced teaches much more. I distinguish science as practiced (which looks outward from the sphere of the known to the surrounding space of the unknown) from science as often taught in schools (focused on the known). Science as practiced gives training in the exciting and productive tension between solitary creativity and collaborative creativity. It gives a sense of participating in a cumulative human enterprise that is much larger than oneself. It gives a sense of the universality of the human impulse to understand experience, regardless of the origin, language, creed, or other characteristics of the scientist. It gives an opportunity to work with people of enormously different backgrounds and to feel part of the human family, a privileged part with a shared language and shared concepts.

The content of science has civic implications as well. For example, scientific education about human uses of resources both living (forests, fisheries, farms) and non-living (energy, water, land, atmosphere) can make clear how my local actions today affect other people in other places and future times as well as here and now. Environmental education based on sound physics, chemistry, and biology displays the mutual dependence of people, other species, and natural systems around the globe and opens a path to greater dialogue and cooperation across national, linguistic, and cultural boundaries. Science applied to forensic identification can improve the quality of criminal justice and raise awareness of the fallibility of human judgments.

Science as practiced requires lucid, persuasive, and engaging communication; work that is not reported to one's scientific peers is not scientific work. Science as practiced requires honesty; fraud and cheating are suicidal. Science as practiced requires and teaches humility; around the edges of every success loom the unknown, the inscrutable, the recalcitrant, and questions still unanswered. Science as practiced teaches modesty. For each of the numberless complex skills required to do science, always somebody else can perform that skill better, and despite the riches of human talent, nature is cleverer in posing riddles than humans are in answering them. Science as practiced requires and teaches enormously hard work and sometimes rewards it. An experience of science as practiced teaches the importance of deriving satisfaction from the work itself, from knowing that one has pushed oneself to the limits of one's ability.

Aside from the very important technological and economic benefits of scientific education (and technological education, which I include here with scientific education), these cultural and personal benefits of scientific education seem to me to justify the goal of giving every child an experience of science as practiced. Giving every student this opportunity will require teachers who can teach the sciences with love, excitement, and accurate understanding.

## LOVE

Love has a fundamental relation to education. Jacques Delors (1996, p. 12) wrote that education is "an expression of affection for children and young people, whom we need to welcome into society, unreservedly offering them the place that is theirs by right therein. . . ." The word "love" occurs in six chapters in this volume. Charfi and Redissi (Chapter 12) write: "The state has no business worrying about the salvation of souls. Still, it should teach such virtues as loyalty, generosity, courage, love of neighbor, peace, and good works. Without a respect for such virtues, social life is given over to evil" (p. 155). Suárez-Orozco (Chapter 15) writes: "Children growing up today will need to develop the skills to learn, work, love, and live with others, which are increasingly likely to be of very different racial, religious,

linguistic, and cultural backgrounds. Globalization will place a great premium on transcultural understandings. New forms of transcultural empathy and perspective-taking will be at a premium for survival and success in the twenty-first century" (p. 208). I want to explain why love should be recognized as a key ingredient in the preparation of children for basic and secondary education, in the processes of education, and in the long-term outcomes of education.

Before a child ever gets to a school or begins other formal education, he or she is normally born into a family. The child's parent, parents, or caretaker (I will use "parents" as an abbreviation) either love the child or do not, and usually the child responds by loving the parents or not, and loving himself or herself or not. Whether or not the child loves and is loved by the parents, the parents are the child's first teacher(s). It seems inevitable that a child should associate his or her learning from parents, which happens no matter what, with the love that binds him to the parents or the lack of love that estranges him from them. When a child begins basic education in a school, teachers may be the first adults other than parents and relatives with responsibility for care of the child. In the fortunate case where the child and parents were bound by love, the child is prepared to transfer to the teacher the emotional bonding associated with learning. In the unfortunate case where the child did not associate learning with parental love, the child and schoolteacher face the hurdle of changing the emotional sign associated with learning from negative to positive. A role of love in basic education is to associate learning with the most positive of all emotional experiences, the giving and receiving of love.

A child who comes from a home with siblings learns from them as well as from his parents and establishes some mix of love and rivalry. The child may be fortunate if parents and siblings establish a practice of love among siblings, and unfortunate if not. When the child enters school, he or she is also equipped to associate with learning from his peers at school whatever mix of love and rivalry that child associates with learning from siblings at home. A task of the teacher and school is to assure a positive sign to the learning between peers for those not fortunate enough to have brought a positive sign to peer learning. This task is crucial for children where relations with siblings were negative, and will be increasingly important if demographic trends toward reduced fertility increasingly make single-child families more frequent than larger ones.

For children who unfortunately did not establish the habit of loving themselves as a result of the gift of parental love, primary and secondary schools can implant the habit of self-love through explicit positive input from teachers and peers. Without the habit of self-love, love for others is crippled at the starting gate.

The role of love in education can be treated scientifically. In a comprehensive review of the science of early childhood development (Shonkoff and Phillips, 2000), the first recommendation is:

> Resources on a par with those focused on literacy and numerical skills should be devoted to translating the knowledge base on young children's emotional, regulatory, and social development into effective strategies for fostering: (1) the development of curiosity, self-direction, and persistence in learning situations; (2) the ability to cooperate, demonstrate caring, and resolve conflict with peers; and (3) the capacity to experience the enhanced motivation associated with feeling competent and loved. Such strategies and their widespread diffusion into the early childhood field must encompass young children both with and without special needs. Successful action on this recommendation will require the long-term, collaborative investment of government, professional organizations, private philanthropy, and voluntary associations (p. 6).

Moreover:

> Parents and other regular caregivers in children's lives are "active ingredients" of environmental influence during the early childhood period. Children grow and thrive in the context of close and dependable relationships that provide love and nurturance, security, responsive interaction, and encouragement for exploration. Without at least one such relationship, development is disrupted and the consequences can be severe and longlasting. If provided or restored, however, a sensitive caregiving relationship can foster remarkable recovery. The time is long overdue for society to recognize the significance of out-of-home relationships for young children, to esteem those who care for them when their parents are not available, and to compensate them adequately as a means of supporting stability and quality in these relationships for all children, regardless of their family's income and irrespective of their developmental needs. Early experiences clearly affect the development of the brain. Yet the recent focus on "zero to three" as a critical or particularly sensitive period is highly problematic, not because this isn't an important period for the developing brain, but simply because the disproportionate attention to the period from birth to 3 years begins too late and ends too soon (p. 7).

The words "love," "beloved," "loved," "lovable," and "loving" appear throughout this scientific document.

Adam Smith (1759) premised his great book, *The Theory of Moral Sentiments,* on the happiness and well-being people derive from the happiness and well-being of others. He began his first chapter, "Of Sympathy," thus:

> How selfish soever man may be supposed, there are evidently some principles in his nature, which interest him in the fortune of others, and render their happiness necessary to him, though he derives nothing from it except the pleasure of seeing it. Of this kind is pity or compassion,

> the emotion which we feel for the misery of others, when we either see it, or are made to conceive it in a very lively manner. . . . As we have no immediate experience of what other men feel, we can form no idea of the manner in which they are affected, but by conceiving what we ourselves should feel in the like situation.

Adam Smith's sympathy, today called empathy, is a form of loving others as oneself. A neurophysiological basis for empathy was discovered in the function of nervous tissue called "mirror cells" (Iacoboni et al., 2005; Rizzolatti et al., 1995).

In basic education, a crucial goal is to teach a love of learning initially through love of teachers and fellow students from whom one learns. In secondary education, love between teachers and students and between students and students remains an essential catalyst of learning, but increasingly teachers model for students a love of advanced subjects of learning, including the living and nonliving natural world, the worlds of art and imagination, the larger society, other cultures, peoples, times and places, and abstract structures of pure thought. One young woman, recalling a teacher important in her own and her friends' secondary education, wrote: ". . .the teachers most of us remember fondly are those that seem instinctively able to transfer their students' affection for them into academic engagement" (Karnasiewicz, 2006). To the extent that secondary school teachers can foster love of the subjects of secondary education, they establish the motivation and habits of loving learning throughout life.

Another role of love at the secondary level of education is to enlarge the scope of the learner's self-love to envision and create a life of multiple meanings, engagements, and satisfactions. The learner's love earlier focused on family and teachers should be, at the secondary level, indirectly guided by the personal examples of teachers and parents to love of learning about all aspects of the world. The form of love changes from early crushes on teachers and fellow students to an acceptance of the worth and dignity of other people who may be very different in appearance and habits. That acceptance is a form of love. It provides the foundation for civility in a diverse society and for civility among diverse national and global communities; among civic, religious, linguistic, and gender communities; and among past, present, and future communities. The adequate receipt, development, and practice of love can help to extend the values (which ought to be universal) "of nurturing and of internal curbs on violence, deceit and betrayal" (Bok, 2002, p. 287) from familial, tribal, or national boundaries to the entire human species initially, and then eventually to other species. Love is one of education's key ingredients and products.

My claims about the role of love in education are empirically testable and have practical consequences for educating teachers (Annabel J. Cohen, personal communication, November 1, 2006). The question for empirical

research is: What should teachers do to show that they care about each student (and about their subject matter, at higher levels of education), and if they do this, will students learn more and better? Randomized controlled studies could be designed to identify how teachers should behave to show their care for each student and for their subject, and whether students will learn better as a result. If such trials show that students learn best when they love their teachers and their teachers love their subject, then educators should be taught how to encourage their students to love them and their subject.

## THE IMPORTANCE OF BINOCULAR VISION

Binocular vision means having two eyes view the same scene from slightly displaced positions. Binocular vision makes it possible for the brain to create a perception of depth. I think educational analogs of binocular vision should be used much more broadly.

For example, earlier in this chapter I recommended the mastery of at least two languages (one's native language and at least one global language) and active knowledge of at least two ways of imagining, knowing, and representing the world (art and science). Mastery of two or more languages is the linguistic analog of having the stereoscopic vision that two eyes give. First-hand experience with art and science is a conceptual analog of binocular vision. Dual viewpoints give the world a depth not possible with only one point of view.

The desirable educational possibilities of binocular vision do not end there. The arts are plural, not singular. Knowing music, poetry and painting, as examples, gives a deeper vision of the creative possibilities of the human mind than knowing only one of them. Knowing the music of India, China, Africa, and Western Europe gives a richer perspective on the possibilities of human musical imagination than knowing any one of them alone.

Binocular vision in music, as in other areas, can be turned to favorable civic ends. For example, Cape Verde is a former colony of Portugal in West Africa, and Portugal's largest immigrant group originates in Cape Verde. When Portuguese children aged nine to ten studied and learned popular songs of Cape Verde along with popular songs of Portugal, their level of stereotyping of dark-skinned people was significantly reduced relative to their level of stereotyping prior to the program; their level of stereotyping was also significantly less than that of a randomized control group of children who studied and learned only Portuguese popular songs (Sousa, Neto, and Mullet, 2005). Annabel J. Cohen, a psychologist of music at the University of Prince Edward Island, has suggested investigating whether teaching children the music of children in other countries considered enemies of their own countries would make those students less likely to view

people in the other countries with hostility (personal communication, October 6, 2006).

Like the arts in this respect as in so many others, the sciences are plural, not singular. Having a working understanding of some part of mathematics and some part of an empirical science gives two radically different points of view on the roles of reason and experience and the differing meanings of truth in different sciences. In higher education, knowing two academic disciplines immunizes against the parochialism of either one and creates awareness of the multiplicity of academic specialties and parochialisms.

Religious education can benefit from the analog of binocular vision as well. In high school, by good fortune I was forced against my will to take a course on the world's major religions. Like each of my classmates, I was obliged to write an extensive expository paper on any religion other than my own. I developed an admiration for the strengths of the religion I selected for my paper and an awareness of its limitations. This exercise gave me an enlarged perspective on my own and other religions. That perspective has remained a valuable part of my vision of the world.

Similar benefits could have accrued had I been required in primary or secondary school to study the history of regions other than western Europe and northern America. While it is impossible for basic and secondary education to provide a detailed comparative perspective on every area of human interest, basic and secondary education can provide children with enough, progressively more sophisticated examples of a comparative perspective that seeking binocular vision becomes a habit.

The educational importance of binocular vision precedes and extends beyond formal education. Important learning goes on at home long before a child begins formal education. Binocular vision at home is also desirable. Having more than one adult caretaker and model provides an infant and growing child more than one model for responding to the world, brings the child multiple sets of experiences, perspectives, and alternatives to the extremes of any single personality. Encouraging the child to love both family and school, and later encouraging the adult to love family and work—emotional analogs of binocular vision—provide balance and depth in life.

I commend as a goal of education inculcating by repeated example the knowledge that, where there is one way to do a thing or view a thing, there is probably also another. Where one value is important, another value is likely to be important as well. A first step toward leading a life of choices is to have the habit of recognizing that choices exist.

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## NOTES

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2. http://www.air.org/news/default.aspx#pew (accessed February 2, 2006).

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