

Childhood Essentials:

Fostering the Full Range of Human Capacities

“Interactive multimedia leaves very little to the imagination. Like a Hollywood film, multimedia narrative includes such specific representations that less and less is left to the mind’s eye. By contrast, the written word sparks images and evokes metaphors that get much of their meaning from the reader’s imagination and experiences. When you read a novel, much of the color, sound, and motion come from you.”

—Nicholas Negroponte, founding director of MIT’s Media Lab, in *Being Digital*.

WHEN WE CONTEMPLATE A NEWBORN infant, we experience a feeling of reverence for the sacred reality of a new human life — its unique potential and profound mystery. Children who grow in an environment suffused with this sense of reverence, cared for by adults who respect each child’s special gifts and special challenges, have the best chance of thriving.

They also experience, in their very bones, the most personal and persuasive lesson we can possibly teach them about reverence for life. Children, after all, learn much about how to treat others by how we treat them.

In that context, the most daunting educational challenge that new technologies pose is really a moral issue. Human beings now wield unprecedented power to wage war on one another and on other species — and unprecedented power to sustain life as well. How can we prepare our children for these unprecedented moral responsibilities? Will proficiency in technical skills alone suffice? Or will a renewed sense of reverence for life be essential for humanity’s survival — perhaps for the survival of life itself?

Our task, then, is to educate our children in ways that develop the traits of character and habits of mind that shouldering the moral responsibilities of a high-tech future will demand. We fail in that task if we deny the imperatives of childhood. Children’s minds are especially tuned to learning through experiencing the world with their bodies, their hands, and their hearts. Computer technologies have proven useful in many adult realms of activity. But they are advanced intellectual tools that do not engage bodies, hands, or hearts in the experiential ways so essential for children’s development. Instead, they can overwhelm young children with abstract information about grown-up realities. Children of elementary-school age and younger are in general neither intellectually nor emotionally mature enough to benefit from using these tools.¹

The new technologies that are reshaping so much of our culture do present a formidable challenge to education. But the challenge is not to mechanize the education of young children even further. Instead, the most pressing issue is how to enliven and re-humanize education in

the face of an increasingly dehumanized culture. Children, in close company with caring adults, should be encouraged to explore and develop their own inner resources as human beings, including the special qualities they share with the rest of the living world. Then, as adults, they will command not just data but also the wisdom, imagination, courage, and moral will — all uniquely human qualities — to consciously shape their own technological future. They will learn to serve life on earth, not destroy it.

Never have such qualities been so crucial for our shared future. Bill Joy, co-founder and chief scientist of Sun Microsystems and the co-chair of President Clinton's 1998 blue-ribbon panel on the future of information-technology research, predicts that our culture is only decades away from designing technologies that could self-replicate beyond our capacity to contain or control them. The survival of humanity and other forms of life, he warns, will literally be at stake.

Joy also notes that we are racing into this frightening scenario with almost no public debate or planning. His warning, echoed by other leading scientists and engineers, is a wake-up call to parents, educators, and policy makers:

The 21st-century technologies — genetics, nanotechnology, and robotics (GNR) — are so powerful that they can spawn whole new classes of accidents and abuses. Most dangerously, for the first time, these accidents and abuses are widely within the reach of individuals or small groups. They will not require large facilities or rare raw materials. Knowledge alone will enable the use of them.

Thus we have the possibility not just of weapons of mass destruction but of knowledge-enabled mass destruction (KMD), this destructiveness

hugely amplified by the power of self-replication... Nothing about the way I got involved with computers suggested to me that I was going to be facing these kinds of issues... As Thoreau said, "We do not ride on the railroad; it rides on us;" and this is what we must fight, in our time. The question is, indeed, Which is to be the master? Will we survive our technologies?²

With knowledge now so potent a force for good and for evil, all education becomes moral education. One of the most critical moral questions we will have to help our children answer — by the power of our own example — is this: In a world of incredibly powerful machines, what's so special about imperfect human beings and other vulnerable forms of life?

Unless we actually intend our children to become the appendages — or the victims — of powerful technologies, we must educate them in ways that clearly demonstrate the difference. The popular image of the child's mind as a "biological computer"³ to be jump-started has spawned an endless stream of new technologies and products. We are being sold on the idea of an upgrade to childhood itself. Children are pushed to master much more, much sooner than ever before.

Pushing children in this way is both inhumane and counterproductive. The unhealthy stresses it has added to children's lives threaten their intellectual, emotional, social, and physical development. Evidence from many sciences indicates the wisdom of protecting childhood as a lengthy and necessary period of vulnerability and immaturity — a time for extended, loving nurture.

A buried acorn sinks a long, sturdy tap root into the earth, to nourish the mighty oak it will become in the far distant future. Children, like acorns and unlike machines, also must sink

deep, strong roots for a lifetime of growth and a broad flowering of the unique capacities that mark human nature. Recent research has demonstrated anew just how intricately integrated all of these aspects of being human really are, in terms of both healthy growth and healthy functioning — even at the level of neural connections.

No wonder, then, that human capacities range far beyond the narrow limits of machines' logical and mechanical operations. Even the most sophisticated machines, after all, mimic only a narrow portion of human cognitive and physical capacities. They are incapable, for example, of either intuitive or imaginative thinking. Nor can they physically express love with a look or a touch. In fact, our many nonlogical attributes are what make human thinking so alive. What we refer to as the intellect is abundantly enriched by all other aspects of being human — emotional, social, physical, and spiritual — even as it enriches them.

The current emphasis on early computer use and computer-like thinking leads children to “the rigid, logical, algorithmic thinking, bereft of moral, ethical, or spiritual content, that is characteristic of computer interaction,” write Valdemar Setzer and Lowell Monke, themselves computer scientists and educators. Such accelerated but narrow intellectual development, they add, “brings a child’s mental abilities to an adult level long before the emotional, psychological, spiritual, and moral sensibilities have grown strong enough to restrain it and give it a humane direction.”⁴

We therefore urge families and schools to recommit themselves to providing young children with the essentials of a healthy childhood. In our rushed culture, many children, both rich and poor, were deprived of these, even before the current computer craze. But the time and huge

sums of money now being diverted to computers in childhood have further distracted adults from these healthy essentials. All of them — unlike computers — are strongly supported by both research and simple common sense:

- 1. Close, loving relationships with responsible adults.**
- 2. Outdoor activity, nature exploration, gardening, and other direct encounters with nature.**
- 3. Time for unstructured play, especially make-believe play, as part of the core curriculum for young children.**
- 4. Music, drama, puppetry, dance, painting, and the other arts, offered both as separate classes and as a kind of yeast to bring the full range of other academic subjects to life.**
- 5. Hands-on lessons, handcrafts, and other physically engaging activities, which literally embody the most effective first lessons for young children in the sciences, mathematics, and technology.**
- 6. Conversation, poetry, storytelling, and books read aloud with beloved adults.**

Close, Loving Relationships with Responsible Adults

As documented in previous chapters, the quality of children’s emotional connections to parents, teachers, and other mentors is critical to every aspect of their development, including intellectual development. For this reason, any proposed educational reform should be scrutinized for its impact on strengthening or weakening the bonds between the teacher, her students, and students’ families. The same

question can be asked at the level of the whole school, as a community. Is a proposed innovation likely to strengthen or weaken the school's sense of community?

From this perspective, one of the most promising and least expensive school reform strategies is to let teachers to stay with the same group of students for more than one year. Such extended teaching, or "looping," makes it easier for teachers to know students and their families well. Professor David Elkind of Tufts University, former president of the National Association for the Education of Young Children, has pointed out how "ideally suited" such an extended relationship is for many children today, when parents are often pressed for time and children have often experienced frequent turnover in child-care providers:

Because of the attachment of children to teachers whom they have been with for many years, the teacher becomes a much more powerful role model than when the child only has the teacher for a year. The class also becomes more like a family as the children grow up learning and working together... School-age children need someone who knows them as totalities and who can reflect this wholeness back to them. Having the same teacher for a number of years is one of the best compensations for the often truncated interactions of postmodern, permeable family life.⁵

Research also indicates that smaller classes and smaller schools are effective for all students, especially the most disadvantaged.⁶ And fostering a strong sense of community has proven to be one of the most promising remedies for the most troubled schools.⁷

Parents and policymakers often assume that poor children without access to a computer at home will suffer academically. They push for

highly computerized classrooms as the best chance to cross the "digital divide" and help poor children compete academically with those who have home computers.

We know that computers pose hazards to children and can distract adults from children's real needs. But the most disadvantaged children may be at particular risk of educational failure if we insist that they interact with computers for much of the school day. Often, what they most desperately need is more personal, caring attention from teachers, school counselors, and other adults who will take the time to work with their strengths and weaknesses and to convey patient confidence in the child's ability. The research evidence for the wisdom of such special attention is overwhelming.⁸

So the real danger for disadvantaged children, as one technology expert has suggested, is just the opposite of what many parents fear: **"In the end, it is the poor who will be chained to the computer; the rich will get teachers."**⁹

Outdoor Activity, Gardening, and Other Direct Encounters with Nature

A second critical test of every proposed educational reform is whether it will strengthen or weaken the bond between children and the natural world. Our ecological crisis amounts to a "planetary emergency," in the words of environmental educator David W. Orr. It is also an educational crisis, Orr points out, because it demands entirely new ways of thinking, and of setting intellectual priorities:

Those now being educated will have to do what the present generation has been unable or unwilling to do: stabilize world population, reduce the emission of greenhouse gases that

threaten to change the climate — perhaps disastrously — protect biological diversity, reverse the destruction of forests everywhere, and conserve soils. They must learn how to use energy and materials with great efficiency. They must learn how to run civilization on sunlight. They must rebuild economies in order to eliminate waste and pollution. They must learn how to manage renewable resources for the long term. They must begin the great work of repairing, as much as possible, the damage done to the Earth in the past 150 years of industrialization. And they must do all of this while they reduce worsening social, ethnic, and racial inequities. No generation has ever faced a more daunting agenda.¹⁰

Many concerned scientists urge schools to create far more regular opportunities for children of all ages to forge deep emotional bonds with the natural world. Otherwise, they warn, our children, as adults, will have trouble summoning the courage and moral will to respond to such grave challenges.

“We cannot win this battle to save species and environments,” Stephen Jay Gould has said, “without forging an emotional bond between ourselves and nature as well — for we will not fight to save what we do not love.”¹¹

A love of nature is natural in childhood, given enough time for outdoor exploration. The Harvard biologist Edward O. Wilson emphasizes the evolutionary significance of “biophilia,” or human beings’ deep need to connect with the living diversity of nature. We have evolved as part of a rich web of life, according to Wilson, and both biologically and culturally we tend to connect our lives to other species.¹²

Our emotional bonds with the rest of the natural world help us to mature physically, intellectually, and spiritually. Nature’s diversity nourishes our material needs, including food,

clothing, medicines, even the air we breathe. But it also builds our emotional capacity for kinship, affection, awe, nurturing, and beauty; promotes our intellectual capacity for problem-solving, creativity, discovery, and control; and helps stimulate the recognition of a just and purposeful existence. Living diversity, adds Yale University scientist Stephen Kellert, “offers us inspiration, a source of language, story, and myth, a bedrock of understanding of beauty and significance.”¹³

Nature trains all of a child’s senses, and encourages reflection and acute observation, which later support scientific insight and precision in thinking. The noise and flash of electronic media demand the child’s attention. In contrast, the silence and subtle beauties of the natural world encourage children to focus their attention for themselves. This kind of self-motivated attention is critical for persisting in learning tasks of all kinds.

Traditional cultures have long recognized the subtle qualities of nature as powerful teaching tools. Among the Lakota people of North America, for example, children “were taught to use their sense of smell, to look where there was apparently nothing to see, and to listen intently when all seemingly was quiet.”¹⁴

Today, scientists consider childhood the most critical period for “cultivating an affinity, appreciation, awareness, knowledge, and concern for the natural world.”¹⁵

But biophilia is by no means automatic. To cultivate a relationship with nature, children need much time outdoors, both in active play and in quiet contemplation. Young children’s first education in the life and earth sciences comes through their personal, emotionally engaging experiences of nature, as a whole, live world to which the child himself belongs.

Every child has a right to such experiences beginning in early childhood and continuing throughout childhood. They lead both to engaged learning and to the wonder, reverence, and moral commitment that the subject in question — life itself — deserves. But many children today, even in rural areas, are growing up increasingly isolated from the natural world. They have far fewer chances to explore and enjoy the world outdoors on their own than children had in the past.

Computer software that presents sanitized or sensationalized versions of nature are part of the problem. Such intellectual abstractions are out of step with the far more concrete experiences that young children need to relate to the natural world.

Preschool children learn about nature by experiencing the world with their whole bodies, their senses, and their own profound emotional reactions to nature, including wonder, joy, and even fear. Between the ages of six and nine, children also are developing feelings of empathy for the needs and distress of other creatures.

Next, their concrete knowledge and their curiosity about plants and animals increases dramatically. Not until late adolescence, however, do children show more abstract and conceptual consciousness about the natural world. At this later age, they also develop a capacity to make moral judgments about ecological issues and human responsibilities, and a hunger to literally stretch their horizons, enjoying the personal challenge that wilderness experiences provide, for example.¹⁶

Some schools now purchase software simulations of nature as a substitute for live field trips to local rivers, parks, or campgrounds. But such simulations reduce children's actual connection to the real world rather than

increase it — just the opposite of what's intended. As a 1998 report from the U. S. National Science Board noted: "Computing and cyberspace may blur children's ability to separate the living from the inanimate, contribute to escapism and emotional detachment, stunt the development of a sense of personal security, and create a hyper-fluid sense of identity."¹⁷

The report cited the research of Sherry Turkle, a sociologist at the Massachusetts Institute of Technology who has most closely studied these issues. When her own young daughter saw a live jellyfish for the first time, Turkle reported at a 1998 conference, her daughter exclaimed: "But Mommy, it looks so realistic."¹⁸

Reconnecting children to the natural environment would be far less expensive — and far more effective — than electronic simulations and all the paraphernalia required to support them. Intense exposure to nature, such as frequent hands-on exploration of fields and woods and participation in gardening through the seasons, can inspire deep connections to the land and the many species that inhabit it. Such experiences also provide a natural opening to a broad study of subjects like botany, biology, zoology, meteorology, geology, geography, and history.

For a child, even an overgrown patch of weeds in an urban neighborhood can foster magical moments with bugs and flowers. But a small patch of ground, at school or near home, can also be turned into a garden — the ideal hands-on science lab for young children living far from wilderness.

David Orr, who chairs the Environmental Studies Program at Oberlin College, also urges parents and schools to create chances for

children of all ages to immerse themselves in a particular aspect of their own local ecology — a river, a mountain, a farm, a forest, even a particular animal — before introducing them to more advanced lessons based on information abstracted from nature. Children who live near a river, for example, could learn far more if they are allowed to return to it again and again over a period of time, to canoe in it, to experience its various seasons, to study its flora and fauna, to listen to it, smell it, and touch it, and to talk to those who live or work along it.¹⁹

Children from urban neighborhoods with high crime rates, poor housing, and little access to parks are especially in need of such safe, enriching experiences in nature through school and community programs. Again, our most disadvantaged children stand to lose the most when schools divert time and money to flat-screen versions of nature.

Time for Unstructured Play, Especially Make-Believe Play

Some high-tech companies have begun to provide playrooms to try to maximize their employees' creativity.²⁰ But many preschools and elementary schools are reducing or eliminating play and recess from their schedules.²¹ Only adults, it seems, have time to expand their minds through play.

Few parents, policymakers, or school administrators seem aware that a voluminous body of research over the last 30 years has decisively demonstrated that play — especially make-believe play — contributes in unique and critical ways to children's intellectual, social, and emotional development.²² In contrast, studies

over the same time period have failed to demonstrate that computers in elementary education make any critical contribution to children's development. Yet playtime in many classrooms is being sacrificed, as computer time increases. Play also, of course, contributes to children's physical health.

Edgar Klugman and Sara Smilansky, two leading researchers in the field, have argued that the evidence of gains from play is so strong that play should be part of the core curriculum in the education of

young children, through the age of eight. "In many crucial ways," they add, "play, an old friend, awakens the potential of each child."²³

Many studies have demonstrated the relevance of what researchers call "sociodramatic play" — make-believe play involving more than one individual — to scholastic achievement in many subjects, including reading, writing, science, and arithmetic. Studies have shown, for example, that make-believe and other kinds of play help young children learn to classify objects and group concepts in hierarchies, skills that have proven resistant to formal instruction. Children also test and revise their immature ideas about space, time, probability, and cause-and-effect relations during play. They test hypotheses, draw generalizations, and find creative, divergent ways to solve problems. All of these skills are relevant to later achievement in the sciences.²⁴

The Smithsonian Institution is planning a major conference for the fall of 2000 to explore the connection between children's play and adults' scientific and artistic innovations. "It's not that children are little scientists, but that

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—ALISON GOPNIK,
THE SCIENTIST IN THE CRIB

scientists are big children,” explains Alison Gopnik, co-author of *The Scientist in the Crib*.²⁵

From the child’s point of view, “pretend” play is worth doing because it’s fun. But in the process children sharpen and integrate a wide range of concepts and problem-solving skills. They spontaneously improvise from moment to moment in a hypothetical situation. And they integrate their experiences and construct meaning from them. In other words, make-believe presents complex intellectual challenges for young children that are intrinsically motivating. The more children engage in such play, the more proficient they become at it, especially at symbolically representing actions, objects, and abstract situations with language and gestures.

Research also indicates that parents and teachers can create an environment that encourages — or discourages — such play, and the benefits children derive from it. Smilansky has summarized the benefits that research points to from sociodramatic play as follows:

- **Gains in cognitive and creative skills:** Vocabulary, language comprehension, problem-solving strategies, curiosity, ability to take on the perspective of another, innovation, imaginativeness, attention span, ability to concentrate, overall intellectual competence.
- **Gains in social and emotional skills:** Playing with peers, group collaboration, peer cooperation, reduced aggression, increased empathy, better impulse control, better prediction of others’ preferences and desires, overall emotional and social adjustment.

Researchers attribute the loss of play time in preschools and elementary schools to the

increasing emphasis on early academics, linear thinking, and standardized testing in the education of young children.²⁶ The new focus is aggressive and didactic, pushing facts and isolated cognitive skills. Play, on the other hand, seems to have evolved as nature’s far more subtle strategy for motivating children to expand all of their capacities — physical, social, emotional, and intellectual — in an integrated way.²⁷

“Seen through this lens, play is the best possible preparation for adulthood, especially in our highly technological, competitive society,” suggests Arkansas master teacher Sheila G. Flaxman. “Children have never before been exposed to so much, so early. Play not only allows them to practice with all the new concepts — social, emotional, moral, and intellectual — they are learning so rapidly as they develop, but also helps them make sense of, and internalize, all the stimuli to which they are exposed.”²⁸

Substituting computer time for play time may actually reduce children’s ability to play. Teachers report that many children of all income levels who have been exposed to heavy diets of television, computers, and other electronic media now enter kindergarten not knowing how to play.²⁹ More computer time at school means even more exposure to powerful electronic images generated by others. That seems likely to further depress children’s ability to generate their own imaginative dramas.

Studies suggest that children who engage spontaneously and often in make-believe tend to be proficient at solving problems that have no one, simple solution.³⁰ So schools that reduce free play time may be discouraging the very activity that best fosters innovative thinking.

Research also suggests that, for young

children, “high-tech toys” is an oxymoron. The most brain-stretching materials appear to be the simplest, including water, clay, and blocks. Their very simplicity allows children the most freedom in creating and experimenting with endless versions of their own make-believe realities.³¹

As Nancy Foster, a veteran teacher in a play-oriented kindergarten in Silver Spring, Maryland, explains:

We wish to provide play materials which support and stimulate the young child’s capacity for fantasy play — their ability to use objects in many different ways to meet their needs of the moment. A carved piece of wood may, for example, be used as a bridge, or as a telephone, a boat, a cradle, a delivery truck, a fish, merchandise for a store, a package for the mailman to deliver, etc., etc. Younger children, of course, may see it as just another piece of “fire-wood” for the “fires” they love to build by piling up every movable object in the room!³²

The sophistication of many electronic toys and video games, on the other hand, limits the range of a child’s creative responses. The experience may be entertaining — at least till the novelty wears off. But it is more likely to stunt than to expand imagination. Many teachers, including Foster, have noted that children today often need help breaking out of a disturbing psychological fixation in their play, with scenes from some popular video that they have seen. A recent study reported in Walt Disney Home Video Press confirms that observation.³³

Poor children may be particularly vulnerable to such shortsighted classroom policies. Numerous studies suggest that children from families of low socioeconomic status do not tend to develop the verbally elaborate imaginative play that children from families of

higher socioeconomic status do. But research also suggest that certain sensitive interventions by teachers, parents, and other caregivers can help them become more able make-believers and achieve the developmental gains such play promotes.³⁴ Schools that offer little or no time to play, however, are cheating the most disadvantaged children of a chance to catch up.

Music, Drama, Puppetry, Dance, Painting, and the Other Arts

Children are born artists. They are naturally creative — eager to sing, dance, pound rhythmically on tabletops, act out great dramas from their own shared imaginations, and design masterpieces with sand, shells, stones, logs, clay, paint, crayons, or any other material that’s handy. Even as they enjoy the creative process, they are integrating and expanding a wide range of intellectual, emotional, and social skills.

Because the arts both enliven and illuminate everything they touch, they provide powerful motivation and powerful insights for students and teachers. Studies have found, for example, that children have more positive attitudes about school and do better in subjects such as spelling, writing, mathematics, and social studies when their classes include and incorporate the arts.³⁵

The arts are especially appropriate in the education of children of elementary age and younger because they learn most easily when lessons engage their feelings and bodies as well as their minds. Artistic lessons encourage self-discipline, imagination, critical thinking, originality, flexibility and divergent thinking in the face of ambiguity, and facility in using a wide range of symbolic tools, according to researchers and educators. Words and numbers

are both sets of symbols, each representing a different way of thinking about the world and its meaning. Every form of art — music, dance, drama, sculpture — provides children with another set of symbols for thinking about and expressing ideas and meaning.³⁶

Harvard psychologist Howard Gardner has pointed out that most schools focus on developing children’s logical-analytical and linguistic skills. He considers that too limited an approach, given the “multiple intelligences” of human beings. The arts, he emphasizes, help develop the far broader range of intelligences.³⁷

Just as the arts help children develop open minds, they also help open hearts. The arts teach practical emotional skills, including the self-discipline that comes from practice over time, persistence, the ability to delay gratification, healthy ways to reflect upon and express one’s own feelings and the feelings of others, and the self-motivation for learning that stems from the active, emotionally engaging challenges that the arts can bring to all other subjects.

And the arts can develop critical social skills. Children who perform together in a choral group or orchestra, for example, sharpen their communication skills and learn powerful lessons about collaboration and the value of each individual’s gifts and commitment if any group is to “make music” together.

Physically, too, the arts are enriching. They draw on all of the senses, leading to what Eliot Eisner, professor of education and art at Stanford University, calls “the refinement of visual and

tactile sensibilities upon which consciousness itself depends.”³⁸ The arts also challenge teachers to be creative in inviting children to comprehend a wide range of subjects literally “in their bodies.” Geometrical relationships and multiplication tables, for example, can be taught

through creative motion or rhythmic games, and history comes alive when children act out the great dramas of the past.

Charles Fowler, the late well-known music educator, pointed to how profoundly the arts can enrich children’s moral development:

One of the arts most important contributions to the development of young people is the cultivation of their emotional and spiritual well-being. The human spirit in all its manifestations is central to the arts.

Think of the great cathedrals, mosques, and temples, the paintings, sculpture, and music that have been created around the world to put us in touch, and sustain our contact, with the spiritual world. Students can be inspired by the arts to reach deeper within themselves to stand in awe of dimensions of life we cannot fully understand or grasp, of our own fragile and temporal being, and of life itself in the vastness of the cosmos.³⁹

The current emphasis on computer tools in elementary schools encourages children to produce “authentic products,” such as PowerPoint presentations that mimic the style if not the substance of adults’ professional work. The message is clear: the beauty of children’s own simple artistic creations is not good enough. They can and must be held to adult standards, whether or not such standardized fare is really

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—KATE MOODY,
READING SPECIALIST AT THE
UNIVERSITY OF TEXAS

the most effective way to develop the individual child's inner capacities for creative thinking.

Just how sophisticated software will help children construct meaning for themselves, compared to less sophisticated learning tools, such as paper and paints, is not clear. Students' choices of expression, for example, are often severely constrained by the software programs they use, whose parameters are controlled by a whole team of software developers and marketing professionals unknown to the students.

Artistic approaches to learning are not only far more age-appropriate but also far cheaper than the more adult-oriented emphasis on high-tech classrooms. Yet budgets for music and other arts, never generous, are now being cut even further or eliminated in some schools to help pay for equipping and maintaining high-tech classrooms.⁴⁰

Art, music, and physical education are not “frills.” Research shows these multisensory experiences to be essential for the developing brain in general, and for reading proficiency in particular. Kate Moody, an expert on reading, dyslexia, and electronic media at the University of Texas at Gainesville, reports that “experts now realize that creating things with your hands helps to develop the brain, music and songs cause the student to focus on sounds within words and tonal (spatial) relationships, while body movement of all kinds helps produce physical, mental, and cognitive benefits.”⁴¹

Recent research further suggests that childhood may be a window of opportunity, a time when the brain is naturally primed to learn music and possibly other arts most easily — and

to benefit in a wide range of academic subjects from the incorporation of the arts into the whole curriculum. The biophysicist Martin Gardiner, for example, suggests that “learning arts skills forces mental ‘stretching’ useful to other areas of learning,” including mathematics.⁴²

Research also shows that individuals who are not educated in the arts as children are less likely to participate in the arts as adults.⁴³ In effect, then, sacrificing the arts for computers in school may deprive children of lifelong enjoyment of some of the most emotionally, culturally, and spiritually enriching experiences of being human.

Finally, research suggests that schools rich in the arts can be especially healing for at-risk children in troubled neighborhoods. The arts generate healthy outlets for expressing anger, sadness, and a whole range of other confusing and painful feelings, and may even be useful in preventing violence. An immersion in the arts teaches children to respect the cultures of different peoples, to respect themselves, and to experience more deeply the meaning of their studies and of their own lives, even as they build skills and self-confidence through artistic practice.⁴⁴

As Fowler noted in *Strong Arts, Strong Schools*:

My observations in schools are that drugs, crime, hostility, indifference, and insensitivity tend to run rampant in schools that deprive students of instruction in the arts. In the process of overselling science, mathematics, and technology as the panaceas of commerce, schools have denied students something pre-

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MUSIC EDUCATOR

scious: access to their expressive communicative beings and their participation in creating their own world. In inner-city schools that do not offer instruction in the arts, the students have little pride and less enthusiasm, and such deprivation saps their lives of vitality and potential.⁴⁵

Hands-on Lessons, Handcrafts, and Other Physically Engaging Activities

Research clearly demonstrates that hands-on experiences, at home and in the classroom, are powerfully motivating and particularly effective for learning in many realms, including science, mathematics, reading, and languages.⁴⁶

Integrating the arts into these subjects, as described above, is an exceptionally powerful example of hands-on education, because the arts are so emotionally engaging. But children benefit intellectually from a wide array of other concrete encounters with real materials. As with the arts, this includes classes in handcrafts such as knitting and woodworking, and the integration of hands-on activities into academic studies.

A 1990 study showed that children learn spelling more easily when teachers use a multisensory, hands-on approach that includes first saying the spelling of a word, then writing it out by hand, and then seeing it, as they have themselves shaped it by hand. This approach proved more effective than trying to teach children by typing the letters out on a computer screen.⁴⁷

Unfortunately, the solid research evidence of the wisdom of a hands-on curriculum, like the research on play, is rarely applied in classrooms. F. James Rutherford, a leading science educator, noted in 1993:

Hands-on learning activities used appropriately can transform science learning by engaging the

student in the process of science. Unfortunately, these activities are not widely used. It could be because so few teachers have had opportunities to develop skills needed for hands-on instruction. Another factor is that hands-on learning takes time — and the pressure to get on with the overstuffed curriculum discourages many teachers from taking that time.⁴⁸

Teachers are under ever greater pressure today to substitute sedentary work at computer screens for more physically and emotionally engaging activities. Computer proponents argue that computers are just what the latest theory of learning, the “constructivist” model, calls for. According to this theory, students are active learners, constructing their own conceptual framework, constantly “renovating” their mental representations as their understanding of the world grows and changes.

Constructivism is promoted as replacing the old, industrially based model of the school as a factory, in which the teachers were seen as the workers and the students their products — empty containers which teachers filled with knowledge. The new model, however, when applied to computerized learning, often ends up being treated as little more than a dressed-up version of the old one. In the new version, teachers become effective managers, and the students are the workers. The product they are producing is their own learning.

Under this approach, then, schools are still viewed as similar to commercial enterprises, with the emphasis on efficiency, productivity, and the bottom line. This narrow metaphor is hardly appropriate for the care of young children. But it makes the automation of kindergartens and the elimination of such “frills” as creative play, recess, and the arts seem perfectly rational. After all, every other workplace has been automated in the

hopes of productivity gains — why not the classroom?

Because children are the “workers,” we expect them to sit still, at their electronic workstations, for hours on end, intellectually “constructing” as quickly and efficiently as possible their “product” — knowledge. Because we are narrowly focused on children’s cognitive processes, to the exclusion of their emotional and physical experiences, we mistake intellectual abstractions — i.e., data — for the raw material of knowledge construction. In this context, then, the more information children can access, and the faster, the more productive workers they will be.

“The student is still a receptacle for facts — it’s just that he must learn to stuff himself, instead of being stuffed by someone else,” notes Steve Talbott, editor of the online newsletter *NetFuture*. “I’m not sure there’s much difference between the equally constipated outcome of these two approaches.”⁴⁹

Hence, the new classroom emphasis on the Internet. And hence our expectations that children prove their progress by producing projects that resemble as closely as possible the standardized reports and presentations that adult workers produce, using the same sophisticated office equipment that adult workers use in real workplaces. But the most effective teaching and learning may not seem — in the short run — very efficient at all, as Rutherford notes above, or even obviously productive. That’s because hands-on and other “in-the-body” learning experiences lay a foundation for creative abstract thinking that may not fully bear fruit until years later.

Even the U. S. Department of Education, a major booster of high-tech classrooms, does not emphasize computer technology in its own online summaries of what research suggests actually works in science education. Instead, it

strongly emphasizes the wisdom of hands-on activities. The department’s 1993 guide, “State of the Art: Transforming Ideas for Teaching and Learning Science,” states: “Hands-on, inquiry-based science instruction is well established as an effective teaching strategy.”⁵⁰ And its 1994 digest, “Doing Science with Your Children,” expands on this emphasis:

To give your children a firm foundation in science, they should be encouraged to think about and interact with the world around them. Concrete experiences that require the use of children’s senses, such as planting and watching a seed germinate, provide a strong framework for abstract thinking later in life.

Rich sensory experiences (seeing, hearing, tasting, touching, and smelling) can help children become more observant and curious. Exploring the characteristics of objects and living things can help them learn how to classify or group things based on their characteristics. By playfully interacting with their environment, children understand how they are distinct from the world around them and how they can influence aspects of it. Science begins for children when they discover that they can learn about the world through their own actions, such as blowing soap bubbles, adding a block that causes a structure to collapse, or refracting light through a prism. A child best learns to swim by getting into the water, likewise, a child best learns science by doing science. Hands-on science experiences, together with conversations about what is occurring, are the best method for developing children’s science process skills. These experiences go beyond improving science skills to improving reading skills, language skills, creativity, and attitudes toward science. Fortunately, these hands-on sciences experiences are ones that most children enjoy.⁵¹

Experts on science education add that

even older children, ages 9 to 12, still learn best through hands-on experiences. They note that children do not need expensive equipment to “do science.” On the contrary, often everyday life provides the best opportunities, as described in one museum’s guide for parents: “Sometimes science opportunities happen when you least expect them. Your child may notice a spider spinning its web on the way to the store, or soil getting washed away on a rainy day, or a full moon shining. It’s worth getting a little wet or dirty, or losing a little sleep sometimes.”⁵²

The Education Department’s guide for parents also notes that for children, simple is often best: “Opportunities for positive science experiences can be found in kitchens, yards, parks, science museums, beaches, nature centers, and even toy boxes... It is important to remember that often the simplest experiences may produce the most profound learning.”⁵³

Neal Lane, the president’s top adviser for science and technology policy, made a similar point in offering “holiday toy tips” to parents, while he was still director of the National Science Foundation. Parents, he said, should consider “simple toys that kindle their child’s natural curiosity,” and that “stimulate creativity and thinking skills.” A Slinky, he suggested, teaches fundamentals of wave motion, and a pocket-size illuminated magnifier “can cost less than \$10 and provides a wonderland view of nature for children. Simply add insects to create a hands-on science experience.”⁵⁴

Computer simulations are becoming popular classroom resources. But some educators and scientists question the impact of exposing young children to them.⁵⁵ And scientists are beginning to call for more direct observation in the field and practical experience — even in their own research — to correct an

overreliance on computer-generated models.⁵⁶

The current interest in “Web-based education” and ubiquitous Internet access for every student, from the age of five up, assumes that a lack of access to information has been a major problem in elementary schools. Actually, experts on math and science education have argued just the opposite. They have concluded, in part based on analyses of the disappointing performance of American students in international comparisons, that American children have been subjected to far too broad and too shallow a sweep of scientific information.⁵⁷ A deeper, less sweeping but more personally engaging approach — exactly what hands-on classes embody — would serve our children better, science educators have argued.

William H. Schmidt, U. S. coordinator for the Third International Math and Science Study, argues that the curriculum in American schools is “a mile wide and an inch deep... Concentrating instruction on fewer key concepts could substantially improve science literacy.”⁵⁸ Likewise, numerous studies have pointed to the exploration of real phenomena in the physical world is the *a priori* of science literacy. In a special 1999 review of what experts in science education recommend, *Scientific American* reported: “Real-world research that allows kids to test their own theories is best for teaching science.”⁵⁹

But the Internet’s infinite trail of links discourages concentration on key concepts. Thomas Sherman of the Virginia Polytechnic Institute and State University has pointed out that educators sensitive to young children’s developmental needs actually try to “limit children’s access to information by simplifying messages and sequencing contents.” Their intent is to avoid overwhelming children with

information that is so outside their experience they can neither understand nor assimilate it.

Given that many adults experience “information fatigue syndrome,” the sheer volume of information from Web surfing could be very confusing to children whose intellects are still maturing, Sherman adds.⁶⁰ And flashy software simulations, with all conditions and outcomes predetermined, are the opposite of messy real-world exploration.

On the other hand, when urban schools with high proportions of low-income children use computers in the classroom, they tend to emphasize “drill and kill” remedial software, which almost seems calculated to stamp out a child’s curiosity and wonder about the science of the real world.

“There is an implicit racism in the rise of mind-numbing software in inner-city schools,” says Judah Schwartz, co-director of Harvard University’s Educational Technology Center. “Lock up such software in the closet.”⁶¹

Conversation, Poetry, Storytelling, and Books Read Aloud with Beloved Adults

A rich diet of face-to-face, oral conversations with parents, teachers, and other caring adults provides the basic nourishment children need to succeed in reading, writing, and many other forms of academic learning.

Literacy actually begins with being held and fed, writes Barry Sanders of Pitzer College in *A Is for Ox: Violence, Electronic Media, and the Silencing of the Word*. Nursing, Sanders notes, provides a “fundamental, kinesthetic connection to literacy.” Vigorous sucking strengthens the infant’s respiratory system, which later contributes to the rhythms and patterns and

itches of speaking and listening. All five senses are involved as the infant, held close, feels and hears the rhythm of the parent’s heart and breath, as well as the vibrations of whatever the parent may say or sing. Such warm, close interactions with loving adults — literally, the human touch — have been shown in study after study to promote language and literacy skills in the most powerful and natural way.⁶²

Building on such early, emotionally engaging experiences, children learn to listen and to speak as social and cultural acts. Later, they learn to read and to write — that is, to “listen” to the meaning of others’ written words, and to express themselves in writing. So orality, as well as touch, is an essential prelude to literacy. According to Sanders:

Literacy fits over orality like a protective glove, following every contour and outline that orality hands it. Orality provides the rhythms, the intonations, and pitches, the very feelings, that find final expression in writing... Children need to hear language in order to learn language. This may sound like a tautology, but a child must hear language spoken by a live human being. Conversely, a living human being must listen to the child, and suffer through all the millions of questions and complaints. An electronically simulated voice will not work.⁶³

Kate Moody, the University of Texas reading expert, stresses the importance of a child being able to count on one or more adults who will “talk them through their world.” She writes that “conversational experience, which can be provided by any caring adult, is of immense importance to the child’s emerging abilities to listen, pay attention, follow directions, develop vocabulary and interact socially.”⁶⁴

Such conversations are by no means simple exchanges of information or one-sided

entertainment. Adults who are in close, prolonged contact with a child intuitively adjust the complexity of their communication to the child's growing ability to comprehend verbal and nonverbal cues in conversation, and to express himself within a cultural context.⁶⁵ Over time, such conversation helps children develop their own inner voice, which then becomes an invaluable guide, in the classroom and out, in planning and making choices.

Much of a child's learning about language takes place through nonsense rhymes, songs, and other forms of word play — through verbal games with adults and other children. Other children, too, provide the human companionship necessary to practice language skills. One study found that children who talk together while playing tend to become better and earlier readers, especially if their play includes play with language, such as silly rhymes and tongue-twisters.⁶⁶

Narratives, or stories, are essential to both oral and written communication. Storytelling captures the imaginations of children in ways that foster intellectual, emotional, and moral growth. It also provides a literacy booster for children that even parents who cannot read well themselves can provide. Children love stories made up just for them; they love the recounting of family history. Rhymes also naturally captivate children, and prepare them to treat words in reading as individual units that represent individual sounds with meanings attached to them. Research suggests that learning to read rhymes is easier than learning to read straight prose.⁶⁷

The element of rhythm in poetry and in good storytelling also aids school learning, as a basic sense of timing seems to help children learn to read. The imagery and playfulness of stories and

poems feed children's inner powers of image-making and wordsmithing.

Finally, literacy thrives in an environment that is rich in books, with ample time for adults to read them to and with children. Reviews of research indicate that reading aloud to children is "the most important activity for building the knowledge and skills eventually required for reading."⁶⁸

Here too, research suggests that direct human contact makes the difference. What seems to make reading aloud so powerful is the conversation that accompanies it, as children and adults actively discuss the story in an emotionally secure environment. It seems that parents, teachers, and other adult readers, through such conversation, can guide children to move from the words and pictures in a text to their own imaginative pictures and to comprehend the stories by relating them to their own experiences.

As Senator James M. Jeffords, chair of the Senate Health, Education, Labor, and Pensions Committee, has noted:

No matter how much technology we apply in the classroom, no matter how drastically our educational system may change during the 21st century, nothing will ever take the place of a good book and a caring adult to share it. The quiet space of a book sets a child's imagination free. And it is this first introduction to reading that will excite a child about learning for the rest of his or her life.⁶⁹

What about reading books on computer, with exciting graphics added? Isn't that even more effective in promoting literacy? Some teachers report that the animation and other multimedia features of electronic books are so visually diverting that they actually distract children from the story.⁷⁰ One survey of

computer-based reading programs found that few “have consistently proven to be effective and few have produced substantial achievement gains in students’ reading performance.”⁷¹ There is some evidence that computer programs can help children who have trouble understanding language with pre-reading skills in phonological awareness — the awareness of individual sounds in words. But it’s not clear that this translates into later success in reading.⁷²

The late Jeanne Chall, who was a leading expert in reading research, observed in more than 300 schools before concluding that the critical factor in interesting children in reading was not the particular method or technology but the teacher.

“It was *what the teacher did* [emphasis from the original] with the method, the materials, and the children rather than the method itself that seemed to make the difference.”⁷³

Nor have computer programs designed to help children learn to write been particularly effective. That may be due to inherent aspects of the technology itself, according to Alison Armstrong and Charles Casement:

Unlike print, which encourages reflection and a careful consideration of various points of view, computer software urges immediate action. Words and images on-screen invite constant change or substitution — that is, after all, one of the things the computer and the software it runs are designed to do. And the faster you can manipulate what you see on the screen, the more control you appear to have over the technology you are using. Speed and control are emphasized at the expense of thoughtfulness and understanding.⁷⁴

Children growing up today will have nearly a third fewer face-to-face interactions over the course of their lifetimes . . . human conversation, so vital to children’s emotional, social, and intellectual development, is on the wane.

Given what is now known about the importance of sharing conversations and sharing books with adults as the basis for literacy, two recent educational trends are especially troubling.

First, many school libraries, habitually underfunded even before computers, are now letting their book collections dwindle and using the money to buy computer hardware and software instead. In 1999, the average cost of a school library book was \$16, but the median expenditure for books in elementary school libraries was just \$6.73.⁷⁵

With elementary school populations rapidly increasing, the lack of money for the purchase of books is especially troubling because they are “the very place where a wide variety of interesting books on many reading levels can lead to a lifelong love of reading.”⁷⁶ A major research review in 1993 found that the amount of time that children spend voluntarily reading material they chose themselves is positively related to reading comprehension, vocabulary growth, spelling ability, grammar, and writing style. It also found that providing students with a large library collection is one effective way to boost reading achievement.⁷⁷

Linda Wood, a Rhode Island librarian representing the National Association of School Librarians, put it simply, in testifying to the U. S. Senate in 1999: “There is no point teaching a child how to read if there is nothing for the child to read! It is not the method of teaching reading that lies at the heart of any reading crisis; it is access to reading material.”⁷⁸

The second disturbing trend is the

substitution of time with computers and other electronic media for such live interactions, at home and at school. Children today are already spending far less time with their parents than in the past — according to one estimate, about 40 percent less time than 30 years ago.⁷⁹ Now, even when parents are home, children are increasingly spending time alone. A 1999 study by the Fortino Group in Pittsburgh estimated that children growing up today will have nearly a third fewer face-to-face interactions over the course of their lifetimes than the preceding generation. The difference is due to the increasing time that children are spending — at school and at home, where they are often alone in their own rooms — using electronic media of all kinds.⁸⁰

The amount of time that Americans of all ages spend interacting with computers and other electronic media, instead of speaking directly with each other, is now being cited by educators and health-care professionals as a destructive trend for the social coherence of families and communities.⁸¹ Human conversation, so vital to children’s emotional, social, and intellectual development, is on the wane.

Emphasizing computers in the education of young children seems likely to exacerbate their deficits in such conversational experiences, not correct it. Instead of rushing into early academics with computer programs, families and schools could renew the far more developmentally appropriate curriculum of spoken, shared language.

“Let us take youngsters out of the linguistic limbo they find themselves in and move them back into the key experience they have missed — orality,” writes Barry Sanders. “The teaching of literacy has to be founded on a curriculum of song, dance, play, and joking, coupled with

improvisation and recitation. Students need to hear stories, either made up by the teacher or read out loud. They need to make them up themselves or try to retell them in their own words... Good readers grow out of good reciters and good speakers.”⁸²

This approach is especially well suited to families where adult literacy is an issue. As Stanford University Professor Larry Cuban has argued, spending on adult literacy programs — which will both help prepare parents for the job market and enable them to read with their children — is a wiser expenditure of limited public dollars than school computers.⁸³

Poor families rely more on school libraries for books to read at home. Yet spending on unproven technologies is siphoning tax dollars from this proven educational practice.

Parents who may still be learning to master reading themselves could be empowered immediately by the kind of practical parenting education that would encourage them to tell their children their own stories. A focus on technology they can’t afford at home may be a further blow to their confidence as parents and to their children’s self-confidence in school, as

In summary, the educational essentials we advocate above share five features:

- Each supports the development of the full range of a child’s human gifts, not just the intellect.
- Each is strongly supported by research and practical experience.
- Each was already endangered in schools before the current enthusiasm for computers.

- Each is even more threatened by the new emphasis on computers.
- Each is especially critical to the education of our most socially and economically disadvantaged children. Likewise, when computers replace them, the loss most harms our most at-risk children.

they learn to devalue their own handiwork in comparison with others' glitzy printouts.

The pace and the power of high technology cries out for real educational change. But the moral choices our children will confront will be the most demanding aspect of tomorrow's high-tech agenda. Therefore, the single educational reform that is most critical for educators, parents, and policymakers to begin implementing today is to enliven our schools and our homes with these healthy essentials of a human and humane education.

As Valdemar Setzer and Lowell Monke conclude, in arguing that such an agenda for children is truly future-oriented:

Our hope is that the introduction of computers only after a childhood environment steeped in love, beauty, and respect for children's natural, holistic growth may make it possible for them to put these machines in their proper place... We recognize that it will take courage to withstand the pressures against it. Perhaps the most important thing is to try. Right now, more than anything else, we need more voices challenging the trend toward technological dominance of education.⁸⁴



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