

INFO-TOPIA

COMPUTERS KEEP GETTING SMARTER. CAN WE?

BY ROGER C. SCHANK



Is intelligence an absolute? Does mankind get smarter as time goes by? It depends on what you mean by intelligence, of course. Certainly we are getting more knowledgeable. Or at least it seems that way. While the average child has access to a wealth of information, considerably more than was available to children 50 years ago, there are people who claim that our children are not as well educated as they were 50 years ago and that our schools have failed us.

Today, questions about what it means to be intelligent and what it means to be educated are not at the center of our scientific inquiry, nor are they at the center of our popular discourse. Still, we live our lives according to implicitly understood ideas about intelligence and about education. Those ideas will be seriously challenged in the next 50 years.

About 10 years ago, I was asked to join the board of editors of *Encyclopaedia Britannica*. The other members were mostly octogenarians and mostly humanists. Because I was both a scientist and much younger than everyone else, most of what I said was met with odd stares. When I asked the board if they would be happy to put out an encyclopedia 10 times the size of the current one if the costs involved remained the same, they replied that, no, the current encyclopedia had just the right amount of information. I responded that they would be out of business in 10 years if that was their belief. They had no idea what I meant—although I tried to explain the coming of what is now called the World Wide Web. At a later meeting, after having heard me make similar assertions about the future, Clifton Fadiman, a literary hero of the 1940s, responded, “I guess we will all have to accept the fact that minds less well educated than our own will soon be in charge of institutions like the *Encyclopaedia*.”

The chairman of the board of the *Encyclopaedia Britannica* at that time was the late Mortimer Adler. He was also responsible for a series called *The Great Books of the Western World*, which was (and is) sold as a set. These books represent all the great written works of the world's wisdom—according to Adler and his colleagues, anyhow—most of them books written prior to the 20th century. I asked Adler whether there might be some new books that could be included, and he replied that most of the important thoughts had already been written down.

This idea, that all the great thoughts have already been thought, has been prevalent in

the American idea of education and intelligence for a long time. Here are the admission requirements for Harvard College in 1745:

When any Schollar is able to read Tully or such like classically Latine Authour ex tempore, and make and speake true Latin verse and prose Suo (ut aiunt) Marte, and decline perfectly the paradigms of Nounes and verbes in the Greeke tongue, then may hee bee admitted into the Colledge, nor shall any claim admission before such qualification.

What *The Great Books* series and Harvard of 1745 have in common is an underlying assumption that the study of man and his institutions had been sufficiently mastered in ancient times and therefore education required you to be well read and well versed in the thoughts of those who had preceded you. An educated person in this view is one who is able to discuss with erudition a variety of historical, philosophical and literary topics. Being educated—and therefore being intelligent—has, for the last century and many centuries before that, been about the accumulation of facts, the ability to quote the ideas of others and a familiarity with certain ideas. Education has meant accumulating information, and intelligence has often meant little more in the popular imagination than the ability to show off what one has accumulated.

But what happens when the facts are in the walls?

Fifty years from now, knowledge will be so easy to acquire that one will be able simply to say aloud whatever one wants to know and hear, an instantaneous response from the walls—enhanced by a great deal of technology inside those walls, of course. Knowing offhand what Freud had to say about the superego won't mean much when you can turn to the nearest appliance and ask what Freud had to say and hear Freud (or someone who looks and sounds a lot like him) saying it and finding five opposing thought leaders from throughout time ready to propose alternative ideas if you want to hear them and discuss them together.

But is intelligence simply the ability to be informed of answers to your questions, or is it the ability to know what questions to ask? As answers become devalued, questions

become more valued. We have lived for a very long time in an answer-based society. Signs of it are everywhere: in the television shows that people watch, such as *Jeopardy* and *Who Wants to Be a Millionaire?*; in the games that people play, such as “Trivial Pursuit”; and most of all in school, where answers are king. Increasingly, the chief concern of our schools is testing. School has become a regimen for learning answers rather than learning to inquire.

New technologies will change all this. When the pocket calculator was introduced, people asked whether calculators might as well be used in math tests, since from now on such devices would always be available. As a result, math tests began to focus on more substantive issues than long division. The introduction of artificial intelligence into everyday devices will have the same effect. As machines become omnipresent and able to answer questions about whatever concerns us, the values we place on each individual's being a repository of factual knowledge will diminish. The old idea of school, based on the notion that the most knowledgeable person in town had information to impart and the rest of us were forced to sit and memorize that information, will give way to new ideas of knowledge acquisition. Knowledge will no longer be seen as a commodity. Anything obtained easily is devalued in society, and it will be the same with knowledge.

What will be valued will be good questions. Computers can only take you so far, we will hear people say.

Imagine the following: You are sitting in your living room, talking with your spouse, and an issue comes up between you. You turn to the wall for a response. “Who was right?” you demand. The wall points out that it has a number of virtual people available to join your conversation. You choose some characters whom you have heard about or conversed with before. A lively discussion ensues. Eventually the limits of the computer's collective knowledge are reached. The walls know no more of relevance. “This, then, is an exciting question!” you exclaim. Knowing a good question makes you ready to enter into a discussion with other live humans interested in similar questions. You tell that to the walls, and suddenly the people interested in such questions—those who have gone beyond the software in the same



way that you have—are all there in your living room (virtually). In a world where this is possible, what does it mean to be educated? What does it mean to be intelligent?

To think about the education part of that question, we have to ask what a child's life would be like in that world. Fifty years from now, school as we know it will have atrophied from lack of interest. Why go to school to learn facts, when virtual experiences are readily available and the world's best teachers are virtually available at any moment? Education will mean—even from the age of two—exploring worlds of interest with intelligent guides available to answer your questions and pose new ones. World upon world will open to the child who is curious. Education in such a society will be a matter of what virtual (and later real) worlds you have entered and how much you have learned to do in those worlds.

To Fadiman's remark quoted above, I responded that minds would not be less well educated, just differently educated. In the world of Clifton Fadiman, an educated mind was one that had been trained at Harvard (or its equivalent) and was conversant with the major ideas in Western thought. His idea of education did not include, for example, being able to program in JAVA, or understanding the basics of neuroscience. In 50 years, there will still be Harvard, but the value of its imprimatur will have been altered tremendously.

Education in its deepest sense has always been about doing, rather than about knowing. Many scholars throughout the years have pointed this out, from Aristotle (“For the things we have to learn before we can do them, we learn by doing them”) to

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This essay was written for *The Next Fifty Years*, a collection edited by John Brockman and published in July by Vintage Books.

Galileo ("You cannot teach a man anything; you can only help him discover it within himself") to A. S. Neill ("I hear and I forget; I see and I remember; I do and I understand") to Einstein ("The only source of knowledge is experience"). Nevertheless, schools have ignored this and chosen—in the words of John Dewey—to "teach by pouring in."

The virtual schools that will arise to take the place of current institutions will attract students less because of the credentials they bestow than for the experiences they offer. Since these experiences will be there for the taking when a learner decides to learn, most students will start college long before the age of 18. Success in various virtual experiences will encourage us to encounter new ones, much as video games do today. Certifying agencies will worry more about what you can do—what virtual merit badges you have achieved—than what courses you have taken.

Fields of endeavor will create experiences in those fields. Instead of Harvard or Columbia offering courses in physics, physicists from around the world will work with designers who will build software to create physics experiences. Those experiences will be available to everyone. The old idea that the smartest people were those who received the best grades from schools that tested them to see how well they had learned will morph into a notion that the smartest students are the ones who pose questions for the software that have to be sent to humans in order to be answered. Intelligence will mean the ability to reach the limits of an educational experience.

Will we collectively be smarter as a society because of all these innovations? In terms of raw capacity for thought, people are as smart now as they ever were or ever will be. But a brilliant cave dweller, who had available to him limited knowledge of the world and limited wisdom from the ages, could work only within the parameters of the tools he knew. He may have understood the nature of humans and their institutions as well as the Greeks who followed him. He may have been as intelligent as the Greeks who followed him. But in any absolute sense he wasn't too smart, because there was so much that he hadn't experienced.

The same is true of our view of the Greeks, of course. Aristotle seems brilliant because he tackled issues we still tackle today

and had great insights into those issues. Yet Aristotle can also be almost funny in his naïveté when he approaches subjects with which he had little experience and with which we have had so much more. Each generation improves on the experiences it opens up to the next. But a leap of tremendous proportions is coming in the next generation. The fact that we still have teachers and classrooms and textbooks will be almost laughable in 50 years. People will look back at us and ask why it took so long for us to change our notions of education, why we thought SAT scores mattered, or why we thought memorizing answers was a mark of intelligence in any way. The notion that education is about indoctrination by the state—an idea boldly stated in the 1700s and little acknowledged today—will seem scary. The governmental control of information—still popular in some countries, and still possible in those countries without computer access—will become an archaic notion. Too much experience will be available too readily and too cheaply to prevent anyone from experiencing anything. Governments will have to give up even imagining that they are in the education business, an area they dominate today, and will be unable to control the broad distribution of virtual experiences in much the way that they are failing to control television and computer access in country after country today.


We will begin to understand in the next 50 years that experience and one's ability to extend its range is the ultimate measure of intelligence and the ultimate expression of freedom. The creation of virtual experience will become a major industry; our homes will be dominated by virtual experiences; our schools will have been replaced by them. What we see today in video games and science fiction movies will become our reality. Today, games like *Everquest* attract hundreds of thousands of players who inhabit virtual worlds in an effort to gain status, form relationships and acquire various virtual objects. These games are so real to the participants that the virtual objects they employ are for sale (for hefty prices) on eBay. Many players of these games have a social life entirely based upon them. In the future, these worlds will become much more sophisticated and even more intertwined with the real world.

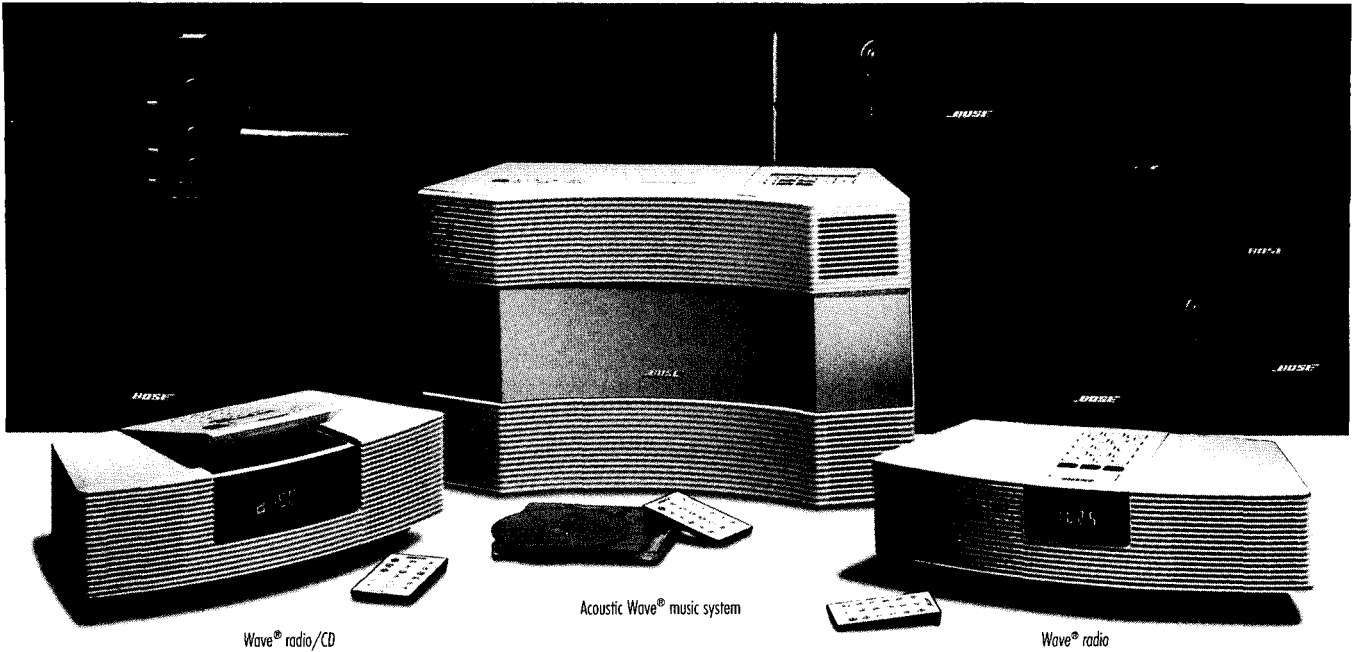
We really will be able to go wherever we want to go on any given day, and all anyone will ask of us is where we have been and what

experiences we have had there. We will seek out those who are more experienced than we in the virtual worlds they have entered. We will understand that it is the questions that remain unanswered and those who can think critically about them that are the factors in any true measure of intelligence. Of course, this last idea is well understood in universities today, but it is not really appreciated in business or government. Politicians want simplistic points of view; teachers want correct answers; businesses want solutions; venture capitalists want profits; the media want national soap operas; certifying agencies want scores. Those who are considered smart in a society like that are those who have succeeded in supplying it with what it wants. In such a supply-and-demand view of knowledge and intelligence, even Clifton Fadiman would have felt left out.

I was once asked to review some technical colleges to see how they were teaching. In a class for future chefs, each student had his own cooking facilities and they were busy making food. All I could say was that I had nothing of interest to add. The school was teaching doing by having students do. While this is not a radical idea in technical colleges, it seems to be radical in our other institutions of higher learning. As more tools for doing become available, it is doing that will matter. At Carnegie Mellon, where I work, new students must put together their own computer as soon as they arrive on campus and use that computer for the next four years. You can be sure that they understand how computers work once they have built one themselves.

It is what we can do, not what we know, that will matter in an educational system based on realistic performance environments. The important intellectual issues will revolve around questions arising from the nature of students' interactions in the virtual educational world.

When educational environments demand questions, ask how questions were obtained, and demand to know the experiences that brought on those questions, then the profound change that computers offer will have been realized. We will all be smarter—a great deal smarter—in the sense that we will not be afraid of new experiences. We will know how to find those experiences and we will grow from them. Our minds will be differently educated, and our intellectual world will be dominated neither by humanists nor by scientists, but by experientialists, those who have been there and have become curious as a result. 



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We couldn't think of two better fire-breathers to talk about racketeering courts, the perils of an overtaxed, over-regulated economy and the perennial biggest question of all: Is America, in Judge Bork's now-famous phrase, "slouching toward Gomorrah"?

As Spectator readers will know, Bork is the liberals' nightmare—ex-Marine, Richard Nixon's Solicitor General, scourge of abortion, pornography and gay rights, a Chicago-trained fierce advocate of free-market economics and (Hillary save us!) former Yale Law School professor of constitutional law. A preeminent antitrust scholar and federal appeals court justice, Judge Bork was nominated by Ronald Reagan for the Supreme Court in 1987, then martyred at the hands of the Senate Judiciary Committee, in the first great battle of the partisan war for America's courts. Instead of vanishing, he took up a perch as the conservative's conservative, capped in 1996 by his bestselling *Slouching Toward Gomorrah*, a scathing catalogue of liberalism and the decline of Western culture. Today, he is a senior fellow at the American Enterprise Institute in Washington and lion in winter of the antitrust bar.

George Gilder never slouches anywhere. The author of *Telecosm*, *Life After Television*, *Wealth & Poverty* and other books, George has manned the barricades in fights ranging from feminism and the welfare state to unshackling entrepreneurship and supply side economics. As editor of the influential monthly *Gilder Technology Report*, George is both a visionary leader of America's technology renaissance and a withering critic of the regulatory schemings that deny its full promise. The Spectator's Editor at Large, he sat with Judge Bork at AEI's downtown Washington office for a freewheeling three-hour talk.

Slouching, Still

GEORGE GILDER There seems to be something about jurisprudence that incapacitates conservatives with an excessive respect for precedents, which are almost always accumulated offenses and abuses of the other side.

ROBERT BORK Absolutely—and there's a huge body of cases now that go the wrong way because of a misunderstanding of the role of precedent. In statutory law, if a judge gets it wrong, Congress can correct him. In constitutional law, nobody can correct the Supreme Court except itself. That is a good reason to go back and say, "What did the Constitution mean? We've got it wrong all this time." But conservative justices don't do that often enough. Liberal justices do. It's astounding. I can't think of a single ACLU victory during the Warren court years and the Burger years that has been reversed by later courts. They go on repeating the error. Republicans keep appointing justices, and the leftward march of the judiciary continues unabated. The

ACLU's victories are not only never reversed—in fact, they constantly get fresh victories that build on past distortions.

GG So "judicial restraint" translates as capitulation.

RHB One reason all hell broke loose when I was nominated was that the left could see the court going 5-to-4 the other way. They could not accept the idea that the Court might stay within its proper limits and give democracy greater freedom to govern. I remember debating the head of the ACLU a while back, and I said the Supreme Court shouldn't block communities from trying to safeguard their moral and aesthetic environment by controlling obscenity and pornography. He called me a fascist. The ACLU is the litigating arm of the left intelligentsia, which views the democratic expression of the community's values as tyrannical; the only true democracy, according to them, is a tyranny of liberal judges. That's a disaster, because those judges—who often comprise a majority

of the court—have become an adversary to traditional American values.

GG So much for democracy.

RHB The left wing of the Democratic Party relies upon the fact that they can get courts to legislate much more liberal laws than they can get through Congress or state legislatures. That is why the nomination of judicial conservatives—men and women who would interpret the Constitution as it was originally designed—is anathema to left liberals like Senators [Pat] Leahy and [Edward] Kennedy. The battle over judges has extended from Supreme Court nominees to Court of Appeals nominees. That is why Senator Leahy, who is chairman of the judiciary committee, won't give President Bush's nominees a hearing. The Senate Democrats want to politicize the judiciary and give it a strong leftward bias. Conventional jurists need not apply. Meanwhile, the ideologues of the left keep spreading the lie that Republicans are trying to appoint right-wing zealots. They pretend every candidate not on

ROBERT BORK TALKS TO GEORGE GILDER ABOUT LIBERAL JUDGES, PACKED COURTS, MONOPOLY POLITICS & PUSHY PORN