

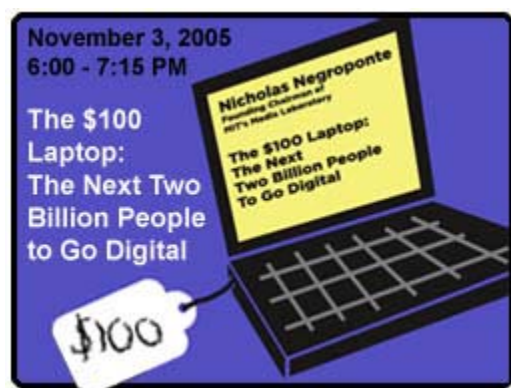


The \$100 Laptop: The Next Two Billion People to Go Digital

24th Annual Morgenthau Memorial Lecture

Nicholas Negroponte , Joel H. Rosenthal

November 3, 2005



The \$100 Laptop

- [Introduction](#)
- [Remarks](#)
- [Questions and Answers](#)

Introduction

JOEL ROSENTHAL: Last year we marked the 100th anniversary of the birth of [Hans Morgenthau](#), born in 1904 in Coburg, Germany.

We also marked the 90th anniversary of the birth of the Carnegie Council, born in 1914, in [Andrew Carnegie's](#) living room on Fifth Avenue.

As I mentioned last year, it is worth considering just how and why Carnegie and Morgenthau became linked. They are certainly a most unlikely pair—Carnegie, the great industrialist and philanthropist, the bobbin boy who rose from the factory floor to become the great titan of the U.S. Steel Corporation. By the time of his death in 1919, Carnegie was known as the richest man in the world, and also the most generous.

Morgenthau, the quintessential scholar, teacher, public intellectual, author of *the* textbook on international relations. [Politics among Nations](#) was its title, first published in 1948 and reprinted in seven editions over a span of over fifty years. By the time of his death in 1980, Professor Morgenthau was known not only as a preeminent theorist, but also as a formidable public figure, a true wise man of American foreign policy.

In thinking about these two extraordinary men, it occurred to me that Mr. Carnegie and Professor Morgenthau shared a surprising quality. Despite the incredible hardships of their personal lives and their self-professed realism, both, by nature, were idealists. Both were propelled through life by an overwhelming sense of destiny and moral duty. Both understood that power was in need of direction, of moral purpose. Both saw their life's work as providing a moral framework for a more peaceful and more just world.

Both Carnegie and Morgenthau were immigrants to America. The circumstances that led to their emigration were, of course, quite different. Andrew Carnegie came to Pittsburgh as a young boy in the 1850s with his family, an economic refugee seeking opportunity. Hans Morgenthau came to America in the 1930s on his own, a penniless academic, fleeing the Nazis and seeking merely to survive.

So while these two men could not have been more different in their life stories, personalities, talents, and careers, both were self-made, the kind of men who make a difference, through their creative genius and sheer force of will. Both were thinkers, as well

as doers. They wrote books and articles. Their appointment books were filled with speeches, lectures, interviews, public appearances. Most importantly, they used their acquired influence to lobby the world's political leaders to promote positive social change.

While Carnegie and Morgenthau never met in person, in a sense they meet here every year at this lecture. Their legacies built the Carnegie Council and their ideas still animate all of the work that we do. So it is on this occasion of the annual Morgenthau Memorial Lecture that we honor both of their memories by taking a hard look at a specific moral challenge. It is in this spirit, and in the spirit of mutual learning, that we invited Professor Nicholas Negroponte to be our 2005 lecturer.

Nicholas Negroponte has distinguished himself as both a doer and a thinker. He is a man of action, a builder of institutions, a resource and a role model for all of us who take seriously the idea of a planetary ethic, that we do indeed live in one globalized world, and that there are moral implications of that fact.

This fall at the Carnegie Council, we launched a series of lectures on the theme of "A Fairer Globalization." The organizing principle is a simple question: Can globalization be made to work for all people? We know that there is a great divide between the haves and the have-nots. Vast inequality is our reality. The world can be divided between those who are connected and those who have been left out.

The statistics are familiar to you: More than 1 billion people living on less than \$1 per day, millions and millions more on less than \$2 per day. Millions die from preventable diseases because of lack of access to clean water, sanitation, and basic health services. Educational opportunity is but a very distant dream for this ocean of disenfranchised people.

As our series developed, and through our [Global Policies Innovation Project \(GPI\)](#), funded in part by the Rockefeller Brothers Fund and the Ford Foundation, we have been featuring what we might call the best ideas, the best that has been thought and said about this topic, the best that is being done to promote and to develop a fairer globalization. Again, our focus is on positive ideas and alternatives, the creation of new opportunities and new choices.

In that light, we are privileged to have Professor Negroponte tell us about his most recent work, The \$100 Laptop, a project that will provide access to billions of the world's youngest and poorest inhabitants. We hear much these days about democratization and empowerment. Here is a real, live example of an idea being put into practice that will improve the lives of countless people in countless ways.

Professor Negroponte is best known to you as the founding chairman of the MIT Media Lab. He is also the founder of [Wired magazine](#) and has been an "angel investor" for over forty startups, including three in China. Professor Negroponte helped to establish and serves as chairman of One Laptop Per Child, a nonprofit organization created by faculty members of the [MIT Media Lab](#) to design, manufacture, and distribute laptops that are sufficiently inexpensive to provide every child in the world access to knowledge and modern forms of education. Thank you, Professor Negroponte, for coming to the Carnegie Council to be our Morgenthau Lecturer for 2005 and to share your exciting project with us.

Remarks

NICHOLAS NEGROPONTE: If you think of any big problem—things like peace, the environment, poverty—the solution, no matter where you look, includes education.

Tonight I would like to talk about the \$100 Laptop in three parts. This is really an education project; not a laptop project. Providing education to children around the world, and since children are the most precious natural resource of any country, is, unto itself, a solution to many of the world's problems.

The Media Lab has, since its inception, been involved with computers in education, and particularly computers for children to learn how to learn. Seymour Papert, who is still alive, well, and very much a partner and the theorist behind all of our work in learning, looked at how children could learn about learning by using a computer, where, effectively, the child is teaching the computer to do things.

Rather than learning things that you then get graded on or facts that you have memorized, how can you learn about learning? This has gone on for many years at the Media Lab. In 1982, the two of us were involved in a center in France that was way ahead of its time. It was doing the right thing for the wrong reason, using computers in developing nations for children, back in 1982.

My first slide is 1982, outside of Dakar. The IBM PC did not even exist. Steve Jobs had given me a couple of hundred Apple computers. We spread them around in schools outside of Dakar. These kids had more computing power than the Senegalese government at that point.

One thing that became so obvious is that it made no difference whatsoever that these kids were from very poor places that had never seen computing. They were playing these like pianos. There just no difference between

what they were doing and kids in the suburbs of Boston.

In 1988, in Costa Rica, the man running for president, [Oscar Arias](#), who is again running for president (because they just changed the law), actually used it as part of his platform. Costa Rica is almost a boutique country. You can do lots of things in small countries that you can't do in big countries. They created an organization outside of the government, so after that government changed, it continued. Every child in Costa Rica now has access to computers and the Internet.

Today over 50 percent of the exports of Costa Rica are integrated circuits—larger than coffee and bananas combined.

This slide was from the late 1990s in Kashmir, where we were using the early versions of WiFi, with very focused antennas. They allowed you to go long distances, like 50 kilometers, to reach over the mountains and get kids on the Pakistani side to talk to kids on the Indian side of Kashmir.

We were very concerned with how you bring telecommunications, at very low cost, to the remote parts of the developing world, by letting people build it themselves. It gets built from the bottom up rather than having a big telephone company come in, build a tower, create cell-phone-type connections or string wires or fibers.

But the truth is that telecommunications is not the problem. There are so many solutions to telecommunications today—WiFi, WiMAX, 3G—and so many things are happening in parallel that the world is getting more and more connected. There are already nearly 2 billion cell-phone users; almost one-third of the planet is already using cell phones.

Telecommunications is also very elastic. If everybody in this room was sharing a WiFi connection, we would all be very happy. If another ten people came in or left the room, we wouldn't notice a difference when we were sending email and browsing the Web.

On the other hand, the devices themselves matter. If you believe that you have to provide one laptop per child, if ten new kids come in the room, you need ten new laptops. The price of that laptop is very fundamental, and today its cost is very high for artificial reasons.

We decided to build a laptop for \$100. People said, "That's impossible," which, for me, is a codeword for, "Go do it, or at least try it."

My wife and I did a project in Cambodia in the late 1990s and early 2000. Money was growing on trees in my world. I had a little too much of it at the time, so I decided to build some schools in Cambodia. My son was living in Italy at the time. I said, "If you can suffer the indignity of working for your dad, why don't you go to Cambodia and set up the Internet in the schools, and I'll send you some laptops," which he did.

These villages have no electricity, water, telephone, or television. Average income is \$47 a year. Since the only power was the power he was generating, I wanted to send them some very power-efficient machines. Laptops tend to be more power-efficient, because they often have to run on batteries.

My son then built WiFi in the village. He encouraged the kids to take the laptops home. They came back the next day. Not one kid had opened the laptop at home. They had all been told by their parents that they couldn't open the laptop, because they might break it, and they didn't want to be responsible.

So he told the kids it didn't matter if they broke them; they couldn't break them. They were using them in class. It is not as if they didn't know how to use them. So they all took them home and opened them, and the parents were delighted because in each case it was the brightest light source in the house. They started using them at home and they became part of their lives. They brought them back to school to charge them, because there was no power at home. It would only last as long as the batteries would last.

In the meantime, Seymour Papert, who lives in Maine most of the time, in the year 2002, persuaded Governor Angus King to turn the concept of One Laptop Per Child into legislation, sold on a very simple story: Imagine a country that has only an oral culture, and no written language. Some elders or intellectuals in that country invent a written language, and they sit around the room and say, "Now we have invented the written language. Let's put one pencil in the back of each classroom." Then somebody says, "No, no. I have a better idea. Let's take twenty pencils and put them in one special room and let kids use that room for one hour a week."

Angus King laughed at that. The law went through. Since the year 2002, they have been rolling out Apple iBooks that are given to kids, who get to take them home and keep them.

What has happened? In those grades truancy has dropped to almost zero. Parent-teacher meetings have gone up astronomically. Discipline is noticeably easier. The most important is that teachers are reporting that the kids in the classroom are more motivated, more interested, and more active than they have ever been before. Kids who never asked questions after school when teachers are office hours are bombarding the teachers with email—to

such an extreme that they had to turn some of the email off at times, because the teachers were getting swamped.

We created One Laptop Per Child (OLPC) outside of MIT as a nonprofit association. I had been getting all sorts of advice for it to be profit-making, because you would be able to attract engineering talent, remunerate people, and sustain yourself afterwards. It turned out to be exactly the wrong idea.

One of the reasons is simple. That is, when you have in the case of OLPC a board of directors, their objectives, their goals, are perfectly aligned with building a \$100 laptop and making it cheaper, and more widely available. I have been on the board of directors of Motorola for about a decade. If we invent a technology that lowers the cost of the display in your handset by \$10, who gets the \$10? My fiduciary responsibility is for the shareholder to get as much of that \$10 as possible. That's the name of the game.

In OLPC, if we make an invention that lowers the cost of the display by \$10, guess who gets the \$10? The kids. It's a \$90 laptop. Then if we do something else, it's \$80, \$75, et cetera. It continues to decrease.

So we have told governments that we will float the price. We will not even quote a price. It might start at \$115.20. From then on, our only guarantee is that it will go down. With the exception of currency fluctuations and maybe the fluctuation of the price of memory, it will continue to decrease.

Scale is important, for reasons that are slightly different than you might imagine. Everybody says, "Sure. You want to make 20 million of these, because you can get somebody to sell you a component at the lowest possible price because you have such a high volume." That is true, but that is not the real advantage of scale.

For a while, we were thinking of making a projector, so that when you opened your laptop, there would be a little projector inside that would project the image onto a simple white piece. It only uses a tiny piece of silicon, so it can be built for about \$15. We knew how to build a projector, full-color, for \$15, so this seemed like the solution at the time.

It turns out that the people who dominate the integrated circuit business for projectors happen to be a very large company that makes these for a couple of hundred dollars a pop. It is what you see inside when you use one in a conference room. The chips cost about \$100, \$150.

We said, "You're interested in very large bright screens, perfect color uniformity, perfect pixels. We're not. We're interested in small screens. We don't care about color uniformity. We can have a few pixels that are failed. It doesn't have to be that bright, because it's small." They said, "That's not our strategic plan, so we're not interested." I said, "That's a shame, because we need 150 million a year." They said, "Oh, well, maybe we could."

If the scale is big enough, you can change the strategic plan of a company. So when somebody says to us, "You can't do something," we are able to say, "Look, this is the biggest installed base you can possibly imagine. I suggest that you participate."

To put the numbers into context, we are talking of producing as many as 200 million machines in year two. There are 1 billion kids on the planet. So 200 million ends up covering 20 percent in that particular year. At the end of this year, the total world output of laptops is slightly below 50 million. So the numbers are a lot larger than the industry is accustomed.

Take iPods. There are not even 30 million in the whole world since the inception of the concept and all the various products that have come out. Add them up worldwide, and you get to a number that is relatively small.

Scale counts. Countries have to give them away free. The ministry of education buys it, distributes it, like uniforms or shoes or textbooks or lunches. Even the poorest country in the world spends about \$200 a year per child for education. To find \$20, which is what it would be per year if you amortized this over five years, isn't quite as hard as all of that. Most countries can do it themselves.

Then we happen to have spectacular corporate partners. After trying to launch it in China and failing, I got people like Google, News Corp, AMD and Red Hat as partners, who complemented each other. When I decided to go that route, AMD agreed in less than 24 hours, Rupert Murdoch agreed in less than 48 hours, and Google in five days.

So within five days, we were in motion. There is no great magic in laptop economics. Fifty percent of the cost of your laptop is sales, marketing, distribution, and profit. We have none of that. So our \$100 laptop is, in truth, a \$200 laptop.

Then if you look at the remainder of the cost of your laptop, 50 percent is the display. We know how to get it down to \$35. About 75 percent of the power in your laptop is used for the operating system.

What I mean by dual-mode display is that we want you to be able to take it out in the sunlight and read it like a

book, or a piece of paper—and it uses the sunlight itself as the energy, not in the sense of solar power, but that it reflects the display—and to use it indoors with so-called transmitted color, to have both modes, so kids can use these like books when they go to bed at night or they go out in the garden. It is something that is with you, but works both indoors and outdoors. If you have tried to use your laptop outdoors, you know what I mean. It is basically impossible.

Windup is very important. You want these to run by cranking them up and storing the power, or be so power-efficient that they can be cranked. Windup is not because they may not have power, like that village in Cambodia. But windup is important because even if you do have power, even if you are Buckley School and you are wealthy enough to have power in your school, you can't start having AC adaptors and power cords tracing all over classrooms.

Open source is a very controversial subject. If you have not seen the Wikipedia, I urge you to do so. The Wikipedia is an open-source encyclopedia, written by the readers. When you do Google searches now, very often the Wikipedia entry comes up.

You say, how could that possibly work? Somebody can go in there and type complete garbage. But the truth is that it is self-cleansing. Somebody else reads it and finds out it's wrong and corrects it. It is so current and up-to-date that within 24 hours after Bush nominated my older brother for director of national intelligence, it was in my entry. It said, "Nicholas Negroponte, the brother of the nominee for director"—and I didn't put it there; he didn't put it there. How did it get there?

Encyclopedia Britannica can't compete. It is not that this is a free encyclopedia; it is a better encyclopedia. And that is what open source is about.

I am often asked, "If this is such a good idea, why isn't it happening in the United States?" I say, "It is. It's happening in Maine." They say, "That's kind of small. That doesn't count."

When the governor of Massachusetts asked me to have lunch with him, I said, "You should do One Laptop Per Child and change education in your state." In September, my office got a call, "The governor is wondering if Nicholas would like to join him for his press conference tomorrow." I said, "What press conference?" They said, "The press conference announcing One Laptop Per Child, his proposed legislation."

So I had people working with us produce a model overnight. The governor got up and said, "I'd like to introduce Professor Negroponte, who will tell you about One Laptop Per Child." Then he started taking questions. What happens to kids who come home from school to their rough neighborhoods to have bully kids beat them up to steal their laptops? He said, "Why would they do that? I'll give the bullies laptops, too."

Now we are working closely with the UNDP to get into places like Africa and small countries, where we can't do it ourselves.

We started looking at how we could make this both an electronic book or a real laptop. If you turn it the other way, you can use it as a games machine. If you lay it flat on the table, you can use it as a tablet and draw on it. So it has about five or six different modes of usage. It folds back, so it can turn into a television set. In fact, we even have some ideas of how multiple machines can behave together to make themselves into an antenna, so that the kids don't need a satellite dish. They are the dish. That means you can have communications in very remote places. This is something the military already does.

This slide shows the \$100 laptop that we will unveil in Tunis at the World Summit on the Information Society. We chose this forum because almost 200 countries will be there—often the minister of education, definitely the minister of communications, and for about forty-five or fifty countries, it will include the head of state.

Because we are nonprofit, because the Media Lab is well-known, because MIT is a good brand unto itself—it's not difficult to get in to see the head of state or the minister of education, even in big countries. We are not selling anything. It is harder for Michael Dell or Bill Gates to get in those offices.

What we have decided to do is to launch with five or six big countries to get scale. Pick the largest Arab country, which is Egypt; the largest Sub-Saharan African country, which is Nigeria; the largest South American country, which is Brazil. Pick China. Pick India. Thailand is in there as a Southeast Asian country.

The idea is to launch simultaneously in those countries. We have created a waiting list in each part of the world to ensure that we can launch with 5 million or 10 million machines in each place.

Building the \$100 laptop turns out to be difficult, but it's not the hardest part of the problem. Rolling it out will be different in each country. We want to get the teachers on our side, even though they are not, in the end, the major agents of change. The kids are doing most of it, as Maine has proved. But in the state of Maine, 80 percent of the teachers were very apprehensive. Over time, we won over almost all of them.

You have to do it exponentially. We have a person going from MIT to spend three weeks in Brazil with the best teachers with other laptops (not ours), showing some of the theories of constructionist learning, learning by doing, tools for kids to make things with—this isn't giving them encyclopedias or drill-and-practice or so-called learning software—and then teaching the teachers, so that, at the end of three weeks, let's say twenty-five out of the thirty are good enough to teach teachers themselves. Then they teach a group of thirty, of which, let's say, twenty-five are good enough to teach a group of thirty. If you do that four times, you get to over 100,000 teachers, the numbers, again, depending on the size of the country. China alone has 220 million kids in primary and secondary school. Half the kids in the world are in China and India.

On this slide, you see our second generation. While we are not building it at the moment, we know how to make electronic paper. You can see a piece of flexible paper in the bottom left-hand corner, which we believe we can produce at ten cents a square inch. It is being manufactured at the moment in small runs meaning 1,000, 2,000 pieces. Last year, Sony released an electronic book based on this technology.

My final slide shows that you can print on a sheet of paper or plastic and bend it to make a laptop. That kind of laptop could cost in the \$20 or \$30 range, but will not happen until 2009 or 2010, which, for some of us, feels like a long way off.

I have never been involved with anything like this before. There isn't a single negative angle to the story. Everybody is rallying around it. Even people who you might think might stand to lose from it, whether it is the traditional manufacturers or Microsoft or somebody who makes textbooks.

People have realized that this is going to happen. We have powerful companies, powerful friends. We have a lot of money suddenly behind us, and governments and heads of state wanting to sign on.

You can't argue against open source and be closed to Microsoft. So we are talking to Microsoft. One of my friends said to me, "Nicholas, you have to talk to them, because the worst thing would be is that they would compete with you by building their own \$100 laptop." I said, "What better news on the planet could there be?" If they want to do it, be my guest.

Questions and Answers

QUESTION: One possible downside is the ultimate disposal of laptops. What is the life of the PC? What do you do with all of them?

Have you looked at solar as a power source as opposed to windup?

NICHOLAS NEGROPONTE: We are looking at all forms of energy. But what is important about the windup is that it's self-contained. One of the things we have to do with our laptop is have a 12-volt input. Car batteries work. Solar power panels very often generate 12 volts, all sorts of parasitic power.

One of the cutest examples I saw, which was done by a faculty member at the Media Lab, was to have a little wheel sticking out of the side of the laptop with a string wrapped around it and a rock hanging on the string, so it works like a cuckoo clock. As this rock goes down and hits the floor, then you just pull the string. You're typing, and you can pull the string. You need another weight on the other side, so the thing doesn't tip.

There are many forms of parasitic power. People have designed seesaws for playgrounds, where kids take their batteries, put them in the seesaw, and the kids on the seesaw are recharging them. Or kicking a soccer ball around generates power, and then you bring the ball in and plug it into your laptop.

The environmental issue is not only a major one, but my most frequently asked question. Part of that comes from the fact that we are dumping used equipment in foreign countries. I don't mean it in the financial sense of dumping, but in the literal sense. Many people are refurbishing laptops and sending them overseas. While that is well-meaning, it is very expensive. We are better advised to find a way to get rid of them in some environmental-friendly fashion rather than export them.

In the case of the \$100 laptop, we will put strong conditions on the manufacturer—we have five manufacturers bidding at this moment. One of them recently quoted a price of \$104. So we are not far off. In the manufacturing process, toxicity exists, and then in the device itself, it is not clear whether the components could ever be physically biodegradable, but we will certainly explore that.

In the developing world, often these devices have a much longer life. I would expect that they would last five, six years, and then be used as a TV. In other words, it may not live on as a laptop, but it would probably be used as an entertainment appliance.

QUESTION: This is a great idea, and I'm all for it. My major concern is not to do with bullies taking laptops away from kids; it's the adults. You will be introducing \$100 laptops into family homes where \$100 can provide a lot of food, a fuel, energy. In many of these countries as well, there are crime syndicates and gangs. Will these

laptops be educational tools, or a new form of currency?

NICHOLAS NEGROPONTE: The worst part of the gray market is not so much robbers and thieves taking them from kids walking home. In some countries, government gives shoes to kids, and the parents sell the shoes, and the kids go to school barefoot.

One of the reasons that this happens is that there is a market for the shoes. There are other feet out there that could use those shoes. While there are other hands that can use the laptop, I point out to people that there are not too many stolen Post Office trucks, and there is not any gray market today on Post Office trucks, but there are lots of stolen cars in the United States.

Why are Post Office trucks not stolen? Because they look like Post Office trucks, and if you are seen driving one, you have obviously stolen or bought it from somebody who stole it. So we will make this machine so distinctive that in order to get rid of that distinction, you will have to destroy it, and help solve it by providing a commercial machine at nearly the same price. That helps a little bit of the gray market.

In places where we have worked, in the worst of urban poverty, adults protect the kids. The kids go to school with their laptops. They are not stolen. The community rallies around to support this. Even the most criminal criminal knows that, for his kids at least, education is the one hope.

If 3 percent of them are stolen, then 3 percent are stolen. But I don't think it will be an epidemic.

My last remark about that is that countries will embarrass each other into doing better. By launching the program in parallel, countries will be competing to use them better.

QUESTION: I spent two years working as an AmeriCorps member in West Philadelphia refurbishing computers and creating a technology service program. We brought Dell computer, literacy classes, high school programs, and various other technology-oriented devices, to the community.

It's wonderful to back the notion of bringing a \$100 laptop to everyone. But you mentioned that this is an education issue. From my experience of working with the teachers in the community, they don't see this so much as a technological problem; they see it as a literacy issue. Yes, the kids are more fluent using macromedia flash, but they can't write. Yes, they are fine learning the basics of computer programming, but they can't communicate; they can't speak.

I am concerned about the lowering of the quality of standards and conditions of what education is coming to be, with regard to technology, because much investment and much intelligent brainpower is going to the hardware question and not so much to the literacy phenomenon.

NICHOLAS NEGROPONTE: What we have found is that the teachers who complain about the kids not being literate often don't realize that literacy isn't relevant to them. We started to discover this right here in Harlem in the 1970s, when we were doing work with Logo, with what were then called mini-computers. There was a school in Harlem with twenty terminals, all running Logo. It was a great success. The school was more or less demolished, not just with graffiti, but broken windows—except for this one computer room that the kids were doing themselves.

At the time, we were being funded by the National Science Foundation to look at the use of computers in learning and how it fundamentally changed the acquisition of knowledge. The funding agents went to look at that school one afternoon. There was only one kid left in the computer room. They were visiting the principal, but they were a little early for the meeting. They went downstairs and they found a kid, who was cleaning the room. They said, "Can you show us the computers?" The kid said, "Sure," and turned on the computers, fired up Logo.

Then they say, "Can you get it to do this?" It did that. So they finally ask Enrique something he can't do. There is a manual beside the computer. He flips through the manual. He finds it. He does it.

The time comes for their meeting with the principal. They tell him, "We were a little early, and we went down to the classroom, and Enrique was cleaning and he showed us what to do. What was remarkable was that this eleven-year-old child not only could do what he was doing, but could go through the manual so quickly to find out how to do something he didn't know."

The principal said, "No. You've made a mistake. It must not be Enrique because he can't read. We are sending him to a special school for the disabled next year." So they go down to the room, and indeed it's Enrique.

One of the NSF people looks at the kid and says, "Enrique, can you read?" He says, "No, I can't read." He said, "But wait a second. What were you doing when you flipped through that manual?" He said, "That? That's not reading. I can do that. They give me these stupid things about Dick and Jane and Spot and balls and stuff. I can't do that." He goes through and he reads it.

I don't even like to read. But suddenly it becomes relevant. Email, communicating, sending your grandparents a

message, and all of these things start to build up. It may not be James Joyce in the beginning, but suddenly reading and writing have a lot of relevance to kids. We may think that those SMS messages are stupid. But it's the beginning of words coming back in other ways.

When I was in school, I was asked to read things that didn't seem relevant. One of the most important and most generalizable things about the use of computers in education is that all of us in this room learned how to walk and talk by interacting with the world, by experimenting, by getting something for doing it, being able to stand up, reach something, communicate, ask for something. Suddenly, at the age of six, we are told, "Stop. For the next twelve years, all of your learning is going to come from being told, by books, teachers, people standing at podiums."

That's okay for some things. But the big change will occur in the way we learned to walk and talk, by exploration, curiosity, self-motivation, driving, communicating with other kids. We want five countries in different parts of the world to launch talking to the other countries. In Cambodia, the first English word of every kid in that village is "Google." They know every soccer player in Brazil by name. They want Renaldo T-shirts, sweatshirts. You can say, "Why should they be learning about Renaldo?" It is not that they are learning about Renaldo; it is that they are using the Net to communicate and learn.

QUESTION: What do you do about printers?

NICHOLAS NEGROPONTE: We have several companies that have offered us \$39 printers, and one person even has a printer that won't use any disposable materials. There will be a whole galaxy of peripherals that plug into this machine—cameras, printers, DVDs. We hope to see a whole industry emerge to make low-end printers, scanners, cameras.

JOEL ROSENTHAL: Thank you for sharing your insights and enthusiasm.

Copyright © 2007 Carnegie Council for Ethics in International Affairs