

**INTERNET AND HONESTY:
FOUND ON THE WEB, BUT IS IT RIGHT?
Considerations on Technology in Service to Society**

by Dr. Robert M. Panoff¹

Summary

Modern computers and communication networks are stimulating the creation and spreading of new knowledge about the world around us, helping us to gain deeper insights into even the most complex of systems. At the same time, it is becoming harder to distinguish the "good," the "bad" and the "ugly." Since anyone can publish virtually anything on the World Wide Web, we must become more selective in our judgements of the quality of the information that is so easily found on the net. It would be easy to become cynical that nothing is true, because so much of the material is found to be "indefensible." The challenge is that each of us must take personal responsibility for creating and disseminating good information and promoting the positive uses of technology.

Introduction

I want to begin by thanking the organizers and sponsors of this UNIV Forum 2008 for their kind invitation for me to speak about a topic that is very dear to me. I hope it is also of great interest to you: the positive role that technology in general, and computers and communication networks in particular, can play in building a better society. This topic has been the focus of a new kind of non-profit research and education organization that was founded more than a decade ago. That organization, Shodor, is now known in the United States and around the world as a leader in using technology in innovative ways to improve education in mathematics, science, and the liberal arts. In this talk I hope to share with you the exciting developments and the new challenges that the Internet and Web technologies present for education and society today.

This talk will have five basic parts. First, so you can understand the context in which I am now working, I will tell you a little about Shodor, with hopes that as you

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come to know us, you will take advantage of the information and courses available on our website for your own life-long education. It might also be true that you will want to partner with us, to work with us, to dream with us in a variety of projects. Second, I will discuss what I mean by technology, and in particular information technology, providing a cultural and historical perspective that we can use to identify how technology can and ought to serve man and society. Then I will describe what I see as the most exciting of the new developments with regard to technology and education, especially with regard to new models of global access. Next, I will discuss some of the toughest challenges that the new technologies bring with them, in particular the importance of personal responsibility in evaluating the value of "information", and the responsibility of society to facilitate access to new modes of learning. Finally, I will return to new opportunities for you to help shape your own future, in hopes that you and I will be motivated to prepare a safe path for those that follow. I am reminded of the words of Gandalf, in J.R.R. Tolkien's trilogy, *The Lord of the Rings*. In the Last Debate, he proposes that we must "do what is in us for the succour of those years in which we are set, uprooting the evil in the fields that we know, so those who come after will have clean earth to till."

The Shodor Education Foundation

I want to tell you a little about my organization, the Shodor Education Foundation. We are not a foundation that gives out money. We are using the word "foundation" in a different sense: we are laying a foundation upon which a sound education can be built, as in the foundation of a building. Such a foundation is often completely underground and unseen, but without which the building that rests upon it would not stand.

Shodor was founded in the spring of 1994 by four faculty members from three different universities. Our specialties are in mathematics, science, computer science, and education. We had been working together for almost 10 years on a variety of projects, many of which were looking at how best to bring computer modeling into the classroom, to transform the dry, repetitive lectures all of us had been subjected to into truly interactive learning environments. We had discovered for ourselves and our students that by harnessing the power of computers to explore otherwise unobservable phenomena, we could open new horizons and enable students to undertake learner-centered, inquiry-based experiments. Instead of reading or hearing about galaxies, we could build them with our students. Instead of wondering in theory how electrons, atoms, and molecules rearrange themselves to minimize the energy of a system, we could explore these topics visually. Instead of staring at a graph of a function, you could explore dynamically how small changes in the parameters change the behavior of the system. And we were convinced that we could teach other faculty members how to improve their teaching as well, thereby serving generations of students who would learn sooner, learn more, and learn better.

In order to offer this training to others without regard to the particular institution they came from, we determined that a new, independent organization was needed. And that is when Shodor was born. Perhaps many of you are unfamiliar with what a "shodor" is. This is a word variation of a "shoder" which is a hammer used in making gold leaf. In order to turn a lump of gold into a thin sheet of gold leaf, someone has to pound and pound and pound the gold, making it go farther and farther. An important characteristic of the process is that at the end of the day, it doesn't do much good if all of the gold has stuck to the hammer. At Shodor, we work very hard to extend educational resources as far as they can go, resources such as time, ideas, curricular materials, courses, modules, and expertise. And one of the most effective "hammers" we have found to extend these resources is technology. At Shodor, we care very much about teachers and teaching, students and learning; but

we don't care too much for artificial boundaries such as school walls, institutional rivalries, or national borders.

My staff is composed of about a dozen scientists with specializations in quantum physics (me!), astrophysics, chemistry, biology, mathematics, engineering, computer science, and business. We also have about thirty students (some in high school, the rest from universities) who work as interns gaining valuable, real world experience. And we have more than 70 younger students who are learning the skills of the 21st century workplace as apprentices. All of our projects involve three interconnected aspects: educational materials development, student research experiences, and faculty enhancement. Currently, we are working to develop a fully-interactive mathematics curricula, known as Interactivate, which is completely free and available on the Web. We are developing new words in American Sign Language to teach computer modeling to deaf students. We are teaching thousands of sighted persons Braille so they can work more effectively with the blind. We are developing new on-line courses in chemistry and atmospheric science, and we are sharing our excitement for learning with hundreds of students right in our own neighborhood through classes and workshops. We offer workshops for college faculty through the National Computational Science Institute. After this talk, or at some appropriate time, I would like to discuss with you how some of you may work with us or for us on some of our projects. We see education as a process that generates *excitement for learning*, then builds *experience in science*, that results in *expertise in the use of technology*.

Technology: An Historical and Cultural Perspective

What do we mean by technology and how does the Internet fit this in the context of human activity? There are many definitions, but I think it is important to realize that whatever your definition, technology is first and foremost the result of human ingenuity. For thousands, perhaps millions, of years, man has sought to fulfill the divine command to have "dominion" over the earth by taming it. Many of the early developments had to do with "technology" that made it easier to hunt or gather or process food. Other developments in technology led to new weapons, sometimes for defense, but all too often for domination of others. Many times, military and financial motives worked together to spread new technologies. Galileo is famous for using a telescope (that he did NOT invent) to look at the moon and Jupiter. Actually, he made a living for a while by selling an "early warning" system to merchants and coastal towns: by looking at the horizon, he could tell when pirate or merchant ships were approaching, and this information would be worth paying for. It helps to know if you are trying to get ready for a battle or a big sale!

Technology is the product of the creative spirit of man. In itself, most technology cannot be said to be good or bad, but technology can be used for good or bad ends. Pope John Paul II often met with scientists, and in one of his addresses to a group of scientists he spoke about technology. He said, "One must never lose sight of the goal of man's real good; one must never give into the temptation to progress without rules or values, which might become a dangerous form of technological control of life." Technology comes from the mind and hands of man, but we must work hard to avoid letting it control us, rather than the other way around.

This is especially true when dealing with information technologies, namely, devices that facilitate computation and communication, or devices that capture and manipulate information that may be numerical or visual. I do not know that much about the current situation in each of your countries, but in the United States, we are rapidly becoming enslaved by a "Tyranny of Immediacy." With computer networks, and e-mail, and pagers, and cell phones it is becoming harder and harder to think and to work without interruption and distraction. All decisions seem to require immediate attention and people expect instantaneous answers to all inquiries. Just because you can be contacted, people believe they have the right to contact you. Students tell me

they often have a dozen IM chat windows open at the same time while they are “doing their homework.”

One goal of the use of technology is to free us up from the drudgery of some tasks so we can spend more time in our creative and reflective modes. There are new technologies that allow us to create and share information, to communicate around the world and to keep in touch with friends and family. But these same technologies can isolate us if we are not careful, or distract us from what we are supposed to be doing. How many of you have sent e-mail to someone in your school instead of getting up and walking 30 or 40 feet to where they were studying in the library? Or how many of you have sent an IM or e-mail to your *roommate* who is just across the room from you? How many of you have spent time in a class that was in a computer lab, or in a class when you were allowed to bring in a laptop, and you spent most of the time doing something other than what the class was supposed to be doing (reading or sending mail, surfing the net, playing a game)? Be honest... technology is not always used for what it was originally intended.

Exciting Developments in Technology: Universal Access to Information

Certainly one of the most stunning developments of the last decade has been the rise and fall of the World Wide Web and the new technology-based economy that it ushered in. As fast as new companies are created, companies only a few years old fold or merge and are reborn. You may not realize this, and for some of you it may seem like ancient history, but 16 years ago, maybe about the time some of you were born, there were only about 6 web sites in the whole world! The technology had just been invented, at least some of it had. The software for the server was working, but there wasn't a very usable interface of the use. At the University of Illinois where I was working, we had a project to develop software to help scientists work together better using communication technology. The goal of the Mosaic project was to extend the capabilities of some of our software to enable geographically dispersed scientists to look at the same data at the same time, that is, we were building and improving a collaboration tool. The original vision for Mosaic (which has now become both Netscape and Internet Explorer and Mozilla and Firefox) was to globalize the scientific process, to enable different scientists in Europe and Oceania and Asia and the Americas to work closer together without having to travel to do so. We wanted the technology to facilitate the conversations and discussions and analysis. This idea of collaboration has been largely lost, and most web surfing these days is done by individuals working alone for their own purposes. Or individuals who escape to the web to be alone with other lonely people electronically rather than deal with the real person in their family, school, or town.

The Web technology was invented to help people work together, but it has been used by most people to focus on their own needs or wants. Rather than achieving a fully interactive exchange of ideas, many people are promoting these technologies for personal amusement. I, for one, would like to see our original dream realized.

Let's talk for a moment about how the computer and network technologies are changing education. In the first place, they are changing the faces. More people, theoretically, can have access to a good education, and the roles of teacher and student are changing. We can use the technology to customize the content to fit the learner. We can use the technology to broaden the base of learners who can extend our own ability to observe the world and learn about it.

Next, technology can change the places of education, and this is the heart of what is meant by the globalization of education. We can work together even though separated by distance and time. We can share resources and ideas. We can collaborate.

And technology can change the pace of education. We can follow a different path through information space to reach a goal that may be very different from someone else in our same class or university. We can move ahead when we are ready, or we can linger to appreciate some new knowledge or explore a new challenge. If we can resist the temptation to create a new "tyranny of immediacy," we can use technology to help us reach our educational goals.

With the rise of the World Wide Web, there is the opportunity for the fall of artificial international boundaries. There is the opportunity for the fall of artificial institutional boundaries. There is the opportunity to scare many university officials who will wonder how their institutions will survive if someone can simply go on the web and take any course anywhere. Without disparaging the reputation of your own institutions, if you could, wouldn't you want to take a course at Harvard or M.I.T. or Navarre or Oxford, or Le Sorbonne, or Athens? With projects like the Open Courseware Initiative, anyone with access to the Web will have access to the raw materials of a great education. On our own website, we offer the information for numerous courses for free. But that doesn't necessarily mean that you will get a great education by simply visiting our website. "Access to educational materials" and "education" are not synonymous. The technology will give you instantaneous access, but the educational experience takes time and reflection, and discussion, and hard work. How many of you have said to a professor, "I think I understand the material, I just can't work the problems." It is the same with information technology. Many people understand how to access the Web, but they have not taken the time to reflect on what they have found.

One way to meet these challenges is through effective, authentic courseware, that is, using the technology in education in the same modes that would be used by experts in math or science. We are working at Shodor, along with many of our collaborators, to develop courseware that incorporates technology in appropriate ways and which promotes a reflective, inquiry-based approach to education. We want this courseware to make both individual and collaborative learning possible. We want the materials to be based on accepted national and international standards for both form and content. You can explore Shodor's web site to find many example of this courseware, but for now, I would like to share with you one in particular, Project Interactivate. This is a set of materials for students and teachers in math and science, and we have included –we hope– all of the pieces that someone would need to supplement existing texts with true interactive explorations.

While these materials are free (free to use, not to copy!) and accessible, they have several limitations. For many years, these materials were only available in English. But through an international collaboration with a private foundation in Columbia, Eduteka, we now have complete Spanish versions of these materials to offer to anyone anywhere. We would welcome the opportunity to partner with other educational institutions who may wish to help translate the materials to other languages.

The Greatest Danger Ahead: Noise vs. Truth

It was once conjectured that a million monkeys typing on a million typewriters would eventually produce all of the works of Shakespeare. Now, thanks to the Internet, we know this is not true! Without meaning to sound at all alarmist or pessimistic, I must use this opportunity to ask your help in helping to address what I consider one of the greatest dangers of the easy access to this great ocean of random stuff. At this point in time, there is no easy way to identify truly useful information from the random noise that you find strewn along as garbage along the information superhighway. There is a cartoon several years old now that depicted a dog typing at a computer, commenting to another dog, "On the Internet, no one knows you're a dog." I have often paraphrased that, "On the Internet, no one knows you're an idiot."

Since there is no "idiot" filter, anyone with access to a computer and an IP number can become a publisher; the question is, "a publisher of what?"

In the world of signal analysis, you always start with NOISE, and the Internet is nothing if it is not first and foremost a very effective generator of noise. If you filter the noise in different ways, you begin to detect a SIGNAL. Some of those signals become patterns that you can take as DATA, or something being "given" for you to consider. Now only when you FORM and opinion about which data you are going to allow IN your sphere of consideration, and what you will "shun" do you have INFORMATION. Now, with information from several sources, you can form a knowledge base, and SOME of that knowledge may be TRUE. Each of these steps is a human act subject to error. In your education, the question is, how do you tell what is noise and what is truth?

I want you to consider a simple example from the world of digital photography. Here are two pictures of me teaching during the last few months in North Carolina. Do you notice any substantial differences in my physique? How would you explain these differences?

I often pose one or two challenges to teachers and students to make this point. I will take my examples from the world of science, because most of us would agree that science should be objective and fact based, and should be a good measure of the value of an information resource. Consider a simple scientific question that *surely* must have a well-defined answer: What is the boiling point of Radium? How would you go about searching for data you could use to form a judgement that would result in information? Do you think that this should be a relatively easy thing to do, especially given the wide variety of sources on the Web? Unfortunately, When we had the students do the search, the answers were many and varied and defied explanation: the values on "scientific web sites" ranged from 700 degrees up to 2010 degrees! And not one site yet, at least none that I have found, would give you a reason to believe the number found on that site. I wish I could say that this is a rare example, but it is more often the case than not.

Here is another: What is the mass of the Earth? Why is it when you search the Web for this information there is such stark disagreement with what should be a well-measured quantity. And why does the most frequently returned answer have the weakest scientific bases? No one is policing the web, and I am not talking about the obvious case of humanly degrading material. I mean that no one is checking to see that sites –be they dedicated to history, art, science, math, engineering, society or the Church– are accurate or trustworthy. If you want, in our discussions afterwards, I can give you examples from almost every area of human endeavor.

The effort has to be made to ask hard questions as we view the world and the information about the world that we glean from the Net. How do we know if it is right? Have we solved the right problem? Have we solved the problem right? Ask yourself at every stage: What can you observe? What can you learn from these observations? How sure are you that you are right?

Technology Serving the Creative Expression of Man

Just as technology flows from man's creative powers, technology can be used to enhance that creativity. But it is a choice we have to make. We can use information technology for good or for ill, to inform, or to lie, to build up one another, or to tear one another down. Listen to the exhortation from the Pontifical Council on Social Communication:

" Great good and great evil come from the use people make of the media of social communication. Although it typically is said – and we often shall say here– that "media" do this or that, these are not blind forces of nature beyond human control. For even though acts of communicating often do have unintended

consequences, nevertheless people choose whether to use the media for good or evil ends, in a good or evil way.

"These choices, central to the ethical question, are made not only by those who receive communication – viewers, listeners, readers– but especially by those who control the instruments of social communication and determine their structures, policies, and content. They include public officials and corporate executives, members of governing boards, owners, publishers and station managers, editors, news directors, producers, writers, correspondents, and others. For them, the ethical question is particularly acute: Are the media being used for good or evil?" (from *Ethics in Communication*, June 2000)

To the list of concerned individuals, I would add you students. Here in Rome, this week, there are so many of you from so many parts of the world. What is common in our experiences is more important than what makes us different. Even though you are still in your formative years, you have a right to good information and a duty to use technology for good ends. You have an opportunity to become leaders in society by becoming leaders in the uses of technology to enhance the construction of a just and noble society. Technology does nothing by itself; it is an instrument, a tool used as you choose to use it. I call upon you, the young and noble students in UNIV, and your professors here and back at home, to face honestly the "most essential" question raised by technological progress: whether, as a result of it, the human person "is becoming truly better, that is to say more mature spiritually, more aware of the dignity of his humanity, more responsible, more open to others, especially the neediest and the weakest, and readier to give and to aid all" (Pope John Paul II, *Redemptor Hominis*, 15).

How does the Internet, its Web 2.0 services such as Second Life, and other technology advances affect you in your daily life? You must ask yourself if the Internet has become a kind of escape from reality more than a virtual reality.

The Internet has been described at times as "a door opening on a glamorous and exciting world with a powerful formative influence; but not everything on the other side of the door is safe and wholesome and true" (PSC, *The Church and Internet*, 2002). As the future of the Church, you clearly are open to formation regarding media, but that requires resisting the "easy path of uncritical passivity, peer pressure, and commercial exploitation" (PSC, *Ethics in Communication*, 2002). As the Church as encouraged, you, so I encourage you: You owe it to yourselves—and to your parents and families and friends, your pastors and teachers, and ultimately to God—to use the Internet well.

How well we remember the words of Pope John Paul II who often told us in these UNIV gatherings that the younger generation is the future of society and the Church. As you prepare for your responsibilities, keep in mind that you will have to actively work for your own proper formation in the workplace, in the university, and in society. In your hands, the Internet can be a tool for accomplishing useful work. In cyberspace, at least as much as anywhere else, you may be called on to "go against the tide," to be as Pope John Paul II said, a sign of contradiction. And that is a good thing!

As we celebrate this week our redemption from that fall of our first parents, a fall which clouded our reason but did not destroy it, we need to work to grow in the power of evidence-based reasoning. This is ever more true when the Internet is presented to us as a source of all things knowable. Our use of information technology should support the examination of the evidence or the process of reasoning. We have to get beyond "PowerPoint-lessness" where we think we are using technology because all of our slides look nice.

We need to use the opportunities of globally accessible resources to begin a deeper discussion of how all of this noise fits together. The net isn't going to organize

itself. The role of education is to form the whole person, to enable each of us to distinguish fact from opinion, and truth from error. We need to work to produce quality materials, and to set the standards by which such materials can be judged. We need to use the same technologies that would give us access to materials to connect ourselves and our efforts in education, to truly collaborate. For technology to have an on-going positive impact on society, more of us have to be quality information producers and not just consumers. But this is not easy. The very heart of *collaboration* is *labor*. It is hard work to work together, to overcome time and space and cultural differences. But it is a goal well worth pursuing, and I invite you to join me in a marvelous quest for truth.

Let us work together to build solid content, not just websites that look nice. Be critical of what you find, and suggest improvements to good sites to make them better. Seek advice, and don't hesitate to share this advice with others who may not have the benefit of the formation we sometimes take for granted. Populate the Web with good materials, with positive services, with truth and knowledge, and you will help drown evil in an abundance of good.

Thank you for your kind attention, thank you for your youth and enthusiasm, and thank you for allowing me to share with you my own hopes for your wonderful future. I look forward to working with you and collaborating through information technology to build a better Web.