National Federation of the Blind Convention

Richard Ladner

July 4, 2008

Introduction

I am honored to speak to you today on the day celebrating the Declaration of Independence. Those who declared independence in 1776 did so because they knew that they had the knowledge, resources, and power to make a new nation. It was not easy, but it was accomplished. In my role as an educator and researcher I stand beside the NFB in its efforts to empower blind people to find their own destiny, true independence.

To let you know about my background, I was born in 1943 as one of twin boys to deaf parents, Emil and Mary Ladner. I have an older sister who lives just down the road in Austin and a younger sister. Both my parents received their college education at Gallaudet University in Washington, D.C., the only liberal arts college for deaf students anywhere in the world. They became teachers at the California School for the Deaf, in Berkeley, California where they taught for a combined 55 years. My parents were active members and leaders in deaf organizations with missions like the NFB's. From them I learned the importance of education and self-determination to persons with disabilities. One thing that frustrated my parents is the "paternalism" that they encountered throughout their lives. Paternalism to them meant the attitudes of many well-meaning hearing people who thought that they knew what was best for deaf people, just as a parent knows what is best for their children. Because of my parents I believe that deaf people and blind people can decide for themselves their own destinies. I can help you in your quest for knowledge and power, but I cannot and will not make decisions for you.

Connections with the NFB

The journey that led me to the NFB is fairly recent. The story starts with Sangyun Hahn, a blind graduate student at the University of Washington in computer science and engineering since 2002. When he applied to UW, he was almost rejected. Someone on the admissions committee wrote that "it would be too hard for a blind person to earn a Ph.D. in computer science." Luckily the chair of the admissions committee contacted me for my advice. I looked at Sangyun's application which showed a high degree of accomplishment and determination. I recommended he be accepted stating among other things that he showed more drive to succeed than most of our Ph.D. students. He was accepted and is doing well. He should complete his Ph.D. in 2009.

Because of my experiences with Sangyun and with the urging of the National Science Foundation I created the Vertical Mentoring Workshop for the Blind in Science, Technology Engineering and Mathematics in summer 2006. The concept was to invite blind high school, college, and graduate students, and blind professionals, all with in interest in science, to come to workshop in Seattle. Each group would mentor the group below them, college students mentoring high school students, and graduate students and professionals mentoring college students. All speakers and leaders of breakout sessions were blind. I asked Sangyun Hahn, Zach Lattin, a blind math major at the University of Washington, Lindsay Yazzolino, a blind high school student with an interest in science, Yang-su Cho, blind technology specialist with the Washington State Services for the Blind, and Mark Riccobono, then Director of Education at the Jernigan Institute of the NFB, to help organize the workshop. The three-day workshop was very successful with about 45 blind people attending, including 4 or 5 with PhDs. Bill Gates Senior, Regent of the University of Washington, gave the welcome.

The main reason that I contacted Mark Riccobono at the NFB about the Vertical Mentoring Workshop was because I noticed the NFBs National Center for Blind Youth in Science on the Web and saw that its goals were similar to mine. Since the Vertical Mentoring Workshop I have worked with the NFB by creating the computer science tracks for the 2007 NFB Youth SLAM and for the 2008 NFB Junior Science Academy. At the Youth SLAM my team of students engaged 15 blind high school students in programming instant messaging chatbots, software robots that can have human-like behavior and do various tasks in response to user questions, like "what is the weather in Baltimore tomorrow?" This summer I will have another team of students attend the NFB Junior Science Academy to engage 6 to 12 year olds in "Computer Science Unplugged," a set of activities to learn about computer science without using a computer. Next summer, I hope to have another computer science track at the 2009 Youth SLAM.

Education

As a professor for 37 years at the University of Washington, a public university, I am committed to higher education for everyone who has the desire for a better life. Until 2003 my focus had been on the typical student without a disability. With the arrival of Sangyun Hahn, and other circumstances, my focus has changed to working on increasing the number and success of students with disabilities in science, technology, engineering and mathematics. There is recognition by both industry and government that a diverse workforce leads to better products and services for everyone. An engineering design team that is one dimensional, without women, without minorities, and without persons with disabilities will design products and services that are not at good as would be created by a diverse team.

In recognition of this the National Science Foundation has created the Broadening Participation in Computing program. With funding from this program, I have partnered with Sheryl

Burgstahler to create the Alliance for Access to Computing Careers. The program, which we call AccessComputing, is a nationwide resource to help students with disabilities pursue computing fields and computing educators and employers, professional organizations, and other stakeholders develop more inclusive programs and share effective practices. AccessComputing is supported our participation in the Youth Slam last summer and in the Junior Science Academy this summer.

Technology

One important key to education for blind students is access technology. I would like to talk with you about some access technology projects that I have helped develop and my vision for future of access technology. First notice that I call this technology "access" technology, and not "assistive" technology for a reason. "Assistive technology" rings a little too paternalistic to me. The technology will assist you do something, like you can't do it yourself. Access technology seems more empowering. It is technology that enables you to access information or other resources on your own, without assistance. A great example of access technology is the screen reader. Once the screen reader is installed, a blind person is on their own accessing information.

I would like to talk with you about two of my access technology projects: the Tactile Graphics and the WebAnywhere projects.

The Tactile Graphics Project has developed technology to accelerate the process of translating figures from textbooks from a visual form to a tactile form. The main innovation is processing the figures in batches, not one at a time, using our own software and standard products like Adobe Photoshop and Illustrator, optical character recognition, and Braille translation. Imagine if automobiles were still made one at a time, rather than on an assembly line. They would be very expensive and hard to get. Most tactile graphics are still made one at a time, which is too slow and costly. We have invented the assembly line for tactile graphics. It will require a new or retrained workforce, but the time has arrived to increase the availability of tactile graphics. Our software is freely available for download by anyone who wants to use it.

WebAnywhere is a web service that provides screen-reader functionality for the web. Developed by my graduate student Jeff Bigham, it requires no special software to be installed, and therefore, enables blind people to access the web from any computer they happen to have access to. WebAnywhere will run on any machine, even heavily locked-down public terminals, regardless of what operating system it is running and regardless of what web browsers is used. To use WebAnywhere just go to http://webanywhere.cs.washington.edu to access a preliminary version of the service. There is no charge. Just to repeat, WebAnywhere is a web service, like other web services you might use such as for e-mail, calendar, search, or shopping. WebAnywhere figures out what you are trying to read and speaks it to you. It also permits

navigation of web pages in a way very similar to an installed screen-reader. It is not a replacement for your installed screen-reader. It can be used only for accessing the web.

Computers are magical devices. Their beauty is that can be programmed to do almost anything, including accessibility tasks. PDAs, cell phones, and other mobile devices are computers with wireless communication capability. Companies and university research labs are already programming PDAs to do multiple accessibility tasks. Unfortunately, each task may require costly software to be installed. My vision for the future is using computation and communication to provide much cheaper access technology. In some sense the future is almost here. There is no real reason that optical character recognition (OCR) should be so costly. Indeed there is free OCR as a web service. You have a camera on your PDA, take a picture of the menu, upload to the OCR web service, then read the resulting text file with a screen-reader web service. This would take multiple steps, but imagine these steps could be automated, and they will be. Basically my vision is that access technology has moved from the desktop to portable devices, and with ubiquitous communication will move to web services, which, by their nature as shared resources, should be cheaper.

Empowerment

I like to say that the goal of my work both in research and outreach is to enable persons with disabilities to not only be independent, but to be empowered. I would like to tell you the story of Nicole Torcolini that demonstrates what I mean. Nicole is blind, hard of hearing, and with some facial disfigurement due to cancer treatment at the age of four. When Nicole came to my Vertical Mentoring Workshop in summer 2006 she was about 15 or 16 years old. At the workshop, she attended a breakout session on math accessibility led by my blind graduate student, Sangyun Hahn. At the session Sangyun taught the students about LaTex one of the principal mark-up languages for math. Most mathematicians and many scientists use LaTex to prepare mathematical formulas. By contrast, blind people use a form of Braille called Nemeth code to prepare math. Both Nemeth and LaTex are linear representations of two-dimensional formulas like fractions, roots, and other math notation.

As it happens Nicole prepared solutions for her math homework and exams in Nemeth code. The only problem was that her teacher didn't know Nemeth, so someone who knew Nemeth would have to translate them for the teacher. Nicole, having taken AP Computer Science, decided to take matters into her own hands. She wrote a program to translate Nemeth to LaTex, which can be compiled and printed, yielding beautifully typeset math. Using her program she could turn in the best looking math in the class. Nicole was empowered with her knowledge of computer programming, Nemeth, and LaTex to solve her own accessibility problem.

Next year Nicole will enter Stanford University as a computer science major. Hopefully, she will continue to help change the world for the better.

Conclusion

In conclusion, I know there are a lot of young people here today who are thinking about what careers they should pursue. I think many of you should consider careers in science and technology, and in particular computer science. Microsoft and Google each hired more than 10,000 new employees last year. There are literally thousands of smaller computing companies all growing. Most important, computer science needs you and your perspectives.

Thank you.