



Numbers, numbers everywhere

Scientific literacy in today's world must come together with numerical literacy

John Paulos, in his book *Innumeracy, Mathematical Illiteracy and Its Consequences*, asks, “How many pizzas are consumed each year in the United States? How many words have you spoken in your life? How many different people’s names appear in the *New York Times* each year? How many watermelons would fit inside the U.S. Capitol building? What is the volume of all the human blood in the world?” While

perhaps these questions are more entertaining than essential, the point is clear that numbers and their magnitudes are everywhere.

For something close to Nevadans, take for example some amazing numbers from our state’s mining industry:

did you know that Nevada mines produced 6.3 million troy ounces of gold in 2006, 81 percent of all the gold mined in the USA and 8 percent of all the gold mined in the world, and this placed the USA fourth behind South Africa, China and Australia? Did you know that the technology currently employed in the mining industry by companies like Newmont at the Twin Creeks’ mine near Winnemucca involves processing more than 1 ton of ore for each troy ounce of gold extracted, and that this can be done with a solid margin of profit? Did you know how important gold is for virtually all the electronics we use today? The point here is that science and math are all around us in incredibly vital and important ways.

With the help of the Washoe County Education Collaborative, local businesses, and the Colleges of Science and Education, the Gateway Curriculum is in place for the Washoe County high school class of 2010. This “Gateway to the Future” mandates three years of science and four years of math, up from two

and three years, respectively. In addition, with Washoe County’s leadership, a similar set of requirements was adopted statewide during the 2007 legislative session. So the climate is ripe for a scientifically and mathematically literate citizenry and workforce to embrace Nevada’s future.

It is a uniquely human trait to question and investigate our world, and Gateway is for those who must learn the precise numerical score to the issues and challenges we all will face in the years ahead. Gateway is also for students who might otherwise decide that science and math are something other people do. Additionally, Gateway is for those who assume that technological advances are not for them.

From the lowest grades onward, the biggest gift that an education in science and math can give is a deep appreciation for the beautiful complexity of our world and the need for us to think logically and with quantitative precision when we analyze it. Of course this means mastering the skills of computation, estimation and conceptual understanding in arithmetic, algebra, geometry, discrete math and statistics. However, to be effective, engaging and lasting, the work that is done with mathematics must be relevant to our daily lives.

The Washoe County Gateway math curriculum calls for all students to attain a minimum of a second year of algebra by the time they graduate. Now with four years of math, many will go one year beyond this. But algebraic thinking and calculation is only the beginning—like doing scales before you can play a song on the piano or calisthenics before you are strong enough to play football. For example, why not consider the algebra behind the bar codes on everything we buy and scan these days? What about the modular arithmetic behind the cryptography of safely encoding credit card numbers on the Internet? Instead of using logarithms and exponentials to solve

for x and check your answer in the back of the book, why not use them to navigate real estate or stock markets or develop an understanding of therapeutic levels for medications and the dangerous consequences of illegal drugs or multi-drug interactions? The possibilities are endless. It is up to anyone who uses math or science to help our teachers to explain it to the minds which hold our future. We cannot teach students every application but we can teach enough of them to instill awe, excitement and a deep appreciation for man’s quest for knowledge and the role of numeracy within it.

We must do all we can to get even the youngest of students to the frontiers of science as quickly as possible. This is a challenge like no other—for scientists to communicate and for teachers to embrace new adventures in their teaching and their own learning. Parents and counselors should not be telling their kids, “I was never good at math and I haven’t needed it in my career.” They should be saying, “I wish I knew more math and science, for the world of today is so different than when I was a kid!”

University outreach

Faculty from the colleges of Science, Education and Engineering, as well as many other great faculty and researchers across the campus and at the Desert Research Institute, should be commended for their outreach to the education of Nevada’s future adults.

Thanks to Department of Physics faculty and students, the University’s College of Education and the Nevada Terawatt Facility produced a colorful and educational portfolio on high energy density physics. The Terawatt Facility’s amazing high energy plasma studies use incredible amounts of energy exerted over extremely small time spans. The brochure’s colorful and accurate depictions of these amazingly short and powerful processes have captured the imaginations of many young minds. Yet to even

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partially simulate these reactions, which take far less than a trillionth of a second to complete, requires weeks of supercomputer time. Cracking the key to these interactions may eventually lead to unlimited supplies of energy through nuclear fusion and the development of lasers that can focus so precisely they can destroy previously inoperable cancerous tissue without touching the healthy tissue that surrounds it.

When I was an undergraduate in the early 1980s, research was something faculty rarely discussed with their students and certainly no one who didn't already have or was about to

get a doctorate actually did research. Today, however, the University is among the most forward-thinking of institutions, and has its own Office of Undergraduate Research led by M. Saiid Saiidi, professor of civil engineering. The support of the University, which includes grants and faculty mentors, is making undergraduate research—complete with the possibility of profound and influential discoveries—quite attainable. I believe that the next step in this evolution is to make these discoveries and challenges more and more accessible and exciting to our K-12 minds.

On April 7, the University of Nevada Reno, Truckee Meadows Community College, Western Nevada College, and the Washoe County Education Collaborative co-sponsored an inaugural outreach conference. This event brought together researchers of all types, as well as educators and administrators from K-12 and beyond to celebrate what has been done and to brainstorm what could be possible. I hope this can be an annual event.

The future Einsteins in a multitude of disciplines are a gigantic responsibility for all of us. 

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