

35 Asking Good Questions: A Congressman Looks at Science Education

Representative Rush D. Holt

As the Congressman from New Jersey's 12th District, I represent a swath of central New Jersey from the Delaware River to the Jersey shore. It is one of the most well educated districts in the country. About two-thirds of adults have a college education—nearly twice the national average.

There is also a heavy concentration of research and development in this congressional district. In addition to seven colleges and universities, the district is home to the highest concentration of pharmaceutical companies in the nation and hundreds of telecommunications and other high-tech industries.

I hear a great deal from my constituents about the issues involved in science and education. Citizens in my district understand the importance of both a commitment to basic scientific research and quality education for our children. They know that the continuation of our strong economic growth of recent years depends on generating new ideas and having a well-trained work force.

Since being elected to Congress last year, education has been my top priority in Congress. I fought for and won a seat on the House Education Committee, and have been working hard to push science and math education as a leading congressional priority. I also now serve on the National Commission for Math and Science Teaching in the 21st Century. This Commission is chaired by former Senator and astronaut John Glenn and includes academics, educators and business leaders from

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around the country. The Commission is addressing the developing crisis that public schools face in recruiting and retaining qualified math and science teachers.

Science education at the elementary and secondary level must be a critical component of our nation's science and technology policy. I believe improving science education for ALL students is the most important and effective thing we can do to promote science and technology in America.

There are more than 346,000 computer and software jobs open in our nation. Last year Congress passed legislation that would allow more immigrants into our country to fill such jobs because there are not enough Americans with the training required to fill them. Legislation to allow even more immigrants under the H-1-B visa program is pending in Congress as well. Businesses everywhere are seeking employees with technical training and problem solving skills. Thus it is vital that we provide superior science education for ALL students, not just for future researchers. In this regard, we certainly have our work cut out for us in Congress.

Asking Good Questions

The title of the essay, "Asking Good Questions," comes from a story told by Nobel Laureate Isador Issac Rabi of his childhood. When asked the secret of his success, he would tell of growing up in an immigrant neighborhood in New York City, where all the other children's parents would ask them, "What did you learn in school today?" His parents, however, would ask, "Izzy, did you ask a good question today?"

This is the essence of science: asking good questions and asking them in a way that they can be answered empirically and verifiably. It is this skill much more than a bunch of scientific facts—that we must pass on to students at all levels.

This goes beyond naturally curious questions. Philosophers of science remind us that science is the only self-correcting system of knowledge. Lewis Thomas called science "life's shrewdest maneuver for understanding how the world works." Most of us go through life looking for evidence confirming what we think we know. The great lesson of science is a tough lesson: prove yourself wrong or allow others to do so. It is ultimately satisfying.

In our science classrooms, it is questioning that we want to encourage in children. Often, however, we end up diminishing this desire in students. Traditionally, we have taught science in a rigid system.

Today's national structure for science education in the US grew out of a meeting held in Chicago in the 1890s. The representatives of universities in this meeting decided that high school students should take one year of biology followed by one year of chemistry followed by one year of physics.

Few things in science have changed as slowly as that prescription for education. It has led to a compartmentalized conception of science. This antiquated system must evolve to meet the needs of children living in our modern world. I am a firm believer in teaching every science to every student, every year.

Teacher Training

There are two aspects of education that critically affect student understanding: Teacher training and student assessment are areas in which both the academic and industrial communities can help affect real change.

Achieving the goal of teaching more science and scientific reasoning to more students demands much from teachers and administrators. I believe that teachers are the most critical element in improving education. Nothing makes more of an impact on our children than a well-trained, caring, and dedicated teacher. Ways need to be found to provide real support and training for science teachers.

Too much is being asked of some of our teachers without providing them the training they need. In Florida only 52 percent of high school science teachers have a degree in the subject they are teaching. In California only 50 percent of high school math teachers have a degree in math. In my home state of New Jersey these numbers are slightly better: 70 percent of high school math teachers have a degree in math and 72 percent of high school science teachers have a degree in science. Among elementary school teachers, large numbers express limitations and hesitation in science teaching.

On the national level, a recent study by the Department of Education tells us that only 20 percent of teachers feel qualified to use modern technology and to teach using the computers that are available to them. I recently visited a school in my district that had dozens of computers sitting in boxes because teachers did not know how to use the technology.

In the next few months, Congress will be considering legislation to help our teachers. This legislation will include helping local schools hire more teachers and keep them well trained. From my position on the Education Committee, I will play an active role during the debate on this legislation.

Under consideration will be the training of students in colleges and universities who are going to be teachers. The role of the federal government in ensuring that teachers entering the workforce are well prepared will be part of this debate. Also under consideration are proposals to significantly change the programs by which the federal government provides professional development opportunities for teachers. Providing support for our science teachers is absolutely necessary in helping our students achieve deeper scientific understanding.

Student Assessment

Although few can argue that testing can be useful to assess student achievement in a particular area, it is vital that student tests are truly measuring student learning and understanding, not just a regurgitation of facts. Are we asking good questions of our students to make sure that they gain the scientific reasoning we want them to develop? It often seems to be a rule that students will only learn the things that they know they will be tested on.

Bruce Alberts, the President of the National Academy, likes to say “If we don’t measure it, it may not exist.” We must continue the development of appropriate assessment methods to test both a teacher’s understanding of the topics they teach and the student’s mastery of the learned subject. This is where the academic community and the science policy community can change things.

What follows is a quote from a recent SAT II exam preparation book provided by a coaching company.

“We’ll show you that you don’t really have to understand anything... . When we get through, you may not really understand much about the difference between aerobic and anaerobic respiration. But you don’t have to, and we’ll prove it... . Whether or not you understand your answers, the scoring machine at the ETS will think you did. Their scoring machines don’t look for brilliant scientists and they don’t look for understanding... . Stick with us, and you’ll make the scoring machines very happy.”

This example illustrates the truth about how testing affects students' understanding. It also illustrates that what we expect at the college level will trickle down to how students are taught at the high school level and below. Clearly the development of meaningful student testing programs should be an important part of federal education policy.

Legislators in Washington are concerned about providing technical training to all students in America to prepare them for the high-tech jobs of the future. Student testing is the means used to judge whether federal dollars are being effectively spent. If the science community is serious about having our children understand scientific reasoning it needs to get involved in this debate over the testing process.

Conclusion

As Congress debates education policy during the next year, more needs to be done to ensure that science education and teacher training do not get lost in the push for more flexibility and freedom for local schools.

It is vital that the science community is involved in discussions with Congress. Congress still listens to the voices of the public, and thus, each scientist has a role in moving these education issues forward. Members of Congress like to know what is going on in their districts. The way to get legislators excited about science education is to get them out into the classrooms and show them examples of the positive impact of science education. You can get them excited about science education by showing them examples of kids doing science in their own backyard.

Before you is the challenge to find these examples of science in classrooms in your area. Then call up your Representative's local office and ask them to visit these classrooms. Together, we can make a difference both in Congress and in our classrooms.

