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Welcome to National Math Advisory Panel
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Introduction

Good morning. I am pleased to welcome members of the National Math Advisory Panel and the public to MIT's campus and to the Broad Institute, a breakthrough collaboration in genomics research between MIT, the Whitehead Institute for Biomedical Research, and Harvard University and its affiliated hospitals. We are delighted to have you here with us, because MIT shares a commitment to improving mathematics education in the US. We are grateful to the members of the National Math Panel for taking on this vital and substantial task.

As we look to the future, it could not be more clear that a solid foundation in mathematics will be crucial for every citizen in this country, because we are now in an era when technical and scientific literacy has become as important as language literacy. The future of the US economy and our standard of living depend on innovation and technological advances. Nobel laureate Robert Solow, a member of MIT's economics department, was the first economist to demonstrate the relationship between innovation and the economy. He showed that more than half of US economic growth since World War II derived from technological innovation. We are only now beginning to grasp the profound implications of Professor Solow's work. An important moment came during last January's State of the Union Address, when President Bush drew an explicit connection between economic growth, and investments in research and talent. Science and math education is a prerequisite for innovation.

The US higher education system is often considered the best in the world. And MIT is fortunate to attract some of the nation's best and brightest high school math students in mathematics. But we know their attainments are all too rare: Forty percent of four-year college students end up taking at least one remedial course. We need to repair the leaks in the K-12 pipeline that feeds higher education. Other countries understand this and have been building up their human capital through rigorous and comprehensive pre-college education. Tom Friedman coined the notion of a "flattened" world; more recently I have heard others suggest that the world is "tilted"—and not in our favor. A technology-driven global economy simply demands skills based on mathematics. Some economists are predicting that by as early as 2020, the US will be short of 14 million workers with the competency to compete for middle-income jobs in a global economy.

To compete successfully in the global marketplace, our future engineers and scientists will need more than technical skill: They will truly have to be leaders. In addition to the standard mathematics and engineering coursework, our students need interdisciplinary skills: business acumen, policy knowledge, foreign language facility, and the ability to work effectively with diverse teams of collaborators. One member of the MIT faculty, Professor Woodie Flowers, who is renowned for his inspirational leadership in the nationwide FIRST High School Robotics Competitions that now reach tens of thousands of high school students, talks of a new model for engineering students, one that is “technology literate and philosophically grounded.” In order for the US sustain its preeminence in science and technology, we need to assure that our students are prepared to be engaged leaders. A strong early math foundation is essential.

The Role of Higher Education

Higher education has a responsibility to help strengthen K-12 education, because we are in this together. The central expertise of colleges and universities generally does not include the core work of primary or secondary education, and our first obligation, of course, is to our own students. But, even so, we can build better bridges between K-12 education and college. MIT does not have an education school, but we can and do build partnerships in which we share our expertise. Our faculty and students work with K-12 students and teachers in a wide variety of settings, from local schools to summer programs that draw participants from around the country.

One of the truly innovative approaches MIT has taken toward education has been through MIT OpenCourseWare, known as “OCW”. This Institute-wide initiative offers web access, free of charge, to the teaching materials used in over ninety percent of MIT’s undergraduate and graduate courses, including syllabi, course notes, assignments, and problem sets. OCW now includes about 1200 courses. This is not a distance-learning program; instead, it allows educators, students, and self-learners around the country and around the world to benefit from the materials created by our faculty and to join a learning community in which knowledge and ideas are shared openly and freely. As one measure of OCW’s impact, every day it receives over 36,000 visits—visit to content, not just “hits”. We hope in the near future to develop a similar model for the best high school teaching materials in math, engineering, and science, gathering the knowledge of exceptional high school teachers into an online dynamic curriculum for the benefit of all.

MIT’s iLabs, another innovative approach to learning at a distance, allows students to conduct real laboratory experiments remotely from any Internet browser. In the future, such remote laboratories might allow high schools to access college laboratories or to share labs and instrumentation.

Finally, we need to think about how colleges and universities can help strengthen the use of technology in primary and secondary education. While technology will never replace the face-to-face teacher-student relationship, computers can provide a powerful supplemental tool for bolstering problem solving, and invention. Today, my office is wherever my laptop and I are: future classrooms may be similarly mobile.

The Panel's assessment of pedagogy will be as important as its study of curriculum. And even as we examine the current best practices for math education, it is crucial that we continue to fund research in education and learning, including supporting new tools for education. We are still far from knowing all we can about learning. As a neuroscientist, I can tell you that we can expect to see critical breakthroughs in understanding cognitive processing. We need to keep the door open to those advances.

Conclusion

There is no single, easy answer for improving American math education. This is a complex systems problem with multiple factors. Part of the difficulty is that there is no typical student. We must keep our very strongest students more engaged and challenged in math courses, and more inspired about the importance of math for their future lives and careers. At the same time we need to amplify efforts to bring up those who have fallen behind. Socioeconomic factors and changing demographics add further complexity: to realize our national potential, we must develop the math and science skills of historically under-represented groups.

This Panel's job is not easy. We are grateful that you are engaging your talents and energy on this challenge, which may well represent one of the greatest threats to America's future economic growth and prosperity.