



NATIONAL COUNCIL OF
TEACHERS OF MATHEMATICS

Testimony

Research and Science Education Subcommittee

of the

House Science and Technology Committee

Addressing the Critical Needs

of the U.S. Science, Technology, Engineering,

and Mathematics Education System

Francis (Skip) Fennell

President, National Council of Teachers of Mathematics

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Good morning, Chairman Baird and Congressman Ehlers. My name is Francis (Skip) Fennell. I am a professor of education at McDaniel College in Westminster, Maryland. I am here today as President of the National Council of Teachers of Mathematics (NCTM).

First, thank you for the opportunity to speak with you about the important effort undertaken by the National Science Board to develop a national action plan for STEM education. NCTM believes that creating a coherent STEM curriculum and placing a well-qualified, highly effective teacher in every STEM classroom are critical goals for this effort. In a national system where every local school board is empowered to decide what is taught and who does the teaching in every classroom, there are daunting, but not insurmountable, challenges to achieving these goals. By establishing an independent National Council for STEM Education, we can reestablish the sustained critical focus in education that was the hallmark of this great country's success in response to the launch of Sputnik 50 years ago. We support the creation of a national council and are optimistic that it would develop an agenda that would identify and address the issues that would make a meaningful difference in student learning. The National Council of Teachers of Mathematics is very willing and eager to support this effort.

Before I turn to NCTM's comments on the report, I would like to address an element of a child's education that is often overlooked by policy experts and elected officials. As members of the

National Science Board and other prominent education leaders have noted, a child’s first—and perhaps most—influential teacher is a parent. Any call to action—small or large—must recognize the crucial role that parents play in encouraging children and exposing them to knowledge and ideas about any topic or subject, including mathematics. Without parental support and involvement, it will be very difficult to convince young people of the urgency and importance of STEM literacy in this country.

Just as parents must do their part, educators and lawmakers must do what we can to reach beyond the “best and brightest” students, lending tangible support and extending viable options to *all* young people throughout our K–12 system. And it is important that we truly reach all students and meaningfully address the persistent problem of achievement gaps in education. This is a challenge for all of us involved in education, and it is one that we must continually address in all its forms.

The NSB STEM Action Plan

As you know, in August the National Science Board released a draft of what is now its final report, “A National Action Plan for Addressing the Critical Needs of the U.S. Science, Technology, Engineering, and Mathematics Education System.” NCTM submitted a number of comments, expressing support for the overall intent of the plan and, in general, its recommendations. Implementing all aspects of the plan could produce significant—and, more important—enduring, change in STEM education, laying the foundation for high academic achievement in STEM fields in the future and providing all students with the knowledge required to be successful, productive citizens.

NCTM especially supports those recommendations that acknowledge the need for more and better STEM teachers. Time and again, research has shown that the most important factor in student achievement is the quality of the teacher. We endorse all efforts to ensure that students are taught by well-qualified and highly effective teachers. We strongly support offering resources for their academic preparation, increasing STEM teacher mobility between districts by creating national STEM teacher certification standards, and preparing STEM teachers to teach STEM content effectively.

It is the position of the Council that every student has the right to be taught mathematics by a highly qualified teacher—a teacher who knows mathematics well and who can guide students’ understanding and learning. A highly qualified teacher understands how students learn mathematics, expects *all* students to learn mathematics, employs a wide range of teaching strategies, and is committed to lifelong professional learning.

All teachers must understand how students learn mathematics. They must know how to plan, conduct, and assess the effectiveness of mathematics lessons. In addition, they must listen and question, knowing how and when to make important teaching decisions. Highly qualified teachers of mathematics not only understand, but also invest in, the particular culture of their students and school. They dedicate time and energy both inside and outside the classroom. And they are adept at actively engaging students of diverse backgrounds and strengths in significant and challenging mathematical tasks that help them understand concepts, learn skills, and solve problems.

The creation of an Assistant Secretary of STEM Education at the Department would bring much-needed coordination among the numerous existing programs that address STEM education. And the formation of a new, independent, non-federal National Council for STEM Education to coordinate programs nationwide would raise the profile and importance of science, mathematics, engineering, and technology education and development.

Finally, we believe that a coherent “STEM education roadmap” can be defined through the combined efforts of the National Science Foundation and the Department of Education.

Working together and drawing on the findings and expertise of other agencies and organizations in the education and scientific communities, these partners can attain this goal, and its achievement will support and serve STEM education well. We strongly encourage capitalizing on the work that is currently being accomplished on learning and educational practices by the National Science Foundation. This work can augment and improve current instructional practice and student learning.

The forthcoming work of the National Mathematics Advisory Panel should also provide guidance on the future for mathematics education. The panel’s report, which will be published and released in February, continues to emphasize the importance of research on the teaching and learning of mathematics and the need for high-quality teachers and curricular coherence, through findings that are reinforced by research.

NCTM's Curriculum Focal Points

As the Board noted in its report, one of the most significant challenges facing STEM fields and mathematics education is a lack of curricular coherence in the early grades. Today's mathematics curricula tend to be dominated by long lists of very specific goals, standards, objectives, or learning expectations, which present teachers with a formidable challenge. How does a teacher identify what is most important and address the common criticism that our curriculum is "a mile wide and an inch deep?"

The impact of this lack of curricular coherence is felt in many ways. For example, student mobility is much greater today than in the past, and it continues to increase. More and more students are changing schools, and frequently they must adapt to a completely different curriculum as a result. Greater curricular coherence is needed horizontally, among states, and vertically, across grade levels.

In 2006, the National Council of Teachers of Mathematics addressed this issue with the publication of *Curriculum Focal Points for Prekindergarten through Grade 8 Mathematics: A Quest for Coherence*. *Curriculum Focal Points* describes significant mathematical concepts and skills for each grade level. It presents a way to organize and connect critical mathematics topics from grade to grade. Focal Points are the related ideas, concepts, skills, and procedures that form the foundation for understanding, lasting learning, and success in higher-level mathematics, beginning with algebra.

Curriculum Focal Points presents a focused framework to guide states and school districts as they design and organize the next revisions of their expectations, standards, curriculum, and assessment programs. The focal points are intended to frame discussions that will eventually inform the decisions of textbook publishers and assessment developers, as well. They answer the question, “What are the key mathematical ideas or topics on which the others build?” The ultimate goal would be for these suggestions, the Focal Points, to lead to the development of mathematics curriculum goals that are more cohesive from grade to grade and from school to school.

In fact, this process has begun in many states. NCTM has already made presentations in, or worked with, more than 20 states that are referring to *Curriculum Focal Points* as they develop state standards and assessments. Because mathematics is such an important foundation for all STEM fields, and because younger students learn mathematics almost exclusively in the classroom, the early mathematics education of all students is crucial to the future success of any STEM planning and policies.

Conclusion

Building on the momentum created by a series of landmark reports and the tireless work of leaders in education, business, industry, and government, the Congress in recent months has enacted important new policies that will potentially fuel this work. You and your colleagues on the House Science and Technology Committee accomplished much of this work. We thank you for all your efforts. Mathematics educators are particularly encouraged by new investments in teacher recruitment and retention programs, including the changes made to the Noyce Scholarship program, and a new Math Now initiative, which will help mathematics teachers

teach students who are the hardest to teach. These innovations, which we hope will be funded, are sorely needed.

In closing, I cannot tell you how excited I am about the attention that mathematics and the STEM disciplines are receiving. The COMPETES bill, the NSB's plan, and conversations around changes to the Elementary and Secondary Education Act are the fruits of years of effort to bring about change, and I look forward to seeing where it takes mathematics educators and our nation's students.

I will be pleased to answer any questions. Thank you.