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Slow Off the Mark

Elementary School Teachers and the Crisis in Science, Technology, Engineering, and Math Education

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Introduction and summary

You can't throw a stone without hitting a STEM initiative these days, but most science, technology, engineering, and math initiatives—thus the STEM acronym—overlook a fundamental problem. In general, the workforce pipeline of elementary school teachers fails to ensure that the teachers who inform children's early academic trajectories have the appropriate knowledge of and disposition toward math-intensive subjects and mathematics itself. Prospective teachers can typically obtain a license to teach elementary school without taking a rigorous college-level STEM class such as calculus, statistics, or chemistry, and without demonstrating a solid grasp of mathematics knowledge, scientific knowledge, or the nature of scientific inquiry. This is not a recipe for ensuring that students have successful early experiences with math and science, or for generating the curiosity and confidence in these topics that students need to pursue careers in STEM fields.

"No Common Denominator: The Preparation of Elementary Teachers in Mathematics by America's Education Schools" by the National Council on Teacher Quality, documented the need for more rigorous mathematics preparation of elementary level teacher candidates.[1] And in the two years since its release, very little has changed—despite evidence showing that elementary school students have higher achievement in mathematics when their teachers know more about how to teach math well.[2]

In this report, we focus on the selection and preparation of elementary school teachers, most of whom will be required to teach mathematics and science when they enter the classroom. It is elementary school mathematics and science that lay the foundation for future STEM learning, but it is elementary school teachers who are often unprepared to set students on the path to higher-level success in STEM fields.

In order to improve STEM learning, we must strengthen the selection, preparation, and licensure of elementary school teachers. We need higher standards for selection into teacher preparation programs—standards that include demonstrated proficiency in math and science at a level that is far higher than our current

pool of teacher candidates. Elementary grade teacher preparation programs must include more—and more rigorous—math and science courses in both content and pedagogy, and teacher candidates must perform in these courses at the high levels that we would expect of our students.

Furthermore, states must strengthen their licensure requirements so that teachers cannot obtain a license without passing the math and science sections of the exams. Finally, alternative certification programs should continue to recruit candidates who were STEM majors in college or are STEM professionals, and their licensure should be streamlined in order to get them into classrooms as soon as they are ready.

These steps represent a dramatic departure from current policy, but serious action is needed now in order to improve the prospects for our future global competitiveness. We cannot wait any longer to get serious about STEM policy. Strengthening our elementary school teachers in math and science is the first critical step in the right direction. To that end, we make five specific recommendations in this report:

- Increase the selectivity of programs that prepare teachers for elementary grades
- Implement teacher compensation policies, including performance-based pay, that make elementary teaching more attractive to college graduates and career-changers with strong STEM backgrounds
- Include more mathematics and science content and pedagogy in schools of education
- Require candidates to pass mathematics and science subsections of licensure exams
- Explore innovative staffing models that extend the reach of elementary level teachers with an affinity for mathematics and science and demonstrated effectiveness in teaching them

As we will demonstrate, improving the ability of our elementary school teachers to teach the facts, concepts, and procedures critical to success in STEM fields is required if our nation is to succeed in the globally competitive arena of the 21st century.

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