



No Common Denominator

The Preparation of Elementary Teachers in
Mathematics by America's Education Schools

Full Report
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6. CONCLUSION

American elementary teachers as a group are caring people who want to do what is best for children. Unfortunately, their mathematics instruction leaves far too many of them ill-equipped to do so. We are confident that the education schools that rose to the top in our evaluation process are preparing teachers *relatively* well compared to the majority of education schools in this study, which rated so poorly. Their teachers stand readier than most to forestall the frustrations of youngsters leaving the familiar world of the counting numbers and dealing with the debut of division with fractions. Nonetheless, the standards against which these education schools were judged only lay a solid foundation. Further improvement is still necessary. A deeper understanding of elementary mathematics, with more attention given to the foundations of algebra, must be the new “common denominator” of our preparation programs for elementary teachers. We are only at the beginning of the process of seeing how that new measure might be calculated.

Most of the many mathematicians and mathematics educators we consulted for this study share a vision of teacher preparation programs that are no longer the refuge of math-averse students and in which remediation does not overwhelm efforts to immerse students in a compelling blend of mathematic content and pedagogy. The realization of this vision will require considerably more in the way of building blocks and design plans than we were able to accommodate in this study.

All reform efforts hinge on ensuring that applicants for teacher preparation programs have a firm grounding in mathematics. Admitting candidates who are unwilling or unable to successfully complete a standard high school mathematics program means admitting people whose own elementary and middle school education has failed them, an *a priori* disqualification for teaching at those levels.

Turning to the architecture of reform in education schools, much remains unsettled: the structure and departmental home of courses in which the appropriate instruction can be delivered, the means of integrating content and methods instruction and the professional training for those who can best convey the amalgam of the two, and the nature of textbooks with which such integrated instruction might be supported. We applaud innovative institutions that seek to address those unsettled issues, such as Louisiana State University, with its combined content and methods instruction in its elementary education program.

As we move forward with reforms, we hope to see high-quality research providing evidence of the effects of all teacher preparation programs, innovative and otherwise, on the performance of both their graduates and their graduates’ classrooms.¹⁰⁵ (Indeed, the use of classrooms for the mathematics preparation of prospective teachers as the seedbeds for scholarly research may be one of the strongest forces driving their

¹⁰⁵ One such study has examined the effects of Louisiana mandates that those enrolled in teacher preparation programs take more content-specific Praxis tests, and that programs work toward accreditation and align their programs with state and national PreK-12 content standards and standards for teachers.” Vaishali Honawar, “Gains Seen in Retooled Teacher Ed,” *Education Week* Vol.27 N10, (31 October 2007), pg. 1.

improvement.) Because conveying the difference between a superficial and a deep understanding of the mathematics all of us learned as youngsters is so difficult in the abstract, we offer our rudimentary “Exit with Expertise: Do Ed Schools Prepare Elementary Teachers to Pass This Test?” as a tool to help policymakers and all others understand what mathematics preparation must be designed to achieve. We welcome its improvement by the community of professionals who prepare our elementary classroom teachers.

Until such time as an improved instructional model is developed, education schools should increase the efficacy of existing content courses by: intensifying instruction on essential topics with the “laserlike focus” endorsed by the National Mathematics Advisory Panel for K-12 mathematics instruction, selecting the best of current textbooks, and setting high standards for student performance in courses and in exit tests. The prospect that mathematics specialists will become increasingly common in elementary classrooms due to initiatives promoted by groups including the National Academies does not change this imperative for improvement since those specialists can emerge from the same courses and programs as regular elementary classroom teachers.¹⁰⁴ The reforms that will make such teachers more mathematically competent could improve mathematics specialists as well.

While it is encouraging that six education schools in our sample informed us that their requirements for mathematics courses would be increasing in the next few years¹⁰⁵ (and only one mentioned a decrease¹⁰⁶), this rate of change is simply too slow. With mathematicians and mathematics educators sharing a new consensus about K-12 mathematics instruction, the pace of improvement in the substance and process of teacher preparation can accelerate. An ever increasing number of elementary teachers must walk into their classrooms with the self-assurance that comes from a firm understanding of elementary mathematics, even those who as children left classrooms with their confidence shaken.

Teacher preparation programs are properly responsible for equipping elementary teachers to navigate the mathematical demands of the classroom. Yet as hopeful as we are that the pace of dramatic reforms in teacher preparation will be rapid, many mathematically weak graduates of preparation programs will join their counterparts among the ranks of current teachers. Sustained inservice training directed by mathematicians and mathematics educators is essential to imbue the practice of those professionals with a deeper conceptual understanding. Numerous training programs for current teachers such as the Intensive Immersion Institute of the Massachusetts Mathematics and Science Partnership, the Vermont Mathematics Initiative, and the training associated with a new software-based curriculum entitled “Reasoning Mind” show promise for dramatically increasing the mathematical competence of their graduates. They should be expanded and replicated.¹⁰⁷

104 Committee on Prospering in the Global Economy of the 21st Century: An Agenda for American Science and Technology, National Academy of Sciences, National Academy of Engineering, and Institute of Medicine, *Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future*. (Washington, D.C.: National Academic Press, 2007).

105 Green Mountain College (VT), King’s College (PA), Saint Joseph’s College (PA), Univ. of Wyoming, Boston College (MA) and Boston University (MA). The latter two programs provided us with materials on their new coursework and our evaluation reflects their enhanced programs. Green Mountain College (VT) did not respond to our requests for information on new requirements.

106 MacMurray College (IL)

107 The Intensive Immersion Institute trains about 200 teachers per year, most teaching grades 4-8 in a 65 hour course, <<http://www.doe.mass.edu/omste/msp/fy04projectsum.html>>; the Vermont Mathematics Initiative trains about 75 teachers per year, all teaching K-8, in an 80 hour or a more extended course, <<http://www.uvm.edu/~vmi/>>; Reasoning Mind trains 125 teachers per year, most teaching grade 5, in a course totaling 120 hours, <<http://www.reasoningmind.org/>>.