

## How to End the Math and Science Teacher Shortage

by Liv Finne  
Director, Center for Education

April 2009

### Summary

Washington public schools face long-term, persistent shortages of qualified math and science teachers. In 2001, the legislature realized the state's rigid certification requirements limit the supply of qualified teachers. That year lawmakers passed a bill to create an Alternate Route program to make it easier for mid-career math and science professionals to enter the teaching profession.<sup>1</sup> As implemented by the Professional Educator Standards Board (PESB), however, the Alternate Route program is a failure. Since 2002, the program has produced only 286 new math and science teachers, far short of the number needed.

Despite this failure, the legislature is considering a proposal to put the PESB in charge of a "coordinated approach...to create an adequate supply of well-qualified mathematics and science teachers." Under the bill, the PESB would set measurable goals requiring schools of education to produce a certain number of math and science teacher graduates.

The weakness of this approach is that schools of education are the source of the original problem. The schools do not produce graduates with academic degrees in math and science; only graduates with teaching degrees and a low level of training in these core subjects.

This Legislative Memo presents research showing why the Alternative Route program failed, analyzes why a new "measurable goals" program would likely fail as well, and describes a workable approach with a proven track record of increasing the number of qualified math and science teachers in the classroom.

### Why the Alternate Route Program Failed

The Alternate Route program, as currently operated by the PESB, actually makes it harder, not easier, for a highly-trained, mid-career professional, like an engineer or a computer specialist, to become a public school teacher.<sup>2</sup> The program requires interested candidates to have first earned a college degree in math or science and to have five years of work experience. They then must earn at least 45 credits from an approved school of education, pay all tuition and fees, and work in a classroom without pay under a mentor teacher.

---

<sup>1</sup> Revised Code of Washington 28A.660.040, "Alternative route conditional scholarship program."

<sup>2</sup> In 2002, the Professional Educator Standards Board created four alternate routes to traditional teacher certification. Only one of the four alternate routes, Alternate Route Three, granted access to the classroom for individuals with math and science degrees from the private sector. The other three alternate routes are open only to teachers' aides with associates degrees already employed by a school district, classified staff of a school district with a B.A. and "subject matter expertise" in a shortage area, or individuals with a B.A. already teaching under a conditional or emergency credential.

For most people, it is not possible to meet the requirements of the Alternate Route program and hold down a full-time job at the same time. The people this program is supposed to attract are likely to have families, a mortgage, car payments, student loans and other personal and financial responsibilities. They usually cannot afford the time, expenses and income loss required by the PESB.

These heavy restrictions explain the disappointing results of the Alternate Route program. Between 2002 and June 2008, only 286 candidates have successfully filled math and science positions (156 in math and 130 in science) and become state-certified teachers.<sup>3</sup> Far from meeting the state's pressing needs, the program has produced an average of fewer than 26 new math teachers and 22 new teachers of science per year, not even enough to replace the teachers in these fields who retire each year.

Local school officials continually note their difficulty in finding teachers qualified to teach math and science to their students. The Office of Superintendent of Public Instruction reported 551 vacancies for mathematics teachers in Washington for the academic year 2005-06.<sup>4</sup> Large numbers of teachers will be required to replace retiring teachers in the next ten years, and at least 450 additional math teachers will be needed to teach the additional third year of high school math now being required to graduate from high school.<sup>5</sup>

## **Why the “Measurable Goals” Approach Probably Won’t Work**

PESB officials argue that the solution to this problem is not to change teacher credential laws, but instead to intensify teacher recruitment efforts, and establish quotas that will force schools of education to produce more qualified math and science teachers.

There are several reasons why this top-down, mandated approach will not work. First, the PESB has been trying for more than six years to eliminate the teacher shortages in math and science, working under a specific mandate from the legislature. It has not been successful.

Second, school of education administrators are unlikely to meet the required quota, since they have little incentive to do so. The state grants schools of education a monopoly on supplying teachers to public schools, and continues to provide funding regardless of whether or not they are meeting the staffing needs of K-12 schools across the state. Given their continued monopoly status and funding, new instructions handed down by the PESB are unlikely to change the way they do business.

Third, since private schools are not subject to the teacher certificate limitation, any experienced math or science professional considering a teaching career is likely to accept a job at a private school. Under state law, private schools may hire whomever they like. Even if the salary is lower than at a public school, the private school offers mid-career professionals the benefits of immediate paid employment and on-the-job mentoring.

Finally, past teacher recruitment efforts and credential mandates have failed to produce an adequate supply of qualified math and science teachers for public schools. To date only seven

<sup>3</sup> “Ensuring an Adequate Supply of Well-Qualified Math and Science Teachers,” Report to the Governor and legislature by the Professional Educator Standards Board, December 2008, page 28. The PESB recently added a fifth alternate route, called Retooling Teachers.

<sup>4</sup> “Educator Supply and Demand in Washington State, 2006 Report,” Office of the Superintendent of Public Instruction, Spring 2007, page 6, available at: <http://www.k12.wa.us/certification/pubdocs/SupplyDemand2006.pdf>.

<sup>5</sup> “At Least 450 New Teachers Needed to Meet New Math Requirements,” Professional Educator Standards Board, January 25, 2008. This number does not include current attrition and mobility rates of math teachers, so the overall need for math teachers is likely to be higher.

university and community college education programs, out of a total of 22 in our state, have complied with the PESB's Alternate Route program.<sup>6</sup> Doing more of the same is likely to produce the same poor results.

## **Washington Schools Lead the Nation in “Out-of-Field” Teachers**

Washington public schools rate particularly low in one measure of teacher quality: we have too many “out-of-field” teachers, who hold neither an academic major nor state certification in the subjects they teach. Based on teacher-reported data, Washington ranks near the bottom (48th) in the nation as having the highest proportion of out-of-field teachers. Fully one in four Washington high school classes in the core areas of English, math, social studies and science is taught by an out-of-field teacher.<sup>7</sup>

Out-of-field teaching is a particular problem in the subject of math. The research shows that secondary school teachers who have a bachelor's or master's degree in mathematics are more likely to produce high student achievement than their colleagues who lack such degrees. Experts in a field are usually passionate about their own subject – mathematicians love numbers, English majors see beauty in good writing – and they tend to convey this excitement to their students. Alternatively, teachers cannot teach a subject they do not know.

Washington public schools fare particularly poorly in math. Only 40% of Washington's middle and high school teachers of math either minored or majored in math in college.<sup>8</sup> The rest, 60% of math teachers in Washington, hold either a low-level math qualification from a school of education, or they have no training in math at all.

## **Credential Laws Force Officials to Pass over Highly-Qualified Teachers**

Under state law, public school officials are required to hire only candidates holding an officially-issued teacher certificate to teach in public schools. As mentioned, this restriction does not apply to private schools. Even highly-qualified professionals with years of work experience in the fields of math and science are barred by law from teaching public school students.

For example, Microsoft recently announced it planned to lay off 5,000 of its workers, many of them skilled in math and computer sciences. None of them may seek or accept a teaching position in a public school without first going through the lengthy and costly teacher certification process. Boeing has announced lay-offs of 10,000 high-skilled workers – many are engineers, planners, designers, project managers – who are similarly barred from accepting public school teaching positions. All of these professionals, however, are immediately available to teach in private schools.

State law also bars higher education faculty from teaching in K-12 public schools without a state-approved certificate. Higher education faculty can, however, be hired by K-12 private schools. This means academic professionals with both strong subject knowledge and years of classroom experience cannot teach in a public school. A college professor who teaches a biology course to 19-year-olds at a state university is not allowed to teach the same subject to 18-year-olds in a public high school.

---

<sup>6</sup> See PESB website, bill H.B. 2000, and “Ensuring an Adequate Supply of Well-Qualified Math and Science Teachers,” report to the Governor and legislature by the Professional Educator Standards Board, December 2008.

<sup>7</sup> “Core Problems, Out-of-Field Teaching Persists in Key Academic Courses and High-Poverty Schools,” by Richard M. Ingersoll, The Education Trust, November 2008.

<sup>8</sup> “Learning to Teach with Technology,” by Vaishali Honawar, *Education Week*, March 27, 2008, page 30.

## **A Teacher Credential “Matters Little” for Student Performance**

One research study after another shows that allowing schools of education to control who can enter the teaching profession has not resulted in academic excellence in the classroom. One study of 10,000 teachers in grades four through eight by the Harvard Graduate School of Education found that a teaching credential “matters little” in raising student achievement.<sup>9</sup> The study found that student learning in math and reading correlates closely with mastery of the subject by the teacher, but was poorly related to whether the teacher held a state-issued certificate. The study found that subject mastery by the teacher confers ten times more educational benefit for students than a state-issued certificate.

The lead author of this study, Professor Thomas Kane, recommends that school districts move away from hiring teachers based on school of education requirements and instead move towards a system which allows principals to evaluate the performance of individual teachers in the classroom. Individual schools should provide training, mentoring and classroom support to new teachers to promote talent within the profession.

Over time, each school would develop a dedicated team of motivated professionals who take pride in helping students. Teachers who know that educational achievement will be recognized and rewarded will eagerly take on the most difficult students. When these students show a spark of understanding and develop an eagerness to learn, the teacher’s feeling of accomplishment is that much greater.

## **An Approach That Works: Hiring People of “Unusual Competence”**

Private school teachers are hired based on knowledge of the subject they will teach. They end up in the classroom because they are experts in math, physics, biology, computer science, engineering, history or English, not because they hold an education degree or managed to pass the certification test.

Private school teachers routinely receive classroom training and guidance from mentor teachers. Those who show skill in educating children are retained. Those who do not are asked to seek work opportunities elsewhere. Unlike public schools, private schools seldom allow an under-performing teacher to remain in the classroom.

This common-sense practice allows private school administrators to achieve constant improvement in their teaching staff. It also allows them to tap a vast pool of professional talent. For example, 240,000 people in Washington have college degrees or higher in math or science. Private school administrators are free to interview, screen, hire and train any qualified applicant from this vast pool of talent. Public school administrators are not.

Private schools impose few barriers on mid-career professionals who want to become teachers. Private schools provide whatever training and orientation is needed, insure that new teachers comply with state codes on safety, conduct and civil rights, and generally allow them to begin work with a minimum of red tape and expense. In private education, a qualified professional can leave his old job, receive the needed classroom training and orientation, and within weeks begin a new teaching career helping students.

---

<sup>9</sup> “Photo Finish: Teacher certification doesn’t guarantee a winner,” by Thomas J. Kane, Jonah E. Rockoff and Douglas O. Staiger, *Education Next*, The Hoover Institution, 2008 at [www.hoover.org/publications/edn-ext/4612527.html](http://www.hoover.org/publications/edn-ext/4612527.html).

## Conclusion

The Alternative Route program has failed to increase the supply of math and science teachers in public schools, and imposing a “measurable goals” policy on schools of education is likely to produce the same disappointing results. The legislature should abandon a top-down mandated approach and instead seek to broaden the talent pool of potential math and science teachers.

The legislature can greatly increase the talent pool of qualified math and science teachers by allowing public schools to hire instructors the way private schools do. RCW 28A.195.010 allows private schools to hire individuals of “unusual competence” without the restrictions imposed by schools of education or the Alternative Route program. This provision should be extended to public schools.

Making school districts eligible for “unusual competence” hiring authority would give public school students access to experienced, highly-qualified math and science professionals with full academic degrees in the subjects they teach. School districts should be authorized to recruit, interview and train such individuals, and then retain or dismiss them based on their performance in the classroom.

Expanded hiring authority and wider recruitment efforts, combined with adequate training and support, offer the best way to open up new opportunities in the teaching profession, relieve the teacher shortage in critical academic areas, and improve the quality of public education for all students.

*Liv Finne is director of the Center for Education at Washington Policy Center, a non-partisan independent policy research organization in Seattle and Olympia. Nothing here should be construed as an attempt to aid or hinder the passage of any legislation before any legislative body.*