STATE OF WASHINGTON
PROFESSIONAL EDUCATOR STANDARDS BOARD

Ensuring an Adequate Supply of Well-Qualified Math & Science Teachers

December 2008

A Report to the Governor, Education, Higher Education and Fiscal Committees of the Washington State Legislature

Submitted by the Professional Educator Standards Board

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Background and Introduction

Legislative charge:

> *" . . . .conducting a comprehensive analysis of math and science teacher supply and demand issues by the professional educator standards board. By December 1, 2008, the professional educator standards board shall submit a final report to the governor and appropriate policy and fiscal committees of the legislature, that includes, but is not limited to: (i) Specific information on the current number of math and science teachers assigned to teach mathematics and science both with and without appropriate certification in those subjects by region and statewide; (ii) projected demand information by detailing the number of K-12 mathematics and science teachers needed by the 2010-11 school year by region and statewide; (iii) specific recommendations on how the demand will be met through recruitment programs, alternative route certification programs, potential financial incentives, retention strategies, and other efforts; and (iv) identification of strategies, based on best practices, to improve the rigor and productivity of state-funded mathematics and science teacher preparation programs. As part of the final report, the professional educator standards board and the Washington state institute for public policy shall provide information from a study of differential pay for teachers in high-demand subject areas such as mathematics and science, including the design, successes, and limitations of differential pay programs in other states. In order for the professional educator standards board to quantify demand, each school district shall provide to the board, by a date and in a format specified by the board, the number of teachers assigned to teach mathematics and science, both with and without appropriate certification and endorsement in those subjects, and the number of mathematics and science teaching vacancies needing to be filled, and the board shall include this data, by district, in its analysis."*

Per the budget proviso language above, the 2008 legislature charged the Professional Educator Standards Board (PESB) with:

- Quantifying, based on district report, current and projected supply and demand for math and science teachers;
- Providing information, based on a Washington State Institute for Public Policy Study, on differential pay for teachers in high-demand subjects like math and science; and
- Recommendations on how to meet the expected demand, including strategies for improving the rigor and productivity of current teacher preparation programs.

The PESB undertook several initiatives in response to this charge:

1. **Data Collection:** With the assistance of the Washington State School Directors Association (WSSDA), the PESB sent out surveys to all Washington school districts

requesting the assignment and credentialing data for all math and science teachers, as well as projected demand data, as requested by the legislature. This report details the methodology and findings from this survey, supplemented by data available by emerging state data systems.

2. **Review of Research / Best Practices:** PESB conducted a review of research and best practices in other states to ensure an adequate supply of well-qualified math and science teachers. The PESB also contracted with a team of researchers at University of Washington (UW), in collaboration with the Center for Strengthening the Teaching Profession (CSTP), to survey Washington undergraduates' views on teaching as a career choice. UW staff also contributed to the review of promising recruitment policies and practices.

3. **Differential Pay Study:** The legislative charge also required the Washington State Institute for Public Policy (WSIPP) to study and provide information on the design, successes, and limitations of differential pay programs in other states. Strictly due to timing, findings from their study are contained in Appendix E rather than incorporated into this report.

4. **Task Force: Ensuring an Adequate Supply of Math and Science Teachers**
No single entity in Washington State possesses responsibility for all aspects of ensuring Washington has enough excellent math and science teachers for all students. Like most states, there are many programs and initiatives with this aim and it is an issue with which many education stakeholders struggle. For this reason, the PESB assembled a short term Task Force with broad stakeholder representation to:
    - Examine new data related to Washington's supply and demand for qualified math and science teachers;
    - Analyze current recruitment efforts and promising practices suggested by research and other states; and
    - Contribute to recommendations on needed next steps.

    The task force has been composed of representatives from:

    Governor Gregoire's Office

    Office of Superintendent of Public Instruction

    Association of Washington School Principals

    Washington School Personnel Administrators Association

    Washington Association of School Administrators

    Washington Education Association

    State Board of Education

    Washington Association of Colleges of Teacher Education

    Higher Education Coordinating Board

    Council of Presidents

    Partnership for Learning

Business Roundtable

Center for Strengthening the Teaching Profession

State Board for Community and Technical Colleges

The Task Force met formally in August, October and December, providing substantive input that contributed greatly to this report.

Recruitment versus Retention

Through this report, we use "recruitment" as an umbrella term for those strategies aiming to ensure a strong pool of individuals that will provide Washington State a steady supply of excellent math and science teachers, including "pipeline" strategies that extend all the way from middle-school students into the teaching profession, expanding access to various types of preparation, removing barriers to facilitate ease of entry, and even retooling of the existing workforce to recruit in needed areas.

Further, a 2006 study by Earley and Ross makes a distinction we have applied to this report.[1] They assert that recent federal and state policy include retention-related policies among strategies that serve as a recruitment tool. While retention is clearly critical, they argue that state policy needs to disentangle teacher recruitment and teacher retention. They agree training and hiring good teachers is labor policy, whereas retention is investment policy. Labor policies are often called upon to be nimble and capable of change to address market need. Investment policy needs a measured, long-term response. There is much to suggest that retention strategies must be stable and sustained, whereas recruitment strategies imply change with the market. It is in this vein that we would suggest consideration of retention strategies and recommendations for investment in retention separate from the recruitment strategies suggested in this report.

Related to this, the final section of this report addresses related issues that require attention if the recruitment strategies we are suggesting are to be successful.

Picture of Supply and Demand of Math and Science Teachers in Washington State

As mentioned in the Background and Introduction section, the legislative charge given the PESB included a requirement that the PESB solicit, and all school districts provide:

> *(i) Specific information on the current number of math and science teachers assigned to teach mathematics and science both with and without appropriate certification in those subjects by region and statewide; and*
>
> *(ii) projected demand information by detailing the number of K-12 mathematics and science teachers needed by the 2010-11 school year by region and statewide.*

The PESB received data from 81 percent of the school districts representing 89 percent of Washington's total student population. The demographics and enrollment of districts that submitted information and those that did not were similar. Although the sample drawn cannot be generalized to the districts that did not submit information, it is unlikely that the missing data would significantly change the information reported in this study.

How many science and math teachers work in Washington?
There are an estimated[a] 4,005 science teachers and 5,088 math teachers working in Washington. However, because a math teacher may also teach science and vice versa, some teachers will be counted twice. A more reliable way to discuss endorsement is by course. For this study, PESB collected information by Full Time Equivalency (FTE), a proxy for courses. In these cases, a teacher who teaches biology for their entire day was coded as 1.0 Biology, and a teacher who teaches biology for half a day is coded as 0.5 Biology.

In Washington, the sum of FTE in science is 3,031 and 3,716 in mathematics.[b]

What is the endorsement profile of Washington's math and science teachers?
PESB's data showed that 89.6 percent of FTE in math and science is taught by endorsed teachers.[c] In math, 93.2 percent of FTE is endorsed (96.2 percent at the middle level and 90.7 percent at the high school level). In science, 85.1 percent of FTE is endorsed (86.4 percent at the middle level and 84.3 percent at the high school level).[d]

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[a] PESB completed the legislative charge by attempting to collect endorsement information of math and science teachers from all districts in the state of Washington. To that end, PESB managed to collect information covering 87 percent of Washington's public school students. To arrive at an estimate for the total number of math and science teachers, PESB added 12.68 percent to its collected data (the percent of enrolled students in the districts that did not report). However, without proper sampling, PESB cannot address the accuracy of the measurement (i.e. provide confidence intervals needed for generalization).
[b] See Table 1 in Appendix A.
[c] These results are not generalizable to the districts that did not report to PESB.
[d] For disaggregated results, see Table 2 and Table 3, or Figure 1 and Figure 2 in Appendix A.

Over the course of two years, the PESB studied and debated whether to change the K-8 endorsement to a K-6 and insist upon subject-specific endorsements for middle grades. Rural and remote districts in particular voiced strong objections to new subject-specific endorsements, arguing that K-8 allowed for flexibility of assignment needed for their small schools. In 2006, after finding the K-8 endorsement weak in content, the PESB reviewed and revised the standards and greatly increased the K-8 subject rigor. Although we are confident that new teachers under the revised competencies have adequate subject knowledge for middle-level math and science, lesser content knowledge may exist among teachers with pre-2006 K-8 endorsements.

Are there differences between geographical regions?
To facilitate comparisons between regions, an outcome variable was constructed by retaining the reported FTE for *endorsed* teachers and recoding the *not endorsed* teachers as the product of their FTE and -1 (contrast variable). PESB found no statistically significant differences existed of the proportions of *non-endorsed* teachers between different geographic regions in Washington.[a]

What is the projected need for science and math teachers in Washington?
To forecast the demand for math and science teachers, PESB asked Washington school districts to project their supply and demand for the 2010-2011 school year. Extrapolating from those that responded (71 percent), Washington school districts expect to hire between 290 and 343 additional math teachers (an annual increase of 2.4 to 2.8 percent) and between 566 and 720 additional science teachers (an annual increase of 5.5 to 7.3 percent). With these high numbers, it seems that either the districts are unable to accurately forecast the number of teachers needed in future years or that PESB's tool drew inaccurate results.

In September 2008, the Federal Government's Institution for Education Statistics (IES) released enrollment projections for Washington to the year 2017. Between 2008 and 2017, IES projects enrollment in Washington to increase by 7.4 percent (an annual increase of 0.8 percent). Using the PESB's estimated FTE for science and math teachers currently working in Washington, we would expect an increase of 499 full time math and science teachers by 2017 due to increased enrollment.

Although some analysis[b] has been done on teacher retention rates using the Office of Superintendent of Public Instruction's (OSPI's) personnel database (S-275), there has been no work on trend analysis or analysis of math and science teachers in particular. This lack of information is likely due to problems in the S-275 database and the inability to connect teachers with assignments. It is expected that OSPI's new data collection system will allow for closer analysis of trends of teacher retention.

Finally, in January of 2008 PESB surveyed districts to find out how adding an extra year of math to high school graduation might impact the teacher. Districts reported that they

[a] See Table 4 in Appendix A.
[b] See www.cstp-wa.org

would need to increase their high school math staff by about 15 percent to cover the increased course load.

Therefore, PESB's best projection for the demand for math and science teachers is an annual +0.8 percent due to growth in enrollment, with a one-time addition of up to 15 percent needed in high school math to offset added graduation requirements. This projection bars any changes in demand due to job market variability or teacher retention.

The endorsement variable's ability to predict hard-to-staff schools

After PESB's initial review of the literature concerning staffing in science and math, we expected to find hard-to-staff issues in rural and remote school districts. Additionally, we expected to find hard-to-staff schools within large urban school districts. The federally collected Common Core of Data (CCD) allowed us to identify rural and remote schools, and we were fortunate that a large urban school district had just identified its hard-to-staff schools for intervention. This data allowed us the opportunity to test the endorsement variable's sensitivity to Washington's hard-to-staff schools (i.e. these schools should show a higher number of teachers working out of endorsement).

PESB found that endorsement, as divided in this study, does not appear to have the ability to differentiate between *hard-to-staff* schools and *not hard-to-staff* schools. It is likely because most teachers are considered appropriately endorsed (ceiling effect).[a] We believe that measuring endorsements is important to understand hard-to-staff subjects and locations, but a more accurate picture of staffing problems will require measuring variables directly linked with staffing issues. Such variables might include measures such as when a position opened, how long it took to fill, how many qualified candidates applied, and how long the successful applicant stayed in the position.

Notes on methodology

PESB started by attempting to gather the FTE, Certification Number, and Endorsements of all math and science teachers working in Washington. This data was collected though a survey first sent out in May of 2008 through OSPI's Memos and Bulletins with reminders throughout the summer and fall. As the deadline approached, superintendents received two direct e-mails from PESB reminding them of the legislative charge. Finally, districts that failed to complete the survey by the deadline received follow-up phone calls.

PESB received data from 81 percent of the school districts representing 89 percent of Washington's total student population. The demographics and enrollments of submitting and non-submitting districts were similar. Although the drawn sample cannot be generalized to districts that did not submit information, it is unlikely that the missing data would significantly change the information reported in this study.

[a] See Table 5 and Table 6 in Appendix A.

Next, working in conjunction with an OSPI endorsement specialist, appropriate endorsements for middle and high school math and science courses were identified and placed into four categories of interest, including *Subject Endorsement, Pre-Endorsement, Related Endorsement*, *K-12 Endorsement*, and *Not Endorsed*. *Subject Endorsement* identified teaching endorsements that are clearly appropriate for the subject. *Pre-Endorsement* includes teachers working under a certificate earned prior to the 1987 changes (before endorsements were added to certificates). *Related Endorsement* identifies endorsements that do not match the course taught, but are considered appropriately assigned by the PESB. *K-8 Endorsement* identifies middle level teachers working under Washington's K-8 Endorsement. Finally, *Not Endorsed* is used for all endorsements not considered appropriate by the PESB.

The certification numbers PESB collected were submitted to OSPI to be matched to teacher's endorsements on file. For certification numbers that could not be matched to OSPI's certification database, information collected on the PESB data form was substituted. Comparisons of the data collected by PESB and OSPI showed some differences. However, the differences were small, and it is unlikely that these differences would skew the data enough to change the results in this report.

Next, PESB's collected certification numbers were matched to OSPI's Personnel Database (S-275). This database links certification numbers with Educational Service Districts, School Districts, and School Buildings. The unique identifiers in the S-275 also allow for connections between PESB's data and the CCD.

The CCD is collected by the National Center for Education Statistics, a division of the U.S. Department of Education's Institute of Education Science. This database provides a complete listing of public schools in the country and includes basic descriptive information about schools, teachers, and students. This database includes information such as a school's geographical location and proximity to urban or metro areas. The CCD also includes information about federal programs such as Title I and Free or Reduced Lunch. Finally, the CCD includes information about enrollment, disaggregated by gender, grade, and ethnicity.

The final database was constructed so that the FTE for each teacher was subdivided by specific courses. For each portion of the FTE, the teacher's endorsements were analyzed and recoded into *Subject Endorsement, Pre- Endorsement, Related Subject Endorsement, K-8 Endorsement*, or *Not Endorsed*. This database makes it possible to apportion a teacher's day into endorsed and unendorsed by subject taught. The system is hierarchical so that *K-8 Endorsement* does not reflect the total number of teachers with a *K-8 Endorsement*, but only the portion of those who lack *Subject Endorsement, Pre-Endorsement, and Related Endorsement*.

Analysis of the data was mostly descriptive statistics. Testing for differences between groups was accomplished by comparing the differences of means using a T-test. The outcome variable was constructed by retaining the reported FTE for *endorsed* teachers and recoding the *not endorsed* teachers as the product of their FTE and -1.

Constructing this variable allowed for the comparison of the proportion of FTE taught by an endorsed teacher (created a contrast variable).

Lessons Learned

FTE
Full Time Equivalency is a standardized term for apportioning a teacher's schedule. However, district-reported FTEs divided their school days into 4, 5, 6, or 7 portions (a district may include teacher preparation and/or lunch/homeroom as part of the school day). Therefore, an identical course (including the identical length of time) may be apportioned a 5th, 6th, or 7th of a day. The result is that a teacher teaching one fifty-minute mathematics course may be apportioned as teaching math 1/7, 1/6, or 1/5 of a day. This problem has less effect on the reporting of full-time teachers teaching a single subject, but it certainly adds error to the collection of this category.

Course Name
With districts choosing the title for each course, it is difficult to match courses to courses, let alone courses to endorsements. Sometimes course names are generic, such as *General Science* or *Ninth Grade Science* and sometimes they are specific to a subject where there are no endorsements, such as *Forensics.* Also, courses with the same name may be much different, as is the case with *Physics* being taught in one district as a twelfth-grade elective or a ninth-grade required course. Finally, we need a systematic way to identify advanced courses such as Honors, Advanced Placement or International Baccalaureate.

Endorsement Name
There are hundreds of different endorsements on file. Each time a study on endorsements is completed, a laborious process of vetting and culling all proper endorsements from the master list needs to be performed. Additionally, much of the information is not directly evident, requiring consultation from an OSPI specialist. Worse, much of this information relies on employees' knowledge about the history of endorsements, knowledge that will likely leave OSPI when employees leave. While the old information should be maintained, old endorsements need to be recoded into useful categories.

Attempting to Survey all Districts
The resources required to collect information from a recalcitrant district can be high, yet not collecting it will affect the final data's quality and accuracy. Attempting to collect information from all school districts ensures that every recalcitrant district will be encountered and lowers the amount of resources available to collect for each recalcitrant district. Limited resources in turn ensure that an attempted collection of all available data will be less accurate than a successful collection of a sample of data. What we end up with are results, but no way to measure the results' accuracy.

Non-Matching Data
Some collected teacher certification numbers could not be matched to OSPI's databases. The reason is likely entry errors at the district or OSPI. It is also possible that the OSPI certification database may have errors or may not be complete.

S-275 Errors
After looking at the data, it is clear that the S-275 personnel data is accurate at the district level but has problems at the school level. This is a fairly common problem with state-collected personnel files where teachers are paid at the district level. However, without accurate building results, it will continue to be difficult or impossible to accurately measure most of Washington's teaching staff issues and trends.

Too Many Surveys
In the fall, districts receive multiple surveys from different agencies collecting teacher data. Human resource specialists, math and science program coordinators, school principals, assistant superintendents, and in small districts the superintendents themselves, may fill out these surveys. During follow-up phone calls, it is difficult to find the person in charge of the survey. Also evident from follow-up phone calls is that in many instances a person was never actually delegated to the task. Finally, districts commonly complained that they were being asked for the same information many times in redundant surveys from multiple agencies.

Final Note
For a study with relatively easy research questions, such as the ones above, data issues are unlikely to change corresponding policy recommendations. However, the downfall of this study is that its data is not useful for comparisons with future data. To be sensitive to trends, methodologies need to be more carefully administered with much more accurately collected data. The study presented in this report offers a snapshot, but we won't be able to use it to answer more salient questions, such as to see how endorsement profiles are changing as the workforce changes.

Other Sources of Supply and Demand Data in Washington State

OSPI conducts a biennial survey that asks Washington school districts about their current openings, perceptions of supply versus demand for various teaching areas, and forecast of future need. [2] The 2007 report marks the fourth report conducted since 2000. Findings from the 2007 survey include:

- All Educational Service District (ESD) regions report math and all science endorsements as "Considerable" or "Some" shortage.
- Districts report need as "Increasing" or "Considerable".
- Surplus exists only in the areas of elementary education and social studies.
- High-need subject areas persist statewide, although districts in some rural/remote and central regions of the state show higher degrees of shortage.

Overall, the report concludes that the degree of shortages in Washington State has increased in most areas since 2004, and may worsen given increased federal and state requirements such as No Child Left Behind (NCLB) and added state graduation requirements.

As mentioned in the previous section, in January, 2008, the PESB conducted a survey of Washington school districts, asking them to estimate how many additional math teachers (either as full or partial FTEs) they will need when the State Board of Education (SBE) increases the graduation requirement to 3 credits. With 97% of school districts reporting, they estimate up to 466.48 FTE will be needed. One of the interesting findings is how many districts reported needing an additional partial FTE, in anticipation of adding one or two courses, but do not anticipate they will need or be able to fund an additional full-time teacher.

Raising requirements for new teachers, as well as for students, may also add to the challenge of ensuring an adequate supply of qualified math teachers. In 2007, the PESB adopted new, more rigorous and relevant subject knowledge standards for beginning teachers; including far greater rigor in math for elementary, middle and secondary level teachers. These new standards not only ensure adequate rigor such that our K-8 and middle-level teachers have adequate knowledge to instruct through algebra, and secondary math teachers through calculus, they are also well-aligned with our Essential Academic Learning Requirements for students. A new subject knowledge test for each subject endorsement is also required.

The picture of the supply pipeline is a complicated one. The PESB surveyed Washington's 21 higher education teacher preparation programs, and they reported that currently, although there are 307 potential math teachers enrolled in teacher preparation programs, the capacity to enroll more is nearly five times that. It is also interesting to note the proportion of math and science endorsements on first teaching certificates produced, as compared to elementary education.

Endorsement on First Cert
3 year rounded average - 05-07

	CWU	EWU	TESC	UW	UWB	UWT	WSU	WWU	13 Private
Math	33*	8	2	7	0	1	12	23*	78*
All Science	27*	25	15	23	1	4	30	69*	158*
Elem Ed	303	174	17	69	74	56	354	345	982

** includes Alternative Route Program*

By reviewing participation in the Educator Retooling Program, repayment rates of Future Teacher Conditional Loan Scholarship recipients who are elementary teachers unable to find employment and supply demand data, we have good reason to believe that we are overproducing elementary teachers and significantly under producing math and science teachers.

Table 1 shows additional data on production and capacity of Washington's current approved teacher preparation programs. Of particular note:

- Enrollment has increased at a number of institutions, but only one preparation program (Western Washington University) is enrolling at capacity with plans for increased math and science enrollment.
- Half to three-quarters of the annually issued endorsements in math and science are to teachers coming from out-of-state – we are a significant importer of math and science teachers.

More Than Just Increased Production

Getting a true picture of educator supply and demand is complicated. Vacancies can occur through retirements, resignations, leaves of absence, or transfers of educators into other positions. A recent University of Washington report showed that over a five year period, 13% of teachers transfer inside their district and 7% leave their district for another.[3] So some of what is represented as vacancy is the need for new/returning individuals, but some is individuals shifting from one school/district to another. This is important to understand for those tempted to compare annual vacancies with numbers in that field annually produced by educator preparation programs. For example, the fact that district administrators report 470 math teacher vacancies and preparation programs produced 175 teachers endorsed in math does not mean that preparation programs should produce 295 additional math teachers. Some vacancies will be filled by transfers, and some by out-of-state teachers moving to Washington. While greater production is needed, it also may not substantially impact vacancies in rural and remote communities if the program is not connected with or in geographical proximity to that community. In other words, Washington State University might greatly increase their production of math teachers, but will one of them be willing to move to Onion Creek or

Oroville? So meeting educator demand is also dependent upon the number and location of programs.

In addition, meeting the demand will not be achieved by new hires alone. State policymakers and local school districts will also need to pursue greater "retooling" of the existing teacher workforce. This means opportunities for teachers in areas of less demand, like elementary education, retooling to have the skills to assume new assignments in math and science teaching in middle and secondary grades; as well as teachers adding on this new area of competency in order to teach a broader range of subjects.

In November 2006, The PESB and SBE, in collaboration with OSPI, released a Joint Math Action Plan that included strategies for improving recruitment and retention.[4] Last year the legislature provided over $2 million for new scholarship programs being administered by the PESB that support new types of recruitment strategies, including a "retooling" scholarship to allow existing teachers in non-shortage areas to gain credentials in shortage areas, like math; a new program and scholarships that strengthen the pipeline for paraeducators to gain their degree and certification; and a new program aimed at encouraging low-income minority high school students to pursue college and a teaching career.

While these new programs and investments are yielding increases in our supply of well-qualified math and science teachers, effectively meeting our educator demand now and into the future will require a more complex and strategic approach to supply.

The OSPI Supply and Demand reports suggests that policies aimed at alleviating shortages must take into account the nature and cause of these shortages. The report proposes that shortages may be classified into one of three types:

1. A recruitment/retention shortage – which occurs when too few candidates are attracted to a particular subject area or role, such as special education or mathematics;
2. A training shortage – caused by lack of adequate access to preparation programs that produce educators in shortages areas; and
3. A distribution shortage – which occurs when too few educators are willing to work/live in districts experiencing a shortage.

Clearly each type requires different strategies.

Table 1: Math and Science Teacher Production and Program Capacity

Reported Math FTE Needed to Meet New Grad Req.	**Prep Programs: Math Enrolled**	**Prep Programs: Math Capacity**	**Endorsements Issued: 5 year Average (02-06)**	**All Alt Route Program Completers**	**Educator Retooling Program (2008 first year of program)**
ESD 101: 43 * *Spokane Area*	CWU: 30	CWU: 45	Math: WA-170 ***OS-125	2002-03: 169	Math-20
ESD 105: 29 *Yakima Area*	EWU: 20	EWU: 40	Biology: WA-137 OS-82	2003-04: 103	Middle Level Math-20
ESD 112: 36 *Vancouver Area*	TESC: 10	TESC: 90	Chemistry: WA-51 OS-29	2004-05: 158	Middle Level Science-20
ESD 113: 41 *Olympia Area*	UW: 8	UW: 25	Earth Science: WA-34 OS-8	2005-06: 101	Science-6
ESD 114: 25 *Kitsap Peninsula*	UW-B: 16	UW-B: 75	Science: WA-110 OS-57	2006-07: 84	Special Ed-62
ESD 121: 171 *Puget Sound Area*	UW-T: New Prog	UW-T: 60	Physics: WA-32 OS: 16	2007-08: 122	ELL-57
ESD 123: 44 *Pasco Area*	WSU-P: 25	WSU-P: 40	Mid-Level Math/Science (3 Yr Average): WA-29 OS-26	Roughly 1/3 of these alt route completers were in math.	
	WSU-Tri: 1	WSU-TRI: 20			
ESD 171: 24 *North Central WA*	WSU-V: 0	WSU-V: 40	Elementary Ed: WA-2,335 OS-824		
	WWU: 50**	WWU: 50			
ESD 189: 55 *Skagit Valley Area*	Privates: 147	Privates: 912			
STATE TOTALS: 468	307	1397	WA: 2898 OS: 1167	123 (6 year average)	185

* Districts reported a range of teacher shortages in math. For the purposes of this chart, we took the top end of that range.
** Western Washington University is the only traditional teacher prep program that is enrolling at its full capacity.
*** OS stands for Out-of-State
Number for science endorsements does not equal number of teachers – most science teachers obtain more than one science endorsement

How is the education community experiencing and addressing math and science teacher supply / demand?

One of the reasons why the PESB assembled a Task Force with broad stakeholder representation is that no one entity in Washington State has sole responsibility for teacher recruitment. Most players in the education community play a role in it and have over time developed ideas and strategies for addressing it.

At the first meeting of the Task Force, the representatives shared the perspective of their various agencies, boards and associations in response to three questions:

- Are there current initiatives in which you are engaged / you are implementing related to this goal? What indicators do you have that they are effective / ineffective?
- What do you see as the current challenges / barriers related to ensuring an adequate supply of qualified math and science teachers?
- Are there specific strategies / changes in policy for which you are advocating?

Appendix B contains a summary of their responses. What's clear in reviewing the responses is that we're all experiencing the same problem from different angles. Only through collaboration can we understand our various perspectives and reach appropriate solutions. The overriding issues that resonated with the Task Force members were:

- We have to come together and develop a systemic approach that addresses what we have all encountered with this challenge.
- Failure to develop a systemic approach will result in only a larger number of scattered projects, not the statewide strategy we need.
- One-size does not fit all. Our state is large and demographically diverse.
- Both the economic situation and the need for well-informed policy and practice demand starting with analysis of current practice and ways we can build upon it.

General Issues Relating to Teacher Recruitment: Perspectives from Research

Although all hard-to-staff positions desire the same outcome — a qualified teacher — each has arisen within a unique set of circumstances. Many experts believe that effective solutions must individualize, which has led researchers to use geographic and demographic elements to categorize teacher shortages. Along with the student and community demographics, most solutions consider location of the shortage, potential applicant pool, and who is most likely to stay beyond a year or two.

Through this report, we use "recruitment" as an umbrella term for those strategies aiming to ensure a strong pool of individuals that will provide Washington State a steady supply of excellent math and science teachers, including "pipeline" strategies that extend all the way from middle-school students into the teaching profession, expanding access to various types of preparation, removing barriers to facilitate ease of entry, and even retooling of the existing workforce to recruit in needed areas.

Teacher recruitment is an important component to teacher quality. Teachers with higher levels of education, endorsement and experience are not evenly distributed throughout the job market.[5, 6] While some of the problem is due to retention and transfers, a considerable portion is due to initial selection.[7]

Sometimes referred to as *Geographical Proximity Preference,* location is an important component for the teachers selecting their workplace. As many as 20 percent of teachers are working in the same district as when they were students.[8] Of those teachers who do not return to their hometowns, many choose to teach in schools that are demographically similar or in close geographical proximity to their hometowns.[7] Areas that must import teachers because of low rates of educational attainment, such as rural and inner city urban, tend to have higher rates of teacher shortages.[7, 9]

Geographical Proximity Preferences

- *Many teachers return to work in their hometown.*
- *Teachers not working in their hometown, tend to work in areas with similar demographics.*
- *Areas that produce low numbers of college graduates must import teachers.*
- *Most hard-to-staff schools are net importers of teachers.*

Like all job markets, a teacher's salary is an important component to recruitment and retention. While this issue is often central to discussions on improving the workforce, the general advice seems to be that teaching is part of the local market and school districts need to be competitive with the surrounding districts and job market. With Washington's current education funding policies, the ability to adjust salaries is limited.

While it might seem obvious to simply ask schools and districts whether a teacher shortage exists, this may not be the best way to understand the problem. Here are other objective outcomes to consider:

- Unfilled teacher vacancies
- Class size

- Overloaded teachers (time spent on employment related activities)
- Teacher working out of area
- Under-provision of teaching (when enrollment size suggests the number of teachers or courses should be higher)[10]
- Teacher turnover

Need for Individualized Solutions

Teacher recruitment issues are not "one size fits all" and solutions need to be fitted for individual schools. It is vital to consider who is being recruited, because barriers such as proximity to a university and socioeconomic factors will influence the profile of the pool of potential teachers. [11, 12] Generally, research suggests that within urban areas recruitment problems are linked to isolated poverty, while within rural areas difficulties are related to geographic isolation.

Who Is Being Recruited?

Experts and researchers typically divide the potential teacher work force into the following categories:

- *New Teachers,* which can be further subdivided into new college graduates, career changers, or career advancers**;** it might also be divided by the location and type of training.
- *Switchers* are experienced teachers moving to a new position. Subdivisions of this category include switching within school/district and switching between districts.
- *Movers* include experienced teachers who are currently working as teachers in another state.
- *Reentry* is an underused category and includes teachers returning to public teaching after an extended absence. This category is diverse and may include teachers who were teaching in areas where certification was not necessary (community college, private school, pre-K), or in other careers (may or may not be education-related). This category would also include teachers who left to pursue advanced degrees, raise a family, or follow a reassigned spouse. Like all categories, reentry may create unique barriers to certification.
- *Retoolers* are existing staff in a school or district or unemployed teachers seeking to switch to a new teaching subject area (e.g. from elementary education to middle-level math or science) in order to be more marketable / fill a district or school need.

Urban Recruitment

Teacher working environments can vary dramatically due to student composition, resources, and school leadership. Generally, teachers show a preference for higher-achieving and higher socio-economic class students.[7] Teacher quality indicators do not vary much between large urban cities. However, large variation and clustering typically exists between districts within a particular city.[7] Also, challenges in urban teacher recruitment are related to school rankings, so variations in teacher quality indicators will exist in individual schools within districts.[13] Because variation occurs at the school

level, teacher recruitment initiatives for large urban areas may be more effective when individualized to a building.

Issues surrounding teacher contracts and human resources can also be a barrier to hiring qualified teachers.[14] A large urban school's strict bureaucratic adherence to hiring calendars will allow more nimble schools to contract first, leaving late starters with fewer qualified candidates.[7, 8, 14, 15] Additionally, improper prescreening, overuse of temporary contracts, and improper forecasting tends to hinder a large urban district's ability to get and keep qualified teachers.[14, 16]

Rural Recruitment

Rural communities have unique teacher recruitment issues, including geographic isolation, economies of scale, and lower fiscal capacity.[17] Research suggests isolation is the primary barrier to rural teacher recruitment and issues such as distance to shopping and family can be a deal-breaker for potential recruits.[18-21] Candidates considering moving to isolated communities have also revealed concerns about availability of quality health care and education for their children. Other identified issues include the frequency of and preparation for severe weather events and the availability of adequate housing.[21-23]

Because a certain standard of care must be maintained whether a school serves 10 students or 2,000, small communities and small schools have teacher recruitment issues related to economy of scale.[15, 17, 23, 24] Rural districts may need to travel further distances to recruit and train teachers, yet small staffs may impinge on the needed flexibility. And although a rural school district may qualify for grant assistance, the small staff may not be able to acquire the additional funding. Finally, small staff size also affects NCLB's requirements for "Highly Qualified Teachers." This can be especially challenging for rural school districts where middle and high school teachers need to teach multiple subjects to complete full-time contracts.[18, 22]

Problems with the Generalization of Rural

Unfortunately, issues within the category of rural are not linear or genearalizable.[24] Because of this, many researchers and experts break the category further into:[19]

- Small, or Very Small - By definition rural is sparsely populated, but there can be important differences between a community of 2,000 and 500.
- Isolated, or Very Isolated - The distance needed to travel to larger markets differ dramatically. And like size, issues related to differences in distance are not linearly related.
- Old and New Residents - Most rural areas are not stagnant and regularly acquire new residents. These new residents are often poor and may have barriers in language and education. As agriculture aggregates into larger and larger farms, the dynamics of the rural economies are changing.[24]

Promising Practices

The Task Force convened by the PESB examined information from staff and presenters about status of initiatives in Washington State and promising practices in other states. Members identified those strategies that seemed most relevant and able to bring about progress toward the goal of ensuring an adequate supply of well-qualified math and science teachers. In this section, we provide the broad scope of strategies discussed and considered.

Strengthen the Pipeline from K-12 through Teaching Career

Recruitment for traditional route teacher preparation typically lies in the teacher "pipeline" and thus is a longer-term strategy that sustains throughout a baccalaureate degree program and teacher preparation.

Recruiting traditional route teachers can begin in middle or high school with programs such as South Carolina's Teacher Cadets, clubs like Future Teachers of America, and conferences similar to New Jersey's "A Step Ahead."

South Carolina's Teacher Cadet Program

- *Includes over 2,000 students at 175 High Schools*
- *Is a selective honors course that earns college credit*
- *Is a hands-on and contains observations and field experiences*
- *2006-2007 post survey found that 39 percent of graduates planned to enter teaching*

In Washington State, the 2008 legislature created the Recruiting Washington Teachers (RWT) program, operated by the PESB. The program's aim is to:

- Recruit, train and support underrepresented, multicultural and multilingual students for teaching careers;
- Design and deliver programs aimed at encouraging high school students to consider and explore teaching careers in state-identified shortage areas – including math and science; and
- Coordinate and integrate support services designed to overcome barriers for underrepresented populations to complete higher education teacher preparation programs and enter the teaching profession.

Funds provided under this grant program support partnerships between teacher preparation programs, high schools and community based organizations to design and deliver programs aimed at encouraging diverse high school students to explore becoming teachers with an emphasis on shortage area endorsements.

RWT programs provide a summer academy program and academic-year support program for students that inspire their aspirations and provide guidance toward both pursuit of a college degree and a teaching career. Students are guided through all aspects of the college application process, including college readiness placement tests, and are provided classroom practicum experiences with K-12 teachers.

Recruiting Washington Teacher's program – Year One 2008:
62 students – 32% African American; 31% Hispanic; 18% Native American; 15% Asian

In this first year of the program, the PESB received twelve outstanding proposals, but funding was only available to support three. In addition, there are no scholarship funds tied directly to this program, so the program falls short of addressing the major barrier to college participation – financial support. Currently, 62 students representing 32% African American, 31% Hispanic, 18% Native American, 15% Asian and 4% Caucasian are participating in Washington's three RWT partnership programs.

Overall, Washington could do more to build a level of interest and excitement in math and science for middle and high-school students that could help fuel higher numbers pursuing studies leading to a major in math and science. A stronger overall pool of math and science majors is needed and would help numerous industries wanting for graduates in these fields, including education.

Strengthening the link between high school and college is one important piece of a strong pipeline strategy. Another is ensuring strong links between community colleges and our four-year baccalaureate institutions.

About half the state's teachers begin higher education in our community colleges.

Washington has made strides to strengthen the pipeline between community college and four-year degree programs for individuals interested in math and science degrees and a teaching career. About half the state's teachers begin in our community colleges. New associates degrees with direct transfer agreements in chemistry, biology, physics, general science and math provide greater access and affordability for prospective teachers. According to the 2006 Prosperity Partnership report, Washington needs to produce 8,000 additional baccalaureate graduates in science, technology, engineering, and math (STEM) fields by 2010. An estimated 3,000 will need to start their education at STEM related courses at the community and technical colleges. In 2008, the colleges awarded 956 STEM associate degrees. To meet this challenge, the colleges will need to triple their annual graduates.

In 2007, the legislature funded the Paraeducator Pipeline Program administered by the PESB. The program is designed for experienced, employed classified instructional employees to earn an Associate in Math Education degree with a Direct Transfer Agreement. Once the transferable associate degree is earned, individuals are accepted into an alternative route program that will allow them to earn their baccalaureate degree, residency teaching certificate with an endorsement in secondary mathematics and either an English language learner or special education endorsement. Conditional loan scholarships in exchange for equivalent years of teaching service in Washington's public schools are available for all four years of the program.

Through administering the Paraeducator Pipeline Program, in partnership with the community colleges, several challenges were quickly identified. Eligibility for the program proved to be cumbersome in terms of the three year work experience

requirement and the prerequisites for entering the math strand at an extremely high level (pre-calculus) was often impossible for working paras to obtain without having the opportunity to refresh their math skills. Accessibility to classes and lack of scheduling flexibility by some school districts made it difficult for working adults to succeed in the program. Recruitment and identification of candidates by the school districts was also sluggish. It became clear that the partnership models between the community colleges and the school districts were not strong enough to provide the paraprofessional with the support that they needed to be successful in the program.

Additionally, the PESB found that paraeducators who have had to satisfy highly qualified requirements under the Federal No Child Left Behind legislation often have a multitude of credits that do not satisfy requirements for a transferable AA degree. Additionally, many community colleges have paraeducator certificate programs that enable students leaving high school to become paraeducators quickly. While this is an attractive pathway for many individuals, once they have completed these certificate programs they are still credit deficient in the types of courses that are needed to earn a transferable AA degree.

It becomes clear then that potential teacher candidates need to be identified early on in the community college system. Appropriate advising for candidates entering paraprofessional certification programs needs to be developed and supported so that high quality candidates understand which type of classes they need to take to enable them to continue on a career ladder to full teacher certification.

As a response to these challenges, the PESB will seek legislative change to allow expansion of the pipeline program to include not just paraprofessionals but also first and second year students in math and science departments at the community colleges. For recruitment purposes the community college math and science departments have access to individuals who have demonstrated an aptitude in these academic areas. In our effort to make teaching a viable option for these talented candidates, scholarship programs, appropriate advising, mentoring and alternative route programs that focus on internships and strong clinical experience, are aspects of the pipeline program that need to be strengthened. The PESB is currently working with community college administrators and department chairs to discuss how we can expand the parameters of the pipeline program so that in addition to paraprofessionals, we are able to identify and support talented math and science students, in their first two years of college, to pursue a career in teaching. We have identified that scaffolding is needed at the community colleges to support candidates with advising for transferrable AA and Associate in Math Education degrees, support and preparation for Washington State WEST-B/E requirements and clinical experience through partnerships and access to school districts.

Beyond high school and community college, the pipeline to teaching that begins when a student enters a baccalaureate program needs to be much stronger. Promising practices in other states focus on enhancing the attractiveness of teaching, available

financial and counseling support, and ensuring tighter connections within institutions that may present barriers.

North Carolina's Teacher Fellows Program recruits exceptional students into traditional teacher education programs. Like Washington's Future Teacher Conditional Loan Scholarship Program, it provides multiple years of scholarship to sustain individuals through baccalaureate studies and into traditional teacher preparation. Years of scholarship funds are equivalent to years of subsequent teaching service. Where it differs from other loan forgiveness programs, however, is its dual focus on diverse candidates of high academic caliber, together with emphasis on the selectivity and prestige of the program, creating a highly positive and desirable image of participation in the program and pursuit of a teaching career. The program also provides opportunities for fellows to explore and experience many aspects of the teaching profession early in their undergraduate studies.

A seemingly contradictory notion gaining footing nationwide, selectivity as a means of increasing entrance into the profession, is a strategy emerging both within baccalaureate and post-baccalaureate teacher preparation programs. Fellows programs like North Carolina's, the prestigious Woodrow Wilson Teaching Fellows Program in Indiana, the Math and Science Scholars Program at Texas A&M, the Teacher Academy at City University of New York, or the numerous partnerships between higher education institutions and non-profit organizations like Teach for America and The New Teacher Project are highly selective, aimed at candidates of highest academic caliber. The combination of financial support in exchange for teaching service, combined with the prestige of being accepted into these types of programs, has yielded a far greater number of applicants than slots in these programs.

Ensure Tighter Connections Between Colleges of Education and Liberal Arts and Sciences

Key to strengthening the pipeline of individuals in baccalaureate programs pursuing teaching is better connections between the math and science departments, through which students are gaining their degrees, and the colleges of education.

UW Survey of Washington math and science undergraduates 2008
35% "might consider teaching career"
7% "already considering"

The PESB contracted with a research team at University of Washington, in collaboration with the Center for Strengthening the Teaching Profession, to survey undergraduate students with declared majors in math and science about whether they would consider a teaching career.[25] 35% indicated they might be willing to consider a career in teaching; 7% said there were already seriously considering it. Two findings from this survey stand out as indicative of the need for tighter connections between colleges of education and liberal arts and sciences. First, in terms of factors influencing their decision to become a K-12 teacher, the vast majority viewed their college instructors and the media as neither a positive or negative influence. In addition, researchers

administering the survey noted that those math and science students expressing an interest in a teaching career appeared to know little about how to go about pursuing this and in fact, asked the survey administrators for information and guidance. These both suggest that providing greater encouragement and information to math and science majors may yield results.

The full report on survey results is included under Appendix C.

Some traditional preparation programs are also establishing tighter connections with colleges of liberal arts and science within their institution as a source for recruitment. One outstanding model of this is UTeach, which started at the University of Texas in Austin and is working to expand to more universities. UTeach is similar to Math and Science Scholars (MASS), another program located in Texas.

The principal behind UTeach is to create a compact degree program that allows math and science teachers to become certified in four years while completing their math and science degrees. The program begins in the freshman year, has an emphasis on field experience, and is mostly located within the math and science departments. Financial incentives include offering free or reduced price courses, especially in the recruitment phase of the program. A unique aspect of the program is the role of the professors and administrators as recruiters and champions of the program.

The Mathematics and Science Teachers (MAST) Project at California State University Fullerton operates similarly to UTeach, and also affiliates with numerous high school Future Teacher Programs to strengthen their pipeline into a combination math or science degree / teacher preparation program.

The University of Colorado and University of Wisconsin both provide opportunities for math and science majors to tutor high school students for pay and/or credits. This has the secondary effect of exposing them to, and increasing their interest in, pursuing teaching.

In Washington State, Western Washington University's 2009-11 biennial budget request includes a proposal to create a Teach Washington Program that incorporates the components of the UTeach and University of Colorado program designs. If funded, Western plans to:

- Increase the number of high quality high school mathematics and science teachers graduating each year from approximately 50 to 100 over five years.
- Design and implement programs to prepare a substantial number of middle school teachers to earn one of the new endorsements in middle school science or mathematics.
- Expand their efforts to improve our elementary education program to both ensure that all graduates are prepared to be effective mathematics and science teachers and certify many graduates to serve as specialists in their schools.

As mentioned earlier, pipeline programs imply sustained support and investment. But once well-established they can be a strong recruitment mechanism with long-term contribution. The lessons learned as we pilot these programs over the past two years is that state support must be consistent and maintained so that the programs can gain traction and begin to produce quality teachers in higher numbers. Having a short term goal of producing shortage area teachers quickly will not be reflected in these types of programs. Washington has made strides to strengthen the pipeline between high schools, community colleges and four-year degree programs to support individuals interested in math and science degrees and a teaching career. As more candidates are recruited and supported through these programs it is likely that we will see a higher number of future teachers who will stay in Washington's schools as career teachers and leaders.

Critical to the success of any pipeline program, whether it extends from middle school, high school, community college or baccalaureate programs, is the need for early identification of math and science candidates of promise, advising and scholarship support.

More can be done to counsel individuals with an interest in teaching, to pursue math and science as well. Traditional counseling, aimed at persuading candidates with their hearts set on elementary education to consider math and science teaching at the middle and secondary grade levels, is of limited impact if the candidates themselves lack interest or confidence in their academic ability in these areas. Undergraduate programs in education need to ensure rigorous and engaging math and science curriculum for all prospective teachers. In addition, classroom practicum experiences for undergraduate students considering teaching should include a deliberate focus on K-12 math and science curriculum and learning opportunities. Beyond the impact of these efforts, however, colleges and universities will also have to make the difficult decision to limit their state-funded enrollment in elementary education and other surplus areas, and focus on recruitment and production in shortage areas, to better meet state need.

Shift and Increase Enrollments to Recruit and Prepare More Math/Science, Fewer Elementary

In 2007, the PESB added to the criteria for approval of new educator preparation programs that they must demonstrate that their proposed program enrollment reflects state/regional need. This is not yet, however, a significant consideration as part of ongoing review of existing programs, which focuses primarily on the quality of preparation. The PESB will be examining the need for considering strategic enrollment strategies as part of program review when it conducts its review of current program design standards in 2009. But, particularly for public institutions, decisions about enrollment often occur beyond the college of education, at a higher level of institutional leadership.

Since 1999, the Higher Education Coordinating Board (HECB) has operated competitive grant programs to expand and create new academic programs in high-demand fields.

More recently, institutions have requested "high-demand" funding enrollment slots directly from the legislature, including some requests for teacher shortage areas, such as math and science. Most of the public baccalaureates have included a request for high-demand enrollment slots for math and science teacher education in their '09-'11 requests.

A number of legislators have questioned whether private colleges and universities should be allowed to compete for state high-demand funds on an equal footing with the public colleges and universities in order to bolster statewide efforts.

Five years ago, the Dean of the College of Education at Western Washington University made a bold proposal to the institution's provost and president. Allow her to reduce enrollment in the elementary education program – the "cash cow" of many institutions - by half, and in return she would restructure the program, create new enrollment slots, program redesign and recruitment that would double their production of educators in high demand areas (math, science, special education, ELL) in five years. The plan has worked. The College's Science Mathematics and Technology Education (SMATE) program, in partnership with 4 local community colleges and 28 school districts, has not only filled their math and science slots to capacity, but has Western seeking additional slots to meet candidate demand.

In 2007, the Legislature created a Joint Committee on the Education of Students in High-Demand Fields. The committee concluded with a January 2008 report that suggested state adoption of a definition of high-demand in order to better focus efforts. The suggested definition was programs in which "the number of students prepared for employment per year from in-state institutions is substantially less than the number of projected job openings in that field, statewide or in a sub state region." But the committee did not reach consensus on how to increase the capacity of Washington institutions in high-demand fields, nor how to increase institutional capacity to draw students to those slots where capacity exists. Some suggest a need to consider both "high demand" as well as "high need" to differentiate between inadequate slots to meet state need and inadequate students to fill slots to meet state need. The PESB surveyed current higher education preparation programs about their capacity to produce math teachers. Though currently enrolling 197 teacher candidates across programs, they have a stated capacity to enroll 1,100 more.

Recent reports from national organizations, including the American Association of State Colleges and Universities and Southern Regional Education Board, highlight a growing number of states elevating dialogue and accountability about the productivity of teacher preparation programs above colleges of education to institutional leadership.[26, 27]

Washington State has established strong policies that govern the quality of teacher preparation in the form of standards and assessments to which we hold colleges of education accountable. But as we've encouraged more innovation in program design in order to recruit a broader array of teaching candidates, as we've asked them to extend their geographic reach to un-served areas of our state, and as we've established incentives for greater recruitment and production of teachers in shortage areas, there are neither adequate incentives nor support for colleges of education to make necessary changes.

Included in the PESB's '09-'11 request package to OFM, is a proposal for the formation of an "Institutional Priority for Teacher Education Task Force" composed of the presidents and academic provosts of our public institutions, along with other key K-12 stakeholders, to examine the place of educator preparation in public institutional mission and how institutional leaders may better prioritize and support it. The Task Force would consider:

Evergreen State College attributes the jump in enrollment of candidates for math and science endorsements in both their MEd and MIT programs to intense recruitment and advertising, availability of retooling scholarships, and personal outreach to districts. Although a small program overall, they tripled their enrollment in one year, with plans for continued growth.

- Increasing high need enrollments in shortage teaching areas and reducing enrollment in non-shortage areas;
- Providing more innovative program designs, such as:
    - Requiring all four-year public institutions to offer a fully field-based post-baccalaureate certification-only program in partnership with one or more schools in a school district;
    - Converting School Improvement Focused Assistance Schools into Professional Development Schools with high concentrations or saturation levels of teacher candidates; and/or
    - Creating teaching "fellowships" or "residencies" focused on shortage subject areas and/or on training needs of a particular community / student population that emphasizes a "grow our own" model to recruit, train and retain teachers within a community.
- Legislative and institutional support to implement programs that establish unique and strong partnerships between the colleges of liberal arts and the colleges of education, including building stronger pipelines for candidates transitioning from community colleges to baccalaureate and teacher preparation programs; and
- Higher education institution reporting, such as performance agreements, as a means of measuring and reporting the production of highly qualified teachers.

In difficult fiscal times, state policymakers will need to consider ensuring the best possible match between state enrollment dollars and state need. In education, this means investments in greater production of teachers in shortage areas and less in non-shortage areas.

Increasing the Number of Preparation Program Providers - Out-of-State / Online Providers

In Washington State, there are an increasing number of online and out-of-state institutions enrolling and arranging field experiences for candidates residing in Washington State. These candidates are preparing according to the standards of that institution's home state, then, via the provision of interstate reciprocity, transferring their credentials to Washington State. On the one hand, these institutions have increased program access for both preservice candidates as well as in-service teachers seeking to add subject endorsements. On the other hand, a number of school districts, and our

own in-state preparation programs, have raised concerns about the disconnect between the out-of-state institution's curriculum and the context of Washington public schools as the field placement setting; as well as concerns about the quality of the field experience and level of supervision overall. The PESB heard examples of institutions placing student teachers into classrooms without knowledge of the school district, or even the principal, and without necessary safety assurances such as a background check. To our Board, this seems policy and practice-wise a different situation than that envisioned by interstate reciprocity agreements. Interstate reciprocity recognizes mobility of fully prepared / certified teachers. We're not sure it envisioned / is sufficient to address programs that "straddle" borders and approval requirements, where the formal coursework of a program meets one state's standards, but the field experience takes place in another. Many states are wrestling with this and struggling to find policy solutions that will both allow greater access while providing basic assurance of quality. The PESB is moving toward Washington Administrative Code (WAC) adoption in 2009 that we believe will address both assurance of field placement agreements with districts and annual data reporting on candidates from all institutions conducting field experiences in Washington.

Program Design as Recruitment Strategy

Gone are the days when almost all teachers entered the profession straight out of college and stayed with it their entire career. This reflects trends across nearly all professions and industries - young people today expect to change careers multiple times over their lifetime. This of course has enormous implications for recruitment. Pipeline is still important, but equally so strategies to recruit young adults who've already entered the work world and are looking for a change.

Demographic data of the teaching profession reflect this trend. Preparation has shifted from primarily undergraduate to increasingly post-baccalaureate. The average age is older, and although diversity is increasing, we've a long ways to go in having a teacher workforce that better matches the demographics of student population. These factors, combined with a more deliberate focus on quality as measured by performance and outcome, not inputs, means increasing desire and ability to structure programs to appeal to a broader range of potential candidates.

With the definitions of "traditional" and "alternative" increasingly blurred, the common denominator among newer, promising program design models is fully field-based preparation linked to likely employment through a strong school and preparation program partnership; whether it's an urban teacher residency or fellowship program, a "grow your own" program in rural communities, a professional development school, mentored internship, or a conditionally-certified teacher working toward full certification via an alternative route program.

Recent research on the power of field-based preparation that represents true partnership with schools and districts on not only prospective teachers, but existing teachers and K-12 students, is compelling. In Minnesota and Kansas, strong

partnerships between school districts and higher education preparation programs operate a co-teach model, in which a prospective and existing teacher are paired in a classroom. This has resulted in not only improvements in teaching, but demonstrable student achievement gains. In a similar partnership, Western Washington University's Science, Mathematics and Technology Education (SMATE) program's field-based partnerships have demonstrated gains in student learning as well. At Nooksack Elementary school, for example, 5th grade science scores on the Washington Assessment of Student Learning (WASL) rose from 36% passing to 90% passing in two years of the program.

Beyond the positive implications for student learning and teacher effectiveness, a recent report on Urban Teacher Residencies may have broader implications for other field-based preparation models as well.[28] As is the case in other states, many of the prospective teachers in our higher education preparation programs, in whom we invest public dollars, do not go on to become teachers. 2005-06 placement rate for Washington's approved preparation programs was 57%. Advocates for strong partnerships between school districts and preparation programs, like Urban Teacher Residencies, argue that higher placement and retention rates make them both better tailored to local need and a better state-level investment. They suggest another potential funding mechanism for state policymakers is to consider directing enrollment slots to established partnerships, rather than putting the full burden of funding for planning, recruitment, program design and operation with institutions.

Alternate Route Certification Programs

Although the lines between alternative and traditional are blurry, interest in alternatives to traditional campus-based programs continues to be high among policymakers and candidates and there are certain expectations associated with programs defined as alternative. Operating on the premise that teaching's attractiveness is not only the function of compensation but ease of entry, alternate route certification programs offer services intended to lower the transitional burden of the potential teacher candidate. *Ease of Entry* includes items such as financial inducements, abbreviated or tailored training, and job placement. Inducements are typically bonded scholarships, reduced tuition, and education repayment. Abbreviated training with job placement takes advantage of teacher compensation and benefits while reducing anxiety by quickly locating and securing employment for the teacher candidate. Additionally, through advising and administrative support, programs that focus on ease of entry work to address the lesser, yet still burdensome requirements related to navigating program identification, and meeting testing requirements. Alternate route training and preparation need to provide the tools to succeed so beginning teachers do not become frustrated and leave the profession; yet extra training may be a deterrent for some to enroll in alternate route programs.

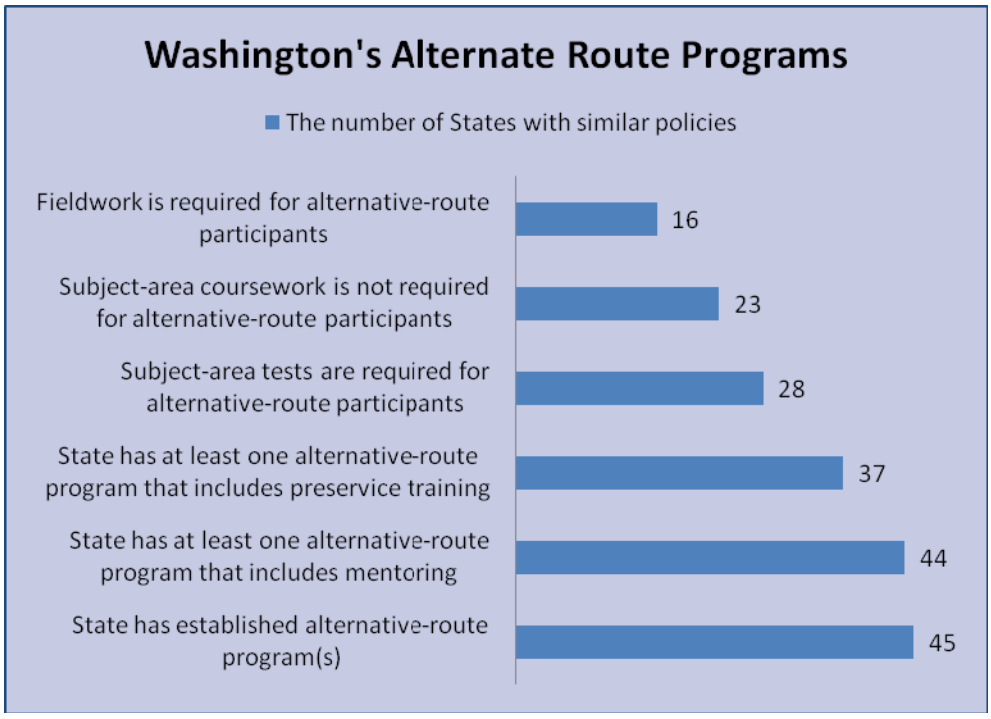
Washington's Alternative Route Partnership Grant Program - how does it compare?

Washington State's establishment of an Alternative Route program started with 2001 legislation that provided funding to incent partnerships between school districts and higher education institutions to offer an abbreviated, classroom-based mentored internship for midcareer professionals and experienced paraeducators. The majority of Alternative Route candidates are prepared to teach in statewide or geographic shortage areas. As of June 2008, program completers had earned a total of 582 endorsements in state identified shortage areas, including 130 in Secondary Sciences, 80 in Secondary Math, 76 in Middle Level Math/Science, 60 in ELL and 236 in Special Education.

Additionally, candidates have earned endorsements in geographic shortage areas including world languages, music, and health and fitness.

Alternative Route programs in Washington State have been successful in building strong partnerships between colleges of education, ESD's and school districts. Hallmarks of Washington's Alternative Route programs include focus on shortage areas, strong clinical experience and increasing the diversity of Washington State's teaching force. Since 2002, Washington's Alternative Route programs have produced over 650 teachers in shortage areas. 97% Alternative Route candidates meet their teaching service requirement in Washington State public schools.

A full fact and data sheet on the Alternative Route program is under Appendix D. Here is how Washington's Alternate Route program compares to other states.



* Data provided by Ed. Week's Education Counts Research Center

Like Washington, most states have alternate route programs. Of these, almost all programs have one or more tracks with mentoring, but fewer have programs that include preservice training. Washington has both. About half the states require subject tests for entry, as Washington does, and about half allow subject-area coursework during route, which Washington does only for Route 1 candidates. Finally, Washington is one of sixteen states that regulate one or more alternative route programs to include practice teaching or fieldwork for prospective teachers before they enter their own classrooms.

As is the case for Alternative Route programs in most other states, the Highly-Qualified Teacher provisions of the No Child Left Behind Act requires that if individuals are actually teaching pre-certification on a provisional / conditional certificate, they must be enrolled in a program that will lead to full certification within three years. Washington's current Alternative Route program, ensures preservice conditionally-certified teachers are certified within one year. NCLB has driven most states' Alternative Route programs to be in partnership with a state-approved preparation program.

Because of this, continued growth of Washington's Alternative Route program requires continued growth in interest / participation of Washington Higher Education preparation programs, or other state-approved providers. Program growth is also inhibited by the ability and/or willingness of programs to extend to geographic regions currently lacking access to preparation.

Urban Teacher Residencies

Urban Teacher Residencies (UTRs) are a new design that focuses on all aspects of the continuum – recruitment, preparation, hiring and induction, in large urban school districts, but may have application to suburban or groups of smaller districts as well. UTRs aggressively recruit high caliber residents into teaching areas that align with district need. UTRs often involve external assistance for at least this component. In the case of Boston and Chicago, Teach for America provides recruitment support. Analogous to a medical residency model, these programs have intertwined coursework and clinical experience and ensure that residents have at least one year of guided clinical experience with an experienced mentor teacher before becoming teachers of record in their own classrooms. This is identical in design to Washington's Alternative Route 3. Residents generally receive some form of compensation or stipend during their residency year, which is in a cohort with experienced mentors. In year two, residents are given classroom assignments, while continuing to receive intensive mentoring support. Other components of UTRs include:

- Tightly woven theory and classroom practice, reflecting that districts particular needs and improvement goals;
- Cohorts of presumed future employees / teachers contribute to /cultivate professional learning community and collaboration;
- Model requires strong and sustained partnership between higher education and district; and
- Creates tight linkage between district shortages / needs and higher ed enrollment of residents.

The costs associated with UTRs include upfront recruiting costs, preparation program and induction costs, and other operational and communication-related costs. To date, UTRs have been supported by a mix of private philanthropic funds, district funds, state funds, and some federal funding. Districts with UTRs see program expense as an investment, in that they assume they will achieve higher retention rates and longer-term sustainability. For example, in Boston, they estimate that their 47% attrition rate of beginning teachers within three years costs $3.3 million annually and believe the UTR program's 90% retention rate thus far will mean savings and better outcomes for students. Most UTRs have included a commissioned research component, so over time greater data about impact workforce and student achievement will be available.

Teaching Fellows Programs

Similar to Urban Teacher Residencies in program design and in significant involvement of an external third-party, the Teaching Fellows program is a trademark of the non-profit The New Teacher Project (TNTP). TNTP has worked with 20 large school districts across the country providing highly-selective recruitment that draws high-caliber candidates to teaching positions in high-need schools and districts. Identical to Washington's Alternative Route 4, Fellows are the teacher of record in their own classroom, typically under a provisional state certificate while enrolled in an alternative or traditional route preparation program at night or weekends, working toward full state certification. In some states, TNTP is authorized to be the actual preparation program, in others they partner with a higher education institution.

Key features of TNTP's Teaching Fellows program include:

- Abbreviated six week teacher practicum training prior to teaching, developed by TNTP;
- Emergency teaching certification laws that allow teaching fellows to begin drawing a teacher salary and benefits without an internship;
- Partnering with local and online programs to gain a reduced price certification program;
- Taking advantage of the AmeriCorps Education Awards Program;
- Offering information and administrative support to lessen the burden of certification barriers, such as Praxis testing, emergency certification paperwork, and job placement; and
- While fellows are expected to work in hard-to-staff areas, they are not offered guaranteed contracts and are not bonded beyond the teaching contract.

Although differing little in terms of policy alignment or program design, what is present in both Urban Teacher Residencies and the Teaching Fellows program that is either not present or a weak component of Washington's Alternative Route Partnership Grant program is a far more active partner role on the part of school districts, as well as the third-party involvement and accompanying funding that is crucial to their recruitment and hiring efforts.

National Non-Profit Recruitment and Staffing Programs

Beyond their role, described in the previous section, in specific site-based preparation program models, Teach for America and the New Teacher Project impact state and district marketing and recruitment efforts and bring other valuable forms of assistance and funding.

Teach for America

Members of TFA are recruited from the top schools in the nation and agree to move to some of the most difficult-to-staff American public schools. In places where it is installed, TFA applies the state's provisional certification laws to train and certify its recruits to work in the classroom. The program requires a two-year commitment, and much of its appeal lies beyond the two years, where members are granted special

access to reserved seats in some of the top graduate schools and respected companies. This is consistent with TFA's mission to ensure that Corps members go on to assume leadership roles dedicated to expanding educational opportunity.

While it is widely believed that TFA is limited to non-traditional educators, its incentives are attractive to all college graduates. A significant portion of TFA members has a bachelor's or master's degree in education and many also hold a teaching certificate.[29]

	Beginning Teachers	All Teachers	
	Non-TFA	Non-TFA	TFA
Bachelors or Masters in Education	33.3	54.4	24.6
Held Regular or Initial Teacher Certification	37.6	67.4	51.4

Souce: The Effects of Teach For America on Students: Findings from a National Evaluation 2004

This is an important consideration in reviewing research on TFA versus non-TFA beginning teacher performance.

With most of its recruits exiting by the third year, retention, which is not an explicit part of the mission of TFA, is exceptionally low.[30] Reasons for low retention include geographic proximity – TFA members are not recruited from the area where they will be teaching – along with the recruitment incentives that mature after the two-year commitment. TFA's recruitment efforts have not generally reflected areas of state need, either in terms of subject-matter shortage areas, like math or science, or a focus on those geographic areas experiencing greater shortages. However, TFA has recently launched a new Math and Science Initiative that proposes to step up their recruitment and placement of math and science TFA corps members in low-performing, hard-to-staff schools.

Although no formal recruitment or preparation partnership with TFA currently exists in Washington, 185 TFA corps alumni are graduates of Washington State higher education institutions that taught were recruited to teach via TFA in other states.

The New Teacher Project

The New Teacher Project (TNTP) shares a similar purpose as TFA, but it takes a different course to achieve its goals. TNTP initially envisioned itself as a consultant service focused on teacher recruitment via alternative routes to certification. But since its inception in 1997, TNTP has worked to develop long-term collaborate relationships with school districts. In addition to the recruitment into Teaching Fellows programs described previously that is the mainstay of TNTP's interaction with school districts, TNTP assistance also focuses on providing states and districts with objective analysis of their hiring and staffing practices. Their 2005 report, *Unintended Consequences: The Case for Reforming the Staffing Rules of Urban Teachers Union Contracts* sharply criticized outdated rules restricting districts' ability to hire promising candidates, keep the strongest beginning teachers and secure teachers for classrooms where they are most needed.[31] Numerous large districts have subsequently contracted with TNTP to conduct analysis of their practices, leading to significant changes.

Improving the Hiring Process

Difficult-to-staff urban schools in particular often lack policies that are aligned with effective teacher recruitment practices. After initially approaching schools, teacher candidates often end up feeling discouraged, neglected, and even[14] Teachers, especially new teachers, usually accept the first position offered. Even experienced teachers offered multiple contracts tend to accept the first offer.[8] A large urban schools' strict bureaucratic adherence to hiring calendars allows other more nimble schools to contract with much of the qualified teacher pool, leaving late starters with fewer qualified candidates.[7, 8, 14, 15] Additionally, improper prescreening, overuse of temporary contracts, and improper forecasting often hinder a district's ability to hire qualified teachers.[14, 16] These issues often put the large urban HR department in the position as gatekeepers rather than recruiters.

TNTP apportions much of its success to finding answers to these issues. With TNTP's achievements, it makes sense to look at how they have defined these issues.[16, 32]

- Late hiring – Not only do teachers usually accept the first contract offered, but teacher quality indicators also tend to drop the later a candidate is hired.
    - Teacher transfers and reassignments take too long – union contracts and inefficient practices push hiring back closer to the fall. Large difficult-to-staff schools within outsized school districts are at a disadvantage.
    - Budgets timetables are finalized too late – afraid of overstaffing, principals wait too long to hire new teachers. Districts most affected have large numbers of mobile students, which make it difficult to forecast staffing needs.

    - Ridged hiring timelines – The most attractive candidates will go to districts that are able to offer immediate contracts. Large urban districts with overly constraining union contracts are the most affected.
- Poor human resources practices – rather than recruiting, many school districts human resources offices are inadvertently excluding potential candidates.
    - Inefficient data management – HR offices need better systems to track a candidate from the first contact, through process, and into placement.
    - Slow response – Not returning phone calls and long periods for processing leave potential candidates in "limbo." Teacher candidates initially drawn to a position will not wait for slow bureaucracy when they have another contract offer in hand.
    - Too many hiring steps – although prescreen, district level interview, and site interviews may be necessary, some qualified candidates for shortage areas could be hired prior to a site interview.

Enhance State Teacher Job Sites

Most state funded teacher job sites are contracted to outside vendors. Washington's vendor, USteach is one of the better vendors. Some states run their own sites, including Minnesota, New Jersey, and Kansas. Minnesota works to make its site more functional, which includes virtual headhunters and email updates. It appears that no teacher job sites offer information on incentives or inducements available for hard-to-staff areas or subjects. Also, the flexibility available to employers is limited, which may explain why many districts do not use the state's job site. For the most part, these sites appear to be used for simple postings. These postings usually link the applicant to the district site where the applicant completes a district application.

Job Fairs

Education job fairs are a common way for recruiting teacher applicants. Whether run by a locality, a university, or a state, they are all very similar. They typically have a small registration fee for the applicants and a larger fee for school districts.

For 20 years, The Washington School Personnel Administrators Association has operated the Washington Educator Career Far, with locations in Spokane and Tacoma. Over 400 districts from 13 states participate. Last year, over 900 candidates attended Spokane, and 2,200 attended Tacoma. Surveys indicated that over 300 candidates were interviewed on site with 110 receiving job offers at the fairs themselves, with assumed many more entering district hiring processes subsequent to the fairs. One irony regarding the success of the Fairs is that they attract recruiters from districts in other states to export away from Washington. Better financial support and participation of Washington districts might allow WSPA to exclude out-of-state districts from participation. Similar to the earlier point re: marketing and advertising, WSPA believe greater funding and assistance in advertising the event, plus a subsidy that would allow Washington districts to participate without cost, would enhance the success of the event and subsequent hiring.

Rural-Specific Strategies

As discussed in the earlier overview of general issues related to recruitment, the challenges in rural and remote districts differ significantly from large and urban districts. The Task Force noted several promising practices in other states worthy of consideration here in Washington State.

Regional Hiring Collaboratives

In several rural counties in California, school districts took a close look at data on their collective teacher workforce with some startling realizations. Not only were they all struggling in terms of finding teachers with appropriate credentials, what little time and resources they had to devote to the problem was in competition with each other for essential the same pool of candidates. With the help of private funding, California's Center for the Future of Teaching and Learning has established two data-driven regional collaboratives; the Kern County Initiative for Recruiting, Preparing and Retaining Highly Qualified and Effective Teachers and the Teacher Workforce Initiative with the Monterey Bay Educational Consortium. Common to both sites has been:

- Creation of a centralized data collection system that enable the region to have accurate workforce data and a clear sense of status and progress toward a qualified workforce;
- Ongoing data-driven dialogue and actions plans among all partners focused on regional strategies and capacity-building;
- Data-driven dialogue and planning with preparation programs that has resulted in tailored program delivery and "grow your own" programs in teaching subject areas needed in each region; and
- Development of better-informed personnel practices in each district and collectively.

In both regional collaborative, the number of emergency permits and underprepared teachers has reduced dramatically and recruitment, preparation and hiring practices are becoming stable and sustainable.

Helping Rural School Districts Obtain Federal Grants

Research suggests that rural districts are not taking full advantage of federal funding available for rural teacher recruitment and retention.[33] Taking advantage of federal grant money requires staff time and specialized training, both can be in short supply in rural districts. Additionally, many federal grants are competitive which also puts a small staff at a disadvantage.

Title IV- Rural Education Achievement Program (REAP)

Title IV of the Elementary and Secondary Educational Act grants rural school districts greater flexibility in spending their ESEA funds. Using REAP Flex, rural districts have the flexibility over funds received under the following programs:[33]

- Title II, Part A (Improving Teacher Quality State Grants)
- Title II, Part D (Educational Technology State Grants)
- Title IV, Part A (Safe and Drug-Free Schools and Communities)

- Title V, Part A (State Grants for Innovative Programs)

Rural school districts can use the funds from the above programs to increase funding for one or more programs that are under the following sections:

- Title I, Part A (Improving Achievement for Disadvantaged Children)
- Title II, Part A (Improving Teacher Quality State Grants)
- Title II, Part D (Educational Technology State Grants)
- Title III (Language Instruction for Limited English Proficient and Immigrant Students)
- Title IV, Part A (Safe and Drug-Free Schools and Communities)
- Title IV, Part B (21st-Century Community Learning Centers)
- Title V, Part A (State Grants for Innovative Programs)

For instance, a rural district can use grant money allocated to *Safe and Drug-Free Schools and Communities* programs to finance *Improving Teacher Quality.* However, *Improving Achievement for Disadvantaged Children* (Title I) resources may not be reallocated to *Improving Teacher Quality.* REAP Flex allows rural districts to pool federal grants into programs where they have greater needs, which may include teacher recruitment and retention programs.

Other Grants for Rural Schools

- Small, Rural School Achievement (SRSA) Grants – This program provides funding for rural districts to be spent under the REAP Flex authority.[23, 33]
- Impact Aid – Under Title VII, this program provides funds to districts with high percentages of American Indian students and students from military bases or low-income housing developments.[8]
- E-Rate – This offers discounts on telecommunications services to lower cost of Internet access.[8]

Retooling Current Educator Workforce

As mentioned earlier in this report, like many industries, education will need to also consider ways of retooling our existing workforce – providing incentives for existing teachers to gain skills they need to be effective in new subject areas or with a new population of students.

Educator Retooling Program

The Legislature authorized funding for the PESB to start up a new program for FY '08 that provides funding support for certified teachers to add shortage subject area endorsements to their existing certificates, including math and science. A maximum of $3,000 per year may be awarded to teachers to be used to pay for tuition for coursework, the cost of the state subject knowledge test (WEST-E) required for endorsement, or other related costs. Funds are contingent upon two years subsequent teaching in the newly-earned shortage endorsement area in a Washington State public school.

In the first year of the program a total of 165 teachers began the process of adding shortage area endorsements to their certificates with support of the Educator Retooling program. Of these, 20 added secondary mathematics, 20 Middle Level Math/Science, and 6 Secondary Science. These are strong numbers for a brand new program, given that a change in teaching assignment and individual planning for enrollment in needed coursework takes time. Enthusiasm on the part of school districts in this program is extremely high. As districts and individuals have additional time to plan to retool, applicants to the program is expected to grow dramatically.

Adjunct Teachers

The idea of allowing part-time community college or baccalaureate institution faculty that teach math and science to also teach math and science part-time in Washington high schools was an idea raised by members of the PESB Task Force, and the only strategy to receive votes of interest from every participating organization. Proponents point out the similarities to Running Start or College in the High School programs. Some counter with concerns that community college faculty do not necessarily possess skills necessary for teaching struggling high school students. But advocates argue that many college faculty members actually have significant experience in teaching struggling learners. For example, the State Board for Community and Technical Colleges provided this data:

- 11 of our community colleges already have full-time and part-time faculty teaching high schools students in math via the various alternative high school programs offered through the colleges. These faculties already are well experienced with working with struggling learners. The 11 colleges that offer alternative high school programs that include math are Bates, Bellevue, Centralia, Clover Park, Edmonds, Everett, Highline, Lake Washington, Lower Columbia College, Tacoma and Walla Walla.
- All but one of the community colleges above also has faculty teaching science in their alternative high school programs (Centralia does not).
- At least 11 community colleges have full and part-time faculty teaching high school level math in their GED programs – with many of those GED students of traditional high school age or just beyond, with many being struggling learners. These include Bates, Cascadia, Centralia, Clark, Olympic, Pierce, each campus of the Seattle District, Tacoma, Whatcom and Yakima. These classes are taught by experienced faculty members with knowledge of classroom management issue and instructional methodology and with practical experience with young people who struggle with learning math.
- All of our community colleges have full time math faculty that teach remedial high school math to college students who are struggling learners, and these faculty are effective at helping these individuals, including 23% who are young people who just graduated from high school.

A further point for consideration, one of our fastest growing course areas at community colleges is math and science, and thus they may themselves be feeling the same pressures as the K-12 system regarding having enough qualified faculty in these fields.

Addressing the need to ensure adequate supply together may be valuable to both sectors.

The State Board for Community and Technical Colleges and Higher Education Coordinating Board are working on producing data on specific numbers for part-time math faculty that would be eligible to serve as adjunct high school math or science teachers part-time. In the meantime, we do know that there are 5,600 part-time teachers in our community and technical college system; so the potential for a reasonable pool in math and science is strong.

There are no existing state laws or regulations that would prohibit this notion, but there are prohibitive regulations under the Highly-Qualified portion of the No Child Left Behind Act as well as some system coordination related to benefits and pension systems that may serve as a significant disincentive.

In terms of federal regulations, while current state policy would allow these individuals to be employed under a conditional certificate, federal law requires their concurrent enrollment in an alternative route to teaching program working toward full state certification. Federal proposals related to adjunct faculty are under consideration, but this is an area that would need to be resolved.

At this time, there is no coordination of salary or benefits for teachers working for both K-12 and college/university employers. Each school district or ESD makes its own salary and benefit eligibility decisions based on the school district/ESD workload. Colleges/universities do likewise. There is no provision in law that allows or provides for workload gained in one jurisdiction to be coordinated with workload gained at the other. Occasionally, this is questioned, as public institutions and K-12 school are both funded by state funds. But as noted, statute clearly recognizes K-12 employers as separate employers from state agencies and institutions. If efforts were made to deliberately recruit part-time college faculty to part-time teaching in public schools, there may be added pressure to coordinate/add workloads together for the purpose of benefit eligibility (health care, retirement, seniority, etc.).

Less supported by the Task Force, and unsupported by the PESB, was the notion of individuals without teaching experience serving as part-time adjunct high school teachers. Districts currently have the ability to hire individuals under a conditional certificate if they deem them to be “highly qualified and experienced in the subject matter to be taught and has unusual distinction or exceptional talent”. But there is much research to suggest that proactive recruitment of individuals with subject matter expertise, but no experience or knowledge of how to teach it, has a detrimental effect on student learning.

Incentives for Teachers to Re-Enter the Workforce

Another population that could be recruited and retooled is teachers not currently in service. Better state data systems might allow us to identify these individuals and direct information and incentives that might influence their decision to return.

The Task Force also identified the need to target military spouses relocating along with their spouse serving in the military. They may find current requirements and processes too burdensome if they are only anticipating residing in Washington State a couple years or less. The PESB has committed to closer examination of the potential policy and process barriers that may discourage military spouses from teaching in Washington State. Similarly, in an increasingly mobile culture, we must do more to ensure information for all relocating spouses with teaching credentials is clear and accessible.

Potential Financial Incentives

A notion embedded in all of the strategies presented thus far, financial incentives are a key component. Whether traditional higher education program, field-based alternative route, retooling existing educators or drawing teachers from other locations, programs designed to attract teachers include financial incentives such as bonded scholarships, targeted incentives, housing allowances, income tax credits, and teacher bonuses. Some are proving more effective than others, and some are still unknown / unproven.

- Bonded Scholarships - any educational program that offers financial incentive in exchange for expected actions is offering a bonded scholarship. This type of inducement consists of any conditional award, including loan forgiveness or teaching fellowships.[22] There is some anecdotal evidence to suggest that bonded scholarships are more effective either later in a prospective teachers undergraduate studies or for recent graduates / career switchers. Asking for a commitment to a teaching career from a middle- or high-school students or even college freshman or sophomore may be less effective.
- Targeted Incentives - incentives for teachers choosing to sign contracts for work in targeted areas (high-poverty, low-income, hard-to-staff, or subject shortages). California's *Teaching as a Priority* program includes incentives available to all credentialed teachers and additional benefits and incentives for teachers who agree to serve in schools in need of improvement. Incentives include $20,000 toward tuition and living expenses for enrolling in a teacher preparation program; loan forgiveness up to $19,000; housing incentives; and additional bonuses for National Board Certified Teachers.
- Better compensation for supervising teachers. Higher Education Teacher Preparation programs all report increasing difficulty finding teachers willing to supervise and mentor prospective teachers during their field experiences. Current average compensation offered by higher education institutions is roughly $150.
- Teacher Signing Bonuses – If a bonus is large enough, say 25 percent, it might make a difference. But it seems most experts agree that signing bonuses have relatively little effect on teacher recruitment.[13, 34-37] Massachusetts' "Initiative for New Teachers" or MINT program provided signing bonuses of $20,000 total over 4 years, targeting high academic performers serving high-need schools. Attrition rates were extremely high at year 4, not coincidentally as teacher repayment obligations ended, and the program was discontinued.

Along with recruitment incentives, many states have incentives for teacher retention, including:

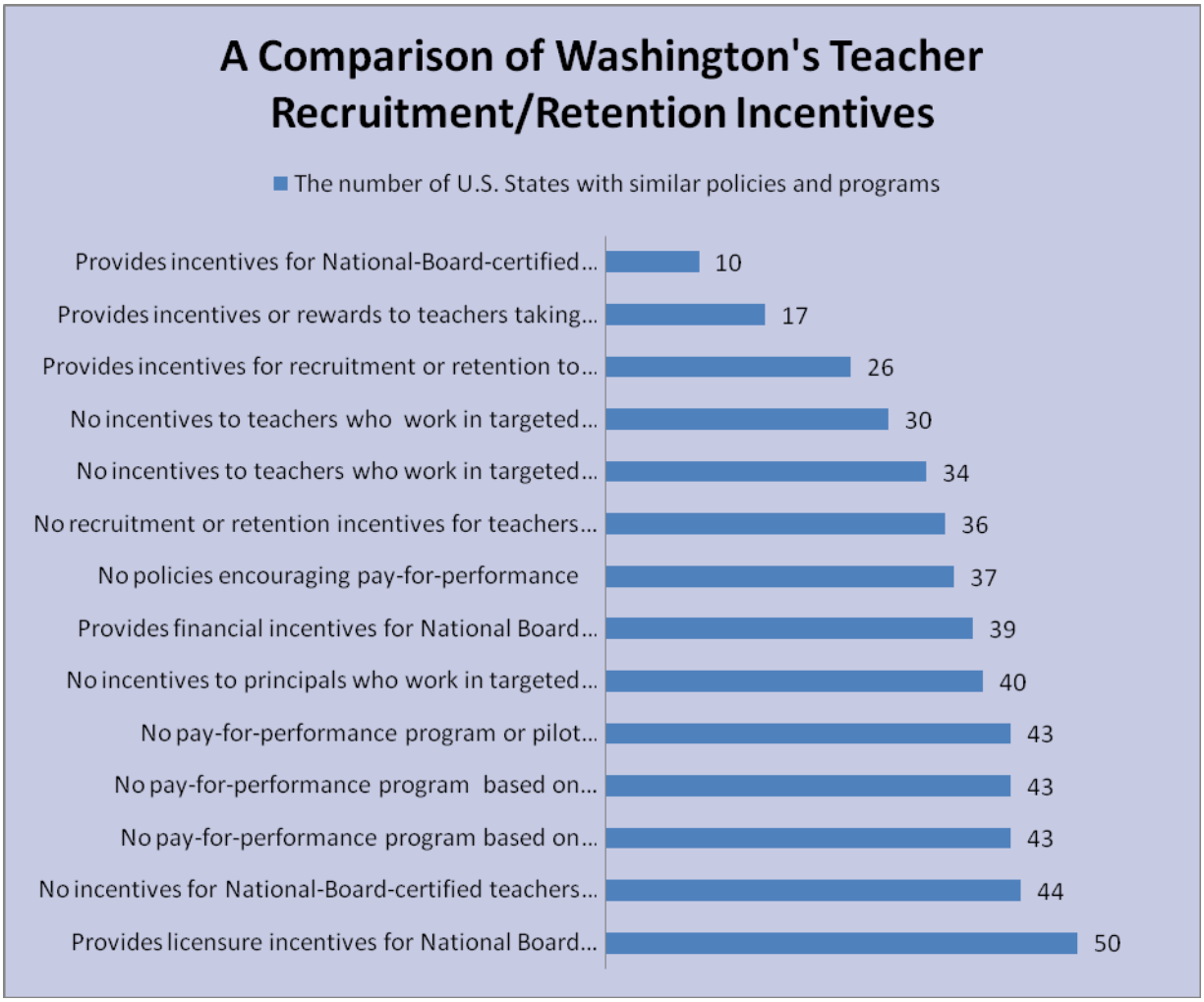
- Targeted Incentives - rewarding teachers for resigning contracts in targeted areas ((high-poverty, low-income, hard-to-staff, or subject shortages).
- National Board Incentives - teacher licensure or financial incentives for teachers to attain National Board certification.
- Pay-for-performance - rewarding teachers and principals for acquiring skills or improving student achievement.
- Pay for increased responsibility – such as assuming leadership roles, serving as a mentor teacher or instructional coach.
- Differential Pay – As noted in the background/introduction section, the legislative charge given the PESB designated inclusion of a separate Washington State Institute for Public Policy Study (WSIPP) of what is known from research and other state practices about differential pay. Strictly due to timing, this report is included under Appendix E rather than discussed within this report. The WSIPP was not descriptive of state efforts, but rather examined the empirical research to support use of differential pay plans, finding it inconclusive. It should be noted that as a concept, most of the members of the Task Force convened by the PESB do not support the notion of differential pay. Although increase in pay is agreed to be a meaningful recruitment and retention factor, providing teachers in certain subject areas higher pay based on market value is generally viewed as corrosive to the professional community given that there is much research to suggest that student achievement, a more meaningful measure and grounds for reward, is the result of the collective contribution of teachers and school leaders. Still, the PESB will continue to watch pilots emerging in numerous state and districts and what results they may be achieving.
- Pay that recognizes past experience - In 2007, the legislature enacted a provision allowing up to five years of previous experience as an Educational Staff Associate in another setting (such as a speech and language pathologists previously employed at a children's hospital) to be counted for purposes of placement on a salary schedule. This was done partly in recognition that recruiting an adequate supply of ESAs relied upon it. While most of the Task Force members were not supportive of the notion of differential pay, there appeared to be support for recognition of past, relevant professional experience as a way to address market value.

How Do Washington's Incentive Programs Compare?

Some of Washington's incentive programs are similar to other states, and some run counter to national trends.

Like all states, Washington offers licensure incentives for the National Board certification. However, Washington does not provide incentives for National Board teachers to take on differentiated roles, which is similar to other states policies. Most states, including Washington, provide monetary incentives for the National Board certification.

Also following the national trends, Washington does not have pay-for-performance programs related to the acquisition of skill or student growth or achievement. Washington does not offer incentives that target principals who work in hard-to-staff schools, but neither do 38 other states.



*Data provided by Ed. Week's Education Counts Research Center

Washington provides no recruitment or retention incentives for teachers working in high-poverty or low-achieving schools, but neither do 35 other states. Also included with the majority of states, Washington does not offer incentives to work in hard-to-staff schools and subjects.

Washington is one of the 25 states to finance recruitment programs for subject shortages. It is also one of only 17 states to offer incentives for teachers taking on leadership roles and one of 10 that offer incentives for National Board certified teachers to work in targeted schools.

Who's in the Pool?

As mentioned previously, life-long careers in the same field are less common and increasingly considered less desirable. Young people today expect to change careers multiple times over their lifetime. Gone are the days when most individuals entered teaching right out of college and stayed in teaching until eligible for retirement. This of course has enormous implications for recruitment.

Consideration of new programmatic approaches for recruiting more and a broader range of individuals to become math and science teachers naturally begs the question, "how big is the pool of individuals interested in teaching, who are they and what would it take to get them to pursue teaching?"

Only 35% of the 42% of 24- to 60- years olds willing to consider teaching would find a salary under $50,000 acceptable.

Career Changers

In September, 2008, the Woodrow Wilson Foundation conducted a survey of 24- to 60-year old individuals holding at least a baccalaureate degree about whether they'd consider a career move to teaching and what factors would influence that decision.[38] 42% said they would consider teaching in the future. Those that indicated willingness cited intrinsic reasons, such as working with children and contributing to society, as qualities that appeal to them about teaching. At the same time, those willing to consider a switch to teaching see the economics of teaching as a significant obstacle. While all acknowledge that teaching is not a lucrative career, they expressed concern about meeting current financial obligations. Not surprisingly, those with lower incomes currently were more likely to be satisfied with a lower annual salary as a teacher. Only 35% of those that indicated a willingness to consider teaching say that a salary under $50,000 would be acceptable. In terms of other incentives and supports, potential teachers possessed little if any understanding about where to begin to pursue a teaching career; no sense of where to pursue additional information. In terms of what they felt they would need in terms of preparation, 68% rated proximity to home as very important followed by "real classroom experience" (65%), that the program be tailored to adults who have been part of the working world (63%) and that they would be providing ongoing mentoring and support (56%).

There is a need in Washington State to better assess the interest of experienced math and science professionals to transition into teaching, and better partnerships between private sector business and the PESB to build and support cohorts of career changers.

One outstanding model of this is IBM's Transition to Teaching Program. IBM started their Transition to Teaching Program in 2005 to address teacher shortages in math and science. This program targets IBM employees with at least 10 years work experience who are planning to leave the company. Participants in the New York and North Carolina program complete their teacher preparation coursework online, followed by field experience. IBM pays $15,000 toward the education expenses of these employees

One of the limitations of the attempts that have been made to assess interest of experienced professionals in transitioning to teaching is that it assumes full-time teaching. Interest in the relatively new notion of using either college faculty or mid-career professionals as part-time "adjunct" teachers in K-12 schools, particularly in secondary math and science, has not be assessed.

Math and Science Undergraduates

In terms of undergraduate students, a research team at University of Washington conducted a survey for the PESB on students' views of teaching as a career choice. Survey participants indicated a major field of study in math, science, computer science, or engineering. Colleges and universities were chosen based on location and institution type (one public state university, one private university, one western Washington community college and one eastern Washington community college. Students were nearly equally divided between freshman, sophomores and juniors, and seniors. A small percentage were graduate or part-time students. 70% were under age 21. 49% indicated they would definitely not consider a career in teaching, 35% indicated they might be willing, and 7% indicated they were giving it serious consideration.

Interestingly, the survey found few differences in undergraduates' views on teaching and the extent to which it would or would not offer certain employment factors, such as stability, intellectual challenge, respected position, and good promotion prospects. Those who expressed interest in teaching did place less importance on earnings and also rated teaching as contribution to society higher both in terms of importance when choosing a job and extent to which teaching offers it.

Table 2: Percent of students indicating a positive, negative or neutral influence of certain factors on their decision to become as a K-12 teacher (N = 369)

	Positive Influence	Neutral Influence	Negative Influence
Experiences I had with teachers when I was in school	61%	33%	4%
The attitude of my college instructors toward K-12 teaching as a career	16%	76%	6%
Media images of teachers	15%	70%	14%
Overall working conditions in school	12%	53%	33%

Note: Percentages may not add to 100% due to rounding and some missing data.

Source: Elfers et. al. (2008) "Undergraduates' Views of Teaching as a Career Choice." University of Washington and Center for Strengthening the Teaching Profession: A report prepared for the Professional Educator Standards Board

Students willing to consider a teaching career were asked about the positive, negative or neutral influence of certain factors on that decision. While their experiences with their own K-12 teachers is a clear and unsurprising positive influence, the fact that the attitude of their college instructors and the image of teachers in the media has neither a positive or negative influence holds strong potential for influence in these areas.

When asked what factors would encourage them to more seriously consider teaching, college loan forgiveness and better beginning pay ranked above other factors.

Table 3: Students' ratings (in percentages) of whether the following measures would encourage them to consider becoming a K-12 teacher. (N=369)

	Definitely	Maybe	Not a Factor
Having my college loans paid off, if I teach for two years after college	64%	21%	13%
Beginning pay at a salary comparable to positions in engineering or technology	60%	30%	7%
An increase in the quality of materials, supplies and technology for teaching	50%	36%	12%
Housing allowance or access to low interest loan toward purchase of a home.	47%	38%	12%
Opportunities for advancement and leadership beyond the classroom	46%	38%	13%
Ability to earn more money if my students perform better	42%	33%	23%
A reduction in the amount of time it takes to earn a teaching credential	33%	38%	26%
A reduction in class size	28%	47%	23%

Note: Percentages may not add to 100% due to rounding and some missing data.
Source: Elfers et. al. (2008) "Undergraduates' Views of Teaching as a Career Choice". University of Washington and Center for Strengthening the Teaching Profession: A report prepared for the Professional Educator Standards Board.

The full UW survey and report commissioned by the PESB is contained in Appendix C.

Improved Public Awareness, Marketing and Communication

As described in the previous section, we know some key things about who is in the pool of potential teachers and what it takes to attract them to various options to entry, but we do very little to market to that interest or provide clear information or guidance to bridge the gap between interest and action.

Raising Interest

Well-intentioned campaigns aimed to peak interest in teaching must be well-linked with options and support, or interests will be frustrated and short-lived. Beyond recruitment must exist support systems to guide career changers all the way from curiosity to classroom. Recall that Washington's shortages are largely about distribution. So even if we target potential math and science teachers – we must ensure we have programs to support their transition that link tightly to employment.

National organizations like Teach for America and The New Teacher Project have been enormously successful in terms of recruitment because they not only maintain tight linkages between preparation and employment, they guide and support prospective teachers through every required step, and they use selectivity and prestige as a recruitment mechanism. As indicated by the UW survey, prospective teachers do not see the media as a positive influence on their decision to teach, nor do they believe that individuals with high academic caliber pursue teaching or that teaching is a particularly intellectually challenging profession.[25] Being accepted into a program like Teach for America is considered a resume' builder because of how they have marketed their search for candidates of academic rigor and their subsequent selectivity of that pool. Not restricted to well-funded private organizations, the state-funded Teaching Fellows programs at several North Carolina Universities and the Meritorious New Teacher programs in the mid-Atlantic region carry prestige and respect that is both influential in recruitment and in securing employment. Washington needs to do more to build the public and media image of the teaching profession.

Lack of Actionable Information

An interesting, unintended outcome of the survey conducted by University of Washington of intended math and science major interest in teaching noted that frequently students inquired of survey administrator how they might go about meeting the requirements for teaching. Most indicated little to no understanding of how to go about becoming a teacher, even though they reside on a college or university campus. In the Woodrow Wilson Foundation survey of 24- to 60- year olds, 73% of those indicating an interest in teaching reported knowing "some" to "very little" about what would be involved in doing so.[38]

Undoubtedly there exists a pool of potential teachers that simply lack the information and guidance to connect with programs and meet requirements. Without this, the road to teaching can well seem a daunting, jargon laden, and costly path.

There is a need in Washington State for much broader dissemination and access to clearer information about pathways to teaching. Formal public / private partnerships that assess, target and guide pools of experienced math and science professionals interested in a transition into teaching have not be established.

Current state websites require understanding of the state system to even know where to begin to look. Using web search engines are likely to land you in a for-profit organization or institutions that may or may not enable the interested party in becoming a teacher in Washington State. If an individual does find their way to relevant, accurate websites, the information tends to be organized for detailed legal accuracy, but relatively unfriendly and overwhelming.

Coordinated Approach

In this area in particular the Task Force believes a coordinated approach is needed. While likely needing to draw upon expertise from both public and private sector, a single entity should coordinate an aggressive awareness, marketing and communications campaign that provides direct links to specific preparation options and classroom employment. With a particular emphasis on recruiting into teaching in math and science, this should include:

- Large-scale campaign with brand identity;
- Improved web presence linking campaign to clear, accurate information on options;
- Region-specific marketing with links to region-specific options, given compelling evidence that all demographics of potential teachers tend to want to teach in their own community;
- Coordination with Washington recruitment efforts of Teach for America and New Teacher Project;
- Greater presence at community colleges and universities – ensure information and awareness about ease of access into teaching profession in every department; and
- Employer incentives to council potential, retiring, and exiting employees about options in teaching. This is an area where tighter connections within state systems may provide support. When corporations experience significant layoffs, the Department of Employment Security provides individuals with guidance related to unemployment benefits and job search resources.

Keeping the Focus on Ensuring Quality Teaching

Barnett Berry, Director of the Center for Teaching Quality in North Carolina delivered a presentation to the Task Force. His advice is a helpful lens as policymakers begin to consider these various strategies. Too often, discussion of how to ensure an adequate supply focuses on the production and producer rather on ensuring a quality product. Let's not lose sight of the fact that our goal is ensuring an adequate supply of well-qualified math and science teachers.

Although much debate exists about what specific instructional strategies really matter to student learning because research has yet to reliably pinpoint them, there are key facts we do know and that must be taken into consideration in recruiting individuals into classrooms.

Fact 1: Both from research and from what any parent or school principal will tell you, there are certain knowledge and skills we want teachers to have from Day 1. They include:

- Ability to organize and manage classrooms;
- Be effective with children with special needs and ELL students;
- Use student data to improve instruction;
- Be able to teach their content in different ways for different learning styles;
- Know how to find and use adaptive materials, curricular and instructional resources; and
- Teach in a way that reflects understanding of the community and culture of the children.

Fact 2: There is plenty of research to suggest that teacher preparation that includes an emphasis on instructional methodology and significant field experience does matter for student achievement.[a]

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[a] Boyd, Hamilton, Lankford, Loeb, Rockoff and Wyckoff. (2007) "The Narrowing Gap in New York City Teacher Qualifications and Its Implications for Student Achievement in High-Poverty Schools" Urban Institute.

Clotfelter, Ladd and Vigdor. (2007) "Teacher Credentials and Student Achievement in High School: A Cross-Subject Analysis with Student Fixed Effects". Urban Institute.

Monk, D (1994). Subject area preparation of secondary mathematics and science teachers and student achievement. Economics of Education Review, 13(2).

Darling-Hammond, L. Teacher Quality and Student Achievement: A Review of State Policy Evidence (2000). Education Policy Analysis Archives. 8(1)

Clotfelter, Ladd and Vigdor. (2007) "How and Why Do Teacher Credential Matter for Student Achievement?" Urban Institute.

See Cochran-Smith, M. and Zeichner, K.M. *Studying Teacher Education: the Report of the AERA Panel on Research and Teacher Education. (2005*). American Educational Research Association.

National Research Council. (2000) *How People Learn: Brain, Mind, Experience, and School.* Committee on Developments in the Science of Learning. National Research Council.

Fact 3: The debate about "Alternative" versus "Traditional" is dissolving as evidence becomes clear: Variation *within* these types of programs is greater than *between* them. There are good and bad alternatives; there are good and bad traditional programs. The important thing is to maintain high and consistent standards for all.

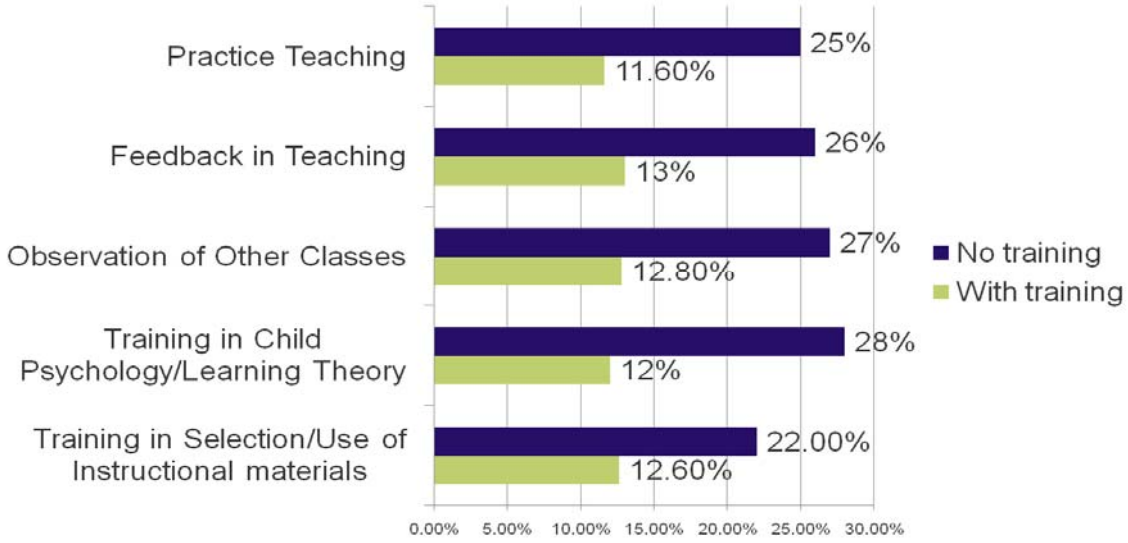
More traditional programs often struggle with:

- Attracting high academic achievers and candidates of color
- Utilizing K-12 experts as teacher educators
- Serving specific labor market needs of local school districts
- Finding university resources to support graduates

More "alternative" programs often struggle with:

- Few opportunities to learn how to teach diverse learners
- Little knowledge of how to find and use adaptive materials
- Woefully insufficient clinical training
- Training to teach only in one school district

Effect of certain types of training / experience on 1st year teachers leaving the profession



Source: Ingersoll in NCTAF (2003). No Dream Denied. Washington DC: Author.

So because there is greater variation within types of preparation than across them, we need to establish and enforce highs standards for all – that focus on the quality of the product – ensuring they have the knowledge and skills we expect of a beginning teacher. Incentives and supports must align with this goal.

In 2007, the Business-Higher Education Forum published their influential report, "*An American Imperative: Transforming the Recruitment, Retention and Renewal of Our*

Nation's Mathematics and Science Teacher Workforce" On this issue, the top Fortune 500 CEOs, together with college and university leaders declared that states need to:

> "*Invest in programs to strengthen the pedagogical skills of STEM professionals seeking to enter the teaching profession.*"

They further recommended that:

> *"Structures to ensure the regular and ongoing review of teacher preparation programs should be broadened to ensure that they include every institution that is involved in preparing mathematics and science teachers." "In the case of alternative teacher preparation programs, we should ensure that such efforts provide age-appropriate pedagogical skills and knowledge of teaching materials for effective classroom instruction to supplement the content knowledge and real world experiences that professionals possess.*"

Recommendations for Action

As we examined efforts in other states, we were struck by the fact that few states have much of a coordinated approach – more of a hodge podge of projects. Although the Task Force and the PESB recognize that ensuring an adequate supply of well-qualified math and science teachers requires an ongoing commitment on the part of many education stakeholders, we also believe the interrelatedness of the various strategies needed to achieve that goal requires centralized coordination and oversight. This was particularly evident as we tried to compare cost to potential productivity for the various strategies we considered. It is crucial to be able to centrally track and analyze evaluative data on an ongoing basis, to be able to inform policymakers about how various strategies – as a whole – are working to address statewide need. Whether the legislature determines this should be the responsibility of the PESB, OSPI or another entity – assigning this responsibility we believe a crucial legislative decision.

The Task Force and PESB also recognize that in tough fiscal times, it is useful to identify the best immediate versus longer-term investments of public and private funds. Below are options discussed in this report, identified in terms of anticipated level of cost. Investments that seem appropriate for state funding are indicated with a "●"; those that have components appropriate for either/both public and/or private funding are indicated with a "❖".

NO / LOW COST – ACT NOW

- **Create an adjunct teaching corps** of part-time math and science faculty at community colleges and baccalaureate institutions with interest in teaching secondary math and/or science part-time in Washington public middle- or high-schools.
    - State Board for Community Colleges, Higher Education Coordinating Board and Professional Educator Standards Board should coordinate to provide information to part-time faculty at community colleges and baccalaureate institutions on part-time K-12 secondary math and science teaching opportunities as well as information to Washington K-12 public school districts on employing part-time faculty.
    - PESB will work with the U.S. Department of Education to ensure compliance with the Highly-Qualified Teacher provisions of the No Child Left Behind Act and amend WAC as needed.
    - Legislature should address potential disincentives caused by lack of compatibility between the differing benefit and pension systems between K-12 schools and college/university systems.

- **Remove unnecessary entry barriers to Washington's Alternative Routes to Teaching Program.** Based on PESB's six years of experience implementing this successful program, we recommend removing some of the entry requirements established at the program's creation that are proving unnecessary in light of careful candidate screening; and that further serve as unnecessary barriers for some

outstanding candidates. We therefore request legislation amending RCW to remove the five year work experience requirement for Alternative Routes 3 and 4 and reduce the paraducator work experience requirement for Routes 1 and 2 to one year.

- **Ensure math and science teacher preparation is adequately prioritized by public institutions.** We recommend that Governor Gregoire convene, per PESB budget request to OFM, a Task Force of Public Higher Education Institution Leadership, along with other key K-12 stakeholders, to examine the place of educator preparation in public institutional mission and how institutional leaders may better prioritize and support it. The Task Force would consider:
    - Increasing high need enrollments in shortage teaching areas and shifting enrollments from surplus to high-need areas;
    - Providing more innovative program designs, such as:
        - Requiring all four-year public institutions to offer a fully field-based post-baccalaureate certification-only program in partnership with one or more schools in a school district;
        - Converting School Improvement Focused Assistance Schools into Professional Development Schools with high concentrations or saturations levels of teacher candidates; and/or
        - Creating teaching "fellowships" or "residencies" focused on shortage subject areas and/or on training needs of a particular community / student population that emphasis a "grow our own" model to recruit, train and retain teachers within a community.
    - Legislative and institutional support to implement programs that establish unique and strong partnerships between the colleges of liberal arts and the colleges of education, including building stronger pipelines for candidates transitioning from community colleges to baccalaureate and teacher preparation programs; and
    - Higher education institution reporting, such as performance agreements, as a means of measuring and reporting the production of highly qualified teachers.

- **Target information on Alternative Routes to Teaching for math and science professionals facing layoff from current employment.** PESB and the Employment Security Department's WorkSource program will work together to connect employers and their employees anticipating layoffs with information, guidance, and financial support related to opportunities to transition to a career in teaching through the Alternative Routes to Teaching and other programs.

MAINTAIN CURRENT INVESTMENTS

- Washington's **Educator Retooling Program,** already enormously well-supported and successful in its first year, is the only source of scholarship support (up to $3,000/year for two years) for teachers to "retool" from elementary education or other non-shortage teaching areas, into fully-qualified math or science teachers.

Scholarship support is in the form of loan forgiveness, with two years of teaching service required for each year of scholarship support.

- **Pipeline for Paraeducators Program** should be continued, with expanded eligibility to include all community college students pursuing Direct Transfer Associate Degrees in Math or Science followed by commitment to baccalaureate in math and science and Alternative Route program to gain teaching credentials. Since roughly half of our teachers begin postsecondary education at a community college, ensuring a strong pipeline through baccalaureate degree and into teaching is critical.

❖ The **Alternative Routes Partnership Grant Program** is entering its seventh year. When it began in 2002, in addition to its mission to prepare paraeducators and midcareer professionals for teaching careers in shortage areas, its innovative program design was also intended to increase the existence of truly field-based preparation models statewide. The challenge for the PESB is to continue with this goal, while incorporating new and emerging high-quality alternative preparation models as well. With continued support from the legislature, the PESB will:

  - o Cultivate residency and fellowship-type models, akin to existing Route 4, but better reflecting role of district in determining workforce needs and incorporating preparation programs as part of learning improvement strategies;
  - o Collaborate with Teach for America, The New Teacher Project, and other national non-profit recruitment and preparation organizations entering Washington State; and
  - o Create quality standards and reporting requirements for online programs approved in other states.

- The **Future Teacher Conditional Loan Scholarship Program** is an important pipeline support in that it sustains future teachers through their pursuit of degree and preparation program requirements in a state-identified shortage area.

NEW SMALL / MEDIUM INVESTMENT

❖ **Pilot data-driven rural regional hiring collaboratives in two Educational Service Districts** serving rural and remote school districts. Based on two model initiatives operated by California's Center for the Future of Teaching and Learning, regional collaboratives build the collective capacity of rural and remote districts to:

  - o Maintain clear and accurate understanding of their teacher workforce needs;
  - o Implement effective recruitment and hiring strategies that meet their collective needs, rather than competing with one another;
  - o Leverage dialogue and planning with higher education institutions for new "grow your own" preparation programs serving the region.

A program coordinator for both sites would draw upon emerging data systems within OSPI to facilitate dialogue and planning related to improving district recruitment and hiring practices, and broker site-based teacher preparation options in partnership with approved preparation programs. While scope and scale for a Washington-

based program may differ, for reference, the Stuart Foundation has provided $250,000 annually in support of the Kern County initiative in California.

❖ **Create tighter, more formal collaboration between colleges of education and liberal arts and sciences**. Modeled after the nationally-renowned U-Teach program at University of Texas and a similar program at University of Colorado, Washington institutions should implement:

- Compact degrees that allow most students to graduate with a degree and certification in math or science in four years;
- New strategies and guidance aimed at recruiting math and science majors into the program;
- True partnerships with schools focusing on not only enhanced field-based preparation, but also professional development of existing teachers, and furthering K-12 student improvement goals;
- Partnerships with community colleges as pipeline into the program; and
- Early and intensive field experiences throughout the program – including early opportunities for math and science majors to tutor high school students for work-study pay and/or credit toward later teacher preparation coursework.

U-Teach started with 25 prospective math and science teachers and has grown to 450 in its tenth year. While the PESB would like to fund this model at all Washington institutions, a more modest approach would be to pilot U-Teach or similar model at two Washington baccalaureate institutions, with preference for largest producers of math and science teachers. An evaluation component should be built into the pilots focusing on impact and what would be required for eventual statewide implementation. The U-Teach Institute was established to assist in replication of the U-Teach model. Their model replication operating budget assumes a start-up budget of roughly $300,000 in the planning year and $438,000 in the first year of operation. U-Teach is funded by a combination of public and private funds.

- **Restructure enrollment funding** for colleges of education to encourage and support greater production in shortage areas and less in surplus teaching areas. High-need enrollment funding should support both the enrollment shift at the higher education institutions and the district partner role in ensuring high-quality field placements, and recruiting and screening candidates in anticipation of hiring needs.

❖ Particularly appropriate for private sector support, **create Corporate-to-Classroom Programs** aimed at either supporting individuals transitioning into the teaching profession, or funding assistance for interested school districts to contract with corporate employees on a short-term conditional certificate to serve as “adjunct” teachers for one or more math or science classes. IBM’s Transition to Teaching program provides financial and other support to mid- to late-career IBMers with bachelor's degrees or credentials in math, science, engineering and related fields pursuing a second career in teaching. Up to $15,000 in financial assistance is

available to program participants to defray the costs of training, and a stipend for the period participants are on a leave of absence for student teaching.

- **Fund analysis of multi-district hiring practices**, with implications for improved statewide practices, by The New Teacher Project (TNTP). This would mirror reports and analysis conducted nationally and in numerous states and districts by TNTP. Estimated cost = $300,000.

LARGER INVESTMENTS – LONG-TERM FOR STATE FUNDING OR POTENTIAL FOR MORE IMMEDIATE IMPLEMENTATION WITH PRIVATE FUNDING

- Produce and operate an **aggressive, sustained public awareness, marketing and communications campaign** aimed at encouraging talented math and science students to commit to a career in math and science teaching. Linking private sector expertise in this area with specific options and requirements identified and coordinated by the PESB, this initiative would encompass:
  - Campaign emphasis that stresses incentives, professional respect and career ladder opportunities to enhance public image of teaching profession as career choice;
  - Improved web presence linking campaign to clear, accurate information on options:
  - Region-specific marketing and preparation options;
  - Employer incentives to council retiring and exiting employees;
  - Coordination with STEM programs at colleges and universities;

- **Create the Washington Teacher Cadet Program**, modeled after the South Carolina teaching cadets program, in multiple Washington districts statewide, to enhance the future teacher pipeline in all regions and demographics. Middle- and High-School students that pursue math and science degrees and enter teaching could be provided loan forgiveness. South Carolina's program operates in 175 high schools. Since the program began in 1987, 40% of the 2,400 cadets have become teachers.

- **Fund teacher residency and fellowship programs**, with oversight by the PESB, operated by Teach for America or The New Teacher Project, in which teaching interns earn significant stipends or salary.

- **Fund completion and full implementation of E-cert and CEDARS data systems at OSPI**. Accurate teacher workforce data is an important foundation of many of the recruitment strategies discussed in this report and the extremely outdated nature of our current state system by which individuals apply for licensure is a significant barrier and disincentive.

- Increase **scholarship support for future STEM scholars** overall; with targeted loan forgiveness for those who commit to specified years of teaching.

- **Address the primary barrier to interest and entry into the teaching profession – adequate compensation**. Allow pay recognition for past professional experience in math and science and provide adequate compensation for teachers supervising teaching interns / student teachers.

Related Issues Requiring Attention

Strategies we've discussed for creating a strong pipeline and healthy pool of individuals that supply Washington State with a steady supply of excellent math and science teachers is in essence just the beginning. Keeping and ensuring continuous improvement of these teachers requires additional steps.

Retention
The best of recruitment efforts will be of limited value if we cannot retain good teachers. Key to retention of new teachers is a supportive school environment. It makes little intuitive sense, yet is very common, that first-year teachers wind up with the least desirable assignments with the worst facilities and equipment. This often means they are assigned those students that are struggling most, and in greatest need of an experienced teacher. Newly-certified teachers need a reasonable teaching load, in an appropriate assignment, with the continued support of a mentor teacher to guide their continued professional growth.

Compensation System
Opportunities for professional growth with related compensation is also related to recruitment and retention; especially for mid-career professionals considering the teaching profession. Washington needs more opportunities for increased responsibilities within teaching, such as serving as a mentor, curriculum advisor, or school improvement consultant, are key to retaining great teachers that desire continued growth and development. Both the UW and Woodrow Wilson Foundation surveys confirm, potential for career growth and associated compensation is an important factor in the decision to pursue teaching.

High Quality Professional Development
Washington lacks meaningful information about the quality, quantity, access to, or satisfaction with the enormous array of professional development available to teachers. Solid understanding from research about what constitutes good professional development exists. We need assurances that it is available for our educators and leads to improvements in practice.

Meaningful Evaluation Systems
Our current system of evaluation is long overdue for evaluation. Recruitment and licensure are about preparing the basic model – the skills one should possess before being charged with a classroom full of children. We know that teachers gain competency – or not – in their first three years like no other time in their career. Reliable and fair evaluation of their effectiveness once they are licensed professionals is critical. It informs preparation program accountability and need improvements as well as continued employment decisions.

Appendix A

Table 1

Estimated Total Teachers and Sum of FTE

		N	Sum of FTE	Estimated* N	Estimated* Sum of FTE
Math	High School	2273	1831.75	2561	2064.03
	Middle Level	2242	1466.12	2526	1652.03
	Subtotal	4515	3297.87	5088	3716.06
Science	High School**	1954	1642.94	2202	1851.27
	Middle Level	1600	1046.6	1803	1179.31
	Subtotal	3554	2689.54	4005	3030.59
Total		8069	5987.41	9092	6746.64

* Estimation is achieved by adding an extra 12.7 percent N and FTE for the enrollment of districts that did not respond.

** Counting by subject increases the N to 2908 (counting a teacher with multiple subjects once for each subject).

Table 2

Descriptive Statistics for Math FTE (of the districts that reported)

Level	Endorsed (Y/N)	Endorsement Type	N	Sum of FTE	Mean
High School	Properly Endorsed	Subject Endorsed	1574	1394.38	0.8859 (0.2171)
		Pre-Endorsed	206	140.32	0.6812 (0.3447)
		Related Subject Endorsed	184	127.33	0.6920 (0.3182)
	Not Properly Endorsed	Not Endorsed	309	169.72	0.5492 (0.3354)
Middle Level	Properly Endorsed	Subject Endorsed	662	499.39	0.7544 (0.2899)
		Pre-Endorsed	301	179.80	0.5973 (0.3254)
		K-8 Endorsed	1002	642.31	0.6410 (0.3122)
		Related Subject Endorsed	166	88.99	0.5361 (0.3018)
	Not Properly Endorsed	Not Endorsed	111	55.63	0.5012 (0.3059)

Table 3

Descriptive Statistics for Science (of the districts that reported)

Subject	Endorsed (Y/N)	Endorsement Type	N	Sum of FTE	Mean
Biology	Properly Endorsed	Subject Endorsed	643	403.66	0.6278 (0.2957)
		Pre-Endorsed	106	57.4	0.5416 (0.3020)
	Not Properly Endorsed	Not Endorsed	78	40.36	0.5174 (0.3096)
Chemistry	Properly Endorsed	Subject Endorsed	337	203.48	0.6038 (0.4503)
		Pre-Endorsed	60	35.47	0.5912 (0.3320)
	Not Properly Endorsed	Not Endorsed	44	14.37	0.3267 (0.2017)
Earth Science	Properly Endorsed	Subject Endorsed	175	99.3	0.5674 (0.6560)
		Related Endorsement	4	1.93	0.4825 (0.0888)
		Pre-Endorsed	49	21.05	0.4296 (0.2600)
	Not Properly Endorsed	Not Endorsed	116	60.06	0.5177 (0.3292)
Integrated Science	Properly Endorsed	Subject Endorsed	54	39.1	0.7241 (0.2853)
		Related Endorsement	21	14.73	0.7014 (0.2835)
		Pre-Endorsed	18	14.01	0.7783 (0.3110)
	Not Properly Endorsed	Not Endorsed	19	16.02	0.8432 (0.2857)
Other Science	Properly Endorsed	Subject Endorsed	217	105.48	0.4861 (0.2941)
		Related Endorsement	144	68.58	0.4762 (0.2891)
		Pre-Endorsed	70	32	0.4571 (0.3022)
	Not Properly Endorsed	Not Endorsed	82	33.79	0.4121 (0.2789)

Descriptive Statistics for Science (Continued)

Subject	Endorsed (Y/N)	Endorsement Type	N	Sum of FTE	Mean
Physics	Properly Endorsed	Subject Endorsed	284	146.45	0.5157
					(0.3192)
		Pre-Endorsed	42	14.95	0.3560
					(0.2385)
	Not Properly Endorsed	Not Endorsed	115	73.91	0.6427
					(0.3470)
Physical Science	Properly Endorsed	Subject Endorsed	113	71.8	0.6354
					(0.3012)
		Pre-Endorsed	19	8.92	0.4695
					(0.2836)
	Not Properly Endorsed	Not Endorsed	21	10.75	0.5119
					(0.2941)
Total High School Science*	Properly Endorsed	Subject Endorsed	1823	1069.27	0.5865
			1823		(0.3830)
		Related Endorsement	170	85.54	0.5032
			170		(0.2935)
		Pre-Endorsed	364	183.81	0.505
			364		(0.3078)
	Not Properly Endorsed	Not Endorsed	475	249.26	0.5248
			475		
Middle Level Science	Properly Endorsed	Subject Endorsed	439	333.6	0.7599
					(0.2884)
		Pre-Endorsed	182	109.95	0.6041
					(0.3278)
		Elementary Certificate	755	449.51	0.5954
					(0.3038)
	Not Properly Endorsed	Not Endorsed	203	140.12	0.6902
					(0.3078)

The total N and FTE in this table does not exactly match the estimated table because 21 certification numbers could not be matched by endorsements and were removed at this level of analysis.

* N at this level is the sum of product of each unique certification number and the number of subjects taught (a teacher teaching four subjects is counted four times). This does not impact the FTE.

Table 4

Comparison of means for contrast FTE between Regions for Math

Region	N	Mean
Eastern	777	0.6508
	777	(0.4800)
Central	482	0.6812
	482	(0.4419)
Western	2068	0.6606
	2068	(0.4701)
Puget Sound	1539	0.6468
	1539	(0.4829)

No statistically significant (p.< 05) differences between any of the means.

Table 5

Comparison of means for contrast FTE between Endorsed and Not Endorsed

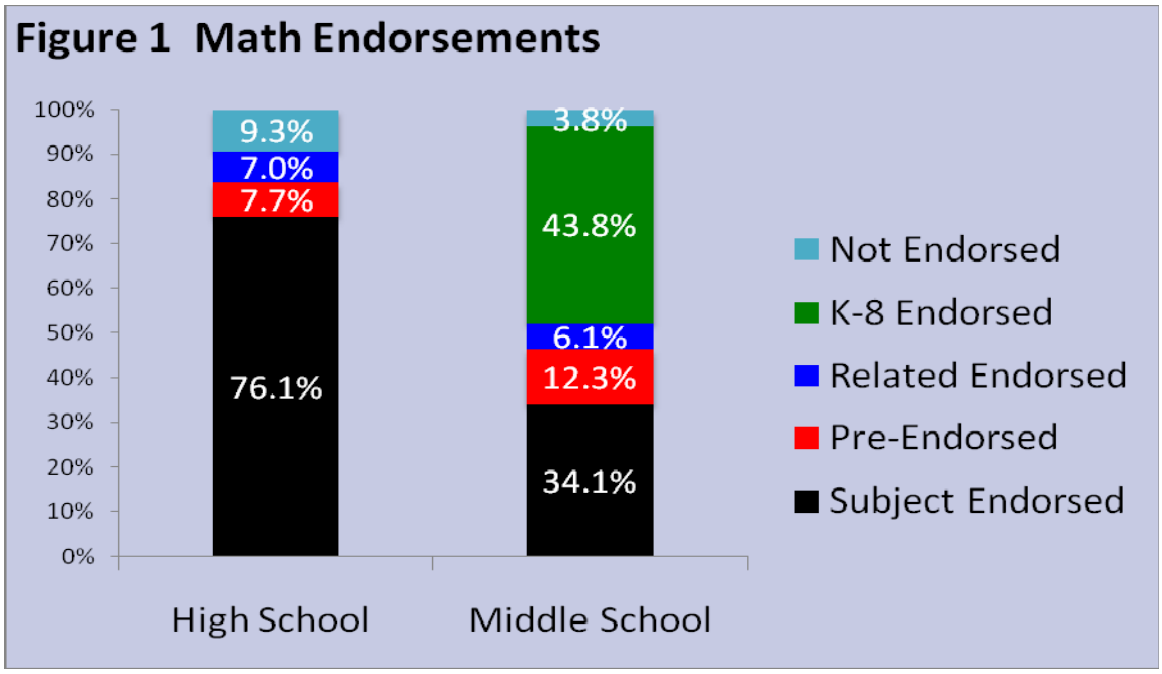
	N	Mean
Missing	332	0.7080
		(0.4310)
Large City	284	0.6504
		(0.4773)
Midsize City	259	0.6423
		(0.5308)
Small City	697	0.6559
		(0.4614)
Large Suburb	1466	0.6476
		(0.4836)
Medium Suburb*	294	0.6839
		(0.4548)
Small Suburb	108	0.6510
		(0.4549)
Town Fringe	247	0.6751
		(0.4826)
Town Distant	238	0.6783
		(0.4348)
Town Remote	189	0.6313
		(0.4818)
Rural Fringe	421	0.6707
		(0.4557)
Rural Distant	254	0.6678
		(0.4627)
Sum	4789	0.6606
		(0.4707)
Rural and Remote	195	0.5972
		(0.4846)

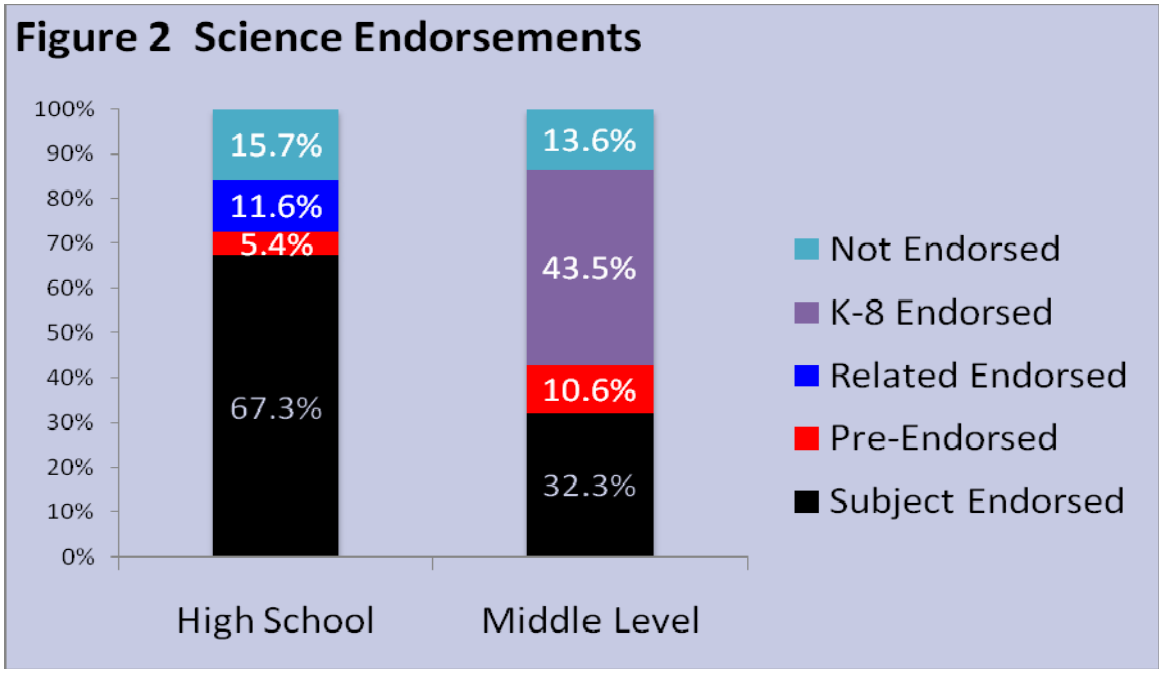
*The only statistically significant (p.< 05) differences between the *Rural and Remote* mean.

Table 6
Comparison of means for contrast FTE between Urban Hard to Staff schools in one large urban district for math

	N	Mean
Not Hard To Staff	334	0.9714
	334	(0.1386)
Hard to Staff	24	1.0000
	24	(0.000)

No statistically significant (p.< 05) differences between the means.





Appendix B

Perspectives on the Shared Challenge: Input / Report from each Task Force Member

From the perspective of your organization / agency / board:

- Are there current initiatives in which you are engaged / you are implementing related to this goal? What indicators do you have that they are effective / ineffective?
- What do you see as the current challenges / barriers related to ensuring an adequate supply of qualified math and science teachers?
- Are there specific strategies / changes in policy for which you are advocating?

Washington Association of School Administrators (WASA)
Mack Armstrong, Assistant Executive Director

- Tremendous variation and diversity in demographics among our school districts – consequently, trying to get one picture of the situation isn't realistic; complex situation; no simple fix.
- Recruitment of teachers that match demographics of students is important and challenging; particularly multi-lingual. This is also a good example of how hard it is to predict where in the state certain challenges arise; would predict this as an Eastern Washington issue, but also huge need in Western Washington.
- Districts have urgent need to "fill a slot" and because of this need flexibility in hiring.
- Districts need to predict and plan into future about potential shortages.
- Sometimes it's hard to predict impact of policy changes (e.g. State Board graduation requirements).
- Strategies:
    - One-size doesn't fit all; need solutions tailored to differing district needs;
    - Support early recruitment – seek out candidates that want to go into teaching for the right reasons;
    - Need better compensation overall; equitably;
    - Salary bonus / differential pay for math and science won't work. Will create conflict and will backfire. It might achieve short-term gains, but would have longer term negative consequences on the entire profession;
    - Support high standards of training – this should not be compromised; and
    - Model – Partners in Learning project with Cheney School District.

Association of Washington School Principals (AWSP)
Jerry Bender, Director of Government Relations

- Important to hire the right person.
- AWSP 2008 legislative platform includes "Support efforts to increase the numbers of hard to fill teacher positions i.e. English Language Learners, Special Education, Math and Science by reviewing the professional and alternative certification requirements." Principals feel the professional certification and alternative route programs are hard to get through.

- Strategies:
    - Need to start recruitment early – middle and high-school students;
    - Need financial incentives / loan forgiveness;
    - Differential pay – not a first choice for us; and
    - Need more opportunities to "grow our own"; like the Washington Alternative Route model that allows paraeducators in a community to become a teacher and then model that allows us to hire people on a conditional certificate and then do what it takes to get them fully trained and certified.

Washington School Personnel Association (WSPA)
Chris Burton, Executive Director

- We host the WA educator career fair – since 1986. 178 districts from within the state participated of our 296 and 109 districts from 14 other states. Trend is overall increase in district participation; decrease in prospective teacher participation. Anecdotally, participating districts believe quantity of candidates down but quality up.
- Annual 2-day workshop re: recruitment.
- Strategies:
    - Other states are laying off teachers - need to rethink how we recruit out-of-state; ensure we do not have unnecessary barriers (e.g. cost of certification, testing fees);
    - Improve recruitment of troop spouses – anecdotally, choosing not to teach because don't want to pay cost of certification requirements if will be transferred in a couple years;
    - Lateral moves in profession good investment - Retooling program run by PESB very good – personnel directors really like this program; and
    - Differential pay – we do not support this.

Washington Education Association (WEA)
Lucinda Young, Lobbyist

- Ensuring student achievement in math and science is not just due to math and science teachers; requires a foundation from an excellent elementary teacher for our middle and high-school teachers to be successful.
- Don't need short-term funding fixes and pay schemes - need to fully fund system.
- WEA has task force focusing on recruiting diverse teachers.
- Strategies:
    - Support current Alternative Route Programs; for paraeducators and midcareer;
    - Retooling Scholarships helpful / strong model – grow this program;
    - Must maintain high standards for profession;
    - Recruiting people into math and science careers overall a huge challenge; not just for teaching;
    - Strong school leadership crucial for staffing;
    - Challenge is that math and science majors discouraged from entering teaching by math and science faculty; Need full-ride scholarships;

    - Strongest recruitment mechanism – adequate compensation; and
    - Increase the Retoolers program – strong mechanism.

Center for Strengthening the Teaching Profession (CSTP)
Jeanne Harmon, Executive Director

- CSTP has report with recommendations on attracting high quality teachers to high-need schools (link).
- CSTP conducted studies / has only state data on retention / mobility.
- Focusing on induction models; particularly for rural schools – principals in rural schools are focusing on everything from instructional leadership to staffing to the furnace to bus routes to often also teaching. They have a very different need.
- Strategies:
    - Need to be open minded while maintaining rigor;
    - Don't need to legislate something that everyone must do; but need to try some new things;
    - Need creative solutions re: recruitment; we've done what the current has capacity to do; and
    - BUT whatever we do re: recruitment, unless we support them when get in classroom, we'll lose them – must create conditions for retention.

Washington Association of Colleges of Teacher Education (WACTE)
Stephanie Salzman, Dean, Woodring College of Education, Western Washington University (WWU)

- Difficult to represent WACTE – often have widely differing views.
- Varying approaches to preparation – some are undergraduate, some Masters in Teaching, some Alternative Route.
- When we had the Alternative Route program, one of the problems we encountered was the mentors for the interns reported that they didn't have time to both mentor these interns and attend to teach full-time.
- Strategies:
    - For recruiting math and science, we have to look at Recruitment, Retention, and Renewal. Renewal relates to practicing teachers who play huge role in preparing new teachers;
    - PESB has Pathways program that supports retooling into new content areas;
    - At WWU - #1 – Engaging Arts and Science Faculty – taken us 5 years of work to integrate curriculum of subject area and teaching requirements in 4 years;
    - Extended field experience critical – entire year – same classroom – embedded in school community;
    - Need to make connections with rural and remote districts – we worked with outstanding experienced teachers to help us make those connections;
    - Many of our institutions are using modified professional development school model – close relationships with districts;

- At WWU, when we admit freshmen, if they indicate an interest in math and science, we personally contact them and offer them a classroom practicum in their first year;
- Have to have University-level goals and accountability measures (e.g. WWU will have 50 math and science teacher ed students this year);
- Raise/shift enrollment funding / capacity for those who are already meeting current capacity / turning away candidates; demand recruitment strategy for those who aren't enrolling at capacity; and
- Hold us accountable for preparation of math and science teachers.

Council of Presidents (COP)
Don Bantz, Provost, The Evergreen State College (TESC)

- Whole issue of degree production new big emphasis – accountability to specified numbers – performance contracts - # of teachers, placement rates.
- TESC – one way we've been responsive – last year started a new Masters in Ed with math endorsement – first year - 40 new FTE.
- Focusing on Pipeline – particularly for Native American and African American.
- Looking to extend Masters in Teaching program to Tacoma campus
- Takes a long-term vision.
- Challenges are greater / more important than ever that we hire good people.
- Careful about being heavy handed with institutions; need high expectations balance with flexibility in how people meet those expectations.
- One size / approach not appropriate for such diverse institutions
- Re: accountability – institutions have only so much control over inputs and outputs.
- No control over students that show up at our doors.
- Lots of factors over which we have no control – unions, mandates, economic conditions, funding, etc.

Higher Education Coordinating Board (HECB)
Randy Spaulding, Director, Academic Affairs

- HECB focused on needing a lot more graduates in math and science; STEM, health care, education.
- Circular, long-term problem – you need K-12 teachers in math or science to spark student interest in pursuing a degree / career in math or science, including people to go into teaching K-12 math and science.
- Traditional role of higher ed and HECB – preparation itself and funding.
- Targeted financial aid usually loans and loan forgiveness. One down side – doesn't work for risk averse – feels like too much upfront commitment if not sure want to go into field – studies show this particularly true if considering as mechanism for recruiting minority students.
  College Readiness projects – connect high school teachers with college faculty.
- HECB runs Title II grants – looking at using to provide professional development that retools teachers to shortage areas.
- Barriers? – What is role of HECB? How best support programs and students?

- Math and science – industry vs. teaching – need not so much competing – need to view as same goal – adequate supply of people interested in broader fields of math and science.

Office of Superintendent of Public Instruction (OSPI)
Corrine McGuigan, Assistant Superintendent

- Higher Ed doing better job than ever preparing our teachers and administrators; reflected in student learning.
- Support to new teachers better than ever, but inadequate.
- We've lost ground - # of candidates going into math or science – losing people to businesses – can't hope to compete with what they are offering in terms of compensation – loving kids not enough if you can't afford to buy a house or feed your kids.
- The lesson we've learned from higher ed is when they were worried about losing faculty in these same areas – how did we keep our biology and chemistry faculty? We implemented differential pay. We need to pay attention to that lesson.
- Other lesson from higher ed – they created adjuncts and apprentices to teach part-time at colleges and universities – could we try this model as well? Teaching adjunct teaching a period or two per day?
- When we've asked schools that have been surprisingly successful, despite demographics in student achievement in math – teachers credit 1) strong in content; 2) presence of learning community – teachers working together – key for retention as well – how to create learning communities in rural / remote?; 3) school leadership / support.
- Must increase diversity in teaching ranks – increase #s of teachers of color, particularly in math and science.

State Board of Education (SBE)
Mary Jean Ryan, Chair

- The SBE's focus is on student math and science achievement levels – WA nowhere near where we need to be.
- What are the "suite" of approaches we need to change this?
- SBE and PESB developed a joint math action plan.
- Single biggest thing is how are we going to get the teaching force we need?
- How tackle this systemically? Not going to be just one thing.
- Need period of experimentation, innovation – try on much larger scale.
- Given economy of state – we should be strong in math and science – We fuel our economy with imported talent in math and science – this is embarrassing.
- All stakeholder groups need to pull together on this – unified plan.
- Scale up what's working; need promising practices starting to produce.
- Differential pay – personally I think we should try it.
- Adjunct teachers – we should try that – get community college instructors teaching in K-12. We let K-12 kids go over to community college why don't we let the teacher go to K-12?
- Frustrating that research isn't conclusive – so need to just try things.

- This cannot be characterized by “incrementalism” – need to try lots of things – new things.

Governor Gregoire’s Office
Judy Hartmann, Executive Policy Advisor, K-12 Education

- Isn’t just on approach, need many, but need to start first looking at what we have done and how it’s going – Needed refinements / improvements? Capacity for growth?
- For example - Retooling program – since we’ve heard from many that it is a promising program – we should find out what are the aspects that make it work / desirable? What can it accomplish at full capacity and what are its limitations?
- Another example – Alternative Route 4 – for midcareer professionals – what more can we do here to enhance / expand?
- Not everybody has to do everything – but everybody needs help on this - need to tailor our approach.
- Pipeline – is this helping rural / remote areas? Do we have enough “grow your own” options available?
- Look at programs that are working – why?
- Performance agreements – needs to be not just quantity, but quality - not short-term fix; need to think about consequences for long term of actions today.
- PESB – funded last year for innovative program designs for implementing Standard V (evidence-based knowledge and skill standards) – what if we did focused work in schools districts with math and science teachers around Standard V?
- Also need to look at public-private partnerships

Partnership for Learning (PFL)
Maureen Trantham, Communications Manager

- PFL wants to help raise public awareness of these issues – we see our role as communicating with citizens and business community on this.
- Public doesn’t know about this issue – real lack of awareness that there’s a shortage.
- Need a huge ramp-up of this discussion / awareness.
- Need a larger, coordinated push of folks around this table.
- Hard issue of public to understand.
- One barrier - need clearer information / understanding of what takes to become teacher.
- Need large-scale public awareness campaign.
- Teachers talking to executives at Microsoft – know anyone who wants to go into teaching?
- Alternative Routes – is it too difficult to navigate?
- Work to identify any needed policy changes.

Appendix C

Center for Strengthening the Teaching Profession
CSTP

Undergraduates' Views of K-12 Teaching as a Career Choice

A Report Prepared for
The Professional Educator Standards Board

Prepared by:

Ana M. Elfers
Margaret L. Plecki
Elise St. John
Rebecca Wedel

University of Washington
College of Education

December, 2008

UNIVERSITY OF WASHINGTON

College of Education
UNIVERSITY OF WASHINGTON

Introduction

In Washington state as elsewhere, there is a growing concern about the shortage of math and science teachers in elementary and secondary schools. Recent legislation and school programs that seek to improve mathematics and science education have been introduced, but little is known about how best to recruit those interested in math, science, or engineering to the K-12 teaching profession. While assumptions exist about how to make the teaching profession more attractive to these individuals, knowledge about the factors that might encourage students interested in these fields to consider teaching as a career is limited.

There is some prior research in the United States and in other countries regarding the views of undergraduate students with respect to teaching as a career. A 2005 study of science, math, and engineering undergraduates enrolled in two research universities examined the factors that influenced students' interest in K-12 teaching (Moin, Dorfield & Schunn, 2005). These researchers found that math and natural science majors were more interested in K-12 teaching and engineering majors were least interested. They also found those with mid-level academic performance and those in their junior year expressed a greater interest in K-12 teaching. Another study done in England (Kyriacou & Coulthard, 2000) explored the relationship between the factors that undergraduates deem important in a career and the extent to which teaching offers those desired factors.[1] The researchers found that for respondents who were interested in K-12 teaching, there was a closer match between factors desired in a career and the belief that teaching offers those factors, particularly with respect to a job that contributes to society, offers responsibility, and has mobility.[2] Those who expressed an interest in K-12 teaching also reported that "an increase in the quality of resources for teaching" would be a measure that would encourage them to consider becoming teachers (Kyriacou & Coulthard, 2000, p. 124). These studies suggest that additional examination of undergraduate views could be useful in helping to shape policy discussions about teacher recruitment strategies aimed at addressing undergraduates with a major field of study in mathematics, science and engineering.

In order to provide Washington educators and policymakers with information about the views of students with a focus of study in math, science or engineering and their interest in teaching, the Professional Educator Standards Board (PESB) commissioned a pilot study through a collaboration with the Center for Strengthening the Teaching Profession (CSTP) and the University of Washington (UW). The study is based on a survey of undergraduate students enrolled in math, science, computer science, or engineering courses in several Washington state institutions of higher education.

In October 2008, a research team at the University of Washington began administering the survey to undergraduates enrolled in math, science, computer science, and

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[1] Some of the items from this study were used in the survey of undergraduates in Washington state, with permission from Chris Kyriacou and Melissa Coulthard.

[2] It is important to note that this study included undergraduates from a variety of academic majors.

engineering courses in a small sample of community colleges and public and private universities in Washington state. Due to the short time frame of the study, a strategic non-representative sample was employed. Therefore, the findings represent the views of students included in the pilot study, but not necessarily all undergraduates interested in the fields of math, science and engineering in Washington state. While the sample is limited and non-representative, these analyses offer information and insights that are useful to Washington policy makers, state department officials, district administrators, professional developers, pre-service educators and others in a position to influence the recruitment, professional development and retention of K-12 math and science teachers.

Research Questions

The population for this study is undergraduates enrolled in math, science, computer science and engineering courses in a Washington college or university. The following general research questions provided the foundation for the design of the survey items:

1. What is the level of interest in K-12 teaching among students studying math, science or engineering? What distinguishes students who are interested in teaching from those who are not?
2. To what extent does K-12 teaching offer students the factors that they regard as important in a future career?
3. How do students with a focus of study in math, science or engineering perceive the teaching profession as a career?
4. What policy measures and other influencing factors might encourage these students to consider a career in K-12 teaching?

Methods

As previously noted, the study employed a strategic non-representative sample of math, science, computer science or engineering courses in Washington colleges and universities. The goal in the selection of colleges and universities, as well as courses to survey, was to represent a range of undergraduates studying in math, science or engineering fields as widely as possible given the time constraints of the study.

Four Washington colleges and universities are included in the analysis. The colleges and universities were selected for the study based upon their location and institution type (i.e., state public institution, community college, or private institution). The sample includes one public state university, one private university, and two community colleges located in Eastern Washington and the Central Puget Sound areas.

The survey was administered in person by one of the UW researchers in 26 undergraduate classes (some with multiple sections), with an average response rate of 91

percent.[3] Students with laptops or access to computers in the classroom were given the option of taking the survey online during class.[4]

Characteristics of the survey respondents

The respondents are roughly divided between 1st and 2nd year (freshman and sophomores) and 3rd and 4th year students (juniors and seniors). Fifty-one percent of students identify themselves as freshman or sophomores and 45 percent as juniors or seniors. A small percentage of students indicate that they are graduate students (1 percent) or part-time or other students (3 percent).

Over three-quarters of the students sampled (77 percent) indicate a major field of study in mathematics, science, computer science, engineering or a related science or health field. Fourteen percent of respondents indicate another field of study (e.g., arts, humanities, journalism, business, government, linguistics, social work), while eight percent are undecided. Over half of the respondents are male (57 percent) and identify themselves as White, non-Hispanic (56 percent) (see Table 1). Seventy-seven percent of students self-report a GPA above 3.0. Two-thirds of students (68 percent) are 21 years and under, and nearly three-quarters (74 percent) of students completed high school or secondary school (or received their GED) in Washington state.

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[3] This response rate excludes one class in which students were encouraged to complete the survey entirely online and outside of class time (see note 4 below). Response rates by institution varied from 85 to 100 percent of students in classes surveyed.

[4] One instructor requested that the survey be administered on-line outside of class time. Of the 118 students enrolled in the class, only 15 students completed the survey.

Table 1: Characteristics of All Students by Gender, Age and Race/Ethnicity (N=718)		
Respondents by Gender	Number	Percent
Female	294	41%
Male	407	57%
Missing/decline to state	17	2%
Respondents by Race/Ethnicity	Number	Percent
White, non-Hispanic	403	56%
Black, non-Hispanic	28	4%
Hispanic, Latino/a	44	6%
Asian or Pacific Islander	162	23%
Native American	8	1%
Multiracial	23	3%
Other	7	1%
Missing/decline to state	43	6%
Respondents by Age		
21 and under	491	68%
22-25	145	21%
26 and older	74	10%
Missing	8	1%

Findings

This pilot study of students enrolled in math, science, computer science and engineering courses provides a basis from which to better understand undergraduates' views of the K-12 teaching profession. This sample does not represent all students studying in math, science, computer science or engineering fields. Rather, these findings provide a starting point from which to discuss and ask further questions about how best to recruit math and science teachers in Washington state.

To better understand the target group, the analyses provided in the remainder of this report include only those students who indicated a major field of study in math, science or engineering (including computer science). Undecided students are also included since they may consider these fields in the future. This sub-sample includes 610 students. Among the math, science and engineering students in the sub-sample, 61 percent attend a public 4 year university, 10 percent attend a private 4 year university, and 29 percent attend a community college (see Table 2). The most frequently identified major fields of study include engineering or computer science (35 percent), biology (28 percent), mathematics (13 percent), and physical sciences (e.g., chemistry, physics and earth science, 10 percent), with an additional 5 percent identifying themselves in other science or health-related fields. The sub-sample of math, science and engineering students is nearly equally split between freshman and sophomores (1st and 2nd year) and juniors and seniors (3rd and 4th year).

Table 2: Characteristics of Sub-Sample of Math, Science and Engineering Students by Institution Type, Major Field of Study and Level of Schooling (N=610)

Respondents by Institution Type	Number	Percent
Public 4 year institution	372	61%
Private 4 year institution	59	10%
Community College	179	29%
Respondents by Major Field of Study	Number	Percent
Engineering or Computer Science	212	35%
Biology	170	28%
Mathematics	79	13%
Physical Sciences (e.g., Chemistry, Physics, Earth Science)	60	10%
Other science or health-related field	33	5%
Undecided	56	9%
Respondents Level of Schooling		
Freshman or Sophmore (1st or 2nd Yr)	301	49%
Junior or Senior (3rd or 4th Yr)	294	48%
Other (e.g., part-time)	15	2%

The findings are summarized under the following headings:

- Level of Interest in K-12 Teaching
- Important Career Factors and K-12 Teaching
- Perception of the K-12 Teaching Profession
- Policy Measures and Influencing Factors

Level of Interest in K-12 Teaching

Survey results indicate that while half of the students are not interested in a career in K-12 teaching, a sizeable portion of students would be willing to consider it. In particular, a larger proportion of upper level students and students in certain fields express an interest in teaching as career. The majority of those interested in teaching would like to teach at the high school level. Prior working or volunteer experiences with elementary or secondary school students may have a positive impact on undergraduates' willingness to consider a career in teaching.

The results from this pilot study indicate that among students pursuing a major field of study in math, science, computer science or engineering, 40 percent indicate they would be willing to consider a career as a K-12 teacher. Six percent of the students are seriously considering a career in teaching, and another 34 percent might be willing to consider it. Nine percent were undecided at this time.

Table 3: Percentage of students willing to consider K-12 teaching as a career choice (N = 610)	
Definitely NOT considering a career in teaching	51%
Might be willing to consider a career in teaching	34%
Seriously considering a career in teaching	6%
Undecided at this time	9%

Among those who are willing to consider teaching as a career (N = 243), 65 percent express an interest in teaching at the high school level. Over one-fifth (22 percent) would like to teach elementary students while 18 percent would consider teaching in a middle school. Twenty-two percent of those willing to consider a career in teaching remain undecided about the level or levels they would like to teach.

This sample includes a representation of students across all years in college. When looking at responses by students' year in college, we find that nearly a fifth of students (19 percent) in their first year of college are uncertain of their future career plans, and nearly 60 percent indicate they are definitely *not* considering a career in teaching. A larger proportion of third and fourth year students (juniors and seniors) are willing to consider teaching than first and second year students (freshmen and sophomores). Nearly half (47 percent) of college juniors and seniors might consider teaching or are seriously considering teaching as a career compared with 33 percent of students in their first two years of college. Table 4 provides comparative information on characteristics of the math and science students based on their willingness to consider a career in teaching.

The data do not reflect major differences with respect to the interest in K-12 teaching by age or gender. The percentage of students 21 and under who indicate that they definitely are *not* interested in teaching (52 percent) is similar to the percent of older students expressing a similar viewpoint (47 percent) (see Table 4). A slightly larger percentage of students who identify themselves as white non-Hispanic are willing to consider teaching as a profession than students of color, but the differences are small (40 and 30 percent, respectively).[5]

An examination of student interest by major field of study reveals that a larger proportion of students in mathematics and science (biology, chemistry, physics and earth sciences) would be willing to consider a career in teaching than students in engineering or computer science. Fifty-six percent of students with a major field of study in mathematics and 44 percent in the sciences indicate they would be willing to consider teaching compared with only 32 percent of students studying engineering or computer science.

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[5] The sample sizes for each racial/ethnic group are small as are the differences between students of color and white, non-Hispanic students. Further analysis would be needed to determine any statistical difference.

When examining differences by institution type, the proportion of students at the four-year universities who indicate they are *not* interested in a career in teaching (52 percent), is similar to the 47 percent of students in the community colleges.

Table 4: Characteristics of Math & Science Majors by Three Groups: Not Interested in Teaching (N=311), Might be or Seriously Considering Teaching (N=243) and Undecided (N=56)

	Total	Not Interested in Teaching	Willing to Consider Teaching	Undecided
Respondents by Gender	Number	Percent	Percent	Percent
Female	233	49%	45%	5%
Male	361	51%	37%	12%
Respondents by Race/Ethnicity				
White, non-Hispanic	345	55%	40%	6%
Non-White Race/Ethnicity	252	46%	30%	14%
Respondents Level of Schooling				
Freshman or Sophomore	301	56%	33%	10%
Junior or Senior	294	46%	47%	7%
Respondents by Age				
21 and under	411	52%	39%	9%
25 and older	192	47%	43%	10%
Respondents by Institution Type				
4 Year Institution (Public or Private)	431	52%	42%	6%
Community College	179	49%	35%	16%
Respondents by Major Field of Study				
Engineering or Computer Science	212	60%	32%	8%
Biology	170	51%	42%	7%
Mathematics	79	38%	56%	6%
Physical Sciences (e.g., Chemistry, Physics, Earth Science)	61	43%	49%	8%
Other science or health-related field	33	61%	30%	9%
Undecided	55	38%	36%	25%

Those students with a relative or close friend who worked in schools did not show a greater interest in teaching than those who did not. Of the 58 percent of students who identify a close friend or relative working as a teacher, students were roughly divided between those who might consider a career in teaching and those who would not (43 versus 36 percent).

More than two-thirds of the students (69 percent) surveyed indicate they have had volunteer or paid teaching or work experiences with elementary or secondary students. A higher percentage of undergraduates with teaching or work experiences with K-12 students indicate that they might be or are interested in teaching as a career. Fifty-three percent of students who have experience as a teaching assistant, 50 percent of those who have tutored and 46 percent who have served as a camp counselor indicate they would be willing or are seriously considering teaching compared with only 25 percent of

undergraduates with no teaching or work experiences with elementary or secondary school students.

Important Career Factors and K-12 Teaching

The undergraduates surveyed rate employment security, intellectual challenge, a job that will contribute to society, a job that is respected, and high earnings over the life of a career to be very important in their career decision. The majority of these students view teaching as a career that makes a contribution to society, but that it offers few other factors they identify as very important when choosing a career. In particular, respondents see a career in teaching as offering few of the financial factors that they view as very important.

One way to understand undergraduates' career decision-making is to examine the match between what a person wants from a career and the extent to which he or she thinks a certain career offers this. The extent to which students perceive teaching as offering what they are looking for in a career may indicate a greater chance that they will make this career choice. Given a list of 16 general factors, students were asked to rate each factor's importance when choosing their career. Students were then asked to identify the extent to which they think a career in teaching would offer this.

As Table 5 indicates, students consider certain factors of greater importance when choosing a career. Seventy-seven percent of undergraduates consider stable employment a *very important* factor in choosing a career. However, only 43 percent of the students surveyed perceive that teaching 'definitely' offers a career likely to have job security. This finding is surprising given that historically teaching has been viewed as a relatively stable career option.

Table 5: Students' ratings of the importance of factors in choosing a career and the extent to which they think a career in teaching will offer these (N=610)

	Importance when choosing a career (%)			Extent to which teaching offers it (%)		
Career factor	Very Imp	Somewhat	Not Imp	Definitely	Might	Not at all
Stable employment (likely to have job security)	77%	20%	2%	43%	50%	5%
A job that provides intellectual challenge	67%	28%	4%	32%	52%	14%
A job that will contribute to society	59%	33%	7%	84%	13%	2%
High earnings over length of career	58%	34%	6%	7%	31%	61%
A job that is respected	58%	33%	8%	46%	46%	7%
Good promotion prospects	53%	38%	8%	7%	46%	46%
Good starting salary	53%	41%	5%	6%	35%	58%

Note: Percentages may not add to 100% due to rounding and some missing data.

Two-thirds of the students consider a job that provides intellectual challenge as *very important* in their career choice, but only 32 percent believe that teaching definitely

offers this. Likewise, compensation factors such as high earnings over the length of a career, good promotion prospects and a good starting salary are *very important* to over half of the students, but a large portion of the students don't believe teaching offers these factors at all.

Nearly 60 percent of the students indicate that a job that contributes to society is *very important* and 84 percent view teaching as a career choice would make such a contribution. This finding is consistent with previous survey research among Washington teachers which found that most teachers enter the profession for altruistic reasons, such as the value or significance of education in society or a desire to work with young people (Knapp, et al, 2005).

Among non-financial factors, nearly half of students perceive that teaching 'definitely' would offer a job that family and friends would support (49 percent) and a job that can be easily combined with parenthood (46 percent). Appendix A provides a complete list of the factors and students' responses.

With a few exceptions, undergraduates' views of teaching and the extent to which it would offer certain factors are remarkably similar among students who are interested in teaching and those who are not. Those who are interested in teaching placed less importance on financial factors such as high earnings over the length of a career, good promotion prospects and a good starting salary. A larger proportion of those willing to consider teaching as a career view teaching as a job that offers intellectual challenge.

In this study we also compare the views of those who indicate they are seriously considering or might be willing to consider a career in teaching (N = 243) with those who would not (N = 311) by analyzing their responses to the 16 career factors. Using the raw mean rating score of those who indicate that teaching would 'definitely' offer these factors, we compare responses between the two groups of students. As Table 6 shows, it is noteworthy that in many cases there is little variation between the two groups with regard to the importance of certain factors in choosing a career. However, some slight differences do exist between these two groups. Those interested in teaching place somewhat less importance on high earnings over the length of career, good promotion prospects and a good starting salary. Also those potentially interested in teaching indicate slightly more positive responses with regard to whether teaching provides intellectual challenge (38 versus 26 percent). Appendix B provides a complete list of the career factors and respondents' ratings.

Table 6: Students' ratings of the importance of factors in choosing a career and the extent to which they think a career in teaching will offer these for two groups: Not interested (N=311) and Definitely or might be interested (N=243)

	Importance when choosing a career (%)		Extent to which teaching offers it (%)	
Career factor	Not Interested	Interested	Not Interested	Interested
Stable employment (likely to have job security)	76%	79%	41%	44%
A job that provides intellectual challenge	69%	68%	26%	38%
High earnings over length of career	63%	51%	3%	8%
Good promotion prospects	59%	46%	4%	8%
A job that will contribute to society	55%	66%	83%	87%
Good starting salary	55%	47%	3%	5%
Attitude and support of family or friends toward this job	36%	39%	43%	50%
A job that can be easily combined with parenthood	28%	35%	52%	48%

Perception of the K-12 Teaching Profession

The undergraduates surveyed tend to share similar impressions of the teaching profession. The majority of students strongly agree that teachers are underpaid. The majority of respondents also agree that teaching is rewarding work, a respected profession, and that teachers work a lot of extra hours on evenings and weekends.

To assess how undergraduates in math, science, computer science, and engineering perceive teaching as a career, students were asked to rate how strongly they agree with a number of statements about the teaching profession (see Table 7). The students in this study generally hold similar perceptions of teacher pay, workload, school environment and the respectability of the teaching profession.

A strong majority of students believe that teaching is both a respected profession in our society and rewarding work (88 percent somewhat or strongly agree with both of these statements). A slightly larger percentage of those who are willing to consider teaching as a career agree that teaching is rewarding work than students *not* interested in teaching (93 versus 83 percent). Comments from the open-ended questions on the survey support these findings. As one student wrote, "I feel teaching is a rewarding experience and offers the opportunity to help bring positive change to society."

Table 7: Percent of students indicating agreement or disagreement with statements about the teaching profession (N = 610)

	Strongly Agree	Somewhat Agree	Somewhat or Strongly Disagree
Generally speaking, teachers are underpaid	63%	29%	7%
Teaching is rewarding work	40%	48%	10%
Teaching is a respected profession in our society	37%	51%	11%
Teachers work a lot of extra hours on evenings and weekends	29%	52%	17%
Generally speaking, people with the best grades in school don't become teachers	24%	41%	33%
Students are often unruly and a difficult to work with	18%	49%	32%
Schools are a dangerous place to work	3%	14%	82%

Note: Percentages may not add to 100% due to rounding and some missing data.

Students perceive the teaching profession less favorably when it comes to issues of compensation and workload. In fact, the greatest level of agreement among undergraduates is found with respect to the view that teachers are underpaid. Sixty-three percent of respondents *strongly* agree that teachers are underpaid and another 29 percent *somewhat* agree. A larger percentage of undergraduates who have *no* teaching or work experience with elementary and secondary students *strongly* agree teachers are underpaid, compared to those with experience in schools (69 versus 52 percent). Seventy-one percent of white, non-Hispanic students strongly agree that teachers are underpaid compared with 53 percent of students of color.

The theme of teacher compensation is strongly represented in the open-ended comments, where over a third of students brought up compensation as a reason not to pursue teaching as a career. One student wrote, "I believe it can be a very rewarding career, but growing up with two teachers as parents, I have seen that the salary is not enough. I believe that is one of the biggest things keeping people from pursing it as a profession."

Students also are in agreement that teachers work a lot of extra hours. More than four-fifths (81 percent) of students in the sample either strongly or somewhat agree that teachers work a lot of extra hours on evenings and weekends. Students are in less agreement with the statement, "Generally speaking, people with the best grades in school don't become teachers." Overall, nearly two-thirds of undergraduates (65 percent) somewhat or strongly agree with the statement. Among students responding to the open-ended comments, 12 percent indicated that they would not consider a career in teaching because they view the profession to be repetitive or unchallenging.

Most respondents agree that schools are not dangerous. Eighty-two percent of students disagree that schools are a dangerous place to work. However, two-thirds of respondents

(67 percent) strongly or somewhat agree that students are often unruly and difficult to work with. A smaller proportion of undergraduates who had prior teaching or work experience with K-12 students agree that students can be difficult to work with compared to those with no experience (63 versus 76 percent). Undergraduates *not* considering a career in teaching agree that students are often unruly and difficult to work with at a higher rate than those considering a career in teaching (73 percent versus 60 percent). According to a student who is *not* considering a career in teaching, "I do not want to be a teacher because of the low level of respect that most students have toward their teachers."

Policy Measures and Influencing Factors

A positive influence on the students' decision to consider a career in teaching is the experience they had with teachers when they were in school. This factor is particularly significant for those undergraduates who indicate that they are seriously considering a career in teaching. The perceived neutral influence of media images and the attitude of college instructors toward teaching may provide greater opportunities for teacher recruitment. Students' views of overall working conditions in schools could be a detractor from the profession.

A solid majority (60 percent) of respondents indicate that the experiences they had with a teacher is a positive influence on their decision to become a K-12 teacher. The attitude of college instructors toward K-12 teaching as a career and media images of teachers offer neither a positive or negative influence to the majority of respondents, indicating possible opportunities for improvement in recruitment (see Table 8).

Table 8: Percent of students indicating a positive, negative or neutral influence of certain factors on their decision to become as a K-12 teacher (N = 610)

	Positive Influence	Neutral Influence	Negative Influence
Experiences I had with teachers when I was in school	60%	34%	5%
The attitude of my college instructors toward K-12 teaching as a career	16%	76%	6%
Media images of teachers	17%	67%	14%
Overall working conditions in school	15%	50%	33%

Note: Percentages may not add to 100% due to rounding and some missing data.

There were small differences with regard to ethnicity and interest in teaching in terms of how experiences with teachers influence students' decision to become a K-12 teacher. White, non-Hispanic students are more likely to indicate this is a positive influence compared to students of color (65 versus 53 percent). It is noteworthy that 72 percent of

students seriously considering a career in teaching indicate that the experience they had with teachers in school is a positive influence on their decision to become a K-12 teacher.

Positive experiences with former K-12 teachers are reflected in the open-ended comments received by students. For example, one student wrote that he/she is seriously considering a career as a teacher because, "Great teachers of my past have helped to shape who I am today." Another student seriously considering a teaching career wrote, "I think it would be cool to be an influence in kids' lives like my teachers were in mine." These findings suggest that there may be opportunities for current classroom teachers to encourage promising students to consider becoming a teacher. College instructors also could play a more affirmative and constructive role in guiding talented math and science students toward career opportunities in schools.

Several items in the survey speak to concerns about overall working conditions in schools. While half of students indicate that the overall working conditions of schools were a neutral influence on their decision to become a K-12 teacher, one-third report it as a negative influence. A larger proportion of juniors and seniors (42 percent) indicate that overall working conditions would be a negative influence compared to 26 percent of freshman and sophomores. One student commented that "I would consider a career in teaching if I were guaranteed the necessary resources to ensure a successful classroom environment."

With respect to policy measures that would encourage students to become teachers, students rate college loan forgiveness and higher beginning pay most favorably. A smaller proportion of respondents indicate that better materials and supplies, assistance with housing, and opportunities for advancement and leadership are factors that would encourage them to consider teaching.

In order to increase the supply of well-qualified math and science teachers, a number of policy strategies are under consideration. Survey respondents were asked for their assessment as to whether a variety of policy measures would encourage them to consider K-12 teaching as a profession (see Table 9). Students in the sample would be encouraged by some measures to provide financial incentives to pursue teaching more than other types of measures. For example, college loan forgiveness and competitive salaries are viewed more favorably than low interest home loans and merit pay. Sixty-two percent of students 'definitely' would be encouraged to consider becoming a K-12 teacher if college loans were paid off with two years of teaching after college, and 58 percent of students indicate that beginning pay at a salary comparable to positions in engineering or technology 'definitely' would encourage them to consider it. Forty-five percent indicate that a housing allowance or access to low interest home loans 'definitely would be an encouragement, and 39 percent viewed merit pay as an incentive to consider becoming a K-12 teacher.

Table 9: Students' ratings (in percentages) of whether the following measures would encourage them to consider becoming a K-12 teacher. (N=610)

	Definitely	Maybe	Not a Factor
Having my college loans paid off, if I teach for two years after college	62%	23%	13%
Beginning pay at a salary comparable to positions in engineering or technology	58%	30%	10%
An increase in the quality of materials, supplies and technology for teaching	47%	35%	15%
Housing allowance or access to low interest loan toward purchase of a home.	45%	38%	15%
Opportunities for advancement and leadership beyond the classroom	44%	40%	14%
Ability to earn more money if my students perform better	39%	35%	23%
A reduction in the amount of time it takes to earn a teaching credential	31%	37%	29%
A reduction in class size	30%	45%	23%

Note: Percentages may not add to 100% due to rounding and some missing data.

Among non-financial measures, students are most encouraged by an increase in the quality of materials, supplies, and technology for teaching. Forty-seven percent 'definitely' would be encouraged to consider teaching with an increase in the quality of these resources. Students also are encouraged by opportunities for advancement and leadership; 44 percent identifying opportunities for advancement and leadership beyond the classroom as a definite incentive. Other measures, such as class size reduction, and a reduction in the amount of time to earn a teaching credential received more mixed reviews among respondents in this sample.

The open-ended responses suggest that some students are unsure about the amount of schooling that is required to receive a teaching credential. A student who may be willing to consider teaching wrote that teaching required "too much school for too little pay." A student who is *not* considering a career in teaching wrote, "The time and money spent to become a teacher is not compensated by the pay as a school teacher and lots of teachers are in debt paying off school loans."

As would be expected, students who are seriously or willing to consider a career in teaching rate all policy measures more favorably than students who are *not* interested in teaching (see Table 10). Of particular note, students who would consider a career in teaching are more encouraged by beginning pay at a salary comparable to positions in engineering or technology than students not interested in teaching as a career (71 versus 48 percent). These students are also more encouraged by an increase in the quality of materials, supplies and technology than students *not* considering teaching (61 versus 36

percent). Reduction in the amount of time that it takes to earn a teaching credential was viewed less favorably by these groups (42 versus 24 percent).

Table 10: Students' ratings of whether policy measures definitely would encourage them to consider becoming a K-12 teacher for two groups: NOT interested in teaching (N=311) and Seriously or might consider teaching (N=243)

Policy Measure	NOT Interested in Teaching (%)	Seriously/Might Consider Teaching (%)
Having my college loans paid off, if I teach for two years after college	57%	69%
Beginning pay at a salary comparable to positions in engineering or technology	48%	71%
An increase in the quality of materials, supplies and technology for teaching	36%	61%
Housing allowance or access to low interest loan toward purchase of a home.	39%	54%
Opportunities for advancement and leadership beyond the classroom	38%	52%
A reduction in the amount of time it takes to earn a teaching credential	24%	42%

Discussion

Finding and recruiting qualified teachers to fill positions in chronic shortage areas is no small task. Teacher shortages are not new; over the last thirty years or more, there have been persistent shortages in traditional high demand areas such as mathematics and science. While some evidence suggests math and science teachers have the same rates of turnover as other teachers, unlike many other teaching fields, the system does not have a surplus of newly prepared candidates every year, as a recent study noted:

> The data show that the supply of newly prepared math and science teachers is small relative to that of fields such as English. As a result, while the supply of new math and science teachers is sufficient to cover the losses of teachers due to retirement, unlike the field of English, the supply of math/science is not sufficient to cover pre-retirement losses of teachers due to dissatisfaction. (Ingersoll & Perda, 2006, p. i).

Results from this pilot study indicate that there is a potential pool of undergraduates currently studying in math, science and engineering fields who might be interested in K-12 teaching as a career. The potential exists to increase the supply of math and science teachers from among the ranks of students currently enrolled in our state's colleges and

universities. Given variation in the perspectives of undergraduates at different stages of their college experience, it might be worthwhile to target recruitment efforts toward particular groups of students, such as those beyond their first year in college, and those in certain fields, such as mathematics and the natural sciences.

The undergraduates surveyed hold some unexpected perspectives on teaching as a career choice. In particular, the view that teaching is not necessarily a stable career by these students is somewhat surprising. It may be instructive to remember that the survey was administered during a time of national economic crisis. Among 16 career factors, the factor related to employment security was rated as *very important* by the largest percentage of students (77 percent).

Another surprising finding is the perception by math and science students that K-12 teaching lacks intellectual challenge. While two-thirds of students rate a job that offers intellectual challenge as *very important*, only 32 percent indicate that a career in K-12 teaching definitely offers this. A student who might be willing to consider a career as a teacher wrote, "I want to continue to learn more difficult aspects of science rather than stay at a certain level to match my students." Another wrote, "It doesn't seem like it would be challenging to teach the same material every year."

Captured in the open-ended comments is a desire on the part of math and science students to participate in research, and a concern that teaching would not offer this opportunity. For example, a student who is currently *not* considering a career in teaching wrote, "I want to do math research and K-12 teachers do not have the time/opportunity/flexibility to do so." A student who might be willing to consider a career in teaching wrote, "I would like to combine research and teaching at the K-12 level. [If I became a teacher] I'd be removed from the research field and that's a big drawback." A substantial number of students wrote that they are interested in teaching at the college level in large part because of the research component. It might be interesting to explore whether math, science and engineering students would be more attracted to the K-12 teaching profession if they were offered the option of participating in scholarly research.

When taking into consideration the financial factors that students value in a career, some interesting relationships emerge. As we might expect, those who rate financial factors as *very important* in choosing their career are more interested in policy measures that offer financial incentives to teach. For example, students who rate a good starting salary as *very important* are more encouraged by beginning pay at a salary comparable to positions in engineering or technology than students who rate a good starting salary as *somewhat important* (65 percent versus 52 percent). The open-ended responses to this survey also suggest that financial incentives may encourage students who take into account the economic benefits of a career to consider teaching. As one student wrote, "I don't think that I can choose to become a teacher as a career choice because there are little economic benefits for becoming a teacher. Personally, I don't feel like teachers are paid enough for the dedication they put forth into their career."

A slightly higher percentage of men than women would be encouraged by potential policy measures offering beginning pay at a salary comparable to positions in engineering or technology (62 percent versus 54 percent). However, men are no more encouraged by

the loan forgiveness measure than women. Additionally, fifty-six percent of students of color indicated that they 'definitely' would be encouraged to consider teaching with a housing allowance or access to low interest loans compared to 41 percent of white, non-Hispanic students.

There is some indecision among students with regard to whether a reduction in the amount of time it takes to earn a teaching credential would encourage them to consider a career in teaching. Men, those seriously or willing to consider teaching, students of color, those who value good starting salaries and high earnings over the course of their career are slightly more interested in this policy measure. For example, when considering differences by gender, 35 percent of men would definitely be encouraged to consider teaching if there were a reduction in time to earn a teaching credential compared to 28 percent of women who responded similarly. Forty-two percent of those considering a career in teaching indicate that a reduction in time to certification would be an encouragement, compared to 24 percent of students who are definitely *not* considering a career in teaching. A slightly higher proportion of students of color indicate that this measure 'definitely' would encourage them to consider a career in teaching compared with white, non-Hispanic students (37 versus 28 percent).

Nearly half of students (44 percent) indicate that opportunities for advancement and leadership beyond the classroom would definitely encourage them to consider teaching. More than half of students who are considering teaching rate advancement and leadership opportunities as definitely a factor that would encourage them to consider teaching compared to 38 percent who are *not* considering a career in teaching. Fifty-one percent of students of color responded that they are definitely encouraged by this measure compared to 41 percent of white, non-Hispanic students. Not surprisingly, students who rate good promotion prospects as *very important* are definitely encouraged by this measure compared to those who rate it as *somewhat important* (53 percent versus 37 percent). In the open-ended comments, one student wrote that there are "no ladders to climb."

Finally, information gleaned from conversations with students when the survey was administered indicate that students do not seem to know how to go about becoming a teacher or misunderstand the amount of time involved in obtaining a credential. Several students expressed an interest in becoming a teacher and inquired about the process. Additionally, open-ended comments from students included questions about how they can access this information.

Implications for Policy

This examination of undergraduates' views of teaching provides insights into how Washington might best position itself to make progress towards ensuring that all students have access to well-qualified math and science teachers. In this section, we share some observations and ideas for consideration by policymakers.

- *A potential exists to recruit from undergraduates currently studying in math and science fields*. A sizeable portion of students may be interested in a career in teaching, particularly those who are beyond their initial years in college. Washington has several colleges and universities with strong mathematics, science, engineering, and computer science departments with numerous, bright students who might consider K-12 teaching.

- *Recruitment efforts should emphasize job stability and opportunity to contribute to society*. Among undergraduates surveyed, a large percentage do not view teaching as a stable career option. The majority rate a job that will contribute to society to be very important in a career and believe that teaching does offer this.

- *Financial factors matter*. When examining policy measures aimed at increasing the supply of math and science teachers, college loan forgiveness and higher beginning salaries were the most favored by math and science students.

- *Conditions of the profession are also important*. Students' views of overall working conditions in schools could be a detractor from the profession. These views include a perceived lack of intellectual challenge, limited opportunities for leadership and professional advancement, and the need for higher quality materials and technology in the classroom. Opportunities to participate in research might encourage some students to consider teaching.

- *Opportunities for positive influence*. Currently, media images and the attitudes of college professors are viewed neutrally, but they have the potential to encourage students to consider a career in teaching. Undergraduates' experiences with their elementary and secondary teachers often positively influence their decision to consider teaching as a profession.

- *Increase opportunities for tutoring or engagement with K-12 students*. Students with these types of experiences are more likely to consider teaching.

- *Improved access to information*. Students indicate they lack information about the process for becoming a teacher. Multiple approaches should be used to provide accurate information such as media campaigns, websites, recruitment materials and career counseling centers.

In closing, we draw on a comment made by a student interested in becoming a teacher who wrote, "I remember 3rd grade better than 4th grade…having a teacher that took that extra effort to make sure I was where I needed to be helps me go back and revisit my experience. Long story short, teachers have the greatest impact on our society. Why wouldn't I want to be a part of that?"

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References

Ingersoll, R. & Perda, D. (2006). *What the national data tell us about the math and science teacher shortage*. Paper presented at the NCTAF Symposium on the Scope and Consequences of K-12 Science and Mathematics Teacher Turnover. Racine, WI.

Knapp, M. S., Elfers, A. M., Plecki, M. L., Loeb, H., & Zahir, A. (2005). *Teachers count: Support for teachers' work in the context of state reform*. Seattle, WA: University of Washington.

Kyriacou, C. & Coulthard, M. (2000). Undergraduates' views of teaching as a career choice, *Journal of Education for Teaching*, *26*(2), 117-126.

Moin, L. J., Dorfield, J. K. & Schunn, C. D. (2005). Where can we find future K-12 science and math teachers? A search by academic year, discipline and academic performance level. *Science Education*, *89*(6), 980-1006.

Appendices

Appendix A: Students' ratings of the importance of factors in choosing a career and the extent to which they think a career in teaching will offer these (N=610)

	Importance when choosing a career (%)			Extent to which teaching offers it (%)		
Career factor	Very Imp	Somewhat	Not Imp	Definitely	Might	Not at all
Stable employment (likely to have job security)	77%	20%	2%	43%	50%	5%
A job that provides intellectual challenge	67%	28%	4%	32%	52%	14%
A job that will contribute to society	59%	33%	7%	84%	13%	2%
High earnings over length of career	58%	34%	6%	7%	31%	61%
A job that is respected	58%	33%	8%	46%	46%	7%
Good promotion prospects	53%	38%	8%	7%	46%	46%
Good starting salary	53%	41%	5%	6%	35%	58%
Co-workers that are easy to get along with	51%	41%	7%	21%	71%	7%
Job mobility - easy to get a job anywhere	42%	50%	7%	36%	53%	10%
Easy to find a job	40%	53%	5%	43%	51%	5%
Attitude and support of family or friends toward this job	38%	44%	17%	46%	45%	7%
A job that offers a flexible schedule	37%	52%	10%	13%	44%	41%
A job that can be easily combined with parenthood	31%	38%	30%	50%	42%	6%
Job includes opportunities to travel	22%	44%	33%	6%	36%	56%
A job with a low level of stress	21%	56%	22%	11%	44%	44%
Working with children	11%	30%	58%	87%	9%	3%

Note: Percentages may not add to 100% due to rounding and some missing data.

Appendix B: Students' ratings of the importance of factors in choosing a career and the extent to which they think a career in teaching will offer these for two groups: Not interested (N=311) and Definitely or might be interested (N=243)

	Importance when choosing a career (%)		Extent to which teaching offers it (%)	
Career factor	Not Interested	Interested	Not Interested	Interested
Stable employment (likely to have job security)	76%	79%	41%	44%
A job that provides intellectual challenge	69%	68%	26%	38%
High earnings over length of career	63%	51%	3%	8%
Good promotion prospects	59%	46%	4%	8%
A job that is respected	59%	56%	44%	47%
A job that will contribute to society	55%	66%	83%	87%
Good starting salary	55%	47%	3%	5%
Co-workers that are easy to get along with	49%	53%	22%	17%
Job mobility - easy to get a job anywhere	42%	38%	35%	35%
Attitude and support of family or friends toward this job	36%	39%	43%	50%
A job that offers a flexible schedule	39%	33%	12%	13%
Easy to find a job	37%	42%	43%	43%
A job that can be easily combined with parenthood	28%	35%	52%	48%
Job includes opportunities to travel	23%	21%	4%	7%
A job with a low level of stress	21%	19%	11%	8%
Working with children	5%	18%	88%	86%

Appendix D

Professional Educator Standards Board
Alternative Routes to Teaching Partnership Grant Program

In 2007, the legislature provided additional funding to the Professional Educator Standards Board to expand the existing routes of the Alternative Routes to Teaching Program. This funding provides more conditional scholarships to prepare individuals in shortage teaching areas.

Status of Program:

As of June 2008, 688 paraeducators, classified instructional staff, mid-career professionals and conditional certificate holders have transitioned to a new career teaching in statewide and geographic shortage areas through the PESB's Alternative Routes to Teaching Program. 97% of Alternative Route candidates have entered Washington State's teaching force upon completion of their programs. Additional candidates are currently enrolling in programs during the summer and fall of 2008 and are expected to enter the teaching force with shortage area endorsements after completing their programs in June 2009.

There are five Alternative Route programs that serve paraeducators, classified instructional staff, mid-career professionals and conditional certificate holders in the following areas of the state:

- Mt. Vernon, Skagit Valley and Everett
- Seattle/Tacoma
- Olympia
- Yakima Valley
- A new Alternative Route program will open in the Tri Cities area in June of 2009.

Alternative Route Programs are:

- A **performance-based mentored internship** of one year or less with the length of the program determined by the time required for candidates to demonstrate competency related to residency certificate standards;
- **Field-based**, with formalized learning opportunities offered on or near school/district sites, on-line or via K-20;
- Guided by a **Teacher Development Plan** that identifies program requirements based on assessment of the intern's prior experience and education;
- **High quality and quantity mentoring**, including training specifically designed for intern mentors;
- "**More performance-based**" than traditional programs, according to the Washington State Institute for Public Policy (WSIPP) evaluation; and
- **Cost effective programs are "package priced"** rather than credit-driven and range from $7,000 - $15,000 for post-baccalaureate programs. WSIPP reports that tuition is less for alternative routes programs than for traditional programs at the same institution.

Alternative Route Candidates are:

- Older, with an average age of 41.
- The majority of Alternative Route candidates are prepared to teach in statewide or geographic shortage areas. As of June 2008, program completers had earned a total of 582 endorsements in state identified shortage areas, including 130 in Secondary Sciences, 80 in Secondary Math, 76 in Middle Level Math/Science, 60 in ELL and 236 in Special Education. Additionally, candidates have earned endorsements in geographical shortage areas including foreign languages, music, and health and fitness.
- 76% of mentor teachers report Alternative Route Program teachers to be better prepared than those from more traditional programs and an additional 19% found them at least as well prepared. Similarly, 96% of principals surveyed found Alternative Routes teachers at least as well or better prepared.

What Alternative Routes Program Completers Say:

"I am very happy that I was able to pursue this program. I am a single mom with three kids and I was a paraeducator in special education. This was a smooth transition for me. I could not have accomplished my dream without this program."

"I appreciate the opportunity to pursue my certificate in a non-traditional format. Having lived, worked and volunteered for years – it was great to be able to share and incorporate "real world" scenarios into my learning environment. This was a great fit for me."

The Alt. Rts. program allowed me to work in a career I love. Without the flexibility of the program, it would have been very difficult for to become a teacher."

"The program is a wonderful way to transition into a teaching career. The students that the program attracts are diverse, capable, highly educated and may not have gone into teaching without a program like this."

What's New in Alternative Routes?

New Alternative Routes Program in Eastern Washington
Route 1 Regional Consortia Program
New urban area Alternative Route Program

- Tri Cities – ESD 123 plus four institutions providing an alternative routes program for mid-career professionals in the Tri Cities area scheduled to begin June 2009.
- Regional Consortia Program - Heritage University serving Route 1 candidates in collaboration with a Community College, the Regional Consortia partners and multiple districts. Program targets bilingual paraeducators with AA degrees to prepare in ELL.
- Seattle Pacific University- opened Alternative Routes for candidates to be eligible for scholarships beginning summer 2008.

For more information on Alternative Routes to Certification please visit our website at ***www.pesb.wa.gov*** *and click on Alternative Routes or contact Mea Moore at* ***mea.moore@k12.wa.us***

Appendix E

Washington State Institute for Public Policy

110 Fifth Avenue Southeast, Suite 214 • PO Box 40999 • Olympia, WA 98504-0999 • (360) 586-2677 • FAX (360) 586-2793 • www.wsipp.wa.gov

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Report to the Professional Educator Standards Board: Differential Pay for Teacher in High-Demand Subject Areas

In 2008, the Washington State Legislature passed ESHB 2687 which directed the Professional Educator Standards Board (PESB) to conduct "a comprehensive analysis of math and science teacher supply and demand…"[a]

Among other tasks, the Legislature directed the PESB, in collaboration with the Washington State Institute for Public Policy (Institute), to "provide information from a study of differential pay for teachers in high-demand subject areas such as mathematics and science, including the design, successes, and limitations of differential pay programs in other states."[b]

Finding. We reviewed the national research literature on whether differential pay for teachers in math, science, or other high-demand teaching fields affects whether new teachers are attracted to the profession, or whether the attrition rate of existing teachers is reduced. Unfortunately, existing research on this specific topic is too thin to draw conclusions. To date, there have been very few attempts to offer differential pay and, as a result, evaluation evidence is sparse.

Lacking this research base, we examined a broader question that can shed some light on the topic of differential pay. We reviewed studies that have analyzed how salary increases—for all teachers—affect the degree to which teachers leave the profession.

We found nine credible studies that have looked at this question. We draw two general findings from this body of research. First, higher teacher salaries do reduce attrition rates; all nine studies demonstrated this effect. Second, the magnitude of the effect can be summarized as: a 10 percent increase in teacher salaries leads to a two-to-three percent decrease in teacher attrition rates.

It is important to note that these findings apply to <u>all</u> teachers, not specifically to those in math, science, or other high-demand fields.

Background

This report summarizes findings on research conducted by the Institute on differential pay for mathematics and science teachers. Broadly speaking, differential pay refers to pay policies by which certain groups of teachers are paid more based on their knowledge and skills in particular subject areas. Calls for subject-area pay incentives have emanated from the shortages faced by most schools for well-trained and adequate numbers of teachers in shortage subject areas, mostly mathematics, science, and special education.

Any research into differential pay policies for teachers recognizes that schools must compete in labor markets for the technical skills associated with mathematics and science training. The rationale for

[a] ESHB 2687, Chapter 329, §501 (w), Laws of 2008
[b] Ibid, §501 (w)(iv).

differential pay policies is, therefore, the realization that "individuals with different attributes face different financial opportunity costs to enter the teacher labor market."[a]

The Earnings Gap

Recent research has revealed that there is a difference between what math and science teachers are paid and what professionals in comparable occupations earn. The size of this gap has recently been presented to the Joint Basic Education Task Force by Lori Taylor,[b] who found that, on average, mathematics and science teachers in Washington State earn $54,568 while comparable professionals outside of the teaching profession earn $76,199.[c] Goldhaber (2008) found that teachers with technical degrees—particularly in mathematics and science-related fields—begin their careers earning average salaries that are comparable to those of individuals with the same degrees but who have non-teaching careers.[d] He also found, however, that as individuals gain more experience in the labor market, an earnings gap emerges between teacher and non-teacher salaries, which on average can be as high as $27,890 per year after 10 years of employment experience.[e]

Differential Pay Programs: Evidence From Other States

The key goal of this research was to identify the impact of differential pay policies for mathematics and science teachers on the ability of schools to enhance the recruitment and retention of teachers. We briefly document the states in which differential pay programs exist and what the outcomes of the programs are to date.

Currently, four states provide pay incentives for teachers willing to teach in hard-to-staff subject areas like mathematics, science, and special education. These states are California, Alaska, Louisiana, and New York. Additionally, some school districts provide supplemental pay for hard-to-staff subject areas, including Houston ($5,000), Los Angeles ($5,000), and New York ($3,400).[f]

By 2006, California was funding two incentive programs that awarded pecuniary benefits to teachers accepting assignments in high-need subjects. These incentives are provided on a graduated basis as a teacher completes subsequent years of teaching. Due to the limited number of evaluations from these programs, findings on their successes and challenges are preliminary. While some success has been observed in terms of teacher retention, incentive pay programs appear to face significant challenges, the most common of these being implementation errors, teacher targeting difficulties, and a lack of well-developed data sets that can be used to evaluate the impact of the program.[g]

Results and Findings

As mentioned, given the lack of specific studies on math and science differential pay, we examined the broader research question on how general teacher pay affects teacher attrition.

Over 30 studies that investigated the role of teacher salary increases in influencing teacher retention were identified. A number of these studies were descriptive in nature, while other more empirical studies were not included in this analysis due to methodological weaknesses. We identified nine studies that were empirically sound and methodologically rigorous and used these studies to generate a summary elasticity measure indicating the extent to which teacher retention (alternatively expressed in terms of teacher attrition) responds to changes in across-the-board increases in teacher salaries.

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[a] D. Goldhaber, M. DeArmond, A. Liu, & D. Player. (2008). *Returns to skill and teacher wage premiums: What can we learn by comparing the teacher and private sector labor markets?* Seattle: School Finance Redesign Project, Center on Reinventing Public Education, University of Washington, p. 15.

[b] L. Taylor. (2008). *Washington wages: An analysis of educator and comparable non-educator wages in the state of Washington*. [Draft] Report to the Washington State Institute for Public Policy.

[c] The $76,199 estimate from Dr. Taylor assumes a full 12- month work year; if teachers work 11 months in a year, this figure reduces to $69,849, and if teachers work 10 months in a year, the comparable wage estimate reduces further to $63,499.

[d] D. Goldhaber. (2006) .*Teacher pay reforms: The political implications of recent research*. Washington, DC: Center for American Progress.

[e] In comparison, for individuals with non-technical degrees, the average differential after ten years is estimated to be $18,904. Goldhaber, 2006, p. 8.

[f] Goldhaber, 2006, p. 16.

[g] S. Loeb & L. Miller. (2007). *A review of state teacher policies: What are they, what are their effects, and what are their implications for school finance*. Stanford, CA: Institute for Research on Education Policy & Practice, Stanford University.

Most of the studies used national or state-level data sets to conduct their investigations. Though sample sizes, analysis methodologies, and effect size magnitudes varied significantly, the sample compositions were similar in that more women than men were identified as teachers. In recognition of the non-comparability of the raw effect coefficients/magnitudes, we transformed these study findings into a common metric (elasticity) in order to make the results from the nine studies comparable.

Exhibit 1 summarizes the attrition "elasticity" associated with a salary increase from each of the nine studies. An elasticity is a simple statistical measure describing how a percentage change in one variable (teacher salary in this case) is associated with a percentage change in another variable (teacher attrition). A summary of weighted attrition elasticity is presented in the final row.

Exhibit 1

Salary Increases and Teacher Attrition/Retention

Author	Attrition Elasticity	Sample Size
Imazeki (2005)	-1.4354	8,938
Podgursky (2004)	-0.9546	14,066
Podgursky (2004)	-0.6745	3,245
Ondrich et al. (2008)	-0.5101	4,238
Harris & Adams (2007)	-0.4644	18,786
Podgursky (2004)	-0.3677	4,773
Brewer (1996)	-0.2630	20,160
Strunk & Robinson (2006)	-0.1871	28,885
Kelly (2004)	-0.1440	4,761
Krieg (2004)	-0.0733	2,293
Kirby et al. (1999)	-0.0692	98,951
Podgursky (2004)	-0.0346	48,756
Weighted Average Elasticity	**-0.2372**	

The attrition elasticity of each study in Exhibit 1 indicates that the magnitudes are all negative. This is interpreted to mean that a 10 percent increase in teacher salary has the impact of reducing attrition by a magnitude that ranges from -.346 to -14.35 percent. Averaged across all nine studies, a 10 percent increase in teacher salary corresponds to a reduction in teacher attrition by 2.3 percent. It is important to note that each of the magnitudes represents the responsiveness of average teacher attrition/retention to a general salary increase. They may or may not apply specifically to math or science teachers, but the estimate does provide a general insight into the workings of teacher labor markets.

Citations

Brewer, D. (1996). Career paths and quit decisions: evidence from teaching. *Journal of Labor Economics*, 14(2), 133.

Harris, D.N., & Adams, S.J. (2007). Understanding the level and causes of teacher turnover: a comparison with other professions. *Economics of Education Review*, 26, 325-337.

Imazeki, J. (2005). Teacher salaries and attrition. *Economics of Education Review*, 24, 431-449.

Kelly, S. (2004). An event history analysis of teacher attrition: Salary, teacher tracking, and socially disadvantaged schools. *The Journal of Experimental Education*, 72(3), 195-220.

Kirby, S.N., Berends, M., & Naftel, S. (1999). Supply and demand of minority teachers in Texas: problems and prospects. *Educational Evaluation and Policy Analysis*, 21(1), 47-66.

Krieg, J.M. (2004). Teacher quality and attrition. (2004). Economics of Education Review, 25, 13-27.

Ondrich, J., Pas, E. & Yinger, J. (2008). The determinants of teacher attrition in upstate New York. *Public Finance Review*, 36(1), 112-144.

Podgursky, M., Monroe, R., & Watson, D. (2004). The academic quality of public school teachers: An analysis of entry and exit behavior. *Economics of Education Review*, 23, 507-518.

Strunk, K.O., & Robinson, J.P. (2006). Oh won't you stay: A multilevel analysis of the difficulties in retaining qualified teachers. *Peabody Journal of Education*, 81(4), 65-94.

For further information, contact Irene Ngugi at (360) 586-9436 or Irene@wsipp.wa.gov.

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References

1. Earley PM, Ross SA. Teacher Recruitment and Retention: Policy History and New Challenges. Teacher Recruitment and Retention: How do we Get and Keep Teachers 2006.

2. Lashway L, Bryant B, Burton C, Hett A. Educator Supply and Demand in Washington State. Olympia, WA: Office of the Superintendent of Public Instruction; 2007.

3. Plecki ML, Elfers AM, Loeb H, Zahir A, Knapp MS. Teacher Retention and Mobility; A Look Inside and Across Districts and Schools in Washington State. Seattle, WA: Center for Strengthening the Teaching Profession; 2005.

4. Joint Mathematics Action Plan: Building the Proper Foundation. Olympia, WA: Professional Educator Standards Board; 2006.

5. Hanushek EA, Kain JF, Rivkin SG. Why Public Schools Lose Teachers. J Hum Resour 2004;39(2):326.

6. Ingersoll RM. Teacher Turnover and Teacher Shortages: An Organizational Analysis. American Educational Research Journal 2001;38(3):499.

7. Loeb S, Reininger M. Public Policy and Teacher Labor Markets: What we Know and Why it Matters. Education Policy Center 2004:73.

8. Raffel JA, Beck AS, Prulello M. An Analysis of the Views of Delaware's New Teachers: Recruitment & Hiring, Mentoring & Professional Development, Job Satisfaction, and Future Plans. 2005.

9. Boyd D, Lankford H, Loeb S, Wyckoff JH. The Draw of Home: How Teachers' Preferences for Proximity Disadvantage Urban Schools. NBER Working Paper 2003.

10. Butterworth I. The Nature of Teacher Shortages in Secondary Schools. Oxford Review of Education 1982;8(2):163-74.

11. Balter D, Duncombe W. Teacher Recruitment Practices in New York School Districts. Teacher Quality and Teacher Retention Conference, Syracuse University, May 2005.

12. Bradley KD, Loadman WE. Urban Secondary Educators' Views of Teacher Recruitment and Retention. NASSP Bulletin 2005;89(644):2.

13. Winter PA, Melloy SH. Teacher Recruitment in a School Reform State: Factors that Influence Applicant Attraction to Teaching Vacancies. Educational Administration Quarterly 2005;41(2):349.

14. Stotko EM, Ingram R, Beaty-O'Ferrall ME. Promising Strategies for Attracting and Retaining Successful

Urban Teachers. Urban Education 2007;42(1):30.

15. Balter D, Duncombe WD. Recruiting Highly Qualified Teachers: Do District Recruitment Practices Matter? Public Finance Review 2008;36(1):33.

16. Levin J, Quinn M. Missed Opportunities: How We Keep High-Quality Teachers Out of Urban Classrooms. 2003.

17. Reeves C. Implementing The No Child Left Behind Act: Implications For Rural Schools and Districts. Napperville, IL: North Central Regional Educational Library 2003.

18. Arnold ML, Newman JH, Gaddy BB, Dean CB. A Look at the Condition of Rural Education Research: Setting a Direction for Future Research. Journal of Research in Rural Education 2005;20(6):20-6.

19. Roberts P. Staffing An Empty Schoolhouse: Attracting and Retaining Teachers in Rural, Remote and Isolated Communities. Eric Pearson Study Report.Surrey Hills, Australia: NSW Teachers Federation 2005.

20. Gibbs R. The Challenge Ahead for Rural Schools. Forum Appl Res Public Policy 2000;15(1):82-7.

21. Murphy PJ, Angelski K. Rural Teacher Mobility: A Report from British Columbia. Rural Educator 1997.

22. Schwartzbeck TD, Prince CD, Redfield D, Morris H, Hammer PC. How are rural districts meeting the teacher quality requirements of no child left behind? 2003.

23. No Child Left Behind Act: Additional Assistance and Research on Effective Strategies Would Help Small Rural Districts. Report to Congressional Requesters. US Government Accountability Office; 2004. Report nr GAO-04-909.

24. Monk DH. Recruiting and Retaining High-Quality Teachers in Rural Areas. Future Child 2007 Spring;17(1):155-74.

25. Elfers AM, St. John E, Plecki ML, Wedel R. Undergraduates' Views Of Teaching as a Career Choice: Preliminary report draft. Seattle, WA: Center for Strengthening the Teaching Profession; 2008.

26. Developing Evidence and Gathering Data: About Teacher Education Program Quality. Washington DC: American Association of State Colleges and Universities; 2007.

27. Jackson J. Increasing Accountability for Teacher Preparation Programs. Atlanta, GA: Southern Regional Education Board; 2006.

28. Berry B, Curtis R, Hernandez M, Wurtzel J. Creating and Sustaining Urban Teacher Residencies: A New Way to Recruit, Prepare, and Retain Effective Teachers in High-Needs Districts. Washington DC: Center

for Teaching Quality; 2008.

29. Decker PT, Mayer DP, Glazerman S. The Effects of Teach for America on Students: Findings From A National Evaluation. Mathematica Policy Research Report 2004.

30. Teach For America Teacher's Careers: When And Why They Leave Low Income Schools and the Teaching Profession.

31. Levin J, Mulhern J, Schunck J. Unintended Consequences: The Case for Reforming the Staffing Rules in Urban Teacher's Union Contracts. The New Teacher Project; 2005.

32. Boyd D, Lankford H, Loeb S, Rockoff J, Wyckoff J. The Narrowing Gap in New York City Teacher Qualifications and its Implications for Student Achievement in High-Poverty Schools. Center for Analysis of Longitudinal Data in Education Research Working Paper 2007;10.

33. Christensen GS, Amerikaner A, Klasik D, Cohodes S. Evaluation of Flexibility Under" No Child Left Behind": Volume III--The Rural Education Achievement Program (REAP flex). US Department of Education 2007:79.

34. Hirsch E. Teacher Recruitment: Staffing Classrooms With Quality Teachers. 2001.

35. Fowler RC. The Massachusetts Signing Bonus Program For New Teachers: A Model Of Teacher Preparation Worth Copying? Education Policy Analysis Archives 2003;11:13.

36. Liu E, Johnson SM, Peske HG. New Teachers and The Massachusetts Signing Bonus: The Limits of Inducements. Educational Evaluation and Policy Analysis 2004;26(3):217.

37. Clotfelter CT, Glennie EJ, Ladd HF, Vigdor JL. Teacher Bonuses and Teacher Retention in Low-Performing Schools: Evidence From The North Carolina $1,800 Teacher Bonus Program. Public Finance Review 2008;36(1):63.

38. Peter D. Hart Research Associates, Inc. Teaching as a Second Career. Princeton, NJ: The Woodrow Wilson National Fellowship Foundation; 2008.