STATE BOARD OF EDUCATION

HEARING TYPE: __X__ INFORMATION/ACTION

DATE: NOVEMBER 27–28, 2006

SUBJECT: **REPORT ON JOINT MATHEMATICS ACTION PLAN AND CERTIFICATE OF ACADEMIC ACHIEVEMENT OPTIONS**

SERVICE UNIT: State Board of Education
Edie Harding, Executive Director

PRESENTER: Steve Floyd, Chair of Mathematics Subcommittee
State Board of Education

RECOMMENDATION:

The Board will be asked if they approve the section of the Joint Action Plan that pertains to the high school graduation requirements. The Board will also decide which option (the subcommittee was asked not to provide a recommendation) on the Certificate of Academic Achievement (CAA) Options it would recommend to the Legislature.

BACKGROUND:

At the October meeting, the State Board of Education heard from a variety of legislators, parents, and school district staff on how to address system challenges to help students improve in mathematics. The Board decided to develop joint recommendations with the Office of Superintendent of Public Instruction (OSPI) and the Professional Educator Standards Board (PESB) to address the actions needed to provide support for students. The Board also wanted to examine options for the CAA for students in the Class of 2008–2010.

A subcommittee was appointed (Steve Floyd, Amy Bragdon, Dr. Sheila Fox, and Tiffany Thompson) to work on both issues and report back to the Board at the November meeting. The subcommittee has worked with OSPI and PESB on the joint action plan and will present the joint plan to the Board with a focus on the high school graduation requirements section. The subcommittee will also present options for the Board to consider recommending to the Legislature on the CAA for students in the Classes of 2008, 2009, and 2010.

November 11, 2007
To: State Board of Education Members
From: Edie Harding
Subject: Background for Mathematics Discussion – Not for Circulation

I have drafted this "Framing the Issue" background piece for you all to read. I have presented some of the issues and research on the mathematics challenges you have heard. This is not a comprehensive and "vetted" piece. It is an outline of what I would envision would be greatly expanded for a part of our final report on a meaningful diploma. It would have nice charts and more information and would have lots of people review the points, but alas I do not have the time to do more for right now. I shared this with subcommittee last week and have added a few more pieces.

Why Should the Board Respond to the Mathematics Challenge?

You have new duties under your reconstitution – "Provide advocacy and strategic oversight of public education" in other words you have a bully pulpit to discuss big issues for education. Clearly what will happen to our students in the class of 2008 and beyond if they cannot pass the WASL or alternative assessments is a big issue. Legislators and the public want to know what you think.

Secondly, you are responsible for creating an accountability system. Requiring our students to meet the standards in mathematics (reading and writing) creates the foundation of our accountability system. If we are holding students accountable, we also need to hold the K-12 system accountable that the standards, curriculum, assessments, teacher preparation and professional development, and teaching strategies are in place and aligned to ensure student success. The State Board of Education needs to make sure these foundations for accountability are strong.

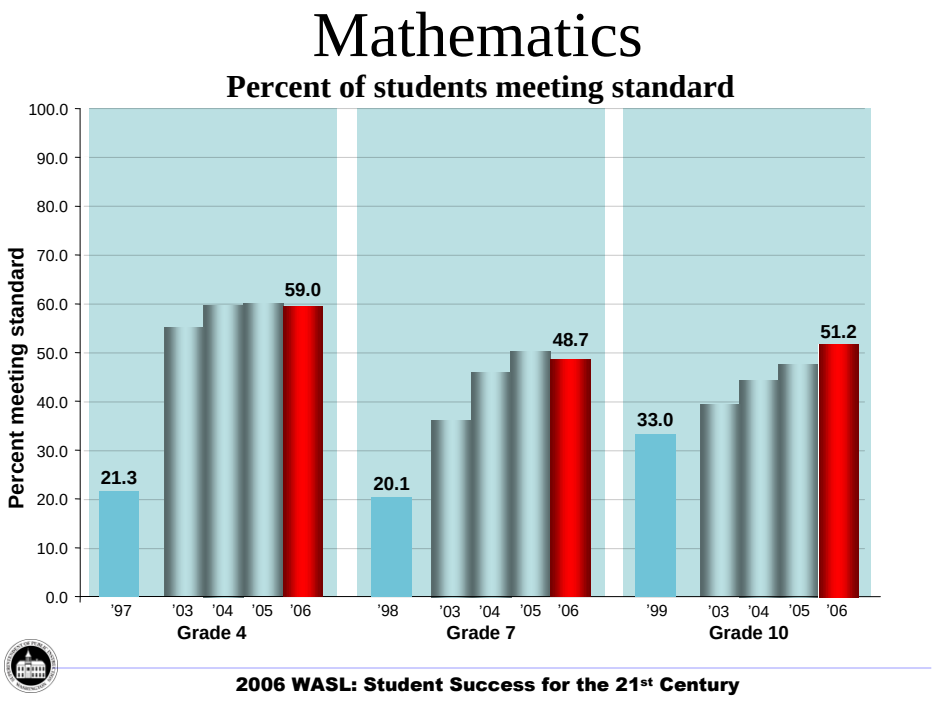
Third, you establish high school graduation requirements or equivalencies for students. The Certificate of Academic Achievement is one of the high school graduation requirements.

This paper outlines some of the problems, studies and solutions that have been proposed to help you as you think through the issues of mathematics. I am not covering reading and writing standards. There has been tremendous success in those areas for many students (but not all) in those areas. We should be proud of the work that has enabled so many students do succeed. Science is another big issue we will need to examine next year.

The Problem

Short Term Issues

Fifty-one percent of all the Class of 2008 students passed the mathematics WASL. Many subcategories of students – low income, Native American, African America, Hispanic, Special Education, Bilingual and Migrant were even less successful with passage rates ranging from 12 percent to 30 percent. While these students will have additional opportunities to retake the WASL or use the alternative assessments, a number of them will still not meet standard thus not obtain a Certificate of Academic Achievement to obtain a high school diploma.While progress has continued to be made over the last six years, the results show much work needs to be done. Results are slightly better in the elementary levels than middle school and high school, but progress has been relatively flat for the last few years. The chart below shows the spring results. 9,686 students also took the August 10th grade WASL (8,306 of those were retakes, the rest were new students or those who had to do a make up because they did not take it this spring). Of those who took the mathematics 10th grade WASL in August, 26.7% met standard.



The percent of students meeting the 10th grade standards (in all three subjects) increased 3% from last year when passing the WASL was not required (42% of students passed all three subjects) to this year when the WASL is required (45% of students passed all three subjects).[1] In Massachusetts, the percent of student meeting their assessment for 10th

[1] Does not include August retake data.

grade increased 20% between the year when the MCAS was not required and the following year when it was required. This suggests that it may be more difficult for greater numbers of our students to pass the WASL successfully than the experience in Massachusetts.

Long Term Issues

What are the reasons for this problem?

There are multiple perspectives on where the problem lies: the current standards, annual assessments, curriculum, teacher quality, high school graduation requirements, and appropriate interventions. You heard and read recommendations from the Snohomish County Superintendents that highlight the need to align our standards, curriculum, instructional materials and teacher preservice and professional development. This is a common theme with many people including researchers such as Bill Schmidt, Director of the U.S. National Research Center for TIMMS.

Below is a short background overview to some very complex issues. There are many papers and books written on these issues. This overview only touches the surface to provide a framework for Board members initial thinking with the anticipation that a more detailed report would be a part of the meaningful high school diploma study.

A particular emphasis on the issues of standards, curriculum and assessment is provided in this briefing paper because they are the basis for our high stakes accountability system and determine whether or not our students will graduate from high school. Much of the information discussed this fall at Washington Learns and the Board meetings has also focused standards, curriculum and the WASL.

Standards, Assessment, and Curriculum

Washington's Essential Academic Learnings (EARLs) and Grade Level Expectations (GLEs) set the standards for mathematics. These are based on the 1989 National Council of Teachers (NCTM) "Curriculum and Evaluations Standards for School Principals and Standards". These NCTM standards were different from previous ones because they recommended more emphasis on how students learn mathematics.[2] The NCTM has made recommendations in its recent review "Focal Points" on K-8 curriculum. One of the new recommendations was that more computational fluency is needed. The Board also heard some legislators and parents[3] express this concern: 1) the

2"A curriculum is more than a collection of activities: it must be coherent, focused on important mathematics, and well articulated across the grades". Specifically, "a well-articulated curriculum gives teachers guidance regarding important ideas or major themes, which receive special attention at different points in time. It also gives guidance about the depth of study warranted at particular times and when closure is expected for particular skills or concepts." http://www.nctm.org/focalpoints/intro_what.asp

3 A group of Washington parents called "Where's the Math?" has been very active in their concerns about the current standards. The subcommittee on mathematic received many letter from them. They want an independent advisory council made up for people who are mathematics experts and independent of OSPI to recommend standards.

need for more skill and drill (computation fluency and less reliance on calculators at an early age); 2) the standards are too process oriented and vague, and 3) the explanations of how to reach a problem are far too complex. Others (OSPI staff and teachers) assert that the Washington standards provide students with the conceptual framework they need to understand and perform mathematics, but that some tweaking of the standards, EARLs and GLEs may be needed to address issues such as computational fluency.

Another topic Board members heard about is that Washington's standards do not meet "international standards". **International standards** are loosely defined, but usually refer to those of countries where students do well on international tests such as Singapore and China Taipei. Studies of these countries show that there is less breadth and more depth to their standards. Measures for international success are benchmarked to the TIMSS (Trends in International Mathematics and Science Study)[4], which is given to students in 4^{th}, 8^{th}, and 12th grade equivalents in 46 countries including the U.S. In 2003 the U.S. students in 8^{th} grade mathematics ranked "14^{th}" with students in Singapore, Korea Republic, Hong Kong, China Taipei, and Japan ranking 1^{st} through 5^{th}. The students in these top ranking countries are more homogeneous with different cultural expectations for succeeding in mathematics than in the U.S.

The Program for International Student Assessment (PISA)[5] is another assessment, which focuses on 15-year-olds' capabilities in mathematics literacy with a focus on real world material. "In 2003, U.S. performance in mathematics literacy and problem solving was lower than the average performance for most Organization for Economic Cooperation and Development (OECD) countries[6]. The United States also performed below the OECD average on each mathematics literacy subscale representing a specific content area (space and shape, change and relationships, quantity, and uncertainty)."[7]

While concerns are expressed about how our students perform as a whole with other countries, Washington students are at or above average in performance compared to other states based on **national tests**. There are many caveats with how to interpret this data

4 The Trends in International Mathematics and Science Study (TIMSS) was developed by the International Association for the Evaluation of Educational Achievement (IEA) to measure trends in students' mathematics and science achievement. Offered in 1995, 1999, and 2003, TIMSS provides participating countries with an opportunity to measure students' progress in mathematics and science achievement on a regular 4-year cycle. Through participation in TIMSS, the United States has gained reliable and timely data on the mathematics and science achievement of our students compared to that of students in other countries. The next cycle of TIMSS is scheduled for 2007. http://nces.ed.gov/timss/faq.asp

5 PISA measures things differently than other assessments. PISA emphasizes the application of knowledge by presenting students with tasks that involve interpretation of real-world material as much as possible. These tasks reflect the underlying assumption of PISA: as 15-year-olds begin to make the transition to adult life, they need to know not only how to read, or particular mathematical formulas or scientific concepts, but also how to apply this knowledge and these skills in the many different situations they will encounter in their lives.PISA also measures different things than other assessments. PISA content is not drawn specifically from school curricula, but rather from broad content areas reflecting the knowledge young people will need for their futures. PISA also assesses a different age level than other studies. PISA's focus on age 15 allows countries to measure outcomes of learning that reflect both societal and education system influences, and measure students' preparedness for adult life as they near the end of compulsory schooling. http://nces.ed.gov/surveys/pisa/faq.asp?FAQType=2

6 Countries with a commitment to democratic government and market economy.

7 http://nces.ed.gov/surveys/pisa/pisa2003highlights_2.asp

depending on who takes the test and the difference in what actual scores means, so please treat these gingerly. Washington ranked 25th for SAT scores (both verbal and mathematics) for 2006, however it is vital to note that the students in states who ranked above Washington had less than 30% of their students taking the test. (Washington had 54%.). Massachusetts ranked 29th (testing 85% of their students) and California ranked 35th (testing 49% of their students). Washington's 8th graders were slightly above average for the NAEP mathematics scores for 2005. California 8th graders were below average and Massachusetts 8th graders were above average and higher than Washington students.[8]

Some of the studies and articles that provide critical reviews of Washington standards and curriculum as well as other states are highlighted below:

- Bill Schmidt (Director of the U.S. National Research Center for TIMMS) in reviewing TIMMS data finds that math and science content in the U.S. is a long laundry list of seemingly endless topics that are "highly repetitive, unfocused, unchallenging, and incoherent, especially in the middle grades."[9]

- The Achieve study in 2004 "How Do Washington's Graduation Tests Measure Up?" found that: 1) the 10th grade WASL was not overly demanding; 2) tests need to be strengthened over time to better measure the knowledge and skills high school graduate need to success in the real world, and 3) Washington needs to develop a more comprehensive set of measures beyond the WASL "on demand" test. Specifically on mathematics, the report says, " even though in the case of the WASL the mathematical content of the items may not be as advanced as that on other state tests, the format of the questions may be challenging for student because there is not a set of answers to choose from. In addition some of the times require a substantial amount of reading and students often have to work through multiple steps to answer[10] the questions."

- The Fordham Foundation gives Washington mathematics standard an "F" because "they are poorly written, unclear, and needlessly long, often have little apparent connection with math. Students focus too much on their own invented algorithms and using calculators. Algebra and geometry are seriously deficient."[11] It grades California, Indiana, and Massachusetts Mathematics standards as "A" because of their clear and rigorous standards; students can demonstrate the ability to master the basic number facts and have facility with the standard algorithms of arithmetic, demonstrate strong mathematical reasoning, and do not overly rely on manipulatives and calculators.

8 http://nces.ed.gov/programs/stateprofiles/

9 A Coherent Curriculum: The Case of Mathematics. American Educator Summer 2002

10 How Do Washington's Graduation Tests Measure Up? Achieve Inc. 2005 p. 35

11 http://www.edexcellence.net/doc/Washington.pdf

The **Washington Assessment for Student Learning (WASL)** is a one time test (although students can take it up to five times) to measure how our students do in meeting the mathematics standards for 10th grade. Students receive credit both for the correct answer and for showing how their work was used to obtain the answer. Washington has provided alternative assessments for students who do not meet the WASL standard through the Collection of Evidence portfolios, the GPA/WASL comparison and the PSAT, SAT, and ACT/WASL comparison. The National Technical Advisory Committee and the State Board of Education determined that the WASL for 10th grade mathematics and the Collection of Evidence[12] are reliable and valid. If Washington decides to change its standards, the revision process would take at least one year with another two-three years to create a new assessment that is reliable and valid.

While the current mathematics WASL is deemed valid and reliable, questions remain about whether our students have had sufficient opportunity to learn with the current curricula available and teacher expertise in mathematics. In Washington, there is **no standard curriculum** school districts must follow unlike states such as California or Texas. It is up to the local school board to adopt the curriculum it finds most appropriate for its students. On average, school districts spend approximately $200 million to adopt new curriculum in all subjects each year. There is no earmark amount for curriculum in the apportionment formula the state uses to fund schools (although there is funding provided to fund all non-employee related cost such as utilities, books, computers, and supplies).

Currently OSPI provides a K-12 Instructional Materials Review, which examines publishers' materials and rates them for how they align with Washington's standards. Based on the review of 12 different high school texts and instructional materials (which were submitted by the publishers) that OSPI did in January 2006, less than half of the materials were rated highly in terms of how they aligned with our mathematics grade level expectations[13]. Teachers may be using supplementary materials that have more alignments.

According to reports from school districts and OSPI, **classroom time** allocated for mathematics may be insufficient. For example, students spend one class per day mathematics. In a recent survey OSPI found that middle school teachers spent an average of 35-50 minutes a day teaching mathematics. Some districts and schools rely on WASL Wednesday or only spend a week. In addition, there is little time for teacher to plan collaborative for quality lessons and examine student work.

Teacher Quality

A second area of concern is that some mathematics teachers lack the understanding of state standards in mathematics. Countries such as Singapore and China have different

[12] "Analysis and Recommendations for Alternatives to the Washington Assessment of Student Learning" report by Linda Darling-Hammond September 2006 also found that all of the alternative assessments hold promise for including in a multiple measures system. http://www.schoolredesign.org/

[13] http://www.k12.wa.us/CurriculumInstruct/K12InstructionalMaterialsReview.aspx

teacher preparation and development than the U.S. Math skills required to teach are higher for elementary school teachers in Singapore. By 3rd grade, China has math specialist teachers. Professional development provided to mathematics teachers is higher (100 hours a year in Singapore). In the U.S. teachers particularly in the middle school may be teaching without a mathematics endorsement. High school teachers with an endorsement in science may teach mathematics The PESB has done significant work in reexamining the standard for middle school mathematics teachers and K-8 endorsed teachers. However, there is variability across the 22 Washington teacher preparation programs about the amount of mathematics needed for elementary and middle school teachers.

Currently, there is no statewide data system ready to provide the types of teachers who are teaching outside their endorsment area in mathematics. The state must rely on field reports to obtain the information. Thus we do not know systematically whether students in rural or poor urban schools have fewer qualifed teachers for mathematics. Some teachers do not have a clear knowledge of how students learn mathematics and how to diagnose and intervene with their deficits.

Graduation Requirements

You have heard from people that the amount of mathematics students take in high school is not sufficient for them to meet the standards.

There is a strong connection between how much mathematics a 10th grader takes and how well she or he does on the WASL. For example, the Olympia school district shared with you that 94% of the students who took algebra I, geometry, and algebra II met the 10th grade mathematics standard when they took the WASL as opposed to 24% who had only taken pre-algebra and algebra I. However, there are other skills and knowledge not taught in these courses that students need to have to meet the standard such as probability and statistics.

Currently **Washington's high school graduation requirements for mathematics** are two credits with no specificity for content or competencies[14]. 27 states require three or more credits, 20 of those require some specific courses (typically Algebra I and Geometry). In a 2005 State Board of Education survey, 60 districts (35%) of the 170 who responded said that they require 3 credits of mathematics for graduation.

There continues to be some pressure on states with exit exams required for students to receive high school diplomas. The Center for Education Policy's report on "State High School Exit Exams: A Challenging Year" found that 22 states in 2006[15] required students to pass an exit exam to receive a high school diploma. The Center maintains: 1) the controversy about exit exams diminishes after diplomas are withheld for several years, 2)

[14] Although the requirement for the Certificate of Academic Achievement to meet the 10th grade mathematics standards implies competencies in certain knowledge and skills.
[15] The number will be 25 by 2012, including Washington.

states provide additional ways for students to obtain a diploma, and 3) state funding for remediation decline after exam requirement is in effect for several years.

One major project nationwide sponsored by Achieve, Inc. is under way to address these issues is The American Diploma Project (ADP) Network, which is a coalition of 26 states dedicated to aligning K–12 curriculum, standards, assessments and accountability policies with the demands of college and work. Based on their surveys and research, they maintain that "employers and college leaders say that graduates from high school need to master higher-level mathematics and communications skills than ever before. New research reveals that the best ticket for student success in work or future learning is taking high school courses in math beyond Algebra II and advanced courses in English and science. But few states expect students to take these courses or master these skills." were significant gaps in their preparation. Professors and employers agree, estimating that four out of 10 graduates are not ready for college or employment."

55% of our high school graduates students[16] go on to post secondary directly from high school. The other 45% will not go to college directly. Should we expect our high school mathematics graduation requirements to be the same? Several studies provide conflicting advice. In a recent study by the Educational Testing Services, " High School Reform and Work: Facing Labor Market Realities" by Paul Barton. The report says that to earn a middle class wage in the United States, a ninth grade level of mathematics (and reading) is needed.[17] A study by ACT "Ready for College and Ready for Work: Same or Different" recommends that "high school students need to be educated to a comparable level of readiness in reading and mathematics whether they are attending college or going to work"[18]. Students should be ready and have the opportunity to take a rigorous core preparatory program in high school.[19] There are other researchers who have looked at this issue- Uri Treisman at the University of Texas Dana Center and Cliff Adelman from the U.S. Department of Education who say that more rigorous mathematic in high school pays off in terms of college preparation and performance.

All of this assumes that our students graduate from high school. Nationally only 70 out of students in ninth grade[20] will graduate from high school on time, 40 will go to college, and 34 will graduate prepared for a four-year college. For African American and Hispanic students: only about half of African Americans (51.6 percent) and Hispanics (55.6 percent) graduate from high school with their freshman classmates. These students are even less likely to take challenging mathematics course. Of the 1.3 million U.S. students who took an Advanced Placement (AP) exam in 2006, 6 percent identified themselves as

[16] Washington State University's Graduate Follow Up Study 2004- please note this study only tracks students on whom they have social security numbers which is about two thirds of the students who graduate. http://www.sesrc.wsu.edu/gfs/GFS_Reports/reports_by_class.asp

17 High School Reform and Work: Facing Labor Market Realities by Paul Barton Educational Testing Services June 2006

18 Ready for College and Ready for Work: Same or Different. ACT 2006 p.1

[19] Ready for College and Ready for Work: Same or Different. ACT 2006 p.2

[20] The Washington Institute for Public Policy 2005 report on high school graduates also found that 70% of Washington high school students who started in 9th grade graduate and that this percentage has been static for 40 years.

African American (less than half of the 14 percent of 2004 seniors who were African American), 12.7 percent as Hispanic (equivalent to their 13.8 percent of 2004 seniors), and 0.5 percent as Native American (less than their 1.2 percent of 2004 seniors). [21] The Manhattan Institute for Policy Research found that only 32% of the students who graduate from high school are prepared to attend a four-year college[22]. Those from African American and Hispanic students are even less ready to attend a four-year college. If we raise our standards for more rigorous mathematics, what strategies do we need in place to help struggling students?

Currently our public baccalaureate institutions require high school students who plan to attend to take 3 credits of mathematics, including algebra, geometry and advanced mathematics. The six baccalaureates have a common placement test. The community college and technical colleges have three different placement tests students can take. Students need to pass Algebra II on one of the above tests or else they will need to take a remedial course.

Interventions

School districts receive funding through federal programs (Title I of the Elementary and Secondary Act) and state programs (Learning Assistance, Initiative 728 Funding, and Promoting Academic Success "PAS"). At this point I can tell you that the legislature provided PAS Program with $28 million ($990 for each student) to provide extended learning opportunities for students who have not met the standards on the 10th grade WASL. In addition, the legislature provided $25 million in additional funding for LAP students who also did not meet the 10th grade WASL.

OSPI has created learning modules for teaching mathematics during summer school. The purpose of the summer school class was to help students develop the mathematical skills necessary to meet standard on the WASL. The activities were aligned with the EALRs and GLEs, along with the item characteristics that define the WASL. Assessment questions were also included. Approximately 4300 students participated in a PAS mathematics intervention this summer. OSPI is still analyzing the data (as is the Washington State Institute for Public Policy) to determine if the interventions made a difference in the number of students who passed the August WASL retakes. Note: Federal Way district results look promising.

One critical area that does not get a lot of attention, but could significantly help students is the use of regular in class assessments of student work to determine their progress. Many teachers lack the tools to do ongoing appropriate diagnosis and target intervention opportunities.

21 http://www.collegeboard.com/press/releases/150224.html;

22 http://www.manhattan-institute.org/cgi-bin/apMI/print.cgi

The above discussion provides a very high level overview of some complex issues, but still boils down to the need for our K-12 system to work with higher education and early learning to develop a comprehensive strategy to align standards, curriculum, assessments, teaching skills and knowledge, high school requirements and interventions. A first step is proposed through the Joint Action Plan proposed by the State Board of Education, the Office of the Superintendent for Public Instruction and the Professional Standards board as well as our education partners. As a part of our work, this joint action plan, must set up ways we will measure our progress through selected performance indicators that can let us know if we are on track. This diagnostic tool will provide a feedback loop and hold us accountable for our work.