

## **EXCELLENCE IN MATH AND SCIENCE**

### **BACKGROUND**

The SBE is deeply committed to the improvement of math and science achievement, as evidenced by its:

- Review of the math and science standards.
- Review of OSPI's recommended curriculum materials aligned to those standards.
- Addition of one credit of mathematics to the state graduation requirements, and the prescription of the content of those credits.
- Support of the state assessment program and its role in establishing the cut scores on the state assessments, including the math and science assessments currently required for graduation for the class of 2013.
- Support of the development of a new model course that would provide an alternative Algebra II pathway in an applied career and technical education context.

Student performance on the math and science state assessments continues to be a concern of the Board, as the percentage of students meeting proficiency in these subjects is much lower than the percentage of students meeting proficiency in reading and writing. Sophomore pass rates<sup>1</sup> in the past five years provide evidence of this trend.

**Percentages of All Students Meeting Standard on the Washington Assessment of Student Learning**

Year	Math	Science	Reading	Writing
2008-09	45.4	38.8	81.2	86.7
2007-08	49.6	40.0	81.8	86.8
2006-07	50.4	36.4	80.8	83.9
2005-06	51.0	35.0	82.0	79.8
2004-05	47.5	35.8	72.9	65.2

### **Strategic Initiatives to Address Math and Science Achievement**

The Office of Superintendent of Public Instruction (OSPI) is taking multiple steps to address math and science achievement. The superintendent will request legislative action to make policy changes to amend the state's graduation requirements in math and science. The Superintendent's recommended changes are included in Attachment A.

OSPI is also recommending a series of systemic actions to improve student achievement. These recommendations are included in Attachment B. Deputy Superintendent, Alan Burke, will address these issues in his presentation at the January meeting.

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<sup>1</sup> Sophomore pass rates under represent the number of students who demonstrate proficiency by the time of graduation. Students may also meet proficiency through retakes or achievement on alternatives to the state assessment (e.g., collection of evidence, ACT/SAT, etc.).

### **Third Credit of Math**

When the SBE added the third credit of math, it stipulated that the third credit should be Algebra II, Integrated Math III, or a course “based on a career oriented program of study identified in the student's high school and beyond plan that is currently being pursued by the student.” Students who elected the latter option would need to meet with a high school representative and parent to discuss the student’s post high school plans and the admission requirements of postsecondary institutions, with the goal of determining a high-school level math course that best fits with the student’s goals. All parties attending the meeting must sign a form to verify that the meeting has taken place, the designated information has been discussed, and the alternative course is appropriate to the student’s goals.

SBE staff will be working, in collaboration with OSPI mathematics and Career and Technical Education (CTE) staff, in the coming months to provide guidance to school districts seeking to identify rigorous, high school level course alternatives to Algebra II/Integrated Mathematics III that qualify for the third math credit. New courses may be developed or existing courses redesigned to take into consideration the state’s new math standards and/or the common core standards being developed nationally. A list of the CTE courses currently under consideration as candidates for the third credit of math can be found in Attachment C.

In addition, the SBE, in collaboration with OSPI and the State Board of Community and Technical College’s Transition Math Project, has supported the development of a proposal for a new model course that would provide an alternative Algebra II pathway in an applied, career and technical education (CTE) context. Students opting for this course as a third credit of math might not choose to pursue a traditional pre-calculus/calculus route. However, the course could serve as a bridge to higher levels of math, should students choose to pursue them.

Math and CTE educators, supported largely by Gates funding, met over five days in August and December 2009 to envision the course and develop the skeleton of a proposal (see Attachment D). One objective of the CTE leadership involved in developing the course is to provide a rigorous alternative to the third credit of mathematics that would not require students to engage in the elective process currently outlined in rule and described above. Once the course is developed, the SBE will need to review it and determine whether such a policy change is warranted.

The Transition Math Project (TMP) has asked the Gates Foundation to allow it to direct unexpended funds from the TMP grant toward the development of this course. If that request is denied, SBE and OSPI staff will pursue other funding possibilities.



## **Mathematics and Science Graduation Requirements**

Recommended Changes by State Superintendent of Public Instruction Randy Dorn

### **Key Background**

The class of 2013, current ninth graders, will be first to be required to pass all state assessments: reading, writing, math and science. However, new content standards for math and science will not be assessed until 2011 and 2012, respectively. That doesn't give students sufficient time to learn the standards that will be measured on the assessments.

### **Recommended Policy Revisions**

State Superintendent of Public Instruction Randy Dorn will request the 2010 Legislature to:

#### **Mathematics**

1. Students in the classes of 2013 and 2014, in order to be eligible to graduate, must:
  - a. Meet standard on the two high school end-of-course math assessments, or state-approved alternatives; OR
  - b. Earn two math credits after 10<sup>th</sup> grade.
  
2. Students in the classes of 2015 and beyond, in order to be eligible to graduate, must:
  - a. Meet the proficiency level on both end-of-course assessments; OR
  - b. Meet the basic level on both end-of-course exams and earn four math credits.
  - c. Students who do not meet basic on both end-of-course exams would be provided multiple opportunities to meet basic by re-testing on a comprehensive exam or by using one of the state-approved alternatives, such as the collection of evidence, SAT, ACT, and AP course exams or a GPA comparison).

#### **Science**

1. Replace the current comprehensive high school science assessment with end-of-course assessments in life sciences and physical sciences.
2. Postpone the current graduation requirement until the class of 2017.
3. In 2015, evaluate whether students have had sufficient opportunity to learn the standards and whether the end-of-course assessments should be required to graduate, beginning with the class of 2017.

#### **Rationale**

##### **Standards, Instructional Material and Classroom Instruction**

Major changes have occurred – and continue to occur – in our state's math and science learning standards and assessments. Those changes will require significant differences in what teachers must teach, what instructional materials should be used, how students are assessed, and our expectations of what students should know and be able to do. The current graduation timeline presents a major concern because:

- The high school math and science standards are being distributed for the first time during the 2009-10 school year, yet students will be expected to demonstrate that they know the core concepts in the learning standards.
- Many school districts do not have the financial resources to purchase new textbooks and other instructional material that are aligned to our new math and science standards.
- The time being devoted to teaching science in elementary school is not sufficient and needs to be increased if we expect students to meet standard in middle and high school.

### **Assessments**

The new math end-of-course tests and a new comprehensive high school math test are under development and will not be administered until spring 2011. Many students in the classes of 2013 and 2014 will have already taken Algebra I or Integrated Math I at least one or two years earlier. This creates a concern because:

- Students may not perform as well on the comprehensive Algebra I/Integrated I test they will need to pass to be eligible to graduate.
- The percentage of students who will be able to take the end-of-course tests in the same school year they actually have taken the course will not increase significantly until the class of 2015.

It also is important to note that teachers have an incentive to ensure their students perform well on the state assessments. With end-of-course assessments, there is a direct link between their instruction and how well students perform on the assessment. This will not be the case with the comprehensive math test, which will be the assessment used by many students in the classes of 2013 and 2014.

For science, the legislature has not yet decided whether to continue with a comprehensive science assessment or move to end-of-course assessments. This decision is fundamental to the timeline and instructional strategies needed for implementing the science graduation requirement. If it is decided to continue to use a comprehensive assessment with the new standards, it will not be available to be administered until spring 2012, when those in the class of 2013 are in 11<sup>th</sup> grade.

### **Instructional Materials and Professional Development**

Teachers need proper professional development to better understand and apply the revised math and science standards in their classrooms. In addition, we must ensure that high school math and science teachers have the instructional materials needed to teach the revised standards. This will likely require that the state assist school districts in the purchase of new, aligned textbooks and instructional materials.

### **Legal Considerations**

The courts have ruled on numerous occasions that states may require students to pass state-level assessments to graduate, but must ensure:

1. That the assessments are reliable and valid.
2. That students have an opportunity to learn the skills and knowledge being assessed.

Given the issues identified above, we are concerned that students will not have ample time to learn the skills and knowledge necessary to perform well on the state assessments.



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## SUPERINTENDENT OF PUBLIC INSTRUCTION

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### OSPI Recommendations for Improving Student Achievement in Math and Science

**Recommendation #1:** Focus on improving core classroom instruction in mathematics and science.

- A. Align state standards and assessments in mathematics and science (using Common Core Standards in mathematics and revised Washington K-12 Science Standards as foundational standards documents) and provide funds to support the purchase of textbooks and instructional materials that are highly aligned to standards in math and science.

**Rationale:** Adopting the common core standards will allow Washington to become “bigger”—we now comprise just two percent of the nation’s population—and therefore attract more attention from textbook publishers and instructional material suppliers.

Adoption of the common core in mathematics will allow teachers and curriculum specialists to spend more time developing teaching strategies and improving pedagogy, and less on gap-filling.

If standards, assessment, curriculum and professional development are aligned, OSPI should conduct regular instructional materials alignment reviews. Publisher materials that meet a rigorous alignment standard should then be purchased through state funding sources.

The common core standards do not include science, but a similar effort is being undertaken by the National Science Teachers Association.

**Funding Source:** RTTT in the short run; QEC/legislative action needed for long term support.

**Legislative Action/s:**

Standards adoption: None required, but stakeholder buy-in is crucial to implementation. Plans have been made to seek legislative approval for state adoption of Common Core Standards.

Aligned instructional materials: Textbooks, instructional materials, and alignment reviews are expensive. The QEC will need to value this highly in order for implementation of a state sponsored textbook purchasing plan.

- B. Develop an online, formative assessment system for math and science that will (1) inform instruction and (2) identify student strengths and weaknesses on skills necessary for success on the MSP and HSPE, and link to instructional resources designed to remedy weaknesses. Information would be available to teachers, students and parents.

**Rationale:** The need for a robust and technologically strong assessment system is well known.

Such a system must contain both a summative and formative component.

Providing assessment instruments that will allow teachers to focus on deficiencies will be helpful, particularly with online assessments that provide rapid feedback.

**Funding Sources:** Currently a \$4M formative assessment proviso that covers the 2009–11 biennium is available. RTTT in the short run, and then QEC/legislation.

**Legislative Action:** A reauthorization of the ESSB 5414 will be necessary for the 2011–13 biennium, with a richer funding stream needed for full implementation in math and an expansion into science.

**Recommendation #2:** Increase the number and quality of entering math and science teachers by improving the pre-service training of, particularly, elementary school teachers, and by streamlining the rules that govern granting teaching certification for math and science professionals who have a desire to change careers and enter teaching.

**Rationale:** Elementary school teachers often enter the profession with a lack of expertise in teaching math and science. Incentives to earn endorsements beyond elementary reading/language arts will be designed to increase the supply of elementary teachers with math/science expertise.

STEM professionals—especially those in the early stages of careers—and STEM majors in colleges and universities should be encouraged to enter the teaching profession in a manner that minimizes time and expense in earning a teaching certificate.

**Funding Source:** None necessary in the short run. RTTT could support the implementation of new legislation.

**Legislative Action:** OSPI will work with the Professional Education Standards Board (PESB) on any changes that would require legislation or administrative code modifications.

**Recommendation #3:** Science should be taught a minimum of 100 minutes per week in grades 1 and 2, 150 minutes per week in grades 3–5, and 200 minutes per week (or one instructional period per day) in grades 6–8.

**Rationale:** Evidence shows that many of Washington’s elementary teachers do not teach science on a daily basis. Publishing minimum science teaching-time guidelines should boost interest in addressing this problem.

**Funding Source:** None in the short run. However, if more science means a lengthening of the school day, significant costs would ensue. In that case, legislative action would be necessary.

**Legislative Action:** None required for a recommendation.

**Recommendation #4:** Support district implementation of stronger math and science programs by increasing professional development of teachers through leveraging public and private resources to expand statewide system improvement initiatives.

- The current system of providing math and science coaches should be given increased emphasis and made more widely available. Coaches, eventually, should be chosen based in large part on results from their teaching evaluations using a new, more robust evaluation system. National Board Certified Teachers also should be considered for coaching positions.
- Support widespread implementation of the Mathematics System Improvement Framework that is currently being utilized with districts in improvement and that is based on our statewide systems approach to improving reading instruction (K-12 Reading Model) and a Response to Intervention approach for providing individualized student academic support.

- Promote the expansion of existing private/public partnerships (e.g., LASER) that provide teacher resources linked to math and science, and work collaboratively with the management of the new Partnership for Learning/STEM Center to disseminate best practices to the field.
- Support the development of CTE equivalency courses that are aligned to standards in math and science.
- Provide compensatory instruction in math and science after school and during the summer.
- Expand the BEST program and/or similar induction/mentoring programs to assist new math and science teachers.

**Rationale:** Existing resources and programs that promote math and science should be given appropriate notice in the field, and should be fully utilized.

**Funding Source:** Existing legislatively-approved provisos, RTTT, and available public and private grants in the short run. QEC/legislation in the long run.

**Legislative Action:** CTE is supported through basic education state funding and federal Perkins monies. Therefore, CTE programs are always subject to legislative/congressional modifications. LASER, a significant public/private partnership in the state, is partially funded through state proviso monies, which are also subject to change. Private funders and grant providers often ask for state or local matching monies, which may require legislative support. Existing compensatory programs like LAP and Title I are expensive and need legislative/congressional approval in the short and long run.

**Recommendation #5:** Introduce policy initiatives that will support new programs designed to promote early learning in math and science.

- Develop a math training program for early learning providers that focuses on numbers, geometry/spatial thinking, and measurement.

**Rationale:** Early learning programs exist that focus attention on reading and literacy, but few focus on numeracy. Preschool math awareness programs can be aimed at the 50 percent of preschool children who attend some out-of-home care.

Many in the early learning workforce are not aware of what young children are capable of mathematically and do not recognize their potential to learn mathematics. Therefore, the establishment of a preschool/daycare provider and parent training program to address this problem is important.

**Funding Sources:** None are available in the short run other than RTTT for early learning. QEC/legislation, private support, and possible federal funds associated with the reauthorization of ESEA may be available in the long run.

**Legislative Action:** The early learning proposal is a new idea that will need legislative sponsorship.

**Recommendation #6:** Make it easier for districts to join multi-district cooperatives for the purposes of beginning a STEM focused high school irrespective of existing district boundaries, and continue to promote program development at skill centers that focus on STEM-related training.

**Rationale:** Bureaucratic impediments to forming multi-district STEM high school programs should be eliminated.

STEM high schools should be granted additional funding to support specialized programs.

Vocational Skill Centers should be encouraged and incentivized to develop rigorous math and science programs (e.g., Digipen, AP Environmental Science).

**Funding Sources:** RTTT in the short run and QEC/legislation in the long run.

**Legislative Action:** Legislative sponsorship and support will be necessary for this recommendation to be implemented.

## **CTE MATHEMATICS**

*The development of Career and Technical Education as a method of delivery for rigorous mathematics is vitally important to the preparedness of students for career and college. Through locally determined course equivalencies and through a variety of CTE courses that embed principles and practices of mathematics, CTE Mathematics is a growing option for students. There are numerous local examples of courses that provide enriching mathematics to students. Many of these courses provide mathematics credit through equivalency crediting, while other courses provide direct CTE Mathematics credit.*

*Below is a list of ongoing efforts to provide a strong mathematics education in career and technical education.*

### **Technical Mathematics for the Trades**

Presented to the Office of Superintendent of Public Instruction in September 2009, "The Building Trades Multi-Craft Core Curriculum," is an innovative training program that provides a gateway from high school or community college to labor-and-management registered apprenticeships. The curriculum has a math component that may be appropriate for students as a one semester course prior or concurrent to entering pre-apprenticeship or technical sciences advanced training programs. Terri Pablo (North Thurston School District) is working with mathematics specialists in her district to determine the alignment of this course with Washington state standards. If sufficient alignment exists, along with potential supplements, the course may be available for districts as early as 2010-11.

### **Financial Fitness / Financial Math**

The Financial Fitness framework was released by OSPI in August 2009, and professional development was offered in August and October. The original framework was written for 90 hours as a financial literacy course, but could be locally adapted to a 180 hour course with a greater focus on algebraic content. The course content has been aligned with the Algebra I Washington state standards. Districts could choose to offer equivalency credit for this course but they must require students to take the end of course exam. In its current form, particular attention would need to be made in addressing quadratic equations to fully prepare students for the exam. Districts could choose equivalency credit for Algebra I, or they could adapt the Financial Literacy framework into a 180 hour Financial Math 3<sup>rd</sup> year option. Further professional development will be offered in the summer of 2010.

### **Advanced Placement Statistics**

AP Statistics is being explored as a possible 3<sup>rd</sup> year math option for students pursuing a post-high school plan in business. A workgroup will be formed at the end of the first quarter of 2010, and the framework will be developed during second quarter 2010. The pilot and implementation timeline will be coordinated with the AP program supervisor at OSPI.

### **Accounting**

Accounting is a 3<sup>rd</sup> year math option used by some districts for students pursuing a post-high school plan in business. In 2007, 1<sup>st</sup> and 2<sup>nd</sup> year Accounting were merged into one CIP code. During the first quarter of 2010, the curriculum and model framework will be reviewed and updated to reflect the change in CIP code. The revised framework will be aligned to Washington state standards. Further professional development will be offered in the summer of 2010 around Accounting.

### **Business Math**

Business Math is a third year math option used by many districts for students pursuing a business or marketing post-high school plan. During the first quarter of 2010, the curriculum and model framework will be reviewed and updated, including alignment to Washington State standards. Further professional development will be offered in the summer of 2010 around Business Math.

### **Applied Mathematics**

Applied Mathematics, developed by the Center on Occupational Research and Development (CORD) <http://www.cord.org/>, has existed in Washington since 1988. The Washington Applied Mathematics Council (WAMC) is continually working on the alignment of the course with Washington state mathematics standards, much the same as other mathematics programs continually develop. The course is heavily dependent upon demonstrations and instructor-developed lessons and materials. This work is shared on the WAMC web site <http://wa-appliedmath.org/>.

### **Algebra II Applications / CTE**

Algebra II Applications is a collaborative effort between OSPI, the State Board of Education (SBE), and the State Board of Community and Technical Colleges to develop an Algebra II “applications” course for students who have completed Algebra I and Geometry or Integrated Mathematics I and II, but prefer a context-driven math curriculum. The course would be for students who enjoy creating and completing mathematically based products. Once developed, the course would be submitted to the SBE for consideration as an alternative third credit of mathematics that would not require students to pursue the election process. The timeline for this course is to have the scope of the course and the development of the modules by the spring of 2010. The goal is to provide professional development in August of 2010. The course will be piloted during the 2010-2011 school year to refine the modules. The expectation is that the course will be ready for full implementation in September, 2011.

### Conceptual Framework for Alternative Algebra II Pathway Course

<b>Working Title of Course:</b>	<i>Algebra II Applications</i>
<b>Intended Audience:</b>	<ul style="list-style-type: none"> <li>▶ Students who have completed Algebra I or Integrated Math I and Geometry or Integrated Math II.</li> <li>▶ Students who prefer a context driven math curriculum.</li> <li>▶ Students who enjoy creating mathematically based products or completing mathematically based projects.</li> <li>▶ Students whose career interests require this type of mathematical reasoning.</li> </ul>
<b>Background/Current Law:</b>	<p>The state of Washington has increased the mathematics requirement from two to three credits and specified the content of the credits: Algebra I, Geometry, and Algebra II (or Integrated Mathematics I, II, and III) for the graduating class of 2013. Students may elect an alternative third credit of mathematics that meets their education and career goals as outlined in their high school and beyond plan. In order to elect this credit, the student must meet with a parent and high school representative for the purpose of discussing the student's high school and beyond plan and the requirements for credit-bearing courses at two- and four-year colleges.</p>
<b>Purpose:</b>	<p>There are a significant number of high school students who may be interested in a contextualized form of instruction for their third year of study. These students would benefit from an alternative third year experience based on the standards for Career and Technical Education. The purpose of this course is to:</p> <ul style="list-style-type: none"> <li>• Maintain and extend prior mathematical knowledge.</li> <li>• Enhance students' application of process skills.</li> <li>• Encourage development of academic discipline and a positive attitude toward learning mathematics.</li> <li>• Connect mathematics with varied student interests.</li> <li>• Keep students engaged in learning.</li> <li>• Ensure a seamless transition to further education (and mathematics classes) and the workplace.</li> </ul> <p>A primary goal of developing this course is to enable students to achieve mathematical proficiency. Students are expected to understand the knowledge described in the learning targets and in the process standards at a depth that enables them to reason with that knowledge—to analyze, interpret and evaluate mathematical problems, make deductions, and justify results. The content standards are meant to be used strategically and adaptively to solve problems. Students' knowledge and skills come to life and take their value when melded with the ways they approach mathematics in this problem-based course.</p> <p>This course would be submitted to the State Board of Education for consideration as an alternative third credit of mathematics that would not require students to pursue the election process outlined in the</p>

	Background/Current Law section.
<b>Student Attributes:</b>	<p>This course will actively promote and teach the Student Attributes as described in the Washington College Readiness Standards. A student in this course will:</p> <ul style="list-style-type: none"> <li>• Demonstrate intellectual engagement.</li> <li>• Take responsibility for own learning.</li> <li>• Persevere when faced with time-consuming or complex tasks.</li> <li>• Pay attention to detail.</li> </ul>
<b>Major Math Topics:</b>	<ul style="list-style-type: none"> <li>• Modeling non-linear functions and systems.</li> <li>• Solving non-linear functions and systems.</li> <li>• Algebraic transformations and inverse variation.</li> <li>• Data analysis and statistical representation.</li> </ul>
<b>Learning Targets:</b>	<p>A2.1.A Select and justify functions and equations to model and solve problems.</p> <p>A2.1.B Solve problems that can be represented by systems of equations and inequalities.</p> <p>A2.1.C Solve problems that can be represented by quadratic functions, equations, and inequalities.</p> <p>A2.1.D Solve problems that can be represented by exponential and logarithmic functions and equations.</p> <p>A2.3.A Translate between the standard form of a quadratic function, the vertex form, and the factored form; graph and interpret the meaning of each form.</p> <p>A2.3.B Determine the number and nature of the roots of a quadratic function.</p> <p>A2.3.C Solve quadratic equations and inequalities, including equations with complex roots.</p> <p>A2.4.A Know and use basic properties of exponential and logarithmic functions and the inverse relationship between them.</p> <p>A2.4.B Graph an exponential function of the form <math>f(x) = ab^x</math> and its inverse logarithmic function.</p> <p>A2.4.C Solve exponential and logarithmic equations.</p> <p>A2.5.A Construct new functions using the transformations <math>f(x - h)</math>, <math>f(x) + k</math>, <math>cf(x)</math>, and by adding and subtracting functions, and describe the effect on the original graph(s).</p> <p>A2.5.D Plot points, sketch, and describe the graphs of cubic polynomial functions of the form <math>f(x) = ax^3 + d</math> as an example of higher order polynomials and solve related equations.</p> <p>A2.6.E Determine if a bivariate data set can be better modeled with an exponential or a quadratic function and use the model to make predictions.</p> <p>A2.6.F Calculate and interpret measures of variability and standard deviation and use these measures and the characteristics of the normal distribution to describe and compare data sets.</p> <p>A2.6.G Calculate and interpret margin of error and confidence intervals for population proportions.</p> <p>A2.7.A Solve systems of three equations with three variables.</p> <p>A2.8.A Analyze a problem situation and represent it mathematically.</p> <p>A2.8.B Select and apply strategies to solve problems.</p> <p>A2.8.C Evaluate a solution for reasonableness, verify its accuracy, and</p>

	<p>interpret the solution in the context of the original problem.</p> <p>A2.8.D Generalize a solution strategy for a single problem to a class of related problems and apply a strategy for a class of related problems to solve specific problems.</p> <p>A2.8.E Read and interpret diagrams, graphs, and text containing the symbols, language, and conventions of mathematics.</p> <p>A2.8.F Summarize mathematical ideas with precision and efficiency for a given audience and purpose.</p> <p>A2.8.G Use inductive reasoning and the properties of numbers to make conjectures, and use deductive reasoning to prove or disprove conjectures.</p> <p>A2.8.H Synthesize information to draw conclusions and evaluate the arguments and conclusions of others.</p>
<b>Career Cluster Focus:</b>	<p>Architecture and Construction</p> <p>Finance</p> <p>Health Science</p> <p>Information Technology</p> <p>Manufacturing</p> <p>Marketing</p> <p>Science, Technology, Engineering and Mathematics</p>
<b>Sample Units of Study:</b>	<p><i>My Ten Year Plan</i> (modeling of non-linear functions and systems; finance, business and marketing)</p> <p><i>Dodge the Bug – What will it cost the industry?</i> (Data Analysis and Statistical Representation; Health Science and manufacturing)</p> <p><i>Survey, Sampling and Marketing</i> (Data Analysis and Statistical Representation; Marketing, Manufacturing)</p> <p><i>Math's Not dead...But He Is, Forensic science and math</i> (Modeling and Solving Non-linear Functions; Police Science and Health Science)</p> <p><i>Flu Frenzy</i> (Modeling exponential growth and decay functions; Health Science and STEM)</p>
<b>Proposed Timeline:</b>	<ul style="list-style-type: none"> <li>• Develop the scope of the course and identify course modules (approx. one day) <i>January, 2010</i></li> <li>• Develop the modules (approx. 40 hours for a year-long course) <i>January, February, 2010</i> <ul style="list-style-type: none"> <li>○ Assign modules to regional teams and convene regionally to develop assigned modules.</li> </ul> </li> <li>• Convene larger group, assuming advanced preparation, to collaborate on the modules (peer review) <i>March, 2010</i> <ul style="list-style-type: none"> <li>○ Edit and standardize the modules; consider assessment, extensions, and interventions.</li> <li>○ Create a virtual workspace.</li> </ul> </li> <li>• Create an evaluation tool (what would success look like?) <i>April, 2010</i></li> <li>• Design professional development <i>April, 2010</i></li> <li>• Conduct professional development <i>August, 2010</i></li> <li>• Pilot the course in a handful of settings to refine the modules <i>September 2010 – June, 2011</i></li> <li>• Implementation, <i>September 2011</i></li> </ul>

<p><b>Needed Supports:</b></p>	<ul style="list-style-type: none"> <li>▶ Significant ongoing professional development for all teachers involved.</li> <li>▶ Structured opportunities for collaboration between CTE and math teachers, including virtual collaboration for small schools.</li> <li>▶ Adequate resources provided, including technological resources.</li> <li>▶ State Board of Education approval.</li> <li>▶ Funding options that support district buy-in.</li> <li>▶ Alternative certification options for teachers who will be qualified to teach this course.</li> <li>▶ Stakeholders outside of education who will contribute to the development of the course.</li> </ul>
<p><b>Designers of Conceptual Framework:</b></p>	<p>Cris Bell (Clark County Skills Center), Greta Borneman (OSPI), Marilyn Bridgan (Clover Park SD), Susan Canaga (Issaquah SD), Kathleen Church (Mukilteo SD), Paul Clement (Bellingham SD), Linda Drake (Pierce County Careers Connections), Leonard Edlund (Bethel SD), Sue Feldman (observer), Christi Harter (Spokane SD), Coretta Hoffman (Moses Lake), Jo Jacobsen (Pierce County Careers Connections), Greg Johnson (South Kitsap SD), Nan Johnson (Seattle Public Schools), Susan Kidd (SBCTC), Andrea Levy (Seattle Central CC), Kris Lindeblad (facilitator), Stu McCurdy (Yakima SD), Dennis Milliken (OSPI), Connie Nelson (Consultant—Applied Math), Steve Sears (Vashon SD), Jennifer Styer (Bellingham SD), Bonnie Tidwell (Seattle Public Schools), Sabrina Underwood (Oak Harbor SD), Amanda Verdugo (North Mason SD), Andy Wesley (Oak Harbor SD)</p>

# OSPI Draft Recommendations for Improving Student Achievement in Math and Science

*Presented by:*

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*January 2010*

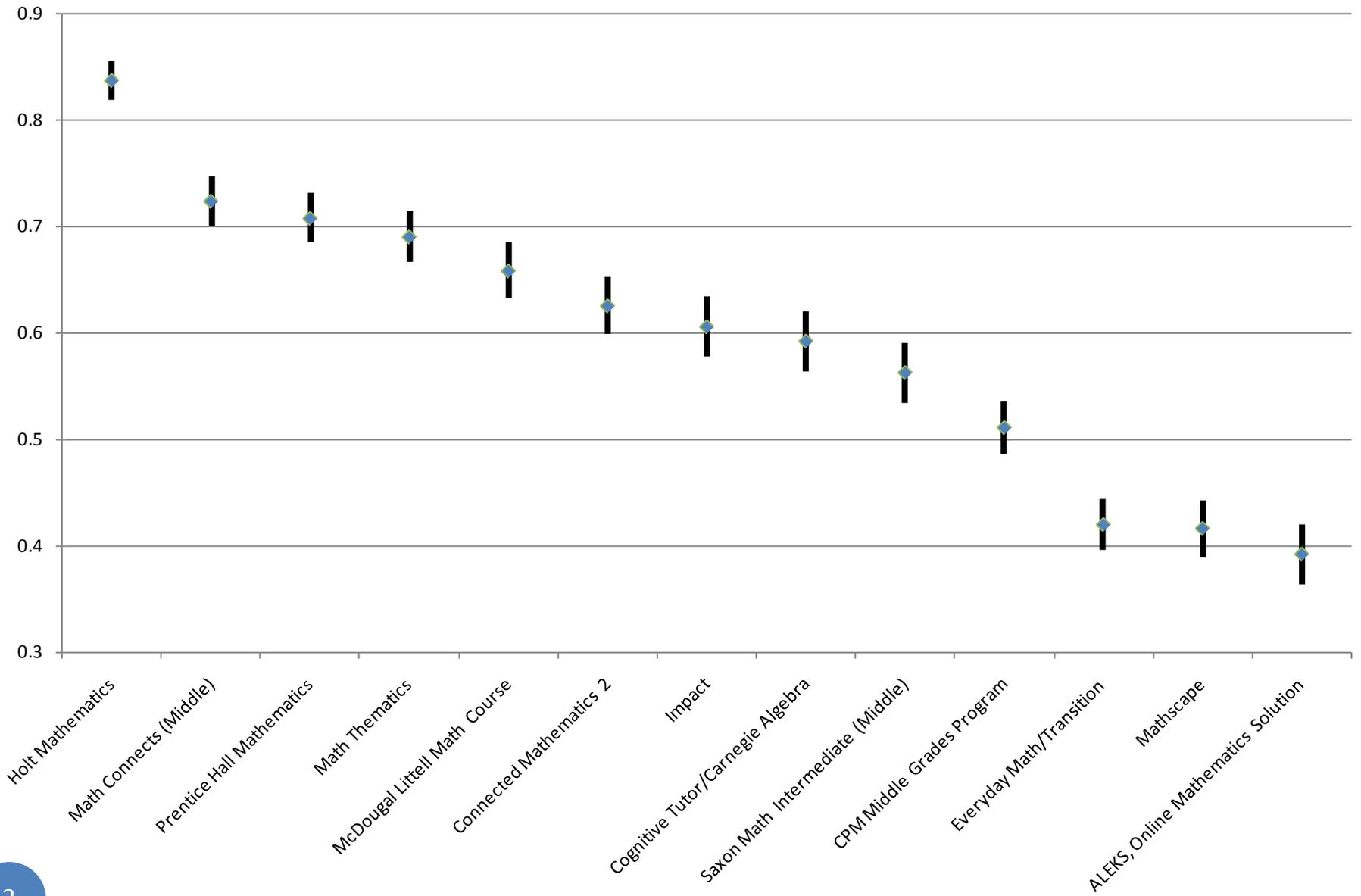


# Recommendation #1

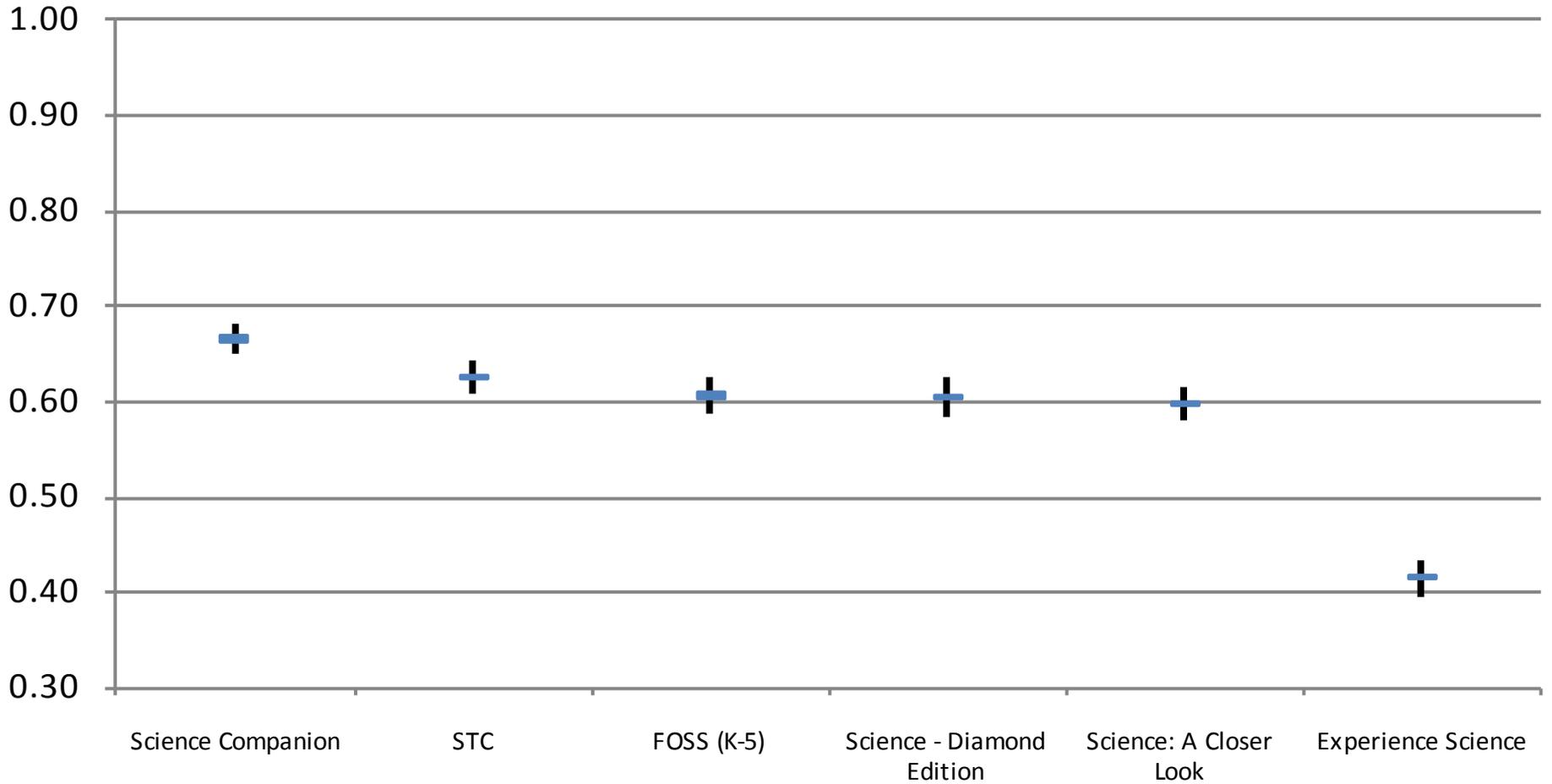
**Focus on improving core classroom instruction in mathematics and science.**

- A. Align with common core standards and assessments and provide funds to support the purchase of textbooks and instructional materials that are highly aligned to standards in math and science.**
- Use Common Core Standards in mathematics and revised Washington K-12 Science Standards as foundational standards documents.

# Middle School Composite Scores with 95% Confidence Intervals



## Elementary School Composite Scores with 95% Confidence Intervals



# Recommendation #1 (cont.)

**Focus on improving core classroom instruction in mathematics and science.**

**B. Develop an online, formative assessment system for math and science that will:**

1. Inform instruction.
2. Identify student strengths and weaknesses on skills necessary for success on the MSP and HSPE, and link to instructional resources designed to remedy weaknesses. Information would be available to teachers, students and parents.

## Recommendation #2

**Increase the number and quality of entering math and science teachers by:**

- **Improving pre-service training, focusing particularly on elementary school teachers.**
- **Streamlining rules that govern granting teaching certification for math and science professionals who have a desire to change careers and enter teaching.**
- **Recruit math and science majors to become teachers.**

## Recommendation #3

**Recommend that science be taught at minimum according to the guidance below:**

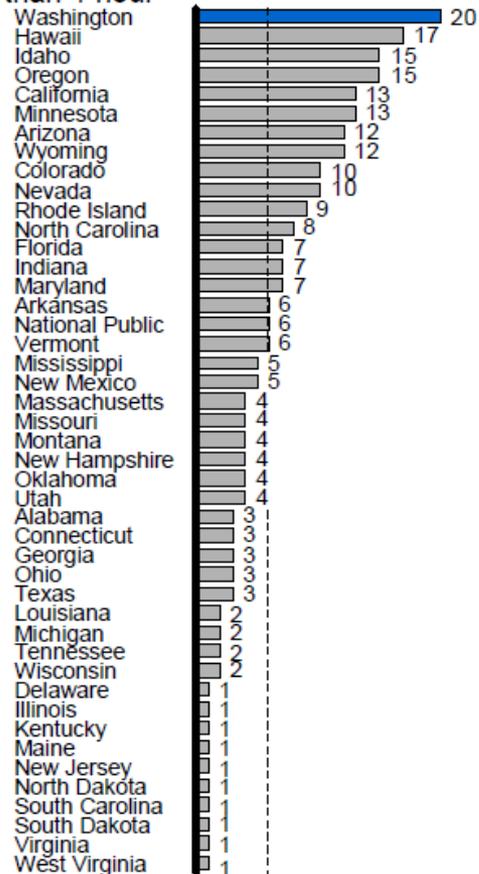
- **100 minutes per week in Grades 1 and 2**
- **150 minutes per week in Grades 3–5**
- **200 minutes per week (or one instructional period per day) in Grades 6–8**

# 1C 20% of Washington 4<sup>th</sup> grade teachers reported teaching less than one hour of science per week

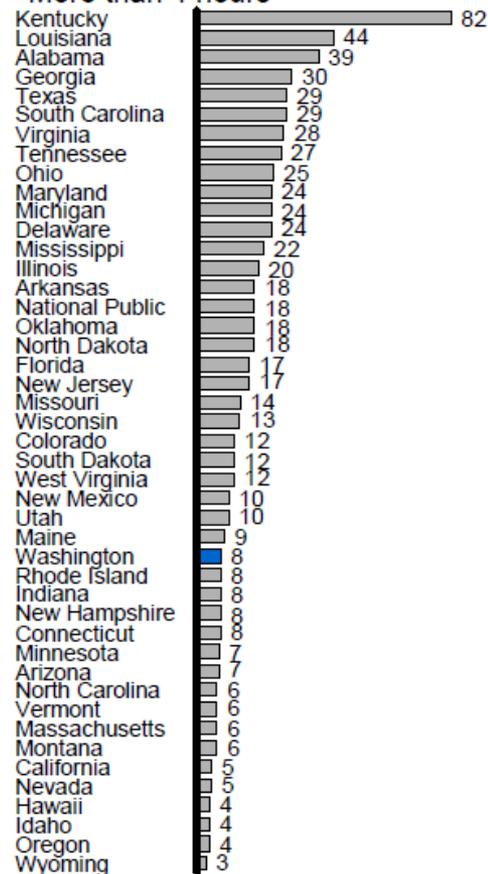
Percent of teachers giving response to question: About how much time in total do you spend with this class on science instruction in a typical week? 2005

Percent

## Less than 1 hour



## More than 4 hours



- 20% of 4<sup>th</sup> grade teachers reported spending less than one hour per week teaching science
- Washington had the highest proportion of teachers teaching less than one hour of science of all states
- Only 8% of teachers reported spending more than four hours per week teaching science

# Recommendation #4

**Support district implementation of stronger math and science programs by increasing professional development of teachers through leveraging public and private resources to expand statewide system improvement initiatives.**

- Increase emphasis on the current system of math and science coaches.
- Widespread implementation of the Mathematics System Improvement Framework .
  - Currently utilized with districts in improvement.
  - Based K-12 Reading Model and a RTI approach for providing individualized student academic support.
- Expansion of existing private/public partnerships (e.g., LASER) and collaborate with the new Partnership for Learning/STEM Center.
- Development of CTE equivalency courses aligned to standards in math and science.
- Provide compensatory instruction in math and science after school and during the summer.
- Expand the BEST program and/or similar induction/mentoring programs to assist new math and science teachers.

## Recommendation #5

**Introduce policy initiatives that will support new programs designed to promote early learning in math and science.**

- Develop a math training program for early learning providers that focuses on numbers, geometry/spatial thinking, and measurement.

## Recommendation #6

**Make it easier for districts to join multi-district cooperatives for the purposes of beginning a STEM focused high school, irrespective of existing district boundaries, and continue to promote program development at skill centers that focus on STEM-related training.**

A large, ornate stone building with two prominent towers and a central archway, serving as a background for the text. The building features Gothic-style architecture with pointed arches, multiple windows, and decorative stonework. The towers have conical roofs. The central entrance is framed by a large arch. The overall scene is slightly faded, emphasizing the text.

**Thank you.**