



**Council of Chief State School Officers
 Mathematics and Science Education Task Force
 June 2006 through October 2006
 REPORT AND RECOMMENDATIONS ADDENDUM**

Following are a list of resources and suggestions compiled by the CCSSO Mathematics & Science Task Force members. Please note that the resources are offered up as suggestions based on the task force member's individual expertise and as such, should be taken as food for thought and fodder for conversation. The list represents a sampling of resources, not a comprehensive set of all resources available.

GENERAL INFORMATION

Timeline of major mathematics & science reports	http://www.nassmc.org/pdfs/timeline_matrix2006.pdf
Various reports on Mathematics curriculum	http://mathcurriculumcenter.org/
<i>How Students Learn: History, Mathematics, and Science in the Classroom</i> , The National Academies Press, ISBN: 0309074339	More information and free summary available at: http://www.nap.edu/catalog/10126.html

LEADERSHIP AND VISION

Leadership and Assistance for Science Education Reform (LASER): National Research Council model of infrastructure for K-12 science	http://www.nsrconline.org/school_district_resources/partners.html Example: Washington state's LASER model: http://www.wastatelaser.org/about.asp
Alabama Mathematics, Science, and Technology Initiative	http://www.amsti.org/
The Appalachian Mathematics and Science Partnership: a comprehensive partnership of educational institutions and regional agencies to reform science, mathematics and technology (MST) education in central Appalachia	http://www.appalmsp.org/
The Delaware Science Coalition is a partnership among the Department of Education, 15 Delaware school districts, and representatives of the Delaware business community. Its purpose is to improve the teaching and learning of science in Delaware.	http://www.sciencede.org/science_index.html

<p>The Delaware Foundation Science and Math Education foundation connects businesses, community groups, and institutions of higher education with systemic, standards-based reform of science and mathematics education in Delaware public schools and classrooms.</p>	<p>http://www.dfsme.net/</p>
<p>Georgia's P-16 Initiative</p>	<p>http://education.gsu.edu/p16/p16overview.html</p>
<p>Iowa Area Education Agencies are regional service agencies that provide school improvement services for students, families, teachers, administrators and their communities. As intermediate agencies, AEAs offer the kinds of services that can be most efficiently and economically provided on a regional or cooperative basis among school districts. The Iowa system is widely regarded as one of the foremost regional service systems in the country.</p> <p>The Iowa Content Network website helps school districts identify content for implementing the district career development plan.</p>	<p>http://www.iowa.gov/educate/content/view/277/177/1/2/</p> <p>http://www.iowa.gov/educate/prodev/main.html</p>
<p>Kentucky is funding "content leadership groups" in Mathematics and Science that meet monthly and consist of teachers, content specialists, instructional supervisors, and even assistant superintendents.</p>	<p>Contact: Karen Kidwell, Science Consultant for the Kentucky Department of Education, Karen.Kidwell@education.ky.gov</p>
<p>Maryland Shared Vision for Science</p>	<p>http://mssa.pbwiki.com/</p>
<p>Rhode Island "Project Making the Grade"</p>	<p>http://tech-collective.org/ui/user/File/TEC_MS_FA_LR%20Final.pdf</p>
<p>Building a Presence for Science, by the National Science Teachers Association (NSTA), is the largest networking initiative of the National Science Teachers Association (NSTA). The program is designed to improve the teaching and learning of science from kindergarten through 12th grade.</p>	<p>http://ecommerce.nsta.org/bap/</p>
<p>The National Staff Development Council's revised Standards for Staff Development provide direction for designing a professional development experience that ensures educators acquire the necessary knowledge and skills. Staff development must be results-driven, standards-based, and job-embedded.</p>	<p>http://www.nsd.org/standards/about/index.cfm</p>
<p>The Wallace Foundation collaborates with selected states, and districts within those states, to help the educators understand and effectively respond to key unanswered challenges: defining the essential elements of leadership, greatly improving the training of principals and superintendents, and providing leaders with the policies, incentives and</p>	<p>http://www.wallacefoundation.org/GrantsPrograms/FocusAreasPrograms/EducationLeadership/</p>

job conditions they need to raise student achievement on a wide scale.	
<i>Lenses on Learning: A New Focus on Mathematics and School Leadership</i> is a modular course that addresses a number of issues of importance to administrators as they seek to support Standards-based mathematics instruction in their schools and districts.	http://www2.edc.org/CDT/cdt/cdt_lo11.html
Resources for advocating for reform in large-scale national assessments and their uses: Maryland Website 3-8 with constructed response Nebraska Stars Washington state's WASL Connecticut's Mastery Test.	http://www.mdk12.org/ http://www.nde.state.ne.us/stars/index.html http://www.k12.wa.us/assessment/WASL/testquestions.aspx http://www.state.ct.us/sde/dtl/curriculum/cmt31a/currla_publicmt3.htm

CURRICULUM, INSTRUCTION, AND ASSESSMENT

A collaborative of 16 states is working to expand and automate an alignment process for judging the correspondence of assessments with content. The project, led by Norman Webb, addresses specific needs for improving assessments so that they 1) will more closely match content standards, 2) will be applicable for students with disabilities, and 3) will increase capacity for linking across grades. The project will make the alignment process system available on CDs that can be readily distributed to states.	http://www.ccsso.org/publications/details.cfm?PublicationID=293 http://www.wcer.wisc.edu/projects/projects.php?project_num=73
The Surveys of Enacted Curriculum (SEC) are a practical, reliable set of data collection tools being used with teachers of Mathematics, Science and English Language Arts (K-12) to collect and report consistent data on current instructional practices and content being taught in classrooms. The resulting data provide an objective method for educators to analyze the degree of alignment between current instruction and state standards and assessments.	http://www.ccsso.org/Projects/surveys_of_enacted_curriculum/
The National Council of Teachers of Mathematics (NCTM) released <i>Curriculum Focal Points for Prekindergarten through Grade 8</i> , which describes the most important mathematical topics for each grade level from Prekindergarten through Grade 8. They comprise related ideas, concepts, skills, and procedures that form the foundation for understanding and lasting learning. <i>Principles and Standards for School Mathematics</i> is an in-depth discussion of curriculum priorities for PK-12 mathematics. NCTM's Illuminations website provides online examples	http://www.nctm.org/focalpoints/ <i>Principles and Standards for School Mathematics</i> and the related Illuminations website: http://nctm.org/standards http://illuminations.nctm.org/

of instruction and assessment related to <i>Principles and Standards</i> .	
References for multiple measures of assessment include:	
Rick Stiggins' work on Year-End Assessments	http://www.assessmentinst.com/index.php
Science State Collaborative on Assessment and Student Standards (SCASS) Project	http://www.ccsso.org/projects/SCASS/Projects/Science_Education_Assessment_Project/
Vermont High Schools on the Move	http://education.vermont.gov/new/html/pubs/high_schools_on_the_move.html
Rhode Island High School Diploma System	http://www.ridoe.net/HighSchoolReform/PDFs/HIGH%20school%20reform/HSDiploma_v071405.pdf
<i>High Schools That Work</i> is the largest and oldest of the Southern Regional Education Board's school improvement initiatives for high school and middle grades leaders and teachers. More than 1,200 <i>HSTW</i> sites in 32 states are using the framework of <i>HSTW</i> Goals and Key Practices to raise student achievement.	http://www.sreb.org/Programs/hstw/hstwindex.asp
<i>Project Lead The Way Inc.</i> (PLTW) is a national program forming partnerships among Public Schools, Higher Education Institutions and the Private Sector to increase the quantity and quality of engineers and engineering technologists graduating from our education system.	http://www.pltw.org/aindex.htm
The National Research Council (NRC) report states that "the next generation of science standards and curricula at the national and state levels should be centered on a few core ideas and should expand on them each year, at increasing levels of complexity, across grades K–8. Today's standards are still too broad, resulting in superficial coverage of science that fails to link concepts or develop them over successive grades."	Brief discussion paper (PDF) on the topic of Core Ideas in Science: http://science.nsta.org/nstaexpress/anchors.pdf
The American Diploma Project (ADP), a partnership of four national organizations and five states, is a collaborative effort to ensure that American high school students have the knowledge and skills necessary for success following graduation, whether in college, the workplace or the armed services.	Achieve's ADP Network information: http://www.achieve.org/node/604
The mission of the Professional Learning Services Unit is to provide leadership, technical assistance, resources and consultative services to the Georgia education community in order to improve student learning through organizational development and professional learning (staff development).	http://www.doe.k12.ga.us/support/improvement/pl.asp

<p>The purpose of Vermont's Framework of Standards and Learning Opportunities is to improve student learning. Grade expectations and associated materials are available at the website provided.</p>	<p>http://education.vermont.gov/new/html/pubs/framework.html</p>
<p>The intent of Iowa's Model Core Curriculum Project is twofold to ensure that all Iowa students have access to a rigorous and relevant curriculum to prepare them for success in postsecondary education and the emerging global economy, and to provide a tool for Iowa educators to use to assure that essential subject matter is being taught and essential knowledge and skills are being learned.</p>	<p>http://www.iowa.gov/educate/content/view/674/714/1/1/</p>
<p>Ohio Department of Education/Ohio Board of Regents high school curriculum models for mathematics and science aligned with new statement of expectations for college entry in mathematics</p>	<p>http://www.ode.state.oh.us/GD/DocumentManagement/DocumentDownload.aspx?DocumentID=1732</p>
<p>Reference materials for Professional Development: Susan Loucks-Horsley, <i>Designing Professional Development for Teachers in Mathematics and Science</i> and Margaret Smith's <i>Practice-Based Professional Development in Mathematics</i></p>	
<p>The National Science Education Standards outline what students need to know, understand, and be able to do to be scientifically literate at different grade levels. They describe an educational system in which all students demonstrate high levels of performance, in which teachers are empowered to make the decisions essential for effective learning, in which interlocking communities of teachers and students are focused on learning science, and in which supportive educational programs and systems nurture achievement.</p>	<p>http://www.nap.edu/readingroom/books/nses/overview.html</p>
<p>Founded in 1985, Project 2061 is a long-term initiative of AAAS to help all Americans become literate in science, mathematics, and technology. To achieve that goal, Project 2061 conducts research and develops tools and services—books, CD-ROMS, on-line resources, professional development, and public outreach—that educators, researchers, parents and families, and community leaders can use to make critical and lasting improvements in the nation's education system.</p>	<p>http://www.project2061.org/</p>
<p><i>Key State Education Policies on PK-12 Education: 2004</i> This CCSSO report informs policymakers and educators about the current status of key education policies across the 50 states that define and shape elementary and secondary education in public schools. The report is part of a continuing biennial series by the Council's education</p>	<p>http://www.ccsso.org/publications/details.cfm?PublicationID=270</p>

indicators program of the Division of State Services and Technical Assistance. CCSSO reports 50-state information on policies regarding teacher preparation and certification, high school graduation requirements, student assessment programs, school time, and student attendance. The report also includes state-by-state information on content standards and curriculum, teacher assessment, and school leader/administrator licensure.	
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TEACHER DEVELOPMENT AND SUPPORT

CCSSO Bridging the Gap in Research and Practice in Professional Development report	http://www.ccsso.org/content/PDFs/ResearchonEffectivePDfinal.pdf
The Iowa Professional Development Model provides guidance to local districts as they design and implement district and building-wide professional development.	http://www.iowa.gov/educate/pdmtm/state.html
Maryland's professional Development Standards and Planning Guide	http://www.marylandpublicschools.org/MSDE/divisions/instruction/prof_standards
<i>Building Capacity</i> : Handbook for developing teacher leadership capacity in math and science (written for Math Science Partnership programs)	http://www.horizon-research.com/reports/2004/mspta_handbook.php
Mathematics Helping Core (Washington) 18 math teachers (1 school plus building a coaching network in the districts)	http://www.k12.wa.us/curriculum/instruct/mathematics/MHC/default.aspx
Partnership for Improving Mathematics and Science (PIMS): North Carolina Cascade model of Professional Development	http://ncpims.northcarolina.edu/index.php?option=com_content&task=view&id=19&Itemid=55
Database of materials for mathematics and science professional development	http://www.te-mat.org/
"Words to the Wise: How to design effective mathematics and science professional development" [Opinion/Editorial] April 25th, 2006 by Iris Weiss, Horizon Research	http://nassmc.org/nassmcor_forums/
Teachers Development Group is a nonprofit organization dedicated to increasing all students' mathematical understanding and achievement through effective professional development.	http://www.teachersdg.org/
The North Carolina Middle Math Project (NCM ²): a collaboration between the Center for Mathematics and Science Education, the North Carolina Mathematics and Science Education Network, and the North Carolina Department of Public Instruction. The goal is to improve mathematics education in grades 6-8 across the entire state of North	http://www.unc.edu/depts/cmse/NCM2/

Carolina, supporting teachers in their professional development and providing academic renewal and financial recognition to support their retention.	
In many other countries teachers are incorporated into the assessment package (similar to how Advanced Placement works). This is a form of built-in professional development. It would be advisable to involve institutes of higher education to help with articulation.	Examples: Advanced Placement exams; Washington state assessments; North Carolina 2 nd grade assessment <i>Unofficial Contact:</i> Jeremy Kilpatrick, Professor of Mathematics Education at University of Georgia, jkilpat@uga.edu
<i>Mathematics: Strategies for Teaching Limited English Proficient (LEP) Students</i> This document serves as a supplement to the K-12 Mathematics Standards of Learning Enhanced Scope and Sequence, which helps teachers align their classroom instruction with the revised Mathematics Standards of Learning that were adopted by the Virginia Board of Education in October 2001. The purpose of the document is to provide mathematics teachers with a brief overview of second language acquisition theory and suggest effective strategies for differentiating instruction for limited English proficient (LEP) students. Differentiated instruction is particularly effective in helping LEP students acquire English and meet academic achievement standards in content classes as it recognizes students' varying background knowledge and experiences, language, culture, learning styles, and readiness.	http://www.doe.virginia.gov/VDOE/Instruction/ESL/LEPmathResource.pdf
E-mentoring for student success (on-line mentoring program for science teachers)	http://emss.nsta.org/program_overview.aspx
Georgia's Principals Center	http://www.principalscenter.org/
The Maryland Principal's Academy	http://www.marylandpublicschools.org/MSDE/divisions/leadership/programs/
Science Objects from the National Science Teachers Association	http://www.nsta.org/main/pdfs/2005LeadershipInstituteProfessionalDevelopment.pdf#search=%22nsta%20science%20object%22 <i>Contact:</i> Jorea Marple, West Virginia Assistant Superintendent of Education, jmarple@access.k12.wv.us
Virginia is adding a mathematics specialist endorsement to its regulations for licensure of instructional personnel. The K-8 mathematics specialist will work in elementary and middle schools to assist students with significant difficulties in learning mathematics and with other teachers. The mathematics specialist position will have responsibilities	http://www.doe.virginia.gov/VDOE/VA_Board/Meetings/2006/ItemF-jun.pdf

<p>similar to a reading specialist. (VAC 20-22-610 Mathematics specialist for elementary and middle education)</p> <p>Senate Joint Resolution 428 was passed in the 2005 General Assembly requesting the Board of Education to include the mathematics specialist endorsement in the Licensure Regulations for School Personnel.</p>	<p>http://leg1.state.va.us/cgi-bin/legp504.exe?051+ful+SJ428ER</p>
<p>MSPnet: The Math and Science Partnership Network. This is a good source of sharing information on the National Science Foundation Mathematics and Science Partnership work.</p> <p>A meta analysis of the State MSP grant projects would be valuable information to utilize. Pat O'Connell Ross and Michael Kestner are leading the State MSP grants and should be able to produce that resource.</p>	<p>http://hub.mspnet.org/index.cfm</p> <p><i>U.S. Department of Education MSP Contacts:</i> Pat O'Connell Ross, patricia.ross@ed.gov; Michael Kestner, michael.kestner@ed.gov</p>
<p>The Virginia General Assembly approved \$20 million for the purchase of graphing calculators and scientific probes to be shipped directly to Virginia schools in support of mathematics and science instruction. No local match is required for participation in this initiative. The use of graphing calculators is a required component of the state mathematics and science standards and permitted on the corresponding end-of-course assessments. Professional development for teachers was included as part of the statewide purchase.</p>	<p>Statewide Graphing Calculator Initiative and Other Educational Technologies:</p> <p>http://leg1.state.va.us/cgi-bin/legp504.exe?000+cod+22.1-199.1 http://www.doe.virginia.gov/VDOE/suptsmemos/1997/adm042.html http://www.doe.virginia.gov/VDOE/suptsmemos/1997/adm071.html</p>
<p>CCSSO Evaluation Tools: this website contains professional development evaluation tools and measures from across the U.S.</p>	<p>http://www.ccsso.org/projects/improving_evaluation_of_professional_development/Study_Results/</p>
<p>Lesson study as a tool by California Mills College</p>	<p>http://lessonresearch.net/</p>
<p>LessonLab Research Institute engages in a variety of research projects, all motivated by problems of education. All projects are designed and conducted by LessonLab's research scientists, in collaboration with researchers around the globe. LLRI is the hub of a growing network of independent researchers doing research on the improvement of teaching and learning in classrooms.</p>	<p>http://www.llri.org/index.htm</p>
<p><i>Taking Science to School</i> reports that today's standards are too broad and result in superficial coverage of science that fails to link concepts or develop them over successive grades. The report also says teachers need more opportunities to learn how to teach science as an integrated whole</p>	<p>http://www.nsf.gov/news/news_summ.jsp?cntn_id=108037</p> <p>Free Executive Summary: http://newton.nap.edu/execsumm_pdf/11625</p>

<p>and to diverse student populations. Teacher preparation and professional development should focus on boosting teachers' knowledge of science, how students learn the subject, and methods and technologies that aid in science learning for all.</p>	
<p>The Virginia Middle School Teacher Corps provides the structure and incentives for school divisions to hire experienced mathematics teachers for middle schools that have been designated as “at risk in mathematics.” Teachers selected as members of the Teacher Corps will be dynamic well-qualified teachers who have demonstrated success in teaching mathematics in challenging environments. While their top priority will be teaching, they may also work with school administrators and faculty to help less-experienced or struggling teachers. A school eligible to participate in the Teacher Corps will have the opportunity to take part in the initiative for at least three years pending available funding. The program is funded by the Virginia General Assembly.</p>	<p>http://www.doe.virginia.gov/VDOE/Instruction/OCP/teachercorps.html</p>
<p>The Interstate New Teacher Assessment and Support Consortium (INTASC) is a consortium of state education agencies and national educational organizations dedicated to the reform of the preparation, licensing, and on-going professional development of teachers.</p>	<p>INTASC: http://www.ccsso.org/projects/Interstate_New_Teacher_Assessment_and_Support_Consortium/#resource</p>
<p>The Improving Evaluation of Professional Development project seeks to assist states in improving evaluations of the quality of professional development for teachers, and especially evaluations for programs and activities aimed toward improving teaching of K-12 mathematics and science.</p>	<p>http://www.ccsso.org/projects/Improving_Evaluation_of_Professional_Development/</p>
<p>The National Council of Teachers of Mathematics provides a range of mathematics professional development opportunities and materials, including the Reflections website, online courses, guided readings, face-to-face experiences, conferences, and more.</p>	<p>http://nctm.org Reflections website: http://my.nctm.org/eresources/reflections/index.htm</p>
<p>Delaware’s Science in Motion (Van) Project assists public high school students in meeting the high expectations of the DE Science Content Standards by providing sustained professional development for teachers that promotes the use of modern technology and inquiry-based instruction to improve student achievement.</p>	<p>http://www.k12.de.us/science/scivan/</p>
<p>BSCS is a nonprofit corporation that endeavors to improve all students’ understanding of science and technology by developing exemplary curricular materials, supporting their widespread and effective use,</p>	<p>http://www.bsos.org/page.asp?pageid=0%7C31%7C95%7C96&id=0%7Cbcs_s_5es</p>

providing professional development, and conducting research and evaluation studies. The BSCS 5E Instructional Model is an effective way to engage students in learning. Developed in the 1980s, the BSCS 5E Instructional Model is a hallmark of the BSCS programs.	
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SUSTAINABILITY AND SCALABILITY

Elmore, R.F. (2002). <i>Bridging the gap between standards and achievement: The imperative for professional development in education</i> . Washington, DC: Albert Shanker Institute.	http://www.shankerinstitute.org/Downloads/Bridging_Gap.pdf
Virginia's Standards of Learning Algebra Readiness seeks to assist school divisions in preparing students for success in algebra. School divisions are eligible for incentive payments to provide mathematics intervention services to students in grades 6-9 who are at-risk of failing the Algebra I end-of-course test as demonstrated by their individual performance on diagnostic tests that have been approved by the Department of Education (DOE). The Department of Education has made available to all school divisions in Virginia an online diagnostic test. School divisions have the option of using this online test or another test that meets specified criteria and is approved by the DOE.	Algebra Readiness Initiative http://www.doe.virginia.gov/VDOE/Instruction/Math/ARI/index.shtml
Florida Virtual School	http://www.flvs.net/
Maryland Virtual High School	http://msde.mdk12online.org/
Virtual Virginia	http://www.pen.k12.va.us/VDOE/Technology/DOEhour/virtualvirginia.html
Wisconsin's Global Education Initiative	http://dpi.wi.gov/cal/pdf/ie-recom.pdf
Carefully design your Math Science Partnership (MSP) RFP to achieve the vision. Align funding streams and program structures to support systemic change in mathematics and science, especially Title I, Title IIA, and Title IIB. Align the Focused Assistance Program (District and School Improvement Model) to the vision.	Example: Washington state started with an adult culture change process; picking a curriculum.
Align funding, certification, PD infrastructure, curriculum, teacher leadership models, IHE program approvals for teacher certification; connected to statewide literacy initiatives. Virginia has sustained reform due to policies that have been put in place; standards, assessments, accountability, technology were embedded in the assessments, therefore technology and on-line assessments were funded.	<i>Contact:</i> Patricia Wright, Virginia Chief Deputy Superintendent of Public Instruction, Patricia.Wright@doe.virginia.gov
The Association of State Supervisors of Mathematics (ASSM) provides	http://smtc.uwyo.edu/assm/

<p>supervising and/or consulting services. Its membership is entirely composed of current or previous state or provincial supervisors of mathematics. The organization not only serves as a network for state or provincial supervisors of mathematics but members are leaders in state and national efforts to improve mathematics education.</p>	
<p>The National Council of Supervisors of Mathematics (NCSM) is an organization for leaders in mathematics education. NCSM supports mathematics education leadership at the school, district, college/university, state/province, and national levels. Its membership constitutes an international force, collaborating to achieve excellence in mathematics education.</p>	<p>http://mathforum.org/ncsm/</p>
<p>The Council of State Science Supervisors (CSSS) is a professional organization composed of science education specialists who serve at the state, territorial, or the protectorate educational agency in the United States and U.S. Territories. CSSS can offer state and national organizations a direct science education link to every school building in their state or territory. These science supervisors can provide information on the types of science programs their schools are using and how well each of the programs are working in their state.</p>	<p>http://www.csss-science.org/</p>
<p>The National Academy of Sciences (NAS) is an honorific society of distinguished scholars engaged in scientific and engineering research, dedicated to the furtherance of science and technology and to their use for the general welfare. To keep pace with the growing roles that science and technology would play in public life, the institution that was founded in 1863 eventually expanded to include the National Research Council in 1916, the National Academy of Engineering in 1964, and the Institute of Medicine in 1970. Collectively, the four organizations are known as the National Academies.</p>	<p>http://www.nasonline.org/site/PageServer?pagename=ABOUT_main_page</p>

The executive summary, report, and addendum were made possible by the contributions of the CCSSO Mathematics and Science Education Task Force:

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