Summary of Funded Race to the Top Applications

SCIENCE, TECHNOLOGY, ENGINEERING, AND MATHEMATICS ACTIVITIES IN ELEVEN STATES AND THE DISTRICT OF COLUMBIA

CENTER ON INSTRUCTION

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CENTER ON INSTRUCTION

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INTRODUCTION

One of the competitive priorities of the U.S. Department of Education's Race to the Top applications addressed science, technology, engineering, and mathematics (STEM). States that applied were required to submit plans that addressed rigorous courses of study, cooperative partnerships to prepare and assist teachers in STEM content, and prepare more students, particularly under-represented groups, for STEM study and careers. This analysis summarizes the proposed STEM activities in twelve awarded Race to the Top applications.

First, the summary provides background information on Race to The Top applications and awards. Next is a brief description of the methodology for the analysis followed by the summary of state applications. The summary is organized into the following sub-sections of the competitive priority:

- approaches to rigorous courses of study,
- collaborative approaches to preparing and assisting teachers and applied learning opportunities, and
- approaches to preparing more students and addressing the needs of under-represented groups.

An additional section, not required in the application, is presented on statewide initiatives and/or networks.

Background information on Race to The Top

On February 17, 2009, President Barack Obama signed into law the American Recovery and Reinvestment Act of 2009 (ARRA). The ARRA laid the foundation for education reform by supporting investments in innovative strategies that are most likely to lead to improved results for students, long-term gains in school and school system capacity, and increased productivity and effectiveness.

The ARRA provided $4.35 billion for the Race to the Top Fund, a competitive grant program designed to encourage and reward states that are creating the conditions for education innovation and reform; achieving significant improvement in student outcomes, including making substantial gains in student achievement, closing achievement gaps, improving high school

graduation rates, and ensuring student preparation for success in college and careers; and implementing ambitious plans in four core education reform areas:

- adopting standards and assessments that prepare students to succeed in college and the workplace and to compete in the global economy;
- building data systems that measure student growth and success and inform teachers and principals about how they can improve instruction;
- recruiting, developing, rewarding, and retaining effective teachers and principals, especially where they are needed most; and
- turning around our lowest-achieving schools.

To receive funds, states were required to submit applications that addressed:

- state success factors,
- standards and assessments,
- data systems to support instruction,
- great teachers and leaders,
- turning around lowest-achieving schools, and
- general selection criteria.

In addition, there were six absolute, competitive, and invitational priorities. One of the competitive priorities focused on STEM (U.S. Department of Education, 2010).

Competitive Preference Priority 2—Emphasis on science, technology, engineering, and mathematics (STEM)

To meet this priority, states were required to address:

- a rigorous course of study in mathematics, the sciences, technology, and engineering;
- cooperation with industry experts, museums, universities, research centers, or other STEM-capable community partners to prepare and assist teachers in integrating STEM content across grades and disciplines, in promoting effective, relevant instruction, and in offering applied learning opportunities for students; and
- preparing more students for advanced study and careers in the sciences, technology, engineering, and mathematics, by addressing the needs of under-represented groups and of women and girls in the STEM areas.

States receiving Race to the Top awards

The U.S. Department of Education announced the four-year competitive Race to the Top grants in November 2009. There were two phases for state applications. States had to submit applications for the first phase on January 19, 2010. The Department received forty-one applications.

The second phase of state applications were due on June 1, 2010. Thirty-five states and the District of Columbia applied.

The Department used a two-tier process to review applications. The initial review was based solely on the written applications and the final review based on a state's written application and in-person presentation. The Department used independent reviewers chosen from a pool of qualified educators, scholars, and other individuals knowledgeable in education reform who volunteered or were nominated (U.S. Department of Education, 2010).

The Department of Education announced the phase one awards to Tennessee and Delaware on March 29, 2010 and phase two awards on August 24, 2010. In phase two, the following applicants received awards: District of Columbia, Florida, Georgia, Hawaii, Maryland, Massachusetts, New York, North Carolina, Ohio, and Rhode Island.

A total of 11 states and the District of Columbia received Race to the Top awards.

Methodology

In November 2010, the Center on Instruction downloaded copies of the twelve Competitive Grant applications posted on the website of the U.S. Department of Education. COI staff members first reviewed the Competitive Priority sections of the grant applications, which varied from three to eleven pages. If the Competitive Priority section referred to earlier application sections and/or appendices, that information was also examined. A themed categorization system was developed for each sub-section of the STEM plan after reviewing all of the awarded applications. Staff members organized the application information according to the themed categorization system of the sub-sections and entered the information into a master worksheet. Then a state profile was developed. Staffers reviewed the sub-sections across states to determine commonalities and differences in proposed activities within themes and the

summary was prepared. Drafts of each state profile and the summary report were reviewed by other COI staff members, who provided feedback.

The information in this report does not include all of these states' previous STEM initiatives and activities. In some cases, states described the recent history of their activities in STEM. This report focuses on the initiatives and activities that were directly related to the three required areas in the STEM priority section of the Race to the Top application, and that were proposed to be funded or continued using Race to the Top Funds.

The next section is a summary of the twelve applications. The first sub-section summarizes the approaches presented in applications for the Competitive Priority sub-section, Rigorous Courses of Study.

SUMMARY OF STATE STEM ACTIVITIES

This section first presents a summary of applicants' approaches to rigorous courses of study. Second, it summarizes activities to assist and prepare teachers. Third, it presents activities on the recruitment of under-represented groups and girls and women.

Approaches to rigorous courses of study

In the STEM competitive priority plans, the first sub-section addressed the need for rigorous course of study in STEM. The activities identified by the applicants were organized into the following approaches to increase rigor: changes in graduation requirements/new diplomas; adoption of/revision of standards; STEM academics and/or high schools; STEM programs, curriculum, and/or courses; and assessments in STEM related subjects. Table 1 summarizes which of the twelve applicants identified activities according to the categories.

Table 1. Summary of increasing rigor activities by states

Applicant	Graduation requirements, new high school diplomas	Common core standards - mathematics	Standards in science, technology and/or engineering	STEM academies, high schools	STEM programs, curriculum, courses	Assessments in STEM-related subjects
DE		x			x	x
DC	x	x	x	x	x	x
FL	x	x		x	x	x
GA	x	x			x	x
HI	x	x		x	x	x
MD	x	x			x	x
MA	x	x	x	x	x	x
NY	x	x	x	x	x	x
NC	x	x		x	x	x
OH	x	x		x		x
RI	x	x	x		x	x
TN	x	x		x	x	x

DE–Delaware, DC–District of Columbia, FL–Florida, GA–Georgia, HI–Hawaii, MD–Maryland, MA–Massachusetts, NY–New York, NC–North Carolina, OH–Ohio, RI–Rhode Island, TN–Tennessee

Graduation requirements

The District of Columbia and ten states referred to graduation requirements. Six states (Hawaii, Maryland, Massachusetts, North Carolina, Ohio, and Tennessee) currently or will require four credits in mathematics and three credits in science for students to graduate from high school. The District of Columbia will require four credits in mathematics and four credits in science.

Florida proposed a seven-year phase-in of increased graduation requirements in mathematics and science with a fourth credit required in mathematics. In 2010, Florida added to the requirements: geometry, algebra II, biology, chemistry or physics, and a third science course.

Florida and Georgia are participating in the American Diploma Project sponsored by Achieve. The states adopted college-ready competencies aligned with the American Diploma Project.

Georgia is one of eight states participating in the College and Career-Ready Policy Institute (a national collaborative focused on increasing numbers of students who are college and career ready). Georgia will require that all elementary and middle schools make science their second Adequate Yearly Progress (AYP) indicator.

Maryland proposed working with universities to develop STEM-ready high school exit criteria for the high school diploma. In 2011, entering ninth graders will be required to earn four credits in mathematics and three credits in science.

Massachusetts will adopt the MassCore curriculum which requires four credits in mathematics and three credits in science for students to graduate from high school. The state will be aligning graduation requirements with four-year college entrance requirements.

The New York Board of Regents College and Career Readiness Work Group will review high school requirements and Regents exams to better align with college success and career readiness. New York currently requires three years of mathematics and three years of science for high school graduation. The state will be setting higher scores on exams for graduation requirements through 2012.

Ohio will align high school exit criteria and entrance requirements to new standards.

Rhode Island is a participant in the State Consortium on Board Examination Systems which aligns curriculum and assessments with college and career

readiness. Rhode Island will use grant funds to support the participation of two or three districts in the implementation of a State Board Exam program that will enable students to exit high school ready to succeed in a two-year college program or enter occupations.

Tennessee referred to the Tennessee Diploma Project which was implemented with high school students in fall 2009. Students beginning high school in fall 2009 were set to begin a new path with increased graduation requirements to 22 credits, a focus on the skills needed for college and the workforce, and new assessments. The overall assessment system includes the ACT's College and Readiness Test, Explore (given in eighth grade) and the PLAN College Readiness Test given in the tenth grade.

New high school diplomas

Hawaii was the only applicant to identify the development of new high school diplomas. In 2008, Hawaii developed the Board of Education Recognition Diploma for implementation in 2013–2017. The diploma will require:

- three years of science (two laboratory courses),
- three years of mathematics (algebra I and II, and geometry),
- meeting end-of-course examination criteria for algebra II, and
- a senior project.

In addition, the Hawaii Board of Education was to vote on the adoption of a College and Career Ready Diploma for students entering high school in 2013. The diploma will offer three optional advanced pathways:

- recognized advanced academic achievement,
- recognized advanced technical achievement, and
- students graduating with a STEM emphasis.

Hawaii will implement a Step Up Recognition Diploma in 2013. The diploma requires four credits in mathematics, three credits of science, a half-credit of expository writing, a senior project and meeting standards on the algebra end-of-course exams. Hawaii will also be aligning high school requirements and STEM goals with the University of Hawaii and colleges entrance requirements.

Standards

Adoption of Common Core state standards in mathematics. In the application section on standards and assessments, applicants had to demonstrate a commitment to and progress toward adopting a common set of K–12 standards by August 2, 2010 (U.S. Department of Education, 2010). One hundred percent of the applicants proposed adoption of Common Core State Standards in Mathematics, an initiative led by the Council of Chief State School Officers and the National Governor's Association.

The District of Columbia will develop Standard Entry Points for Differentiated Learning for students with disabilities based on the Common Core State Standards.

Maryland will revise/align Pre-K–12 curricula, assessments, and accountability systems with the new standards.

North Carolina will review and revise Pre-K–12 standard course of study.

Ohio will align high school exit criteria and entrance requirements to the new standards.

Adoption/revision of standards in science, engineering, and/or technology. The District of Columbia, Massachusetts, and New York proposed revisions in science standards.

The District of Columbia reported that they had already rearticulated the science standards for grades 5 and 8, and for biology. DC will adopt the Common Core science standards. The District of Columbia proposed adopting the Standards for Global Learning in the Digital Age from the International Society for Technology in Education.

Massachusetts will align the academic strand of the career/technical education standards to the Common Core standards.

New York will revise and strengthen technology standards as well as create learning standards for engineering education. New York will also review, revise, and adopt "world-class" standards in STEM disciplines.

Rhode Island was awaiting adoption of the K–12 grade span expectations in engineering and technology that are benchmarked to the Standards for Technological Literacy from the International Technology and Engineering Educators Association.

Note: Maryland has Technology Standards for Teachers, Students, and Administrators. Seventh grade students, teachers, and administrators are assessed on these standards.

STEM academies and high schools

Seven states (Florida, Hawaii, Massachusetts, New York, North Carolina, Ohio, and Tennessee) and the District of Columbia referred to the existence, or opening, of STEM academies and specialized high schools.

The District of Columbia described a STEM high school, charter schools with STEM focus, and six elementary Catalyst elementary and middle schools with STEM themes.

Florida referenced career and professional academy initiatives, especially for lowest achieving high schools, as well as the development of three consortia to build and implement high school STEM programs in rural schools.

Hawaii proposed the opening of two new tech academies and creative academies which will focus on animation, game design, and digital media. In addition, Hawaii described the expansion of Excellence in Science and Technology to fifteen high schools and Fostering Inspiration and Relevance through Science and Technology (FIRST) to middle school academies. The FIRST academies will provide students with contextual learning opportunities in STEM particularly in robotics. Hawaii will launch a STEM portal for students, teachers, and parents. Hawaii will also conduct a system-wide inventory of high school science and mathematics facilities (physical plant, instructional resources, and human resources) to determine high-quality STEM education. Schools in Zones of Improvement will have first priority for a science and math capacity plan based on the inventory.

Massachusetts will build six STEM/early college high schools located on college campuses.

New York will support the transformation of 25 low achieving schools through the creation of a state-level competitive Innovative Secondary Schools Model Incentive Funds for schools focused on STEM themes. The state will expand its math and science/early college high schools and create a network of Smart Scholars Early College High Schools in cooperation with the State University of New York.

North Carolina reported that there are currently 112 career academies directly related to STEM as well as a School of Science and Mathematics, a public residential school. North Carolina will develop four coordinated STEM anchor schools in STEM areas that are relevant to the state's economic development and STEM cluster high schools network for each of the following themes: engineering and energy, aerospace, biotechnology and agri-science,

and health and life sciences. In addition, North Carolina proposed building a network of STEM-themed high schools throughout the state.

Ohio identified the Metro Early College High School as a leader in regionalizing innovation in the state. Ohio also has 10 STEM platform schools through the Ohio STEM Learning Network.

Currently, Tennessee has two STEM platform schools and plans to add three additional STEM schools or leadership development programs. Tennessee also has a virtual school through the Electronic Learning Center that offers high school completion and college dual enrollment courses in STEM and one STEM hub for rural region.

STEM programs/curriculum

Three states (Delaware, Maryland, and North Carolina) and the District of Columbia are currently involved with Project Lead the Way, a national network that provides biomedical and engineering curricula to middle and high schools. The District of Columbia has six schools participating in the Project. Maryland proposed using funds for low-achieving middle and high schools to participate in Project Lead the Way. North Carolina has 60 pre-engineering academies with Project Lead the Way. In addition, those states are also involved in The Gateway to Technology, a middle school technology curriculum from Project Lead the Way.

Three states (Florida, New York, and North Carolina) referred to their Career and Technical Education (CTE) programs with an increased emphasis on STEM pathways. Florida reported while they currently had 300 career and technical education programs, they would be partnering with the Southern Regional Education Board to strengthen the programs and increase the emphasis on STEM career pathways. New York reported more than 800 CTE programs in health, education, human services, digital media, engineering, and community. North Carolina will expand CTE to low-performing schools and other schools that have limited curriculum offerings.

The District of Columbia referred to an elementary and middle school integrated mathematics and science curriculum as well as the implementation of Everyday Math.

Delaware is implementing an Engineering is Elementary curriculum that integrates engineering and technology concepts and skills with science topics

sponsored by Dupont. Delaware is also implementing eMints and eLearning programs that use technology to increase student performance and recover credits.

Florida referred to an increased emphasis on STEM career pathways. The state also described an alternative credit pilot program to award high school core and career course credits for an industry certification program. The program includes state standards and end-of-course examinations in every core area.

Georgia referred to an integrated high school mathematics curriculum and a science mentor program.

Maryland will develop an interdisciplinary STEM-based curriculum for Pre-K to grade 12, with sample problem-based and project-based lessons, and project-based STEM units for grades 4–8. Maryland also proposed the expansion of the Primary Talent Development Science curriculum in low achieving schools. In addition, Maryland is participating in the Southern Regional Education Board's multi-state consortium to develop STEM curricula, instructional materials, assessments, and professional development. (Since 2007, Maryland has used state funds to improve STEM education and assist districts in developing integrated, coordinated STEM programs.)

Massachusetts plans to incorporate STEM subjects into all aspects of Pre-K–12 teaching and learning systems, including the development of curriculum maps for mathematics, science, technology and engineering. The state also proposed the development of a pre-advanced placement curricula to promote success in Advanced Placement courses. Massachusetts will provide supplemental funding to districts to adopt two proven science programs in STEM by low-performing schools.

New York proposed the development of spiraled, sequenced, curriculum models within and across STEM disciplines aligned with Common Core standards. The curriculum models will include: grade-by-grade performance expectations, grade-level learning examples, recommended resources, formative assessment tools, alignment tools, and supplemental guidance for English language learners and students with disabilities. New York also has a partnership with universities and districts for a Science and Technology Entry Program. New York will provide district grants for summer STEM advanced programs in high needs middle and high schools.

North Carolina reported that in 2010 all high school students will complete a Future-Ready Core Curriculum.

Rhode Island will engage teams of teachers from 16 to 20 districts for an intensive curriculum alignment process that will build a standards-aligned scope and sequence for mathematics and science. Rhode Island will be working with the Dana Center to create aligned curriculum resources in science and mathematics as well as supporting districts in creating STEM units of study.

Tennessee will develop cross-disciplinary and project-based curriculum linked to Tennessee STEM industries.

Dual high school/college credit courses

Five states (Georgia, Hawaii, New York, North Carolina, and Tennessee) and the District of Columbia described activities related to dual high school/college credit courses.

The District of Columbia will be developing rules and guidance for dual enrollment in high school and college courses.

Georgia permits eleventh and twelfth graders who demonstrate readiness for college-level work to attend a college or technical school full-time to complete high school graduation requirements while earning college credits.

Hawaii, in partnership with the University of Hawaii community college system, created a Career Technical Education dual credit articulated program in 2009. This program enables high school students to earn high school and college credits for courses.

New York will expand its Math and Science/Early College High Schools to develop a network of Smart Scholars Early College High Schools in partnership with the State University of New York.

North Carolina has created over seventy Early College High Schools located on college campuses. Students can earn a high school diploma and either an associate's degree or two years of college credit.

Tennessee, through its Virtual Charter School, will offer high school completion and college dual enrollment courses.

STEM courses

Several applicants proposed the expansion of Advanced Placement Courses (especially those with a STEM focus), the development and implementation of new courses, and/or virtual courses.

The District of Columbia will implement project-focused classes for STEM integration.

Delaware will work with six to eight districts, with the lowest student performance, and expand Advanced Placement offerings in schools through improved professional development and student-focused support.

By 2011–12, Florida will require all high schools to offer specific Advanced Placement courses (English, mathematics, science, and social studies), the Advanced International Certification Program, or the International Baccalaureate program. In addition to Advanced Placement courses, Florida will require each middle school to teach at least one high school mathematics course. Florida also mentioned a middle school technology integration project to incorporate tools into science, mathematics, English language arts, and the arts.

Georgia will offer college-level calculus I and II courses to advanced high school students and will provide a new Math4-Operations Research course. The new course is an applied mathematics course, featuring real STEM examples, for students to take as their fourth high school mathematics course or as an alternative to pre-calculus or calculus courses.

Georgia and Hawaii also referenced robotics and engineer design courses for eighth graders.

Maryland proposed the expansion of advanced placement courses, with a STEM focus and the development of project-based STEM units for grades 4–8. Maryland's STEM Innovation Network will coordinate STEM internships, co-ops, and lab experiences for interested high school and college students.

Rhode Island will pilot project-based learning to connect the Engineering and Technology Grade Span Expectations to ongoing curriculum and instruction in two districts. The state will also develop an academic vocabulary list for STEM concepts and skills at each grade level, especially for English language learners and students in poverty.

Virtual schools/courses

Six states (Georgia, Hawaii, Maryland, New York, North Carolina, and Tennessee) referenced that Virtual Schools offer STEM courses. Georgia stated that the Georgia Virtual School offers STEM courses. Hawaii proposed the launching of a STEM portal for students, teachers, and parents. Maryland mentioned that they would expand the offering of virtual courses. New York described virtual courses in STEM disciplines and Advanced Placement courses for high needs rural and urban schools. North Carolina's virtual school offers STEM courses in mathematics and science. Tennessee described a virtual school through an electronic learning center that offers high school completion and dual enrollment courses in STEM.

Assessments in STEM-related subjects

The District of Columbia and ten states (Delaware, Florida, Georgia, Hawaii, Maryland, Massachusetts, New York, Ohio, Rhode Island, and Tennessee) will be collaborating in a consortium, the Partnership for Assessment of Readiness for College and Career (PARCC). PARRC will develop K–12 formative, interim, and summative assessments aligned with the Common Core standards. The PARCC will be developing a common assessment across states facilitated by Achieve.

Seven states (Florida, Hawaii, Maryland, Massachusetts, North Carolina, Ohio, and Rhode Island) are participating in the America Diploma's Project Multistate Mathematics Assessment Consortium to administer algebra II end-of-course assignments. In 2010, the University of Hawaii will start a three-year trial to use scores from the American Diploma Project algebra II end-of-course exams to place high school graduates into mathematics courses offered by University of Hawaii.

Five states (Delaware, Georgia, Hawaii, North Carolina, and Ohio) are participating in the SMARTER Balanced Assessment Consortium, which will be creating state-of-the-art adaptive online exams aligned with the Common Core standards, using "open source" technology. The assessments will include the summative assessments and optional formative or benchmark assessments.

Two states (Hawaii and Massachusetts) will develop end-of-course assessments in STEM-related subjects; Hawaii in algebra and biology in 2011–12 and Massachusetts in technology and engineering.

The District of Columbia proposed the expanded use of summative and interim assessments.

Florida will develop a K–3 technology-based formative assessment in mathematics and an interim assessment platform for K–8 math, algebra I and II, geometry, K–8 science, biology, earth/space science, physics, and chemistry. Florida also reported end-of-course assessments for algebra I, geometry, and biology. In addition, Florida will revise college placement tests to reflect college and career readiness.

Georgia will improve the current on-line assessment system with a special emphasis on the number of math 1 and 2 practice items.

Maryland will adjust the scaling of the existing state assessment to assess individual student growth in mathematics for grades 3–8.

Massachusetts will add science to the high school exit exams and create engineering education assessments. The state will develop extended performance tasks for grades 3–11 in mathematics, science, technology/engineering, and two vocational technical areas. Massachusetts will also prioritize formalized formative and interim assessments for mathematics (K–8, geometry, and algebra) and science aligned with curriculum maps. Massachusetts will also enhance its Vocational Technical Competency Tracking System so it monitors students' progress in the state's Vocational/Technical Education framework and Common Core standards.

In addition to revising its science assessments and designing a blended grades 3–8 science testing program, New York will create: 1) new mathematics summative assessments, 2) new formative and summative assessments aligned with Common Core standards, and 3) assessments for technology education. New York will also develop curricula and assessments in multimedia computer technology. New York is a participant in the National Center on Education and Economy's Board Examination Consortium which will align to the Common Core standards. New York will also work with the Center for Assessment to design and implement growth model and value-added model. In addition, New York will track students' STEM experiences through its longitudinal data system.

North Carolina will create a system of K–8 diagnostic mathematics assessments and a K–12 math and science curriculum monitoring assessment.

Ohio's project, Personalize Learning through Formative Instruction, will provide the basis for data-driven instruction in Ohio. Formative instruction is

instruction that is based on rigorous state standards coupled with formative assessments, with constant adjustments made throughout the learning progression based on individual student progress.

Summary on rigorous courses of study

To increase rigor in courses of study, the District of Columbia and eleven awarded states proposed multi-prong statewide and school-level strategies and activities. At the statewide level, states proposed: increasing or changing graduation requirements in STEM-related disciplines and developing new high school diplomas; adopting new or revising state standards in STEM-related disciplines; developing and/or implementing statewide STEM programs, curriculum, and courses; and developing, revising, and implementing diagnostic, formative, interim, and summative assessments. At the school level, states proposed the development and/or expansion of STEM academies and high schools, the support of schools in adopting specific programs and/or curricula, and the development of new and/or expansion of Advanced Placement or other STEM-related courses.

The next section summarizes the collaborative approaches applicants identified to prepare and assist teachers.

State collaborative approaches to preparing and assisting teachers and applied learning opportunities

For this sub-section of the application, the applicants' plans described their cooperation with industry experts, museums, universities, research centers, or other STEM-capable community partners to prepare and assist teachers in STEM content across grades and disciplines, in promoting effective and relevant instruction, and in offering applied learning opportunities for students.

Cooperation with partners

Table 2 presents a summary of partners identified by applicants in this section of the application.

Table 2. Summary of partners by state

Applicant	Districts	Public institutions of higher education	Private institutions of higher education	Business industry experts	Research centers institutes	Museums	Community partners/ associa-tions	Federal, state, or city govern-ment agencies	Other
DE	x	x	x	x					
DC	x		x			x	x	x	Battelle
FL	x	x		x	x			x	
GA	x	x		x	x		x		Public Broad-casting System, Virtual School
HI	x	x		x					
MD	x	x		x					Southern Regional Edu-cation Board
MA	x			x	x				
NY	x	x		x					
NC	x	x		x			x		Founda-tions
OH	x	x		x	x		x		Battelle
RI	x	x	x		x				
TN	x	x							Battelle

Preparing and assisting teachers and applied learning opportunities for students

The activities identified by applicants were organized into the following categories: teacher endorsement/certification, pre-service preparation, teacher internships/externships, professional development, including on-line and virtual courses, the development and dissemination of resources for teachers and administrators, STEM teacher distribution and/or incentive programs/activities, and applied learning opportunities for students.

Table 3 presents a summary of each applicant's proposed activities for preparing and assisting teachers and applied learning opportunities.

Table 3. Summary of state activities for preparing and assisting teachers

Applicant	Teacher endorsement certification	Pre-service preparation	Teacher internships externships	Professional development (PD)	On-line PD virtual courses	Development and dissemination of resources for teachers and administrators	STEM teacher distribution and/or incentive programs activities	Applied learning opportunities for students
DE	x	x	x	x	x	x		
DC				x				x
FL	x	x		x		x	x	
GA	x	x	x	x	x	x		x
HI	x			x		x	x	x
MD	x	x		x	x	x		x
MA		x		x		x	x	
NY	x			x	x	x	x	x
NC		x		x		x		
OH	x			x	x	x		
RI		x	x	x		x	x	x
TN		x		x		x		

Teacher endorsements/certification activities or requirements

Seven states (Delaware, Florida, Georgia, Hawaii, Maryland, New York, and Ohio) described activities or requirements related to teacher endorsements and/or certifications.

Delaware described a variety of scholarships and loan forgiveness programs for teachers (e.g., Critical Needs Scholarships, Christa McAuliffe Teacher Incentive Program, and Delaware Teacher Corps) to become certified in critical needs areas, such as STEM fields.

Florida will increase the elementary teacher certification requirements in mathematics and science as well as increase the emphasis on knowledge of mathematics and the diagnosis and remediation of students' mathematics performance. In addition, Florida will provide teacher stipends for elementary mathematics and science endorsements and reimbursement and loan forgiveness programs for teachers receiving middle school and high school certification in mathematics or science.

Georgia will 1) develop new courses for elementary mathematics and science endorsements, 2) increase the number of effective teachers through partnership with Teach for America, and 3) publicize an Adjunct Teacher Alternative Route to Certification which allows highly-trained subject matter experts to teach science and mathematics courses part-time.

Hawaii will offer online certification for mathematics and science teachers through the University of Hawaii.

Maryland plans to develop an elementary STEM teacher certificate that will enroll its first cohort in 2012.

New York will establish an incentive fund for STEM certification grants to teachers of STEM courses, English language learners, and students with disabilities to teach in high needs schools. New York also plans to have expedited certification routes for individuals, with advanced or doctoral degrees in STEM subjects, to teach in high needs middle and high schools. New York City Mathematics Immersion Program provides candidates without a mathematics major to participate in immersion training in math during pre-service and customized master's program. New York also started a Science Immersion Program similar to the Mathematics Immersion Program.

Ohio referenced the Woodrow Wilson Foundations STEM Fellows Program to recruit, prepare, and retain effective teachers of individuals with backgrounds in STEM fields.

Preservice preparation

Six states (Florida, Georgia, Maryland, Massachusetts, North Carolina, and Tennessee) described activities related to UTeach Programs, four-year programs that provide graduates with STEM field degrees and secondary teaching certificates. Massachusetts plans to create a UTeach Program in a STEM-focused preparation program. Maryland plans to increase the enrollment and completion of under-represented groups in the Maryland UTeach program as well as establish STEM-based programs modeled after the UTeach program. The other states proposed the expansion of the UTeach program to additional campuses or other universities. For example, Florida plans to expand its teacher preparation programs in STEM courses from Florida State University and University of Florida UTeach Programs to other universities. Georgia plans to expand its UTeach programs in science and mathematics to institutions of higher education in three geographic regions of the state to recruit and train undergraduate math/science majors as teachers. North Carolina plans to expand the UTeach to three additional campuses. Tennessee also identified expanding the UTeach program, currently at two campuses, to two additional campuses.

Delaware referred to a STEM Residency Program in 2010–11 for nontraditional candidates to work as assistance teachers under mentors to qualify for first year of teaching.

Georgia plans to use the scores from the Teacher Preparation Program Effectiveness Measures (TPPEM) to determine which pre-service preparation programs are producing effective science and mathematics teachers and focus on increasing recruitment and expansion of those programs.

Maryland will expand alternative routes to preparation in STEM disciplines.

North Carolina described a fast-track licensure program for undergraduate science and mathematics majors at University of North Carolina (Baccalaureate Education in Science and Teaching) (UNC-BEST). The University of North Carolina's Teacher Quality Research Program will analyze the teacher preparation in STEM subjects.

Rhode Island stated that the state had raised test-score requirements for admission to teacher preparation programs.

Tennessee's TEACH/Here, an innovative teacher residency program, is focused on recruiting, preparing, and supporting effective teachers to serve in high needs positions. With a focus on science and mathematics, the program

operates in two school districts in partnership with University of Tennessee Knoxville and the Public Education Foundation.

Teacher internships/externships

In partnership with the University of Delaware, Delaware will implement a STEM residency program in 2010–11 for non-traditional candidates to work as assistant teachers under mentors to qualify for full certification during the first year of teaching.

Georgia plans to expand its Georgia Intern-Fellowship for Teachers program, which places high school STEM teachers in mentored, paid, STEM internships in industry and university research laboratories.

Rhode Island referred to teacher externships in industry for middle and high school teachers through a summer externship program.

Professional development

The District of Columbia and nine states (Florida, Georgia, Hawaii, Maryland, Massachusetts, New York, North Carolina, Rhode Island, and Tennessee) proposed a variety of general statewide and targeted, specific professional development activities/workshops to address the Common Core standards, assessments, and STEM content.

The District of Columbia proposed: 1) the development of a Professional Learning Community for Effectiveness (PLaCEs) around STEM themes to provide support and development to teachers; 2) the launching of an on-line, interactive individualized professional development platform that links student and teacher growth to specific professional growth supports; 3) professional development on Common Core standards and Standard Entry Points for Differentiated Learning; 4) Carnegie Institute training for middle school mathematics and science teachers; and 5) for early childhood teachers training with the National Air and Space Museum to encourage science in the early childhood setting.

Florida will not only provide schoolwide professional development on the new standards in mathematics and science, but also described the collaborative efforts of the Promoting Regional Improvement in Science and Mathematics Project (PRISM). PRISM recognizes and compensates outstanding mathematics

and science teachers and shares their best practices through a STEM outreach program and a repository of experiments and best practices.

Georgia will provide a variety of professional development activities to address the Common Core standards, assessments, and STEM content. For participating districts, Georgia will not only fund school-based math coaches but will also use the Teacher Preparation Program Effectiveness Measures scores of STEM teachers to identify teachers who need professional development and tailor the professional development to these teachers.

Hawaii plans to create an overarching STEM Learning Strategy to provide: 1) comprehensive supports, 2) mandatory statewide professional development on the Common Core standards and the Implementation Toolkit for Science, and 3) services and materials for teachers. In addition, Hawaii, in cooperation with the University of Hawaii, will provide professional development for mathematics and science teachers and research experience for middle school teachers.

Maryland proposed a variety of general statewide and targeted, specific professional development activities/workshops to address the Common Core standards, assessments and STEM content. Maryland also plans to expand coaching so that every school has a math and STEM coach/team leader. In addition, Maryland will provide targeted professional development to low-achieving schools based on student achievement data and teacher effectiveness data through its Breakthrough Center.

Massachusetts plans to provide professional development addressing: 1) pre-Advanced Placement teacher training in mathematics and science; 2) K–8 mathematics instruction through the Massachusetts Intel Mathematics Initiative, and 3) tiered mathematics instructional models. In addition, Massachusetts will conduct regional forums on the Common Core standards. The state also proposed training for vertical teams of middle and high school math and science teachers in low income districts to develop effective pre-Advanced Placement curriculum and instruction in grades 6–10. Massachusetts also plans to staff a math specialist in every District and School Assistance Center to coach districts and expand regional Mathematics Curriculum Networks.

New York will collaborate with the Empire State STEM Progressive Dialogue to provide professional development and support to school leaders and teachers in STEM disciplines. Part of the professional development will focus

on analyzing data, identifying differentiated learning needs of students, and assessing needs for interventions. New York will provide district grants for STEM Advanced Placement training for middle and high school teachers.

North Carolina referenced that Title IID funds were used to create technology-enhanced professional development. The North Carolina Learning Technology Initiative provides every teacher and student with a computer or handheld device. The state also described an Induction Support Program in high-needs schools that will focus on elementary mathematics, middle school mathematics and Algebra I, and high school mathematics and science teachers. The Science House, through North Carolina State University College of Engineering, provides hands-on STEM related professional development through six regional consortia. State-supported professional development focused on STEM subjects will be available through the NC Mathematics and Science Education Network, the NC State University Science House, and the Kenan Fellows Program.

Rhode Island will target Title IIA, Higher Education Partnership Grants, to provide STEM-focused professional development. In addition, Rhode Island will work with the Dana Center to implement a series of Study of Standards workshops, provide professional development on assessments, and create aligned curriculum resources with districts. Rhode Island will also provide professional development to two to three districts on project-based learning aligned with Common Core standards and the state's Engineering and Technology standards. In addition, Rhode Island will develop and certify a network of intermediary services providers with expertise in mathematics, science, and leadership development to facilitate training sessions.

Tennessee will develop regional STEM hubs for professional development, resources, and partnerships. At least one STEM hub will be designated to a rural region and tied to the Tennessee Virtual Charter School. Tennessee will also develop STEM Centers for Professional Development for practicing math and science teachers. The state will support leadership development programs and a STEM infrastructure and sustainability in concert with the new Tennessee STEM Innovation Network. The state will hold annual STEM education conferences, curriculum development workshops, and other conferences.

On-line professional development/virtual courses

Five states (Delaware, Georgia, Maryland, New York, and Ohio) specifically identified on-line professional development/virtual courses opportunities.

Delaware will develop online curricular units.

Georgia will be provide on-line teacher professional development and course offerings in robotics, problem-based inquiry science, statistics, online learning, genetics/biotechnology, climate science, instructional technology, and nano-chemistry.

Maryland will expand online courses in STEM for teachers.

New York plans to invest in a sophisticated on-line professional development system that will facilitate learning communities and cyber-learning between educators, particularly for high needs rural and urban areas.

Ohio will provide online access to curriculum, resources, tools aligned to standards, data analysis tools, and early warning indicators.

Development and dissemination of teacher/administrator resources

Eleven states (Delaware, Florida, Georgia, Hawaii, Maryland, Massachusetts, New York, North Carolina, Ohio, Rhode Island, and Tennessee) discussed activities focused on the creation and dissemination of resources for teachers and administrators.

Delaware proposed the development of online curricular units.

Florida plans to develop an instructional materials database to support teachers.

Georgia will develop an Instructional Technology Toolkit for administrators and teachers to support the effective use of technology in a standards-based class. Georgia will also expand its digital library of resources demonstrating best practices through integrated classroom technology and develop applied STEM modules.

Hawaii will create Common Core instructional materials that will include interdisciplinary, STEM-based approaches, lesson plans, and teaching aids.

Maryland proposes a coordinated online STEM Teachers Count hub which will be a one-stop shop for Pre-K–12 STEM teachers. The hub will include the Online Instructional Toolkit and resources. Maryland will also be participating in

the Southern Regional Education Board's multistate consortium to develop instructional materials and teacher professional development for STEM programs of study.

Massachusetts will develop a digital library to house a collection of resources coded to standards and curriculum maps in partnership with the WGBH Educational Foundation and others.

New York plans to launch a new, improved Career and Technical Education Resource Center at a BOCES. BOCES and Teacher Centers will assist schools in implementing Common Core standards and assessments. There is also a New York State STEM Collaborative with institutions of higher education focused on science.

North Carolina will develop an online Clearinghouse of Instructional Resources.

Ohio Department of Education has approximately 30 curriculum consultants (with input from teachers, curriculum specialists, and universities) who are developing model curricula and revising model lessons for mathematics and science to align with the new standards. Ohio will provide online access to curriculum resources, tools aligned to the standards, curriculum customization tools, formative assessments, data analyses tools, and early warning indicators.

Rhode Island will develop curriculum resources aligned with the state's engineering and technology standards.

Tennessee proposed the development of STEM hubs for professional development that will provide resources as well as a STEMResources.com website.

STEM teacher distribution and/or incentive programs/activities

Five states (Florida, Hawaii, Maryland, New York, and Rhode Island) described activities related to the recruitment, distribution, and compensation of effective STEM teachers.

Florida's PRISM project recognizes and compensates outstanding mathematics and science teachers for industrial internships.

Hawaii will equalize the distribution of STEM teachers through incentive pay, targeted recruitment activities, financial incentives, and differentiated compensation for effective teachers.

Maryland will adopt incentive programs for highly effective teachers and principals taking assignments in high-minority/high-poverty and/or schools in need of improvement, including a focus on highly effective STEM teachers in low-achieving schools.

New York proposed supplemental teacher compensation for STEM teachers to remain in low performing schools.

Rhode Island will develop and fund an incentive system for STEM teachers. They will recruit teachers in mathematics and science through The New Teacher Project and Teach for America.

Applied learning opportunities for students

The District of Columbia and five states (Georgia, Hawaii, Maryland, New York, and Rhode Island) specifically referenced applied learning opportunities for students.

The District of Columbia identified a FIRST Lego League Robotics Clubs and teams and a statewide STEM showcase. Georgia identified the Lego League State competition in cooperation with Georgia Tech. Hawaii briefly identified the Annual Aerospace Student Design Competition.

The Maryland STEM Innovation Network will coordinate the STEM internships, co-ops and lab experiences for interested high school and college students. New York proposed summer STEM Advanced Placement courses that incorporate hands-on learning for high-needs middle and high school students. Rhode Island mentioned the Robotics FIRST Tech Challenge for high school students and plans for implementing project-based learning pilots in two districts.

Summary on preparing and assisting teachers and applied learning opportunities for students

To prepare and assist teachers in STEM content across grades and disciplines, the District of Columbia and the eleven states presented activities that addressed different aspects of the personnel system in education. Some of the activities focused on teacher endorsements/certification, pre-service preparation, and teacher internships. Other activities focused on a variety of statewide professional development activities, including on-line courses and

learning, as well as targeted and specific professional development activities for participating districts and schools. In addition, a number of states recognized the need for creating and disseminating STEM-related resources to teachers and administrators. Finally, a number of states highlighted activities for the recruitment, distribution, and compensation of effective STEM teachers.

For applied learning opportunities for students, five states and the District of Columbia described state competitions, such as Lego League, robotics clubs. Other states referenced hands-on learning as well as student internships and lab experiences.

The next section summarizes the approaches applicants described to prepare more students for advanced studies and careers in STEM, including the needs of under-represented groups and women and girls.

State approaches to preparing more students and addressing the needs of under-represented groups

This sub-section of the application described a plan that would prepare more students for advanced studies and careers in STEM, including the needs of under-represented groups and of women and girls. This section summarizes activities/programs that states described to recruit students from under-represented groups and girls and women.

Preparing more students. Applicants varied in how they discussed preparing more students from general goals to more measured goals.

Delaware's goals were: all schools will offer a rigorous course of study in STEM subjects; formalize, continue and expand collaboration with industry experts, institutions of higher education, universities, research centers, and other community partners to assist teachers in integrating STEM content across grades and disciplines; and prepare more students for advanced study and careers in STEM disciplines, including under-represented groups and women.

The District of Columbia proposed two goals: 1) increase the number of DC students who major in STEM fields in college and enter STEM careers, and 2) establish a college-going culture that enhances girls' interest in STEM careers.

Georgia's goal was to prepare more students for advanced study and careers in STEM, including under-represented groups.

Hawaii proposed increasing STEM proficiency, improving STEM instruction and equitable distribution of STEM teachers, and updating measurable achievement goals reported annually.

Maryland specifically identified increasing the number of STEM college graduates by 40 percent by 2015.

Ohio's goal was to double the number of students pursuing STEM academic majors in college and quadruple the number of students from under-represented groups. Other Ohio goals included: By 2014, Ohio Stem Learning Network STEM schools and ONET schools will serve as the state's innovation platform. Ensure that science and math teachers and specialists in all turnaround schools are engaging students in inquiry-based, applied learning in STEM.

Tennessee wants to significantly increase the number of students who graduate from high school successfully completing their diploma project and complete college degrees in STEM fields and increase the number of students

who make the successful transition to careers in STEM fields. Tennessee stated its activities would promote participation of women, minority, and economically disadvantaged students to equal participation by white males.

Addressing needs of under-represented groups and women and girls

Table 4 presents a summary of which applicants described activities that addressed recruitment of under-represented groups and/or recruitment of girls and women.

Table 4. Summary of activities to address needs of under-represented groups by states

Applicant	Recruitment of under-represented groups	Recruitment of girls and women
DE	x	x
DC	generally	x
FL	x	x
GA	x	generally
HI	x	x
MD	x	generally
MA	x	generally
NY	x	x
NC	x	x
OH	generally	generally
RI	x	x
TN	x	generally

Recruitment of under-represented groups

Six states (Georgia, Hawaii, Maryland, New York, Massachusetts, and Tennessee) identified general recruitment approaches.

For example, Georgia has a Scale the Math+Science=Success public awareness campaign to increase student interest, influence student selection of courses, and recruit diverse math/science teachers. Georgia also referenced recruiting under-represented groups into the UTeach program.

Hawaii will develop a comprehensive campaign for the Step Up Diploma that will include multi-media public awareness and action campaign with more than 100 partners and student pledges.

Maryland proposed: 1) a new digital campaign directed to students that would include web, mobile, social media, games, and simulation elements and focus on exploration of STEM careers and education; 2) student internships, co-ops, and lab experiences for high school under-represented groups; and 3) increasing minority enrollment in Maryland UTeach program. Maryland also proposed adopting incentive programs for highly effective teaches and/or schools in need of improvement, including a focus on highly effective STEM teachers in low-achieving schools.

Massachusetts, while emphasizing STEM college and career readiness among under-represented groups, will provide supplemental funding to districts to scale up programs that embed STEM in courses through pre-advanced placement curricula and STEM Early College high schools.

New York plans to review and scale up current initiatives and support low performing schools in integrating STEM throughout the curriculum with a particular focus on students from under-represented groups. The state will provide equitable access and opportunities to engage in innovative, rigorous STEM curriculum at all levels, particularly in low performing schools. The state will partner with business leaders and educational institutions in local communities to build awareness, develop mentorships and internships in STEM fields, provide opportunities for peer study groups, and increase the number of STEM-centered schools, especially for minority and women students. New York will use the longitudinal data system and the Education Data Portal to help close the achievement gap and further the progress of typically under-represented groups, such as women and minorities in STEM.

Tennessee plans to motivate minorities to participate in STEM fields at rates that match white male students.

Six states (Delaware, Florida, Georgia, Hawaii, North Carolina, and Rhode Island) identified specific programs/activities to recruit under-represented students.

Delaware referred to the Massachusetts Institute of Technology (MIT) Blended Learning Open Source Science or Math Studies (BLOSSOMS) program which helps teachers to integrate STEM content and encourages under-represented groups and women to pursue STEM careers. Delaware also

reported that they are in discussion with MIT to pilot integrated STEM curricula in two-three districts.

Florida, for example, has the Center for Research in STEM with a minority initiative as well as the Florida Partnership for Minority and Under-represented Student Achievement and the College Reach-Out Program.

Georgia Tech/Center for Education Integrating Science, Mathematics, and Computing (CEISMIC) focuses on the recruitment of minorities and under-represented groups.

Hawaii proposed supporting innovation in low performing schools by integrating STEM curriculum with a particular focus on under-represented groups and the development of STEM Centers in Zones for School Improvement. The centers will provide students opportunities to learn about STEM-related careers and encourage students to pursue the college-and-career-ready diploma.

North Carolina State University has a STEM program for students from under-represented groups. North Carolina also has a Math and Science Education Network, a pre-college program on nine University of North Carolina campuses, for middle and high school underserved students.

Rhode Island is participating in the Louis Stokes Alliance for Minority Participation for grades 6–12 students. The regional Alliance includes: the University of Massachusetts at Amherst, Northeastern University, University of Connecticut, University of Rhode Island, and Worcester Polytechnic Institute.

Tennessee will promote the participation of minority, women, and economically disadvantaged students to equal participation by white males.

Recruitment of girls and women

Four states (Florida, Hawaii, North Carolina, and Rhode Island) and the District of Columbia identified specific recruitment initiatives and programs targeted to girls and women.

The District of Columbia will establish a college-going culture that enhances girls' interest in STEM careers.

Florida referred to the Florida Center for Research in STEM which has a female initiative.

Hawaii's Women in Technology Project assists girls, attending rural schools, to pursue STEM careers. Hawaii will also be providing STEM Centers in Zones

for School Improvement. The STEM Centers will provide students with opportunities to learn about STEM-related careers and encourage students to pursue the college-and-career-ready diploma.

North Carolina's Women in Engineering Outreach Program encourages young girls and women to consider STEM careers.

Rhode Island referred to the Girls Reaching Remarkable Levels TECH, in partnership with Rhode Island Technology College and Roger Williams University at Amgen, and Brown University's Women in Science and Engineering targeting middle and high school girls and their pursuit of STEM courses and careers.

Tennessee will promote the participation of women.

Summary on preparing more students

Applicants varied in how they identified goals for preparing more students, from generally stated to more specifically measured goals. To prepare students from under-represented groups and girls and women, a number of applicants proposed statewide awareness campaigns targeted to students and the public. Several applicants targeted recruitment of under-represented groups in specific districts and schools. To recruit girls and women, some applicants referred to the use or and/or expansion of existing programs and activities.

The next section describes statewide Initiatives and/or networks that were referenced in the applications or will be developed.

Statewide initiatives and/or networks

While the application did not require it as part of the Competitive Priority, most applicants referenced and/or described their current state STEM initiatives/networks or their plans to create new initiatives and networks.

Current state STEM initiatives/networks. Six states (Georgia, Massachusetts, New York, North Carolina, Ohio, and Rhode Island) described current coordinating statewide initiatives and organizations which will be coordinated with proposed Race to the Top activities.

Georgia will implement recommendations from their Alliance Mathematics and Science Task Force which was established in 2008. In addition, Georgia will formalize partnerships with business and philanthropic communities to establish a public/private Innovation Fund to provide competitive awards to low performing districts that have innovative ideas about partnerships and applied learning.

Massachusetts referred to a STEM Advisory Council to the Governor as well as seven existing regional PreK–16 STEM networks that connect districts, higher education, and industry.

New York briefly described a STEM Education Collaborative and an Empire State STEM Education Progressive Dialogue, which is a statewide professional development network with universities that provides professional development and support in STEM disciplines.

North Carolina listed a number of existing committees and collaborative organizations with multiple partner organizations (e.g., the North Carolina Business Committee for Education, the NC STEM Community Collaborative (which will be involved in STEM-theme high schools), the NC Learning Technology Initiative, the NC eLearning Commission, and the K–12 STEM Education Group).

Ohio focused on a STEM Learning Network (OSLN), a public/private partnership that includes seven regional hubs, ten STEM platform schools, and twenty-eight grades K–8 programs. OSLN has forty-seven private and public institutions of higher education, eighty-one public districts, and more than 300 business and community partners. It has five regional hubs (Centers of regional STEM activity). In addition, OSLN identifies K–8 STEM Programs of Excellence.

Rhode Island created a Governor's Blue Ribbon Panel on Mathematics and Science Foundations and an action plan which forms the basis for grant-funded activities.

New STEM initiatives/networks

The District of Columbia and seven states (Tennessee, Florida, Delaware, Georgia, Hawaii, Maryland, and North Carolina) proposed the creation of new statewide networks.

For example, both the District of Columbia and Tennessee will form partnerships with Battelle Memorial Institute to develop STEM networks. The District of Columbia's new STEM learning network will leverage existing resources and programs and facilitate collaboration and dissemination. Tennessee's Stem Innovation Network of programs and schools will be modeled on Ohio's STEM Learning Network.

Delaware will create a STEM Coordinating Council that will manage the network of businesses, institutions of higher education, nonprofit organizations, and districts. The Council will work with districts that have the lowest student performance on college readiness exams, and poor STEM rigor, as well as set targets for the adoption of the most high-impact programs for student achievement.

Florida proposed that a STEMFlorida Education Advisory Group will develop a Florida STEM Plan to address its priorities.

Hawaii will create a STEM Learning Network and a statewide STEM portal and program directory that provides information on STEM education, programs, and resources in the state.

Maryland's STEM Innovation Network, in partnership with the Maryland Business Round Table, will develop a comprehensive, physical and virtual network to support STEM stakeholders.

North Carolina proposed building a network of STEM-themed high schools throughout the state.

IN SUMMARY

The American Recovery and Reinvestment Act (ARRA) of 2009 provided $4.35 billion for the Race to the Top Fund, a competitive grant program of the U.S. Department of Education designed to encourage and award states that create the conditions for education innovation and reform. In their applications, states were required to address several areas, including a competitive priority focused on science, technology, engineering, and mathematics (STEM) education. Applicants were required to address rigorous courses of study, cooperative partnerships to prepare and assist teachers in STEM content and applied learning opportunities, and preparation of more students, particularly under-represented groups, for STEM study and careers.

In 2010, the Department awarded Race to the Top funds to eleven states (Delaware, Tennessee, Florida, Georgia, Hawaii, Maryland, Massachusetts, New York, North Carolina, Ohio, and Rhode Island) and the District of Columbia.

To increase the rigor in their STEM courses of study, the RTTT-awarded states and the District of Columbia proposed a wide range of strategies and activities. State-level activities included the development of new high school diplomas, increases and/or changes in graduation requirements in STEM-related disciplines; revisions or adoption of new state standards in STEM-related disciplines (including adoption of Common Core standards); and the development and/or implementation of STEM programs, curriculum, Advanced Placement or other STEM-related courses, and dual high/school college credit courses; and the implementation of revised and/or new assessments (including diagnostic, formative, interim, and summative assessments) in STEM-related subjects. Eight states proposed the development and/or expansion of STEM academies and schools.

The winning applicants proposed plans to cooperate with industry experts, museums, universities, research centers, or other STEM-capable community partners. The goals of these partnerships are to prepare and assist teachers in STEM content across grades and disciplines, promote effective and relevant instruction, and offer applied learning opportunities for students.

To better prepare STEM teachers, the award-winners also presented activities to change aspects of personnel systems in education. The plans addressed teacher endorsements/certifications, pre-service preparation, and teacher internships or externships. Also proposed was a variety of professional

development activities, including on-line courses, and the development and dissemination of resources to teachers and administrators. Several states highlighted activities for the recruitment, distribution, and compensation of effective STEM teachers. Five states and the District of Columbia addressed applied learning opportunities for students through hands-on learning, student internships and laboratory experiences, and state competitions such as Lego League and robotics clubs.

When describing their plans to prepare more students for advanced studies and careers in STEM, including under-represented groups and women and girls, the applicants varied from general statements to specific measured goals. Six states proposed statewide awareness campaigns targeted to students and the public. Six targeted recruitment of under-represented groups through programs and/or projects in specific districts and schools. To recruit girls and women, seven applicants proposed the use or and/or expansion of existing projects, programs, and activities. Four states and the District of Columbia identified specific recruitment initiatives and activities for girls and women.

Many of the applicants' proposals addressed the recommendations of the President's Council of Advisors on Science and Technology (2010). Overall, the council emphasized the pursuit of proficiency in STEM subjects for all students, including girls and under-represented minorities; inspiring all students to consider a STEM career was also emphasized. The Council recommended that states, districts, and schools have clear goals and a coherent strategy for improving K–12 STEM education. Their recommendations fall under five priorities:

- improve Federal coordination and leadership on STEM education;
- support the state-led movement to ensure that the nation adopts a common baseline for what students learn in STEM;
- cultivate, recruit, and reward STEM teachers that prepare and inspire students;
- create STEM-related experiences that excite and interest students of all backgrounds; and
- support states and school districts in their efforts to transform schools into vibrant STEM learning environment.

The partnerships proposed by the RTTT-awarded states and District of Columbia were designed to support these goals.

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INDIVIDUAL PROFILES OF STATE STEM ACTIVITIES

DELAWARE

Date and round for award—March 29, 2010 for round 1

Goals

- All schools will offer a rigorous course of study in STEM subjects.
- Schools will formalize, continue, and expand collaboration with industry experts, institutions of higher education, universities, research centers, and other community partners to assist teachers in integrating STEM content across grades and disciplines.
- Schools will prepare more students for advanced study and careers in STEM disciplines, including under-represented groups and women.

Proposed activities for rigorous course of study in STEM

Standards

- Adoption of Common Core standards in mathematics

STEM programs/curriculum

- Implementation of an Engineering is Elementary (EiE) curriculum that integrates engineering and technology concepts and skills with science topics sponsored by Dupont
- High and/or middle schools' participation in Project Lead the Way and Gateway to Technology with University of Delaware
- eMints and eLearning programs that use technology to increase student performance and recover credits

Courses

- Work with six to eight districts with the lowest student performance and expand Advanced Placement offerings in schools through improved professional development and provide student-focused support

Assessments

- Participation in the Partnership for Assessment of Readiness for College and Career (PARCC), to develop K–12 formative, interim, and summative assessments aligned with the Common Core standards
- Participation in the SMARTER Balanced Assessment Consortium, which will be creating state-of-the-art adaptive online exams aligned with the Common Core standards, using "open source" technology. The assessments will include the summative assessments and optional formative or benchmark assessments.

Proposed activities for preparation of teachers and applied learning opportunities for students

Teacher endorsement/certification activities or requirements

- Scholarships and loan forgiveness for teachers to become certified in critical needs areas, such as STEM fields (Critical Needs Scholarships, Christa McAuliffe Teacher Incentive Program, Delaware Teacher Corps)

Pre-service preparation

- STEM Residency Program in 2010–11 for nontraditional candidates to work as assistance teachers under mentors to qualify for first year of teaching

Development and dissemination of resources

- Develop online curricular units

Proposed activities for preparation of more students, including under-represented groups

- Participation with Massachusetts Institute of Technology (MIT) Blended Learning Open Source Science or Math Studies (BLOSSOMS) program which helps teachers to integrate STEM content and encourages under-represented groups and women to pursue STEM careers
- In discussion with MIT to pilot integrated STEM curricula in two-three districts

STEM Coordinating Council

Delaware proposed the creation of a council to manage network of businesses, institutes of higher education, nonprofits, and districts that have demonstrated innovation in the STEM disciplines. The Council will promote the adoption of high-quality STEM initiatives; ensure that all schools have rigorous courses in STEM fields; ensure the integration of STEM content across grades and disciplines; and prepare under-represented groups, such as women, to enter STEM fields. The Council and the Curriculum Workgroup will work with six to eight districts that have the lowest performance on college readiness exams and less than rigorous STEM programs to identify under-represented groups for STEM careers. They will also expand Advanced Placement offerings, improve professional development and summer institutes in STEM, and provide direct support to students.

Source

Delaware Office of the Governor. (2010, January). *Delaware Race to the Top application for initial funding*. Retrieved from U.S. Department of Education website:
http://www2.ed.gov/programs/racetothetop/phase1-applications/delaware.pdf

DISTRICT OF COLUMBIA

Date and Round for Award—August 24, 2010 for round 2

Goals

- Prepare all students to graduate high school ready for college and career mastery of STEM
- Increase number of students who major in STEM fields in college and enter STEM careers

Proposed activities for rigorous course of study in STEM

Graduation requirements

- High school graduation requires four credits in mathematics and four credits in science.

Standards

- Adoption of Common Core standards in mathematics
- Revising science standards to reflect Common Core science standards. DC has already rearticulated standards for grades 5 and 8 in science and biology.
- Develop standard entry points for differentiated learning for students with disabilities
- Adopt the Standards for Global Learning in the Digital Age from the International Society for Technology in Education

STEM programs/curriculum

- Catalyst initiative of integrated elementary and middle school mathematics/science curriculum
- Implementation of Everyday Math curriculum
- Six schools participating in Project Lead the Way and Gateway to Technology, a middle school technology curriculum from Project Lead the Way

STEM academies/schools

- Described a STEM high school, charter schools, and six catalyst elementary and middle schools with STEM themes

Courses

- Developing rules and guidance for dual enrollment in high school and college courses
- Project-focused classes for STEM integration

Assessments

- Participation in the Partnership for Assessment of Readiness for College and Career (PARCC), to develop K–12 formative, interim, and summative assessments aligned with the Common Core standards
- Expand use of summative and interim assessments.

Proposed activities for preparation of teachers and applied learning opportunities for students

Professional development

- Proposing a Professional Learning Community for Effectiveness (PLaCEs) around STEM themes to provide support and development to teachers
- Launch individualized professional development platform that is dynamic, interactive, online, and links student and teacher growth to specific professional growth supports
- Carnegie Institute training for middle school mathematics and science teachers
- Professional development on Common Core standards and Standard Entry Points for Differentiated Learning
- National Air and Space Museum working with early childhood teachers to encourage science in the early childhood setting

Applied learning opportunities for students

- FIRST Lego League Robotics Clubs and teams and a statewide STEM showcase

Proposed activities for preparation of more students, including under-represented groups

- Increase the number of DC students who major in STEM fields in college and enter STEM careers
- Establish a college-going culture that enhances girls' interest in STEM careers

STEM Learning Network

- The District of Columbia proposed a partnership with Battelle Memorial Institute to develop a STEM Learning Network. The District of Columbia's new STEM learning network will leverage existing resources and programs and facilitate collaboration and dissemination. By 2011, the District of Columbia will have a coordinated statewide plan developed by the STEM Learning Network.

Source

District of Columbia Office of the State Superintendent of Education. (2010, June). *District of Columbia Race to the Top application for initial funding.* Retrieved from U.S. Department of Education website:
http://www2.ed.gov/programs/racetothetop/phase2-applications/district-of-columbia.pdf

FLORIDA

Date and round for award—August 24, 2010 for round 2

Proposed activities for rigorous course of study in STEM

Graduation requirements

- Seven-year phase-in of increased graduation requirements in mathematics and science with fourth credit in mathematics. In 2010, added geometry, algebra II, biology, chemistry or physics, and a third science course.
- Adopted college-ready competencies aligned with the American Diploma Project

Standards

- Adoption of Common Core standards in mathematics

STEM academies/schools

- Develop three consortia to build and implement high school STEM programs in rural schools
- Career and professional academy initiatives, especially for lowest achieving high schools

STEM programs/curriculum

- Currently 300 Career and Technical Education (CTE) programs
- Increase emphasis on STEM career pathways
- Partnership with Southern Regional Educational Board to strengthen CTE programs
- Florida Ready to Work certification program
- Alternative credit pilot to award high school core and career course credits for industry certification program that includes state standards and end-of-course exams in every core area

Courses

- Requirement that each middle school to teach at least one high school mathematics course
- Middle school technology integration project to integrate technology tools into science, mathematics, English language arts, and arts
- By 2010, all high schools required to offer specific advanced courses of programs (Advanced Placement courses in mathematics, science, English, and social studies; Advanced International Certification of Education Program, or International Baccalaureate Program)

Assessments

- Participation in the Partnership for Assessment of Readiness for College and Career (PARCC), to develop K–12 formative, interim, and summative assessments aligned with the Common Core standards
- Development of K–3 technology-based formative mathematics assessment system
- Development of interim assessments platforms for K–8 math, K–8 science, algebra I and II, geometry, biology, earth/space science, physics, and chemistry
- End-of-course assessments for algebra I, geometry, and biology
- Revisions in college placement tests to reflect college and career readiness

Proposed activities for preparation of teachers and applied learning opportunities for students

Teacher endorsement/certification activities or requirements

- Increase elementary teacher certification requirements in mathematics and science; increase the emphasis on knowledge of mathematics and the diagnosis and remediation of students' mathematics performance
- Provide teacher stipends for elementary mathematics and science endorsements and reimbursement and loan forgiveness programs for teachers receiving middle school and high school certification in mathematics or science

Pre-service preparation

- Expand teacher preparation programs in STEM courses from Florida State University and University of Florida *UTeach* Programs to other universities

Professional development

- Schoolwide professional development on new standards in mathematics and science
- The Promoting Regional Improvement in Science & Math (PRISM) Project (collaborative with ten districts and business partners):
  - Recognizes outstanding math and science teachers and shares their best practices
  - Selects and compensates the outstanding teachers for industrial internships
  - Establishes a STEM outreach program
  - Develops a repository of experiments and best practices
  - Provides incentive programs for students to take higher level STEM courses.

Development and dissemination of resources

- Develop an instructional materials database to support teachers' instructional materials decisions

Proposed activities for preparation of more students, including under-represented groups

- Florida Center for Research in STEM with a minority and female initiatives
- The Florida Partnership for Minority and Under-represented Student Achievement
- The College Reach-Out Program

STEM*Florida* Education Advisory Group

- STEM*Florida* Education Advisory Group will develop a Florida STEM Plan to address its priorities. Members of the Advisory Group include representatives of the Department of Education, Senate, institutions of higher education, Pre-K–12 education, Banner Center, foundations, rural district consortia, Agency for Workforce Innovation, information and technology businesses, aeronautics, and manufacturing.

Source

Florida Office of the Governor. (2010, May). *Florida Race to the Top application for initial funding.* Retrieved from U.S. Department of Education website:
http://www2.ed.gov/programs/racetothetop/phase2-applications/florida.pdf

GEORGIA

Date and round for award—August 24, 2010 for round 2

Goals

- Offer rigorous courses of study in STEM
- Cooperate with teachers in promoting effective instruction and offering applied learning opportunities for students
- Prepare more students for advanced study and careers in STEM, including under-represented groups

Proposed activities for rigorous course of study in STEM

Graduation requirements

- One of eight states participating in the College and Career-Ready Policy Institute (national collaborative focused on increasing numbers of students who are college and career ready)
- Participant in the American Diploma Project
- Require that all elementary and middle schools make science their second Adequate Yearly Progress (AYP) indicator

Standards

- Adoption of Common Core standards in mathematics

STEM programs/curriculum

- Integrated high school mathematics curriculum
- Science mentor program

Dual high school/college credits

- Eleventh and twelfth graders who demonstrate readiness for college-level work can attend college or technical school full time to complete high school graduation requirements while earning college credit.

Courses

- Offer college-level calculus I and II courses to advanced high school students through Georgia Tech's Center for Education Integrating Science, Mathematics, and Computing
- New Math4-Operations Research course for fourth mathematics courses—an applied mathematics course featuring real STEM examples. Could be taken as a fourth math course or as an alternative to pre-calculus or calculus courses.
- Provide robotics and engineer courses for eighth graders
- Georgia Virtual School provides STEM courses

Assessments

- Participation in the Partnership for Assessment of Readiness for College and Career (PARCC) to develop K–12 formative, interim, and summative assessments aligned with the Common Core standards
- Participation in the SMARTER Balanced Assessment Consortium, which will be creating state-of-the-art adaptive online exams aligned with the Common Core standards, using "open source" technology. The assessments will include the summative assessments and optional formative or benchmark assessments.
- Improve current Online Assessment System with a special emphasis on the number of math 1 and 2 practice items

Proposed activities for preparation of teachers and applied learning opportunities for students

Teacher endorsement/certification activities or requirements

- Develop new courses for elementary mathematics and science endorsements
- Increase number of effective teachers through the state's partnership with Teach for America

- Publicize and promote Adjunct Teacher Alternative Route to Certification which allows highly trained subject matter experts to teach science and math courses part-time

Pre-service preparation

- Expand UTeach programs in science and mathematics to institutions of higher education in three geographic regions of the state to recruit and train undergraduate math/science majors as teachers
- Use information from Teacher Preparation Program Effectiveness Measures for teachers produced in STEM content areas to determine which preparation programs are producing effective science and math teachers

Teacher internships/externships

- Expand the Georgia Intern-Fellowship for Teachers program, which places high school STEM teachers in mentored, paid, STEM internships in industry and university research laboratories

Professional development

- General statewide and targeted, specific professional development activities/workshops to address the Common Core standards, assessments, and STEM content
- For participating districts, Georgia will not only fund school-based math coaches but will also use the Teacher Preparation Program Effectiveness Measures scores of STEM teachers to identify teachers who need professional development and tailor the professional development to these teachers.
- Provide on-line teacher professional development and course offerings in robotics, problem-based inquiry science, statistics, online learning, genetics/biotechnology, climate science, instructional technology, and nanochemistry

Development and dissemination of resources

- Expand the digital library of resources demonstrating best practices through integrated classroom technology and develop applied STEM modules
- Develop an Instructional Technology Toolkit to support the use of technology in a standards-based class

Applied learning opportunities for students

- Lego League State competition in cooperation with Georgia Tech

Proposed activities for preparation of more students, including under-represented groups

- Georgia has a Scale the Math+Science=Success public awareness campaign to increase student interest, influence student selection of courses, and recruit diverse math/science teachers.
- Georgia also referenced recruiting under-represented groups into the UTeach program.
- Georgia Tech's Center for Education Integrating Science, Mathematics, and Computing (CEISMIC) also focuses on the recruitment of minorities and under-represented groups.

Alliance of Math and Science Task Force

- Alliance of Math and Science Task Force developed recommendations which are being implemented through Race to the Top funds. The Alliance included representatives from: the Department of Education, institutions of higher education, CEISMC, Board of Education, and local districts. In addition, Georgia will formalize partnerships with business and philanthropic communities to establish a public/private Innovation Fund to provide competitive awards to low performing districts that have innovative ideas about partnerships and applied learning.

Source

Georgia Office of the Governor. (2010, May). *Georgia Race to the Top application for initial funding*. Retrieved from U.S. Department of Education website: http://www2.ed.gov/programs/racetothetop/phase2-applications/georgia.pdf

HAWAII

Date and round for award—August 24, 2010 for round 2

Goals

- Increase STEM proficiency
- Improve STEM instruction and equitable distribution of STEM teachers
- Updated measurable achievement goals reported annually

Proposed activities for rigorous course of study in STEM

Graduation requirements

- Require four credits in mathematics and three credits in science for students to graduate from high school
- In 2008, Hawaii developed the Board of Education Recognition Diploma for implementation in 2013–2017. The diploma will require: 1) three years of science (two laboratory courses), 2) three years of mathematics (algebra I and II, and geometry), 3) meeting end-of-course examination criteria for algebra II, and 4) a senior project.
- The Hawaii Board of Education was to vote on the adoption of a College and Career Ready Diploma for students entering high school in 2013. The diploma will offer three optional advanced pathways: 1) recognized advanced academic achievement, 2) recognized advanced technical achievement, and 3) students graduating with a STEM emphasis.
- Hawaii will implement a "Step Up" Recognition Diploma in 2013. The diploma requires: four credits in mathematics, three credits in science, a half-credit in expository writing, a senior project and meeting standards on algebra final exams.

Standards

- Adoption of Common Core standards in mathematics

STEM academies/schools

- Hawaii proposed the opening of two new Tech Academies and Creative Academies which will focus on animation, game design, and digital media.
- Expansion of Excellence in Science and Technology, to 15 high school academies, and Fostering Inspiration and Relevance through Science and Technology (FIRST) middle school academies. The FIRST academies will provide students with contextual learning opportunities in STEM particularly in robotics.

Dual high school/college credit

- Hawaii, in partnership with the University of Hawaii community college system, created a Career Technical Education dual credit articulated program in 2009. This program helps students earn high school/college credits for courses.

Courses

- Robotics and engineer design courses for eighth graders

Assessments

- Participating in the America Diploma's Project Multistate Mathematics Assessment Consortium to administer algebra II end-of-course assignments
- Participating in the Partnership for Assessment of Readiness for College and Career (PARCC) to develop K–12 formative, interim, and summative assessments aligned with the Common Core standards
- Participating in the SMARTER Balanced Assessment Consortium, which will be creating state-of-the-art adaptive online exams aligned with the Common Core standards, using "open source" technology. The assessments will include the summative assessments and optional formative or benchmark assessments. End of course exams have been developed for algebra I and biology and will be administered, pending funding.

Other activities

- Align high school requirements and STEM goals with University of Hawaii and colleges
- In 2010, University of Hawaii will start a three-year trial to use scores from the American Diploma Project Algebra II end of course exams to place high school graduates into mathematics courses offered by University of Hawaii.
- Launch a STEM portal for students, teachers, and parents
- Conduct system-wide inventory of high school science and mathematics facilities (physical plant, instructional resources, and human resources) to determine high-quality STEM education. Schools in Zones of Improvement will have first priority for a Science and Math capacity plan based on the inventory.

Proposed activities for preparation of teachers and applied learning opportunities for students

Teacher endorsement/certification activities or requirements

- Hawaii will offer online certification for mathematics and science teachers through the University of Hawaii.

Professional development

- Statewide training on Common Core standards Implementation Toolkit for science teachers
- Research experiences for teachers through University of Hawaii for middle school teachers
- Hawaii plans to create an overarching STEM Learning Strategy to provide comprehensive supports, mandatory professional development on the Common Core standards, services and materials for teachers.

Development and dissemination of resources

- Hawaii will create Common Core instructional materials that will include interdisciplinary, STEM-based approaches, lesson plans, and teaching aids.
- Hawaii, with the University of Hawaii, will provide professional development for math and science teachers.
- Equalize distribution of STEM teachers through incentive pay, targeted recruitment strategies, financial incentives, differentiated compensation for effective teachers

Applied learning opportunities for students

- Hawaii briefly participated in the Annual Aerospace Student Design Competition.

Proposed activities for preparation of more students, including under-represented groups

- Support innovation in low performing schools by integrating STEM curriculum with a particular focus on under-represented groups.
- Hawaii's Women in Technology Project assists girls, attending rural schools, to pursue STEM careers.
- Provide STEM Centers in Zones for School Improvement. The STEM Centers will provide students with opportunities to learn about STEM-related careers and encourage students to pursue the college-and-career-ready diploma.
- Comprehensive campaign for Step Up Diploma includes student pledge program, multi-media public awareness, and action campaign with more than 100 partners.

Hawaii STEM Learning Strategy and STEM Learning Network

- Hawaii proposed the creation of an overarching STEM Learning Strategy and STEM Learning Network. The primary focus of the Hawaii STEM Learning Strategy will be to provide comprehensive supports, services, and materials for highly effective teachers to help all students successfully compete the "college- and career-ready" diploma.

Source

Hawaii Office of the Governor. (2010, May). *Hawaii Race to the Top application for initial funding.* Retrieved from U.S. Department of Education website: http://www2.ed.gov/programs/racetothetop/phase2-applications/hawaii.pdf

MARYLAND

Date and round for award—August 24, 2010 for round 2

Proposed activities for rigorous course of study in STEM

Graduation requirements

- Entering ninth graders in 2011 will be required to earn four credits in mathematics and three credits in science for students to graduate from high school.
- Added a high school STEM-ready endorsement to the high school diploma

Standards

- Adoption of Common Core standards in mathematics and revise/align Pre-K–12 curricula, assessments, and accountability systems
- The state currently has technology standards for teachers, students, and administrators. Seventh grade teachers, students, and administrators are assessed on standards.

STEM programs/curriculum

- Currently involved with Project Lead the Way, a national network that provides biomedical and engineering curricula to middle and high schools. Funds will be provided for low-achieving middle and high schools to participate.
- Currently involved in The Gateway to Technology, a middle school technology curriculum from Project Lead the Way
- Expand the implementation of the Primary Talent Development Science Curriculum in low achieving elementary schools
- Participating in Southern Regional Educational Board's multi-state consortium to develop STEM curricula, assessments, instructional materials, and professional development
- Develop an interdisciplinary STEM-based curriculum for Pre-K–12 with sample problem-based and project-based lessons

Courses

- Develop project-based STEM units for grades 4–8
- Expand the Virtual Schools offer STEM courses
- Increase use of Advanced Placement courses with STEM focus

Assessments

- Participation in the America Diploma's Project Multistate Mathematics Assessment Consortium to administer Algebra II end-of-course assignments
- Participation in the Partnership for Assessment of Readiness for College and Career (PARCC), to develop K–12 formative, interim, and summative assessments aligned with the Common Core standards
- Adjust scaling of the existing Maryland School Assessment to assess individual student growth in grades 3–8 math

Other activities

- Maryland STEM Innovation Network will coordinate the STEM internships, co-ops and lab experiences for interested high school and college students.
- Since 2007, Maryland has used state funds to improve STEM education and assist districts in developing integrated, coordinated STEM programs.

Proposed activities for preparation of teachers and applied learning opportunities for students

Teacher endorsement/certification activities or requirements

- Develop an elementary STEM teacher certificate that will enroll its first cohort in 2012

Pre-service preparation

- Increase the enrollment and completion of under-represented groups in the Maryland UTeach program as well as establish STEM-based programs modeled after the UTeach program
- Expand alternative routes to preparation in STEM disciplines

Professional development

- Proposed a variety of general statewide and targeted, specific professional development activities/workshops to address the Common Core standards, assessments, and STEM content
- Expand online courses in STEM for teachers
- Expand coaching so that every school has a math and STEM coach/lead teacher
- Targeted professional development for teachers in low-achieving schools through the Breakthrough Center based on student achievement data and teacher effectiveness data

Development and dissemination of resources

- Maryland is proposing a coordinated online STEM Teachers Count hub which will be a one-stop shop for Pre-K–12 STEM teachers that will include the online instructional toolkit and resources.
- Maryland will also be participating in the Southern Regional Education Board's multi-state consortium to develop instructional materials and teacher professional development for STEM programs of study.

STEM teacher distribution and/or incentive programs/activities

- Implement incentive programs to reward highly effective STEM teachers and shore-up STEM shortage areas.
- Adopt incentive programs for highly effective teachers and principals taking assignments in high-minority/high-poverty schools and/or schools in need of improvement, including a focus on highly effective STEM teachers in low-achieving schools.

Proposed activities for preparation of more students, including under-represented groups

- Develop a new digital campaign directed to students that would include web, mobile, social media, games, and simulation elements and focus on exploration of STEM careers and education
- Provide student internships, co-ops, and lab experiences for high school under-represented groups
- Increase minority enrollment in Maryland *UTeach* program
- Adopt incentive programs for highly effective teachers and principals taking assignments in high-minority/high-poverty schools and/or schools in need of improvement; includes a focus on highly effective STEM teachers in low-achieving schools

Maryland STEM Innovation Network

- Maryland's STEM Innovation Network, in partnership with the Maryland Business Round Table, will develop a comprehensive, physical and virtual network to support STEM stakeholders.

Source

Maryland Office of the Governor. (2010, May). *Maryland Race to the Top application for initial funding.* Retrieved from U.S. Department of Education website:
http://www2.ed.gov/programs/racetothetop/phase2-applications/maryland.pdf

MASSACHUSETTS

Date and round for award—August 24, 2010 for round 2

Proposed activities for rigorous course of study in STEM

Graduation requirements

- Adopt MassCore curriculum which requires four credits in mathematics and three credits in science for students to graduate from high school
- Align public four-year college entrance requirements

Standards

- Adoption of Common Core standards in mathematics
- Proposed revisions in science standards
- Align the academic strand of the career/technical education standards to the Common Core standards

STEM academies/schools

- Build six STEM/Early College high schools located on college campuses

STEM programs/curriculum

- Incorporate STEM subjects into all aspects of Pre-K through grade 12 teaching and learning systems; including the development of curriculum maps for mathematics, science, technology and engineering
- Supplemental funding to districts to adopt two proven science programs in STEM in low performing schools
- Development of a pre-advanced placement curricula to promote success in Advanced Placement courses

Assessments

- Add science to high school exit exams
- Prioritize formalized formative and interim assessments for mathematics (K–8, Geometry and Algebra) and science aligned with curriculum maps
- Create engineering education assessments
- Develop extended performance learning tasks for grades 3–11 in mathematics, science, technology/engineering, and two vocational/technical areas
- Participation in the Partnership for Assessment of Readiness for College and Career (PARCC), to develop K–12 formative, interim, and summative assessments aligned with the Common Core standards
- Enhance the Vocational Technical Competency tracking system so it monitors student progress in the mastery of Massachusetts' Vocational/Technical Education Frameworks and Common Core standards

Proposed activities for preparation of teachers and applied learning opportunities for students

Pre-service preparation

- Create a UTEACH program in a STEM-focused preparation program

Professional development

- Provide professional development in tiered mathematics instructional models
- Provide Pre-Advanced Placement teacher training in mathematics and science and for K–8 mathematics instruction through the Massachusetts Intel Mathematics Initiative
- Staff a math specialist in every district and school assistance center to coach districts
- Expand regional Mathematics Curriculum Networks

- Conduct regional forums in Common Core standards
- Provide training for vertical teams of middle and high school teachers of mathematics and science in low income districts to develop effective pre-Advance Placement curriculum and instruction in grades 6–10

Development and dissemination of resources

- Develop a digital library to house a collection of resources coded to standards and curriculum maps in partnership with WGBH Educational Foundation and others

Proposed activities for preparation of more students, including under-represented groups

- While emphasizing STEM college and career readiness among under-represented groups, provide supplemental funding to districts to scale up programs that embed STEM in courses through pre-Advanced Placement curricula and STEM Early College high schools

Massachusetts *STEM Advisory Council* and STEM Networks

- Massachusetts identified a STEM Advisory Council to the Governor as well as seven existing regional Pre-K–16 STEM networks that connect districts, higher education, and industry.

Source

Commonwealth of Massachusetts Office of the Governor. (2010, May). *Massachusetts Race to the Top application for initial funding.* Retrieved from U.S. Department of Education website:
http://www2.ed.gov/programs/racetothetop/phase2-applications/massachusetts.pdf

NEW YORK

Date and round for award—August 24, 2010 for round 2

Proposed activities for rigorous course of study in STEM

Graduation requirements

- Phase in higher scores on exams for graduation requirements through 2012
- Board of Regents College and Career Readiness Work Group review of high school requirements and Regents exams to better align with college success and career readiness
- State currently requires three years of mathematics and three years of science for graduation

Standards

- Adoption of Common Core standards in mathematics
- Revise and strengthen science standards
- Upgrade and make more rigorous technology standards
- Create learning standards for engineering education
- Review, revise, and adopt world class standards in STEM disciplines

STEM academies/schools

- Support transformation of 25 low achieving schools through the creation of state-level competitive Innovative Secondary Schools Model Incentive Funds that are focused on STEM themes
- Expand math and science/early college high schools to develop a network of Smart Scholars Early College High Schools in partnership with the State University of New York

STEM programs/curriculum

- Provide aligned, spiraled, sequenced, content-rich statewide curriculum models within and across STEM disciplines aligned with Common Core standards. Curriculum models will include grade-by-grade performance expectations, grade-level learning examples, recommended resources, formative assessment tools, alignment tools, and supplemental guidance for English language learners and students with disabilities.
- More than 800 Career and Technical Education programs in health, education, human services, digital media, engineering, and community
- Science and Technology Entry Program in partnership with universities and districts
- District grants for Summer STEM Advanced Program in high needs middle and high schools

Courses

- Virtual courses in STEM disciplines and Advanced Placement for high needs rural and urban schools

Assessments

- Participation in the Partnership for Assessment of Readiness for College and Career (PARCC) to develop K–12 formative, interim, and summative assessments aligned with the Common Core standards
- Revise science assessments
- Create assessments for technology education
- Create new mathematics summative assessments
- Create new formative and summative assessments aligned with *Common Core* standards
- Design a blended grades 3–8 science testing program
- Develop curricula and assessments in multimedia/computer technology
- Participant in the National Center on Education and Economy's Board Examination Consortium which will align to the Common Core standards
- Track students' STEM experiences through longitudinal data system
- Work with Center for Assessment to design and implement growth model and value-added model

Proposed activities for preparation of teachers and applied learning opportunities for students

Teacher endorsement/certification activities or requirements

- Incentive funds for STEM certification grants for teachers to obtain certification and work in high needs schools
- New expedited pathway for individuals with advanced degrees in STEM disciplines to teach in high needs schools
- Expedited pathway for individuals with doctoral degrees in STEM disciplines to teach in high needs middle and high schools
- New York City Mathematics Immersion Program provides candidates without a mathematics major to participate in immersion training in math during pre-service and customized master's program
- Started a Science Immersion Program similar to the Mathematics Immersion Program

Professional development

- Empire State STEM Education Progressive Dialogue is a statewide professional development network. Part of the professional development will focus on analyzing data, identifying differentiated learning needs of students, and assessing needs for interventions.
- District grants for STEM Advanced Placement training for middle and high school teachers
- Invest in a sophisticated on-line professional development system that will facilitate learning communities and cyber-learning between educators, particularly for high needs rural and urban areas

Development and dissemination of resources

- Launching a new, improved Career and Technical Education Resource Center at a BOCES that will provide technical assistance
- New York State STEM Collaborative with institutions of higher education that focuses on sciences
- BOCES and Teacher Centers to assist schools in implementing Common Core standards and assessments

STEM teacher distribution and/or incentive programs/activities

- Supplemental teacher compensation for STEM teachers to remain in low performing schools

Proposed activities for preparation of more students, including under-represented groups

- Review and scale up current initiatives and support low performing schools in integrating STEM throughout the curriculum with a particular focus on students from under-represented groups
- Provide equitable access and opportunities to engage in innovative, rigorous STEM curriculum at all levels, particularly in low performing schools
- Partner with business leaders and educational institutions in local communities to build awareness
- Develop mentorships and internships in STEM fields
- Provide opportunities for peer study groups
- Increase number of STEM-centered schools, especially for minority and women students
- Use the longitudinal data system and the Education Data Portal to help close the achievement gap and further the progress of typically under-represented groups, such as women and minorities in STEM

New York *STEM Education Collaborative and Empire State STEM Education Progressive Dialogue*

- STEM Education Collaborative, in partnership with institutions of higher education focused on science
- Empire State STEM Education Progressive Dialogue, a statewide professional development network with universities, that provides professional development and support in STEM disciplines

Source

New York Office of the Governor. (2010, May). *New York Race to the Top application for initial funding.* Retrieved from U.S. Department of Education website: http://www2.ed.gov/programs/racetothetop/phase2-applications/new-york.pdf

NORTH CAROLINA

Date and round for award—August 24, 2010 for round 2

Proposed activities for rigorous course of study in STEM

Graduation requirements

- Require four credits in mathematics and three credits in science for students to graduate from high school

Standards

- Review and revise Pre-K–12 standard course of study
- Adoption of *Common Core* standards in mathematics

STEM academies/schools

- Currently 112 career academies directly related to STEM as well as a School of Science and Mathematics, a public residential school
- Develop four coordinated STEM anchor schools in STEM areas that are relevant to North Carolina's economic development as well as developing STEM cluster high schools network for each of the following themes: engineering and energy, aerospace, biotechnology and agri-science, and health and life sciences
- Proposed building a network of STEM-themed high schools throughout the state

STEM programs/curriculum

- In 2010, all high school students will complete a Future-Ready Core Curriculum
- Sixty pre-engineering academies with Project Lead the Way
- Participation in the project The Gateway to Technology, a middle school technology curriculum from Project Lead the Way
- Expand Career Technical Education to low-performing schools and other schools that have limited curriculum offerings

Dual high school/college credits

- More than 70 Early College High Schools located on college campuses. Students can earn a high school diploma and either an Associate's Degree or two years of college credit.

Courses

- Virtual School offers STEM courses in mathematics and science.

Assessments

- Participating in the America Diploma's Project Multistate Mathematics Assessment Consortium to administer algebra II end-of-course assignments
- Participating in the SMARTER Balanced Assessment Consortium, which will be creating state-of-the-art adaptive online exams aligned with the Common Core standards, using "open source" technology. The assessments will include the summative assessments and optional formative or benchmark assessments.
- Create a system of K–8 diagnostic mathematics assessments and a K–12 Math and Science curriculum Monitoring Assessment

Proposed activities for preparation of teachers and applied learning opportunities for students

Preservice preparation

- Expand the UTeach to three additional campuses
- Fast-track licensure program for undergraduate science and mathematics majors at University of North Carolina (Baccalaureate Education in Science and Teaching) (UNC-BEST)
- University of North Carolina's Teacher Quality Research Program will analyze teacher preparation in STEM subjects.

Professional development

- Title IID technology enhanced professional development
- North Carolina Learning Technology Initiative providing every teacher and student with computer or handheld device
- Professional development on Common Core standards
- Induction Support Program in high-needs schools to focus on elementary mathematics, middle school and algebra I, and high school mathematics and science teachers
- Science House through North Carolina State University College of Engineering with hands-on STEM related professional development through six regional consortia
- State-supported professional development focused on STEM subjects through the NC Mathematics and Science Education Network, the NC State University Science House, and the Kenan Fellows Program

Development and dissemination of resources

- North Carolina will develop an online Clearinghouse of Instructional Resources.

Educator assessment system

- Implement Educator Value Added Assessment System that includes teachers of algebra I, science and advanced placement courses

Proposed activities for preparation of more students, including under-represented groups

- North Carolina State University has a STEM program for students from under-represented groups.
- Math and Science Education Network pre-college program on nine University of North Carolina campuses serves middle and high school underserved students.
- North Carolina's Women in Engineering Outreach Program encourages young girls and women to consider STEM careers.

North Carolina's STEM collaborative initiatives

North Carolina's application described a number of collaborative initiatives, including:

- North Carolina Business Committee for Education
- NC STEM Community Collaborative, established in 2008, to be involved in the STEM-theme high schools
- NC Learning Technology Initiative
- NC eLearning Commission
- K–12 STEM Education Group

Source

North Carolina Office of the Governor. (2010, June). *North Carolina Race to the Top application for initial funding.* Retrieved from U.S. Department of Education website:
http://www2.ed.gov/programs/racetothetop/phase2-applications/north-carolina.pdf

OHIO

Date and round for award—August 24, 2010 for round 2

Goals

- By 2014, Ohio Stem Learning Network (OSLN) STEM schools and ONET schools to serve as State's innovation platform
- Ensure that science and math teachers and specialists in all turnaround schools are engaging students in inquiry-based, applied learning in STEM
- Double the number of students pursuing STEM academic majors in college and quadruple number of students from under-represented groups

Proposed activities for rigorous course of study in STEM

Graduation requirements

- Require four credits in mathematics and three credits in science for students to graduate from high school
- Align high school exit criteria and entrance requirements to new standards

Standards

- Adoption of Common Core standards in mathematics

STEM academies/schools

- The Metro Early College High School is a leader in regionalizing innovation in the state.
- Ohio also has 10 STEM platform schools through the Ohio STEM Learning Network.

Assessments

- Participation in the Partnership for Assessment of Readiness for College and Career (PARCC), to develop K–12 formative, interim, and summative assessments aligned with the Common Core standards
- Participation in the America Diploma's Project Multistate Mathematics Assessment Consortium to administer Algebra II end-of-course assessments
- Participation in the SMARTER Balanced Assessment Consortium, which will be creating state-of-the-art adaptive online exams aligned with the Common Core standards, using "open source" technology. The assessments will include the summative assessments and optional formative or benchmark assessments.
- Ohio's RTTT project, Personalize Learning through Formative Instruction, will provide the basis for data-driven instruction. Formative instruction is based on rigorous state standards coupled with formative assessments, with constant adjustments made throughout the learning progression based on individual student progress.

Proposed activities for preparation of teachers and applied learning opportunities for students

Teacher endorsement/certification activities or requirements

- Woodrow Wilson Foundations STEM Fellows Program to recruit, prepare, and retain effective teachers of individuals with backgrounds in STEM fields

Development and dissemination of resources

- Ohio Department of Education will continue its work to develop curricula and instructional supports aligned with the new standards. Approximately 30 curriculum consultants have been developing model curricula and revising model lesson plans for mathematics and science, with input from teachers, curriculum specialists, and universities.
- Provide online access to curriculum, resources, tools aligned to the standards, curriculum customization tools, formative assessments, data analyses tools, and early warning indicators

Proposed activities for preparation of more students, including under-represented groups

- Ohio's goal was to double the number of students pursuing STEM academic majors in college and quadruple the number of students from under-represented groups.

Ohio STEM Learning Network

- Ohio focused on a STEM Learning Network (OLSN), a public/private partnership that includes seven regional hubs, ten STEM platform schools, and twenty-eight grades K–8 programs of excellence. OSLN has forty-seven private and public institutions of higher education, eighty-one public Local Educational Agencies (LEAs) and more than 300 business and community partners. It has five regional hubs (Centers of regional STEM activity). OSLN has also identified K–8 STEM programs of excellence.

Source

Ohio Office of the Governor. (2010, May). *Ohio Race to the Top application for initial funding*. Retrieved from U.S. Department of Education website:
http://www2.ed.gov/programs/racetothetop/phase2-applications/ohio.pdf

RHODE ISLAND

Date and round for award—August 24, 2010 for round 2

Proposed activities for rigorous course of study in STEM

Graduation requirements

- Participating in the State Consortium on Board Examination Systems to align curriculum and assessments with college and career readiness. Use grant funds to support the participation of two or three districts in the implementation of a State Board Exam program that will enable students to exit high school ready to succeed in a two-year college program or enter occupations.

Standards

- Adoption of Common Core standards in mathematics
- Awaiting adoption of the K–12 grade span expectations in engineering and technology that are benchmarked to the Standards for Technological Literacy from the International Technology and Engineering Educators Association

STEM programs/curriculum

- Engage teams of teachers from 16 to 20 districts to participate in intensive curriculum alignment process that will build a standards-aligned scope and sequence for mathematics and science

Courses

- Pilot project-based learning to connect the Engineering and Technology Grade Span Expectations to ongoing curriculum and instruction in two districts
- Develop academic vocabulary list for STEM concepts and skills at each grade level, especially for English language learners and students in poverty

Assessments

- Founding member of Achieve's America Diploma's Project Mutli-State Mathematics Assessment Consortium that administers algebra II end-of-course exams
- Participation in the Partnership for Assessment of Readiness for College and Career (PARCC), to develop K–12 formative, interim, and summative assessments aligned with the Common Core standards

Proposed activities for preparation of teachers and applied learning opportunities for students

Preservice preparation

- Raised test-score requirements for admission to teacher preparation programs

Externships

- Teacher externships in industry for middle school and high school teachers in Summer Externship program

Professional development

- Target Title IIA, Higher Education Partnership Grants, to provide STEM-focused professional development
- Work with the Dana Center to implement a series of Study of Standards workshops, provide professional development on assessments, and create aligned curriculum resources with districts
- Teams of teachers will build a standards-aligned scope and sequence and units of study in mathematics and science
- Provide professional development on project-based learning aligned with *Common Core* standards and Engineering and Technology standards in two or three districts
- Develop and certify a network of Intermediary Services Providers with expertise in mathematics, science, and leadership development to facilitate training sessions

Development and dissemination of resources

- Develop curriculum resources aligned with *State's Engineering and Technology Standards*

STEM teacher distribution and/or incentive programs/activities

- Develop and fund incentive system for STEM teachers
- Recruit teachers in mathematics and science through *The New Teacher Project* and the *Teach for America*

Applied learning opportunities for students

- Robotics FIRST Tech Challenge for high school teams

Proposed activities for preparation of more students, including under-represented groups

- Participation in the Louis Stokes Alliance for Minority Participation for grades 6–12 students. The regional Alliance includes: University of Massachusetts at Amherst, Northeastern University, University of Connecticut, University of Rhode Island, and Worcester Polytechnic Institute.
- Girls Reaching Remarkable Levels TECH in partnership with Rhode Island Technology College and Roger Williams University at Amgen
- Brown University's Women in Science and Engineering targeting middle and high school girls and their pursuit of STEM courses and careers

Rhode Island created a Governor's Blue Ribbon Panel on Mathematics and Science Foundations and an action plan in 2005, which forms the basis for goals to improve student proficiency and decrease achievement gaps in science and mathematics by 2014. The report forms the basis for grant-funded activities.

Source

Rhode Island. (2010, May). *Rhode Island Race to the Top application for initial funding.* Retrieved from U.S. Department of Education website:

http://www2.ed.gov/programs/racetothetop/phase2-applications/rhode-island.pdf

TENNESSEE

Date and round for award—March 29, 2010 for round 1

Proposed activities for rigorous course of study in STEM

Graduation requirements

- Tennessee Diploma Project expectations. Students beginning high school in fall 2009 will begin a new path with increased graduation requirements from 20 credits to 22, a focus on the skills needed for college and the workforce, and new assessments. Gateway Exams in high school will be replaced by end-of-course exams. The overall assessment system includes the ACT's College and Readiness Test, Explore (given in the 8th grade) and the PLAN College Readiness Test given in the 10th grade.

Standards

- Adoption of Common Core standards in mathematics

STEM academies/schools

- Virtual School through Electronic Learning Center offers high school completion and college dual enrollment courses in STEM and one STEM hub for rural region
- Tennessee has two STEM platform schools and plans to add three additional STEM schools or leadership development programs.

STEM programs/curriculum

- Develop cross-disciplinary and project-based curriculum linked to Tennessee STEM industries.

Assessments

- Participation in the Partnership for Assessment of Readiness for College and Career (PARCC), to develop K–12 formative, interim, and summative assessments aligned with the Common Core standards

Proposed activities for preparation of teachers and applied learning opportunities for students

Preservice preparation

- Expand the UTeach program to two additional campuses
- TEACH/Here, an innovative teacher residency program, focused on recruiting, preparing, and supporting effective teachers to serve in high needs positions. With a focus on science and mathematics, the program operates in Chattanooga and Knoxville, TN school districts in partnership with University of Tennessee Knoxville and the Public Education Foundation.

Professional development and development and dissemination of resources

- Develop regional STEM hubs for professional development, resources, and partnerships. At least one STEM hub designated to rural region and tied to the Tennessee Virtual Charter School.
- Develop STEM Centers for Professional Development for practicing math and science teachers
- Support STEM leadership development programs and STEM infrastructure and sustainability in concert with TN STEM Innovation Network
- Create STEMResources.com website for continued professional development and support
- Hold annual STEM Education conference, curriculum development workshops, and conferences

Proposed activities for preparation of more students, including under-represented groups

- Significantly increase the number of students who make the successful transition to careers in STEM fields
- Promote the participation of women, minority, and economically disadvantaged students to equal participation by white males

Tennessee STEM Network

- Tennessee will form a partnership with Battelle Memorial Institute to develop STEM networks. Tennessee's Stem Innovation Network of programs and schools will be modeled on Ohio's STEM Learning Network. Regional STEM hubs for professional development and resources will be developed. An annual STEM conference will be convened as well as curriculum development conferences.

Source

Tennessee Office of the Governor. (2010, January). *Tennessee Race to the Top application for initial funding.* Retrieved from U.S. Department of Education website:
http://www2.ed.gov/programs/racetothetop/phase1-applications/tennessee.pdf

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