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November 13, 2006

MEMORANDUM

TO: Legislative Education Study Committee

FR: Peter van Moorsel

RE: STAFF BRIEF: MATH AND SCIENCE BUREAU WORKPLAN

The 2006 Interim Workplan of the Legislative Education Study Committee (LESC) includes, as requested by the LESC in June, a report by the Public Education Department (PED) on the implementation of the workplan of the Math and Science Bureau.

Issues:

Creation of the New Mexico Math and Science Bureau

- Though the *Mathematics and Science Education Act*, introduced during the 2006 legislative session did not pass, the legislature did make an appropriation of \$250,000 to PED to establish a Math and Science Bureau. The *General Appropriation Act of 2006* also included two Math and Science appropriations to PED: a recurring appropriation of \$699,300 (after sanding) to fund Summer Reading, Math and Science Institutes, and a \$1.0 million nonrecurring appropriation to fund Summer Institutes for Reading and Math.
- In its FY 07 operating budget submitted to the Department of Finance and Administration on May 1, 2006, PED requested that, of the \$250,000 Math and Science Bureau appropriation, \$230,800 be budgeted for personnel services and employee benefits, and the remaining \$19,200 be budgeted for other expenditures.

- At the June 2006 LESC interim meeting, Dr. Catherine Cross Maple, Deputy Secretary for Learning and Accountability, PED, reported that Dr. Rick Scott would serve as bureau chief and Ms. Claudia Ahlstrom as Math Consultant. Three positions remained open; a science advisor, a researcher, and an administrative assistant had not been hired. Dr. Cross Maple added that in the first six months of the Math and Science Bureau's operation, the bureau chief would develop a workplan, ensure the creation of an advisory group, gather data about areas in need of improvement, and produce evaluations of summer institutes.
- PED has announced that since the creation of the Math and Science Bureau, a Math and Science Advisory Council has also been created. (See Attachment 1 for a list of members.) The council held its first meeting on September 29, 2006, at which Mr. Richard Calabro of the Central New Mexico Community College and Ms. Cheryl Coyle of Gadsden Independent Schools were elected co-chairs of the council.
- The goal of the council is to develop a statewide strategic plan for math and science education crafted with input from key decision makers and stakeholders, and will include budget projections presented to the Legislature. The plan will target the learning and achievement of both students and teachers fostered by using statewide and national data; best practices and exemplary models; and student input.

State and Federal Funding for Math and Science in FY 07

The Math and Science Bureau funded several summer math and science institutes with the 2006 legislative appropriations totaling approximately \$1.7 million, including a recurring appropriation of \$699,300 (after sanding) and a \$1.0 million nonrecurring appropriation. PED indicates that the projects funded were existing projects receiving funds from the state, the federal government or from other sources.

- Approximately \$344,000 has not yet been awarded; PED indicates that these funds will be awarded to be spent before June 30 on new or expanded projects.
- According to the bureau chief, in order to get projects started for summer 2006, the Math and Science Bureau contacted several existing successful programs and encouraged them, with state funds, to expand the work they were already doing.
- According to the 2005 New Mexico Standards Based Assessment, the lowest proficiency rates among all grades for both math and science in New Mexico are in grades 6, 7, and 8. This deficiency is addressed with the large number of professional development programs aimed at middle school math and science teachers.

The Math and Science Bureau provided a selection of professional development "best practices" to programs to which it provided funding. These guidelines are as follows:

- involving all the math and science teachers from participating schools;
- focusing on content and knowledge as well as teaching strategies;
- giving teachers guidance and training in the use of standards-based materials;
- providing follow-up instruction and reinforcement during the academic year;
- encouraging the development of learning communities that would continue their work during the academic year; and
- emphasizing reading and writing in the teaching and learning of math and science.

The Math and Science Bureau finances several programs through the use of federal Math and Science Partnership (MSP) funds, which totaled approximately \$1.65 million for FY 06. The projects receiving MSP funds are as follows:

- New Mexico State University (NMSU), received \$674,858 to fund the program titled Mathematically Connected Communities (MC²), which works to improve middle school teachers' math instruction skills. Programs include summer activities, follow-up support, and online courses toward Masters of Arts in Teaching in math teaching.
- Western New Mexico University received \$250,000 to adapt NMSU's MC² program to work with middle schools in the western part of the state.
- The University of New Mexico received \$433,608 to conduct La META (Mathematics Educators Targeting Achievement), which provides professional development through two-week residential summer immersion courses for middle school math teachers from Albuquerque and the Gallup area, with follow-up sessions on Saturdays.
- A portion of the funds totaling approximately \$260,000 was used for evaluation and administration of these programs.

Federal Math and Science Legislation (PACE and NCIA)

The creation of the New Mexico Math and Science Bureau comes amidst a national push for an increase in the emphasis on math and science education. This attitude is echoed by the introduction of further math and science legislation. The main piece of math and science legislation is S.3936, the *National Competitiveness Investment Act* (NCIA), which builds on the *Protecting America's Competitive Edge* (PACE) Acts introduced by Senators Pete Domenici and Jeff Bingaman earlier 2006. Introduced September 26, 2006 by Senator Bill Frist and 38 others, the NCIA is organized into four divisions: commerce and science; department of energy; education; and the National Science Foundation.

- Division A of the NCIA, also referred to as the *American Innovation and Competitiveness Act of 2006*, addresses the Office of Science and Technology Policy, government-wide Science, and Innovation promotion. One provision of this act is the establishment of a National Science and Technology summit, convened by the President, which is to examine the health and direction of the United States' science and technology enterprises. The summit shall include representatives of industry, small business, labor, academia, state government, federal research and development agencies, nonprofit environmental and energy policy groups concerned with science and technology issues, and other nongovernmental organizations. The bill will also, among other things, conduct a study of barriers to innovation in the United States.
- Division B of the NCIA is known as the *PACE Energy Act*, which establishes a director of Mathematics, Science, and Engineering Education within the US Department of Education to oversee the department's education programs in those areas; directs the Secretary of Energy "to offer" to enter into a contract with the National Academy of Sciences to assess the performance of those programs; provides assistance to states to establish or expand public, statewide specialty secondary schools that provide comprehensive mathematics and science (including engineering) education; establishes outreach and experiential-based learning

programs to encourage underrepresented minority students in grades K-12 to pursue careers in mathematics, science, and engineering; requires each of the National Laboratories to support a Center of Excellence in Mathematics and Science at one high-need public secondary school located within its region; and supports summer institutes.

- Division C of the NCIA addresses education, and, by awarding grants, develops and implements programs to provide integrated courses of study in mathematics, science, engineering, or critical foreign languages, and teacher education, that lead to a baccalaureate degree with a concurrent teacher certification; and develops and implements two- or three-year part-time master's degree programs in mathematics, science, or critical foreign language education for teachers in order to enhance the teachers' content knowledge and pedagogical skills.
- Division D of the NCIA addresses the National Science Foundation, and increases the appropriations to the National Science Foundation from approximately \$6.23 billion in FY 07 to \$11.2 billion in FY 11. A portion of these appropriations, increasing annually from \$33.0 million in FY 07 to \$55.0 million in FY 11, will provide increased support for science education. Additionally, this portion aims to ensure the continued involvement of experts at the National Science Foundation in improving science, technology, engineering, and mathematics education at the elementary, secondary, and postsecondary school levels; awards an additional 1,250 each of graduate research fellowships and traineeships (250 per year from FY 07 to FY 11) under the Graduate Research Fellowship and the Integrative Graduate Education and Research Traineeship Programs of the National Science Foundation; establishes a clearinghouse to share program elements used in successful professional science master's degree programs and other advanced degree programs related to science, mathematics, technology, and engineering; meets critical national science needs; provides \$125.0 million annually to fund an experimental program to stimulate competitive research; encourages the participation of women in the pursuit of careers in math, science or engineering; supports the assessment and development of America's cyber infrastructure; and initiates a program of basic research in advanced information and communications technologies.

Background:

Student Proficiency in Math and Science

The Nation's Report Card reported 2005 state-by-state scores from the National Assessment of Educational Progress (NAEP), which indicated the following about New Mexico's status in mathematics achievement based on Grade 8 math scores:

- overall math scores for grade 8 are higher than only three of 52 jurisdictions tested (the 50 states, the District of Columbia, and the Department of Defense Education Activity schools) and lower than 47 jurisdictions;
- the average grade 8 math score was 24 points lower for Hispanic students and 26 points lower for Native American students than for white students; and
- students eligible for a free/reduced lunch program had an average grade 8 math score that was 24 points lower than students who were not eligible.

In science, New Mexico students in grades 4 and 8 demonstrated little or no improvement between 2000 and 2005 on the NAEP science test and posted scores that were among the lowest in the nation for students considered proficient in the subject as noted in the following data:

- in grade 4, approximately 18 percent of the state's students performed at or above proficiency on the 2005 NAEP test, not significantly different from the 17 percent in 2000 and lower than the 27 percent proficiency rate of fourth graders in the nation as a whole in 2005;
- for students in grade 8, some 18 percent tested proficient or better in 2005, lower than the 20 percent in 2000 and the 27 percent proficiency rate for the nation's eighth graders as a whole in 2005;
- overall, New Mexico performed lower than 37 jurisdictions, and along with Alabama, Arizona, California, Hawaii, Louisiana, Nevada, and Mississippi had the lowest percentages of children performing at a proficient level; and
- according to PED, the average scores in science of all ethnic groups in New Mexico were also not significantly different between 2000 and 2005; however, Anglo students did better than African American, Hispanic, or Native American students.

2006 New Mexico Standards Based Assessment data indicates the following about student performance in mathematics and science:

- in mathematics, the percentage of students at or above proficient ranges from a high of 44 percent in grade 3 to a low of 23 percent in grade 7;
- in science, the percentage of students at or above proficient ranges from a high of 77 percent in grade 3 to a low of 23 percent in grade 8; and
- in both math and science, New Mexico Standards Bases Assessment results are lowest for grades 6, 7, and 8, and are highest in grade 3.

2005 New Mexico First Town Hall (November 2005)

During the 2005 interim, the LESC heard a presentation on the Mathematics and Science Education Town Hall that was convened in mid-November 2005 by New Mexico First on behalf of the New Mexico Partnership on Math and Science Education to examine ways to improve mathematics and science education. The Town Hall generated eight recommendations to address the state's needs related to science and mathematics education. Among these recommendations was "...a New Mexico mathematics and Science initiative that establishes consistency between how teachers are educated, what they teach, the standards that govern what is taught, student learning, and assessment." (See Attachment 2 for a recommended mathematics education example) In support of this, a further recommendation was the creation of a unit within PED that would "...inject expertise into the system at every level from the building level to the state department level, and [...] build and support infrastructure."

The final recommendation made by the New Mexico First Town Hall was to "create ongoing public awareness programs to raise public interest and enthusiasm for science and mathematics." (See Attachment 3 for an example.) *Reality Check 2006*, an ongoing set of tracking surveys on education issues, surveyed attitudes toward math and science education among public school parents, students, teachers, principals, and superintendents. The findings showed that though both parents and students realize the important role of science and math education in finding a good job, few find this to be an important issue facing their own schools. Therefore, despite the fact that many parents agree that US schools should be competitive many would offer resistance in increasing the coursework required of their own children.

Presenters:

Dr. Patrick (Rick) Scott, Bureau Chief, Math and Science Bureau, PED will present on the development and implementation of the Math and Science Bureau's workplan.

Dr. Catherine Cross Maple, Deputy Secretary for Learning and Accountability, PED, will present on the proposed math and science legislation, the staffing of the Math and Science Bureau, and the Governor's announced education initiative funding for reading, math and science summer institutes.

Questions the committee may wish to consider:

1. How has the work of the Math and Science Bureau benefited math and science education in New Mexico?
2. What new forms of math and science education improvements do the Math and Science Bureau or the Math and Science Advisory Council envision?
3. What were the criteria used to ensure equitable distribution of state funds among summer institutes?
4. How many districts, schools, and teachers participate in these summer institutes?
5. How will the effects of the summer institutes on student performance be evaluated?
6. How could New Mexicans' attitudes toward math and science education be described?
7. If enacted, how will the new federal math and science legislation (NCIA) affect math and science education in New Mexico?

Math & Science Advisory Council Members

Last	First	Affiliation	Representing	email
Baca-Ortega	Valentina	Belen Middle School	K-12	valentina.ortega@att.net
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Math & Science Advisory Council Alternates

Last	First	Affiliation	Representing	email
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Math Development Committee

Informal group that assists Math Consultant

Last	First	Affiliation
Ahlstrom	Claudia	PED Math/Science Bureau
Dever	Franny	APS
Pardo	Casilda	APS
Gonzales	Lorenzo	MSA
Price	Kathy	Bloomfield Schools
Guzman	Wanda	NMSU
Stanford	Ted	NMSU
Umland	Kristin	ENMU
Gruszka	Tom	WNMU
Atencio	Carlos	Northern Network
Kinzer	Cathy	NMSU
Snow	Lisa	NMSU

Science Development Committee - To be formed

New Mexico Quality Mathematics Education Model Summary

The New Mexico Quality Mathematics Education Model (QMEM) was developed by the informal “Math Development Committee” in response to recommendations at the New Mexico Town Hall on Mathematics and Science Education. It includes improved student learning through curriculum alignment, continued teacher development and strong leadership at all levels. The following are suggested guidelines for developing, implementing and sustaining a local QMEM:

Curriculum

Adopt and implement a mathematics curriculum (a plan for what and how students learn) that is aligned to New Mexico Content and Process Standards, and Standards-Based Assessment.

The curriculum needs to be mathematically rich, providing students with opportunities to learn important grade level concepts and procedures with a deep understanding. The Process Standards (problem-solving, representation, reasoning and proof, communication, connections) must be emphasized in the instruction and student learning of mathematics.

- Establish a K-12 district curriculum (what and how students learn) that is aligned to New Mexico Mathematics Content and Process Standards
- Adopt standards-based resources that are field-tested and support the New Mexico Math Content and Process Standards and are aligned vertically K-12
- Provide Professional Development opportunities for teachers to support implementation of standards-based teaching and learning
- Use state, district, school, and classroom data as tools to guide implementation of adopted curriculum and insure that the adopted curriculum is the taught curriculum

Professional Development

Educators must be active life-long learners in the pursuit of improving the teaching and learning of mathematics.

The goal of professional development is to support teachers in that pursuit, thereby improving student learning in mathematics. Professional development is not a one-time event; it must be embedded in the daily work of all teachers. It is ongoing and multi-faceted. Therefore all professional development programs must:

- Include high quality, meaningful content (math content and pedagogy, learning theory, assessment) in summer institutes and during the school year
- Establish school-based collaborative professional learning communities for all teachers whose meetings are scheduled as part of the work week
- Develop and use teacher leaders to help guide improvement of student learning and facilitate the collaborative learning communities
- Align with the *New Mexico Standards*, selected curriculum materials, and assessment
- Be evaluated in terms of its impact on teacher and student learning

Leadership

Leadership is the guidance and direction of instructional improvement.

Strong leaders who can act as change agents are essential for the implementation of a Quality Mathematics Education Model (QMEM). State and district leaders, including superintendents, principals and teacher leaders, need to:

- Establish structures for regular teacher collaboration during the school day
- Design and monitor a QMEM implementation plan in which all teachers must participate
- Ensure that all teachers and leaders receive ongoing, quality mathematics professional development
- Use data management structures to monitor implementation of the QMEM and ensure that data collection and analysis is part of the culture of the system
- Ensure that the system provides all students access to all the Standards
- Promote ongoing communication with all stakeholders (community, parents, staff, and students) about the vision and progress of the QMEM

DMS students attend X Prize Cup today

Deming Headlight Article Launched: 10/20/2006 12:00:00 AM MDT

Kevin Buey: Headlight Staff

Students from Deming Middle School and Hofacket Mid High School will be among those from area schools attending the X Prize Cup, today and Saturday at Las Cruces International Airport.

The local students are in MESA — Math, Engineering, Science Achievement.

"What it is, is astronauts trying to get up into space without the help of NASA," Thomas Mayberry, a Deming Middle School seventh-grader said of the X Prize Cup.

"There's a two-and-a-half-million-dollar prize," said Montiqua Speir.

The 2-day calendar has demonstration flights, cash-prize flights, amateur rocket flights, rocket racing and the race to space.

"Some rocketman will be demonstrating a jet pack," said sixth-grader David Marrufo.

Students will also have hands-on experience.

"We get to build a rocket," said Speir.

"They give us materials," said Mayberry.

None have done that type rocketry before, though Katie Poudrier has helped her brother build bottle rockets.

"They didn't stay up very long," she said.

The DMS students earned Friday's trip.

"We won tickets at another MESA thing, at New Mexico State," Mayberry said.

Ruby Garcia, now a sixth-grader at DMS, was among a group 75 Memorial Elementary School students who went to Alamogordo last October for an X-Prize Cup Education Day at the New Mexico Museum of Space History.

The DMS group is sponsored by Guyla Miller and Christina Endrizzi.

The Hofacket group of 30 students is sponsored by Jennifer Zeyen.

"Observing, meeting others," Zeyen said of students' mingling with others students at the event.

"There'll be an astronaut to talk to," said Naomi Baca and Vanessa Snyder, one starting a sentence, the other finishing.