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REPORT

TO: Legislative Education Study Committee
FR: Math and Science Bureau, Public Education Department
RE: Report on Mathematics and Science Education issues in New Mexico

Staff of the Legislative Education Study Committee asked the Public Education Department to prepare a report providing the following information:

- the number of additional mathematics and science teachers and specific science laboratory improvements that will be needed to implement the new graduation requirements by district, including estimated costs;
- a description of how a uniform curriculum in mathematics has been instituted in school year 2008-2009, and how a uniform curriculum in science will be instituted in school year 2009-2010;
- the rule and requirements for unlicensed content area experts (subject matter experts); and
- the following information regarding the FY 09 summer reading, math, and science institutes:
 - a) the amounts awarded to summer institute providers and the purpose of each institute;
 - b) how each institute will be assessed;
 - c) a description of the reports the institutes will submit to PED;
 - d) the selection process for the FY 09 providers, including any changes in the process from the prior year; and
 - e) a description of how teachers' participation in the institutes affect students' performance and achievement.

Please also include the following reports and an executive summary of each:

- the Mathematics and Science Advisory Council annual report;
- the *NM Project 2012* report; and
- the requests for funding for the 2009 legislative session.

Below we report on each of the requested items:

The number of additional mathematics and science teachers and specific science laboratory improvements that will be needed to implement the new graduation requirements by district, including estimated costs.

Additional High School Math Teachers Needed

Table 1 below presents three different estimates of the number of high school math teachers needed to meet the new graduation requirement that will take effect for students entering grade 9 in 2009-2010:

Table 1
Additional Math Teachers Needed to Implement New Graduation Requirements

District	Number of high school math teachers needed estimated by the MSB¹	Number of high school math teachers needed indicated in PED survey²	Number of high school math teachers needed indicated in LESC survey³
Alamogordo	3	Did not respond	2
Albuquerque	15	6 or 7	?
Animas	0	1	Did not respond
Artesia	0	3	Yes
Aztec	3	3	0
Belen	0	1 or 2	Did not respond
Bernalillo	1	Did not respond	Don't know
Bloomfield	1	3	0
Capitan	0	0	Did not respond
Carlsbad	3	4	?
Carrizozo	0	0	0
Central Cons.	1	1	1
Chama	0	1	Yes
Cimarron	0	Did not respond	0
Clayton	0	Did not respond	1
Cloudcroft	0.5	0	Yes
Clovis	2	At least 4	Don't know
Cobre Cons.	0	Did not respond	Did not respond
Corona	0	Did not respond	0
Cuba	0	Did not respond	Did not respond
Deming	3	9	Did not respond
Des Moines	0	0	Yes
Dexter	0	Did not respond	Did not respond
Dora	0	Did not respond	At least 1
Dulce	Data not available	Did not respond	Did not respond
Elida	0	0	Did not respond
Espanola	3	Did not respond	3 or 4
Estancia	0.5	2	Did not respond
Eunice	0	Did not respond	Did not respond
Farmington	3	2	0
Floyd	0	1	Yes
Ft Sumner	0	0	Yes

Gadsden	6	8	Yes
Gallup	1	Did not respond	1
Grady	0	0	0.14
Grants	0	Did not respond	Did not respond
Hagerman	0	1	Did not respond
Hatch	2	2	Did not respond
Hobbs	1	Undetermined	Yes
Hondo	0	Did not respond	0
House	0	Did not respond	0
Jal	0	1 or 2	Did not respond
Jemez Mountain	0	2	0
Jemez Valley	0	2	Did not respond
Lake Arthur	0	1	Did not respond
Las Cruces	16	9	Did not respond
Las Vegas City	1	Did not respond	Did not respond
Logan	0	Did not respond	Did not respond
Lordsburg	0	1	Yes
Los Alamos	0.5	Did not respond	Did not respond
Los Lunas	5	Only a few	Yes
Loving	0	0.5	Did not respond
Lovington	1	2	0
Magdalena	0	Did not respond	Don't know
Maxwell	0	1	Did not respond
Melrose	0	0	0
Mesa Vista	0	3	Did not respond
Mora	0	Did not respond	yes
Moriarty	0	2	0
Mosquero	0	1	Did not respond
Mountainair	0	2	Did not respond
Pecos	0	Did not respond	Did not respond
Penasco	0	Did not respond	Did not respond
Pojoaque	1	Did not respond	1
Portales	1	0	Yes
Quemado	0	1	Did not respond
Questa	0	Did not respond	Did not respond
Raton	0	Did not respond	Did not respond
Reserve	0	Did not respond	Did not respond
Rio Rancho	9	Not sure	4 or 5
Roswell	3	4	Did not respond
Roy	0	0	0
Ruidoso	0	2.5	Yes
San Jon	0	1	Don't know
Santa Fe	4	4	Yes
Santa Rosa	0	Did not respond	Yes
Silver City	1	4	Did not respond
Socorro	1	1.5	1
Springer	0	0	Did not respond
Taos	1	1	Did not respond
Tatum	0	Did not respond	0
Texico	0	Did not respond	Did not respond

Truth or Cons.	2	Did not respond	Yes
Tucumcari	0	2	Don't know
Tularosa	0	0	Yes
Vaughn	0	Did not respond	Did not respond
Wagon Mound	0	Did not respond	0
West Las Vegas	2	Did not respond	Did not respond
Zuni	1	3	Don't know
	98.5		

- 1 One easy way to look at the new requirement is that all students should be taking a math course every year. The Math and Science Bureau (MSB) used 40-day enrollment in STARS to determine how many students were not enrolled in math classes during the 2007-2008 school year. Since students grades are not yet reported in STARS we do not know for sure how many students stay in the courses and pass them.
- 2 The PED survey used "Survey Monkey" and was sent to Superintendents.
- 3 The LESC Survey Monkey was sent to high school Principals.

In many cases, the PED and LESC survey results, despite some contradictions, confirm the MSB estimates. Therefore it would seem that New Mexico will need about 100 additional high school math teachers. In 2007-2008 there were just over 930 individuals teaching high school math with a "regular" education license, but 125 of them did not have the proper license or endorsement. (There were 174 teaching high school math with a Special Education license, but there the qualifications for teaching are different. For instance, those teaching children who take the alternative assessment do not have to be regularly endorsed in math.) Also, the average age was 46 and 42% were over 50. The projected new needs plus the demographics of the current teaching force indicate a particularly serious situation since last year New Mexico public universities only prepared 26 new high school math teachers through their traditional undergraduate and post-bachelors programs. There were also about 30 high school math teachers that had Intern licenses while working on an Alternative License.

Non- traditional Sources of High School Math and Science Teachers:

"Teach for America" currently has six high school Math teachers and six high school Science teachers at schools in the Gallup area with predominantly Native American students. (At the middle school level, they have also placed eight math and five science teachers.) They have expressed interest in expanding to schools with similar populations in the Santa Fe area.

The Math and Science Bureau has learned that several districts are hiring math and science teachers from the Philippines. Apparently other states are doing the same. A recent Associated Press story on the phenomenon of teachers from the Philippines was published online by *Education Week*¹ and appeared in many local newspapers across the country. There are several firms that help districts recruit teachers from the Philippines including Visiting International Faculty Program (www.vifprogram.com), In-talage Inc., and Avenida International Consultants (www.ligayaavenida.com/). STARS does not currently include data that allows us to determine just how many teachers from the Philippines (or other countries) are working in New Mexico.

Additional High School Science Teachers Needed

The change in the high school graduation requirements in science did not change the number of courses required (three), it just raised the number of those courses that have to have a lab

¹ www.edweek.org/ew/articles/2008/09/14/162224nfeusimportingteachers_ap.html

component from one to two. Therefore, the requirement does not imply the need for more teachers. However, as with high school math teaching not all have the proper license and endorsement. Also, the demographics were similar to math: average age was also 46 and 40% were over 50. The public universities prepared 27 high school science teachers in their regular undergraduate and post-bachelors programs, and there were about 30 on Intern licenses.

Specific science laboratory improvements

The LESC survey asked high schools “Will your school need additional science laboratory facilities in order to meet the new requirements?” Responses were received from 58 comprehensive high schools. Of those 31% reported needing lab facilities and 16% were not sure. They were not asked about needing equipment and supplies.

The PED survey found that 53% of those responding would need to build or remodel science labs. Almost 90% reported needing more equipment and supplies.

To try to get more detailed information and straighten out inconsistencies a follow-up survey was sent to the Science Department Chairs at the 118 comprehensive high schools with a follow-up email to the Superintendents. Sixty-six (56%) responded. Almost \$16,000,000 was requested for new or remodeled labs from 18 schools, 13 schools requested almost \$400,000 for equipment, and 28 schools indicated a need for over \$500,000 for other science materials, small equipment and supplies. Only 10 schools indicated that they did not need additional funds to implement the new lab component requirement.

A description of how a uniform curriculum in mathematics has been instituted in school year 2008-2009, and how a uniform curriculum in science will be instituted in school year 2009-2010;

Alignment of Math Curricula

HB 911 (2007) created New Mexico Statute [22-13-1.6](#) which states that

Each school district shall align its curricula to meet the state standards for each grade level and subject area so that students who transfer between public schools within the school district receive the same educational opportunity within the same grade or subject area.

After much discussion and the preparation of alignment documents by grade level for each K-5 and 6-8 textbook series, a memo was emailed to Superintendents on May 31, 2008 with a return date of August 15. It gave districts three options for complying:

Route 1: Submitting Math alignment documents that they had already prepared as part of their on-going EPSS work.

Route 2: Submitting the Math alignment documents that had been prepared by the Math and Science Bureau with any necessary changes to reflect district implementation.

Route 3: Using templates with the *Standards* in one column and other columns for the districts to indicate how they were meeting each *Standard*.

On October 14, 2008, an email was sent to those districts that had not complied reminding them of their statutory obligation. . As of November 14 the following districts have still **not** replied:

Artesia Public Schools
Aztec Municipal Schools

Capitan Municipal Schools
Carrizozo Municipal Schools

Central Consolidated Schools
Cobre Consolidated Schools
Elida Municipal Schools
Eunice Public Schools
Floyd Municipal Schools
Gallup-McKinley Schools
Grady Municipal Schools
Grants/Cibola County Schools
Hondo Valley Public Schools
House Municipal Schools
Lake Arthur Municipal Schools
Logan Municipal Schools
Lordsburg Municipal Schools
Loving Municipal Schools
Lovington Municipal Schools
Magdalena Municipal Schools

Melrose Public Schools
Mosquero Municipal Schools
Mountainair Public Schools
Penasco Independent Schools
Reserve Independent Schools
Roswell Independent Schools
Ruidoso Municipal Schools
San Jon Municipal Schools
Silver Consolidated Schools
Taos Municipal Schools
Texico Municipal Schools
Truth or Consequences Municipal Schools
Tucumcari Public Schools
Tularosa Municipal Schools
Vaughn Municipal Schools

The following two decisions were made in requesting the alignment documents:

- 1) Although HB 911 implied that the obligation was only for districts that had more than one school at a given level, the decision was made to request the alignment documents from all districts.
- 2) The grades 9-12 Math *Standards* have been revised to be in alignment with the American Diploma Project (ADP) Benchmarks for College and Workplace Readiness. Since they have not been officially approved it was decided to wait until said approval before requesting the alignment documents. Grades 9-12 present the special situation that there are not particular *Standards* by grade level. Therefore the alignment document will need to indicate in which course (or courses) each Performance Standard is addressed.

The alignment documents indicate that the districts are using materials that provide exposure to the New Mexico Math *Standards* in grades K-8. In grades K-5, there are ten different textbook series being used and eight in grades 6-8. Although most districts reported using only one textbook series at each grade band, a few are using two. Since most math textbooks follow a development that is sequential, there is some difficulty in the school districts that use two textbooks series in ensuring that the *Standards* are addressed in the same order.

Alignment of Science Curricula

We plan to follow a similar process with the Science alignment. We are preparing the templates and, now that we have a process, we can get started on it earlier in the year.

The rule and requirements for unlicensed content area experts (subject matter experts)

The following is a draft of the rule and requirements that are being proposed for inclusion in a revision of the “Standards for Excellence” that is currently under review:

6.29.1.9

PROCEDURAL REQUIREMENTS:

B. Duties and powers of the district superintendent or the administrator of a charter school. In addition to the powers and duties set out in Section 22-5-14 NMSA 1978 of the Public School Code, the local superintendent (or charter school administrator, where relevant) shall:

(8) ensure that a process is in place to identify, train, assign and support the use of unlicensed content-area experts as resources in classrooms, team teaching, online instruction, curriculum development and other purposes as determined by the superintendent, which shall include, but not be limited to, the following:

- (a) establish the specific expertise of the person;
- (b) obtain a background check and fingerprint records;
- (c) provide the person with a three-hour training, prior to entering a classroom about how the school operates, appropriate teaching methods, and expectations of principal and assigned teacher;
- (d) establish a start date and ending date for the person;
- (e) ensure that the person is under the direct supervision of the teacher assigned when students are present; and
- (f) provide for an evaluation of services upon completion of the assignment

Information regarding the FY 09 summer reading, math, and science institutes:

Summer Math & Science Institutes FY09

Institute Name/Fiscal Agent	Districts	Grades	Amount
Earth Care Teacher Institute/Earth Care International Summer institute with follow-up session and inclass support on integrating "Sustainability Education" and thus Science Education across the curriculum.	Santa Fe	K-12	\$40,000
Earth's Birthday Project Basic Inquiry Workshops/ENMU Prepare "school coordinators" to work with K-6 teachers in various districts so they can prepare teachers to work with the standards-based science materials that will be provided.	Albuquerque, Alamogordo, Bernalillo, Bloomfield, Dulce, Jemez Mt & Valley, Las Cruces, Mora Questa, Rio Rancho, Silver	K-6	\$115,000
ENMU Math Summer Institutes/ENMU Follow-up to 2007 & 2008 Summer Institutes with earlier funding and a one-week 2009 summer institute to support newly adopted K-12 math curricular materials.	Portales, Dora, Floyd	K-12	\$60,000
Northern Network Institutes/ Espanola Schools Summer Math and Science Institutes with classroom follow-up support, curriculum alignment work emphasized.	28 districts in Northern Network		\$220,000
Los Lunas K-8 Math/Los Lunas Schools Summer Institutes and classroom follow-up to support adopted math curriculum	Los Lunas	K-8	\$75,000
Santa Fe Science Initiative/NM Community Foundation Summer Institute and follow up on inquiry-based science. Leverages other funds.	Santa Fe	K-5	\$10,000

STARBASE LaLuz/NM Tech Summer institute and classroom follow-up to prepare and support teachers to work with space related curricula.	Various	6-12	\$80,000
Math & Science Academy (MSA)/NMCC Leverages other funding they receive to increase coverage. Summer Math Institutes with classroom follow-up support. Close collaboration with Northern Network & MC2.	Espanola	K-12	\$75,000
Mathematically Connected Communities (MC2)/NMSU Expands the work done with federal MSP funding to more schools and K-4 on implementing reform-based math curriculum. Uses summer institutes and follow-up support, involves administrators.	30 districts from throughout the state.	K-12	\$500,000
Scientifically Connected Communities (SC2)/NMSU Summer Institutes and classroom follow-up with middle school science teachers on the content and pedagogy needed for inquiry-based instruction.	Animas, Cobre, Deming, Gadsden, Las Cruces, Lordsburg, Reserve, Silver	6-8	\$300,000
Supercomputing Challenge-Growing Up Thinking Scientifically/NM Tech Expand the work that the Supercomputing Challenge has been doing for over 10 years to prepare teachers to integrate computational science into their math and science classes, and assist their students in participating in the annual Supercomputing Challenge supported by Sandia National Labs and LANL.	Various	K-12	\$120,000
Singapore Math Strategies/Roswell Schools Summer Institute and follow-up for implementing strategies from the Singapore Math Program.	Roswell Schools	K-5	\$40,000
Interactive Math Program/South Valley Academy Summer institutes and follow-up classroom support for teachers implementing the Interactive Math Program (IMP).	Albuquerque, Corona, Espanola, Las Vega City, Magdalena, Mora, Moriarty, Wagon Mound	9-12	\$75,000
Math Recovery-Add+Vantage Math/UNM Prepares and supports teacher in using an intervention in early number learning.	Albuquerque, Moriarty, Rio Rancho	K-3	\$70,000
Science Ed Institute of the Southwest (SEIS)/UNM Support teacher use of newly adopted science materials with content seminars and pedagogical follow-up support in Bernalillo.	Bernalillo	K-5	\$100,000
WNMU MSP/WNMU Expand the work and support given through the federally-funded MSP. Collaborates with MC2	Deming, Reserve, Quemado, Lordsburg, Animas, Zuni	K-12	\$120,000
Re:Learning - Reading in the Content Area/ENMU Summer Institutes and follow-up classroom support for teaching reading in the content fields in middle schools	Various with a focus on schools in need of improvement	6-8	\$500,000

Total FY09 funding from HB2 2008 page 181 lines 7-8

\$2,500,000

How each institute will be assessed and a description of the reports the institutes will submit to PED

Each “Summer Institute” is contractually obligated to:

- Within 30 days of completion of each “Summer Institute” send electronic list of participant names, districts, schools, grade level(s) taught, and subjects taught (if grades 6-12) to the Math and Science Bureau.
- Return completed *New Mexico Summer Institute Surveys* filled out by each participant to the Math and Science Bureau within 30 days of completion of each Summer Institute.
- An evaluation report that identifies specific, measurable goals and metrics, and progress made toward achieving those goals will be sent to the Math and Science Bureau by June 1, 2009.

The selection process for the FY 09 providers, including any changes in the process from the prior year

The Selection Committee based its recommendations on the following Guidelines (those in *italics* were added for FY09):

**GUIDELINES FOR REQUESTS FOR FUNDING OF
SUMMER INSTITUTES FOR MATH & SCIENCE TEACHERS (FY 2009)**

Requests **must** include:

- 1) An explicit focus on content that clearly aligns with *New Mexico Standards, Benchmarks and Performance Standards* Math and/or Science;
- 2) A description of how reading and writing instruction will be integrated into the program;
- 3) Instructional teams of content experts (scientists/mathematicians) and science/math educators in a partnership between schools (K-12) and institutions of higher education or non-formal education institutions (e.g. museums);
- 4) Opportunities for teachers to engage in learning experiences that will extend their understanding of science and/or math content, including *a specific focus on development of science inquiry and/or math process skills*;
- 5) A plan for working with **teams** (including departments or full staffs) of K-12 teachers;
- 6) Specific structures, involving school and district administrators, to support participants’ implementation of learned content into classroom instruction;
- 7) *A justification of the program’s design (e.g., research base, results from past funding, needs assessment)*;
- 8) An evaluation plan that includes identification of specific, measurable goals and metrics that will be used to measure progress towards goals; and
- 9) A statement of agreement to participate in data collection as directed by the Math and Science Bureau (PED).

Preference will be given towards requests that also:

- a) Develop content and pedagogy of specific curricular materials teachers will implement;
- b) Have plans to work with **all** of the math and/or science teachers in schools or districts;

- c) Include a letter of commitment *signed by a school/district administrator that indicates how personnel will participate, what school/district resources will be committed to the effort, and how the Professional Development relates to the school/districts' Educational Plan for Student Success (EPSS)*;
- d) Plan to work with Schools in Need of Improvement (SINOI);
- e) *Integrate research on how to incorporate strategies for addressing language acquisition, special education and large gaps in achievement*;
- f) Include an expectation that IHE faculty or other content experts involved in the program visit participants' K-12 classroom;
- g) *Provide guidance to teachers and administrators in using data to improve math and science education*;
- h) *Help teachers and administrators involve families in improving math and science education*;
- i) Include partnerships with community groups and organizations.

A description of how teachers' participation in the institutes affects students' performance and achievement.

The Math and Science Bureau is working to relate teacher participation in Professional Development to their students' achievement. In general, as indicated the *Math and Science Advisory Council Annual Report*, achievement in math and science as measured by the New Mexico Standards-Based Assessments is improving particularly in grade 8 as the greatest share of the Professional Development has been in middle school. In two projects that are partially funded as Summer Math Institutes and serve as models for many of the other institutes the achievement results are very positive:

In the Gadsden District, the work of Gadsden Math Initiative and Mathematically Connected Communities (MC2) have helped the district raise achievement levels that were below state averages at all tested grade levels in 2000 to above state averages in grades 3 and 4 and approaching them in other grades.

The work of the Math and Science Academy (MSA) has helped the Espanola District raise its achievement from 2006 to 2008 from 22% to 32% proficiency in math in grades 3-5. For grades 6-8 the increase has been from 5% to 15%. However, when you look at the students of the teachers that MSA has worked with the gains are even more dramatic.

We are going to receive technical assistance from the Southwest Comprehensive Center (SWCC) on exactly how to associate teacher participation in Professional Development to improvements in their students' achievement.

As indicated above each Professional Development participant is required to fill out a standard "Summer Institute Survey". Below is a copy of the instrument with the results from FY08.

SUMMER INSTITUTE SURVEY

Please fill out the following

Name of Summer Institute _____

Name of Institution providing the Institute _____

Grade levels I teach _____ Subjects I teach _____

1 = I strongly disagree 2 = I disagree 3 = I feel neutral 4 = I agree 5 = I strongly agree
(For each item is the percent of participants responding to each option.)

Institute Materials:

1. The Institute materials were useful and informative.	1	2	3	4	5
Comment:	1%	1%	3%	24%	71%
2. The Institute materials directly supported the goals of the institute.	1	2	3	4	5
Comment:	1%	<1%	3%	23%	72%
3. The Institute materials will be useful in the classroom.	1	2	3	4	5
Comment:	1%	<1%	3%	22%	73%

Instruction:

4. Goals and objectives of the Institute were clear.	1	2	3	4	5
Comment:	2%	1%	4%	24%	69%
5. The Institute was paced well (was neither too fast nor too slow).	1	2	3	4	5
Comment:	1%	2%	9%	28%	60%
6. The Institute was designed appropriately (instruction segments were not too large and built on one another effectively).	1	2	3	4	5
Comment:	1%	2%	7%	26%	64%

Effectiveness of the Institute

7. The Institute enhanced my knowledge of math &/or science content.	1	2	3	4	5
Comment:	1%	1%	8%	27%	62%
8. The Institute enhanced my knowledge of Standards-based curriculum.	1	2	3	4	5
Comment:	2%	2%	13%	30%	53%
9. The Institute enhanced my knowledge of engaging instruction that encourages real world, inquiry-based problem solving.	1	2	3	4	5
Comment:	1%	1%	4%	26%	67%

Overall Evaluation of Facilitators

10. The facilitators were organized and well-prepared.	1	2	3	4	5
Comment:	1%	<1%	2%	19%	78%

11. The facilitators modeled concepts in ways that promoted learning and understanding.	1	2	3	4	5
Comment:	1%	<1%	3%	21%	74%
12. The facilitators demonstrated expertise in the subject of this institute.	1	2	3	4	5
Comment:	1%	<1%	2%	17%	80%

Please also include the following reports and an executive summary of each:

(Attached)

- the Mathematics and Science Advisory Council annual report;
- the *NM Project 2012* report; and
- the requests for funding for the 2009 legislative session.