



NATURAL SCIENCES

Mel Strong mstrong@unm.edu

The Problem:

STEM education in New Mexico has bottomed out after years of neglect in our public school system. Nationally, US students typically rank around 30th in the world in science¹, a fact that in itself should be alarming. However, students from NM are doing especially poorly, testing at or near the bottom of the nation in science².

Low student performance in STEM fields has far reaching consequences for NM. Universities are unable to graduate enough STEM majors to fill the current job market, especially in fields of engineering and computer science³. While NM has the highest number of PhDs per capita in the country, very few of these scientists and engineers are originally from this state. NM employers are currently having difficulty finding technically competent workers at all levels⁴; one can only imagine how ill-prepared NM will find itself when new technical careers come to fruition in the future. Besides the immediate financial impact, STEM education trains students how to collaborate, how to think critically, and how to communicate more effectively - all leading to a better-informed public and better-equipped employees.

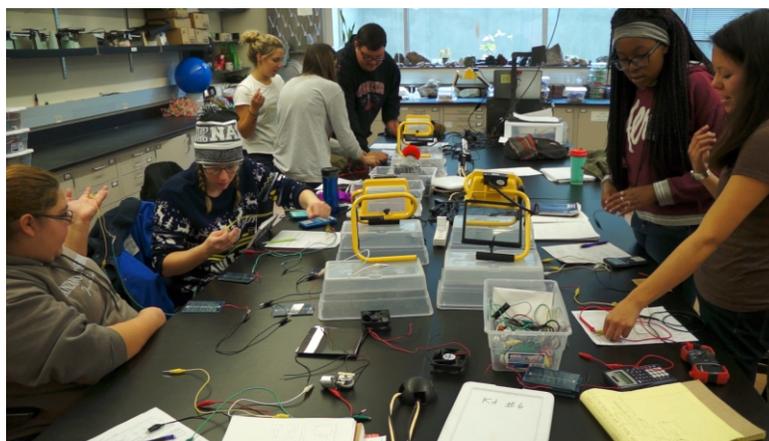
There are several reasons for the poor performance we see in NM students, but a major factor is the current environment of standardized testing and teacher evaluations, where science is being either pushed aside or completely kicked out of many K-5 classrooms. Kids from "passing" schools might be seeing some science, but often kids from "failing" schools are not being exposed to any science until they reach middle school. Many administrators have chosen to eliminate science in K-5 schools as science test scores do not count toward Annual Yearly Progress. Thus many NM students are only receiving science education if they are fortunate enough to have a teacher who can 'sneak' it in or incorporate it into the math and English lessons through cross-cutting activities.

A second major factor for student success in science is correlated with the preparedness, competence, and confidence our primary teachers have in science. Many of our pre-service K-8 teachers have come up through the NM public education system where science was not something they were exposed to as kids. Or, their experience with science was not a positive one. Either way, the vast majority of my incoming pre-service primary teachers at UNM are not interested in science and have no plans to teach it at any grade level.

The great irony in our educational system is that kids' attitudes towards STEM are often fixed by middle school⁵, placing a great responsibility on those teachers who are the least prepared and often the least interested in teaching science. **If we want more STEM graduates at the university level, we must generate this interest in kids before they reach middle school.** This includes not just exposure to science in the classroom, but genuine enthusiasm about science from the teachers.

The Program:

The **Natural Sciences** program at UNM offers three science classes that are aimed at K-8 teachers, particularly those who are interested in early childhood and elementary education. Our classes (a) teach science content relevant to K-8 teachers, (b) offer scalable hands-on activities that could be done with other age groups, (c) provide one-on-one assistance with all students on a daily basis, and (d) utilize interdisciplinary activities that integrate science, math, and technology.



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NM kids tank on national science test

35 percent of 4th-graders and 45 percent of 8th-graders score 'below basic'

BY KIM BURGESS
JOURNAL STAFF WRITER

New Mexico students have stagnated near the bottom of the nation on science proficiency, while those in many other states have improved, according to the latest results from the National Assessment of Educational Progress.

NAEP scores, which are being released publicly today, show that the vast majority of New Mexico's fourth- and eighth-graders did not reach the benchmark in science, with a large per-

centage landing in the lowest scoring category, "below basic."

And, as with most assessments, New Mexico was among the worst-performers in the country. The Land of Enchantment falls into the bottom cluster with California, Alabama and Mississippi.

The exam covers physical science, life science, earth and space sciences, as well as practical application of concepts such as scientific inquiry. Some key results:

■ Only 21 percent of eighth-graders were at or above "proficient," compared with 34 percent nationally. The largest percentage of New Mexico eighth-graders — 45 percent — were "below basic." Nationally, 33 percent were in the lowest category. In Utah, the top performer on this exam, only 18 percent of students were "below basic."

■ A quarter of fourth-graders reached "proficient," compared with 38

See NM KIDS >> A2

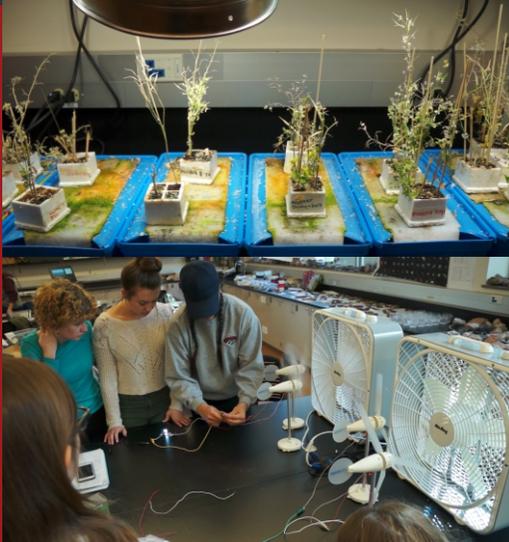
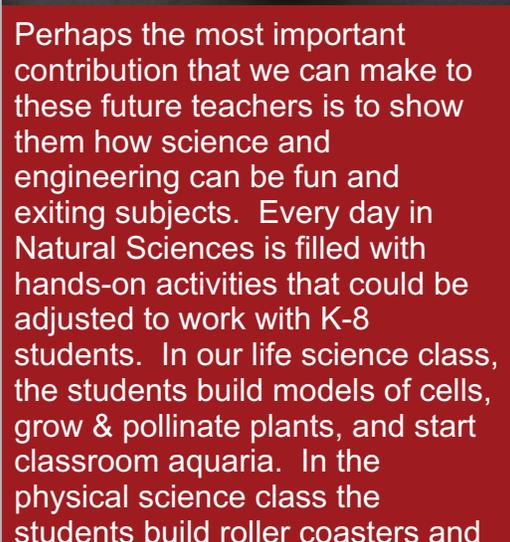
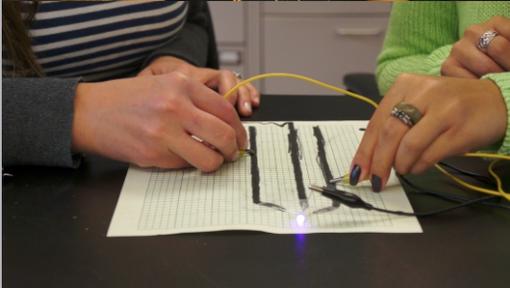
1. <http://www.pewresearch.org/fact-tank/2015/02/02/u-s-students-improving-slowly-in-math-and-science-but-still-lagging-internationally/>

2. <https://www.abqjournal.com/702674/nm-49th-in-report-on-education-quality.html>

3. http://ped.state.nm.us/ped/MathandScienceDocs/2016_Math_and_Science_Annual_Report_final.pdf

4. Jason Espinoza, president, New Mexico Association of Commerce and Industry, personal communication, Nov 14th 2016

5. Maltese and Tai, 2011, Pipeline persistence effects of school experiences on earning degrees in STEM. Science Education, 95.5, 877-907



Perhaps the most important contribution that we can make to these future teachers is to show them how science and engineering can be fun and exciting subjects. Every day in Natural Sciences is filled with hands-on activities that could be adjusted to work with K-8 students. In our life science class, the students build models of cells, grow & pollinate plants, and start classroom aquaria. In the physical science class the students build roller coasters and rockets, grow crystals, discover geologic features of New Mexico using Google Earth, and make correctly scaled solar systems. In our environmental science class, they learn how to read the sky and predict the weather, build climate maps using weather station data, and build working alternative energy circuits powered by the wind or sun.

(Right) Most of our students report that they have never built anything or even used tools. In our classes they build several things using tools and experience the design-test-troubleshoot-redesign-retest cycle of engineering projects such as the mousetrap-powered car. In the upper two photos the students are building their cars; in the third photo they are testing their vehicles to see whose car travels the farthest. Not shown is the stage after the bottom picture, where the students try to figure out why their car isn't working as well as they intended and try to implement changes.

(Below) The best evidence that we are generating interest in science is not something that we can quantify on an exit exam or survey, but we do observe something else that happens organically without any intervention on our part. Below are two images of students on their phones updating their social media with video clips of their class projects....the girls on the left are recording their oobleck experiment while the student on the right is posting a movie of her homemade motor on Instagram. I'm not sure how often this happens in other science classes, but I take it as a sign of success in generating interest in science.



Natural Sciences Canceled

Due to UNM's ongoing budget crisis and lack of support from the College of Education,

Natural Science classes are no longer going to be offered after Spring 2017. Education majors will be taking 'standard' science classes in lecture halls. If you think that our future New Mexican teachers need hands-on science as described here, please let your voice be heard by contacting Hector Ochoa, dean of College of Education, at hectorocha14@unm.edu, Mark Peceny, dean of Arts & Sciences, at markpec@unm.edu, provost Craig White at cwhite@unm.edu, and president Chaouki Abdallah at chaouki@unm.edu.



Professor fights to keep education science program

UNM budget cuts threaten funding

BY MAGGIE SHEPARD
JOURNAL STAFF WRITER

As University of New Mexico deans begin to figure out how to operate on shrinking budgets, one lecturer is launching a campaign to save his program that prepares education majors to teach science to kids.

At a time when the number of science majors isn't on pace to fill the scientific jobs, the school's Natural Science Program leader Mel Strong said his program should not be cut, and he is asking students and supporters to write to the university provost and his dean to help save it. Without the program, education majors are left with core science classes that Strong says are not helpful in preparing them to function in the classroom.

"How do you teach electricity, for example, to say, a fourth-grader? Well, you aren't going to learn how to do that sitting in a Physics 101 class," said Strong of the large lecture classes that teach college-level theory. "In this program, you're going to learn electricity the same way a fourth-grader or sixth-grader is going to learn electricity and have hands-on projects."

Still, the program is on the chopping block in the College of Arts and Sciences and is one among other programs and positions targeted across the campus as the university



ABDALLAH: "Each dean is going to get a bill"



PECENY: Other classes can fill the gap

prepares to meet at least a \$3.5 million shortfall.

"We probably would not be considering this course of action if the university were not facing a 1.5 percent budget cut this year," said College of Arts and Sciences Dean Mark Peceny.

UNM Provost Chaouki Abdallah said every department at the school will be taking a budget hit.

"We are trying to minimize the cuts to the academic side as much as possible," said Abdallah. "But each dean is going to get a bill, basically, saying this is how much you have to cut."

That amount was expected to be determined last week and presented to 11 of the university's deans, who then must figure out what to cut.

"We are trying to be as fair as possible, trying not to hurt people too much, but everybody is going to get cut," Abdallah said.

Peceny said other classes on campus can fill the science content area requirement



Mel Strong, right, assists sophomore Maddison Weaver with making a compass using a magnetized needle at the University of New Mexico's Science and Math Learning Center last week as part of a class that prepares education majors to teach science at a child's level. The program is scheduled to be cut amid the university's budget crunch.

education majors need for their degree. He said the university in the last four years has revamped some of those classes to make them more accessible and appropriate for student teachers.

But Strong said his pro-

gram is the only one designed for student teachers, which make up about 90 percent of his students.

"The College of Arts and Sciences takes very seriously its responsibility to provide the content courses our future

teachers need to succeed in the classroom," Peceny said. "We are seriously considering discontinuing this program only because we are confident that our future K-8 educators can get exactly what they need from the new and reformed

core curriculum science courses."

Some of those classes include a Chemistry in Our Community class that "interweaves the fundamentals of chemistry with topics of local, national and global importance," Peceny said. "The course mixes lecture and active learning methodologies, including some hands-on activities."

Peceny said other science content classes, like the school's Earth and Planetary Sciences 101 and biology class, have been updated from the traditional lecture format and now include more hands-on and current event-oriented perspective.

But Strong said UNM students who want to be teachers have a difficult time taking the college-level, theoretical sciences, especially those taught in large lecture halls, and translating the lessons into activities for children.

Plus, he said, science standards now for elementary and middle-school students span several science topics, including biology, engineering, physics, environmental science and weather.

"Think how many classes you would have to take to cover all of these topics," Strong said.

The program has operated at UNM for 20 years and covers three main fields in its series of hands-on classes.

Strong and Peceny said the classes will be offered next semester, but future courses are under discussion.