Science & Math CESE Education

The BEACON

News from The Coalition for Excellence in Science and Math Education

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President's Message: Jesse Johnson

I've had a chronic case of writer's block lately, so readers get to read about one of my pet peeves. Sometimes when you are debating something, it is inevitable that somebody will tell you "but correlation does not equal causation." The reason this bothers me is because, not only is it often stated incorrectly, as I myself did just now, it is often used in a way to mean "correlation cannot equal causation, therefore I'm right" which is also incorrect. What people need to understand is that causation does, in fact, imply correlation. Logically speaking, this is a standard case of A implies B does not mean that B implies A. A simple way of looking at this is that ice cream sales may increase as the weather warms, but if you see somebody eating ice cream that is not enough to prove that the weather has gotten warmer. People can eat ice cream during winter too. That correlation does not necessarily equal causation is an abused logical fallacy, and yes, that was the correct way of stating it.

Understanding this logical fallacy is important to understanding some of the limits to science that most scientists intuitively understand. Often, the scientific process involves noticing correlations and then using those to see if you can find a cause. In an odd way, the process itself starts with a fallacy, but the rest of the process involves understanding that you started with something that would be fallacious on its own. and then designing tests and experiments to whittle away as much false causation as possible until a model is built up that has predictive value in the natural world.

One of the limitations that this leads to is that there is never really a final answer in science. Readers probably intuitively understand this. Scientists can build up a useful model of a natural phenomenon that has real world predictive value and use that model for centuries, and that would be something akin to scientific consensus. What does it take to make that model obsolete? An empirical observation that contradicts the model. Or to paraphrase Einstein, a single fact can upend a scientific model. An example of this is something called the ultraviolet catastrophe being a major problem with classical physics. That, and other problems, showed that classical physics was not the end-all be-all in physics. Now, classical physics has been superseded by quantum mechanics and general relativity.

Does this mean that classical physics is wrong? The answer to that is more philosophical opinion than fact, but I would say that within the bounds that people such as Sir Isaac Newton were able to observe the world, no, it is not wrong. If I want to predict where an artillery shell is going to land, I'm not going to get the quantum physics book out. I'm going to go with Newtonian mechanics, because it works for such a task. It does not work when things get really small or when things go extremely fast. This points out another limitation of science that the reader probably intuitively knows: A scientific model is only valid in the framework in which empirical observations are possible, though some models are so powerful that they predict things that are not observed for years or decades after those models are established. It is fantastic when that happens, and it all starts because somebody noticed a pattern or a correlation! Another example involves Darwinian evolution verses Lysenkoism. For those unaware, Lysenkoism is the idea that if a man and a woman both cut their left arms off and then had offspring, those offspring would be born without left arms. It's absurd, right? We know about DNA and how the blueprint for an organism gets passed along, so the offspring will have both arms in all likelihood. Yet more discoveries have led to the field of epigenetics, where how genes are expressed can be influenced by environmental factors and those changes can be passed onto offspring. Now, people are going to start asking seemingly absurd questions that aren't so absurd. One such question is "are certain phobias the result of an ancestor's traumatic experience?" It's time to start looking for correlations! But keep an open mind even if you find them because, correlations do not necessarily equal causation. You have to test your model!

Two fields of study where correlations can be especially important are medicine and education. There are both practical real-world complexities that can make issues difficult to separate, and there are also ethical issues to contend with in those fields. When testing your correlations for causation, in an ideal world, you can control all factors and change one at a time. In the real world, if you try to do this in medicine, you are going to get called names like "Mengele" and "butcher," and rightfully so. In education, you might have a pack of angry parents calling for your job because you caused harm to their children. Often, we will fall back on correlations because it's all that we have that we can ethically use in either field, at least until more information becomes available.

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E-mail Beacon submissions or comments to Editor, Rebecca Reiss, rebecca.reiss@nmt.edu

With the CESE method, we use correlations based in demographics to predict how well a school should perform. Some schools perform better than expected and some worse than expected. CESE can tell you which schools those are. What we advocate based on that information is something any competent scientist would agree with: Go into the over-performing and under-performing schools and evaluate why they are performing better, or worse than expected, and if useful information is gained, apply the lessons learned to make all schools perform better.

From physics to biology to education, correlation is a useful tool, especially when you understand the potentially fallacious nature of depending on it. Maybe you found causation, maybe you did not, but if you understand that you need to go in to look, to test, to experiment, to observe beyond just correlations, you can gain extremely useful knowledge by using them as a starting point. You can also prove yourself wrong. Of course correlation does not necessarily equal causation, but I'm still going to use correlation as a tool.

To close, I suggest treating yourself to some ice cream. The weather is really warm this time of year.

2023 Legislature Public Education Bills

Jack Jekowski, CESE

The 2023 60-day New Mexico Legislative Session was unique from several perspectives, not the least of which was a multi-billion dollar "windfall" in projected State revenue primarily due to the continued high revenue generated by the oil and gas industry in the state. This additional money allowed Legislators to explore new education initiatives designed to address the continued response to the Martinez and Yazzie Consolidated lawsuit, recovery from the COVID-19 shutdown, as well as recommendations from the Interim Legislative Education Study Committee (LESC) (https://nmlegis.gov/Entity/LESC/Default) The support staff for the LESC, led by Dr. Gwen Perea-Warniment as the new Executive Director, focused on academic research to identify long-term improvement strategies for our state's education system. The CESE has an excellent working relationship with Dr. Perea-Warniment and looks forward to providing input to the LESC in the future. A similar working relationship also exists with staff at the New Mexico Public Education Department (NMPED) (https://webnew.ped.state.nm.us/) as well.

In their April newsletter following the session, the LESC designated lead Analysts for various topical areas they will be pursuing in the future, see figure on page 3.

The Work Plan for the LESC 2023 year was presented during their May Interim Committee meeting and approved. It is available at https://www.nmlegis.gov/Entity/LESC/Committee_Information.

The education environment was complicated during the session by the resignation of the NMPED Secretary, Dr. Kurt Steinhaus (unexplained, but Dr. Steinhaus had previously taken a leave of absence due to health issues). Governor Lujan Grisham appointed a new nominee for the PED Secretary, Dr. Arsenio Romero, who was confirmed by the

Senate prior to the end of the Session. Dr. Romero is an experienced educational leader in New Mexico.

Monitoring legislation during the session is a non-trivial exercise but is facilitated by accessing the state's real-time legislative website, https://www.nmlegis.gov. From that page you can click on the "legislation" link and select how you want to search the legislation that has been submitted, either by number, sponsor, keyword, or topic. Data is provided on current status, and links for other information such as the current or modified version, financial analysis (Financial Impact Report, FIR) and Committee assignments. After the session you can determine the final status of all bills, or you can go to the Secretary of State's website for a list of Bills, Memorials, Resolutions and Constitutional Amendments, as well as which Bills were Signed, Vetoed or Pocket Vetoed at:
https://www.sos.nm.gov/legislation-and-lobbying/signed-chaptered-bills/2023-legislation/

During the session, Senate and House Education Committee meetings are streamed live (as are most LESC Interim Committee meetings) and can be accessed through the Legislative website.

For the 2023 session, when you search by the three "Education" topics, you will find "Public Schools" (for which you will find ninety-two pieces of legislation recorded); "Post Secondary", (57 pieces of legislation); and "Other", (36 pieces of legislation), for a total of 185 individual pieces of legislation officially submitted. During the Session, I searched by "Keyword," "Education," and found over five hundred pieces of legislation that had that term incorporated in their text.

We are fortunate that the NMKidsCan organization (https://nmkidscan.org/) has a commissioned website (https://nmeducation.org/) with analysts who study the results of the education legislation from the session and provide a summary of all the bills passed, those vetoed, and all education bills introduced. These are detailed in three separate articles published on that website:

- https://nmeducation.org/education-bills-that-became-law/
- https://nmeducation.org/a-view-of-the-2023-legislative-session-education-bills-that-died/
-https://nmeducation.org/a-view-of-the-2023-legislative-session-all-proposed-education-bills/

These articles also provide some additional information and insight on specific topics that were of particular interest to various parties and are an excellent resource for researchers.

During the session, the CESE monitors for any legislation that might be submitted which would harm the educational environment, such as those that are anti-science, as well as providing information if requested from the LESC, NMPED or Legislators. CESE does not "lobby" for legislation.

During this session we participated in discussions about some bills, and the Executive Committee monitored other bills of interest that would have future impacts on the educational system. Below is a brief summary of several of those that were of interest:

HB 126 – Changing Graduation Requirements. This 18-page Bill reflected some significant research that the LESC staff had performed during 2022, looking at how to reshape high school graduation requirements in statute to better reflect the dynamic environment found in our society today, including providing greater flexibility at the local District level to adjust curriculum. The CESE had discussed one recommendation of dropping Algebra II as a graduation requirement, making it an elective for those students who may still need it for college entrance requirements. Some members of the CESE believe a better requirement would be a fundamental statistics class. A concern expressed by the business community was that some students may not realize or be able to obtain the Algebra II credit and thus lose eligibility to some colleges. A similar issue arose regarding the recommendation to make a foreign language an elective, which again, could possibly restrict a student's qualification for entry to some higher education institutions. During the session a widely published Op-Ed by several Teachers of the Year (https://rrobserver.com/proposed-graduation-requirements-close-doors-to-opportunity/) criticized some aspects of this bill. Despite broad support from the LESC members based on presentations made by staff during the Interim, and subsequently, after some discussion and changes during the session, passage of the bill by the Legislature (64-3 in the House, and 40-0 in the Senate), the Governor vetoed the bill indicating "HB 126 lowers

Educator Ecosystem	Student Success	Budget	Infrastructure	Community and Family Supports	Equity
Career Ladder, Recruitment and Retention, HR/Benefits, Leadership, Educator Prep	Early Childhood, College & Career Readiness, Standards, CTE, School Redesign, School Climate, Assessment	State-level, District-level, School-level funding, Federal Funding, Governance, School Boards	Capital Outlay, Transportation, Technology, School Safety, Data Systems, Assessment	Family and Community Engagement, Opportunity-gap programs, SEL, Out-of-school time programs, School Choice	Martinez/Yazzie, Language and Culture, Special Education, Indian Education Act, Hispanic Education Act, Bilingual Multicultural Ed Act, Black Education Act, Accountability
Emily Hoxie	**Jessica Hathaway**	**Daniel Estupinan**	**Tim Bedeaux**	**Bridget Condon**	**Marit Andrews**
(505) 986-4298	(505) 986-4331	(505) 986-4597	(505) 986-4330	(505) 986-4593	(505) 986-4502

the minimum requirements to graduate from high school and weakens graduation standards by removing the current requirement that students complete one course unit in either career/workplace readiness or a language other than English; by removing the requirement that students complete one course unit in dual credit, honors, advanced placement, or distance learning; and by reducing physical education requirements,". The full text of the Governor's veto can be found at:

https://www.nmlegis.gov/Sessions/23%20Regular/ExecMessages/house/HB0126GovMsg.pdf

Note: the signed version of this message will be posted in the future on:

https://www.governor.state.nm.us/about-the-governor/legislative-messages/

HB 126 did lack support from some members of the education community and business, although a lot of work had been done by LESC staff and presented to the LESC during the Interim Committee meetings. The Governor indicated in her Executive Message that she would be open during the next Interim to find ways to achieve transformational change. Following the veto, the Bill's sponsor, Rep. Andrés Romero, authored an article countering the Governor's notes, and promising to bring the Bill back in the future. The rebuttal article can be found at:

https://www.santafenewmexican.com/news/education/sponsor-of-vetoed-bill-overhauling-graduation-requirements-disagrees-with-governors-criticisms/articled029d664-c7fa-11ed-bf1f-8b422a364b39.html

SJR1 and HJR7 - *Change in governance of the public education system resolutions.* These joint resolutions for Constitutional Amendments proposed returning the governance of public education to an elected board and appointed superintendent of public schools, reflecting frustration on the part of some Legislators for how frequently the Secretary of Education had changed over the past 20 years (five different individuals over that period and four in the past five years), and how poorly our schools were still doing after two decades since the change from an elected school board to a Cabinet-Level Secretary. SJR1 appeared to be more thoughtfully composed and had some support but did not make it to the floor for a vote. Back when the change to the current Cabinet-level governance structure was proposed and subsequently approved by the Electorate, CESE had shown national data from the Educational Commission of the States that overall governance was not correlated with student achievement. As indicated in the FIR for SJR1, the LESC analysis also points out that there appears to be "no cause-and-effect relationship between governance structures and student performance." A recent study (https://www.ecs.org/50-state-comparison-k-12-governance/) also shows the lack of correlation, so a concern we would have with yet another major change like this is that bureaucratic requirements for such a change would subsume other more important initiatives to improve the education system. This issue was also mentioned in the LESC FIR.

HB 140 *Tribal Education Trust.* Sponsored by Rep. Derrick Lente, a Democrat from Sandia Pueblo, this legislation would give New Mexico's Tribes additional funding through the interest earned on the Trust, and more freedom to implement reform measures as opposed to the bureaucratic process currently used by NMPED to provide supplemental funding to the Tribes. The original request was for $50M, however early in the session the Bill was withdrawn in return for agreement with leadership that they would make a much larger ask ($250M) in the 2024 Session. Some supporters referenced the Tribal https://nabpi.unm.edu/tribal-remedy-framework/index.html

Remedy Framework (https://nabpi.unm.edu/tribal-remedy-framework/index.html), a plan that indigenous education experts and tribal members created in response to the Martinez and Yazzie Consolidated Lawsuit as the source for this concept. Ultimately, specific pieces of legislation such as this may prove to be the only satisfactory solution to the lawsuit.

HB216 – *LESC to study the entire education system.* This bill was also vetoed by the Governor, indicating that the Higher Education Department and Early Childhood Education and Care Department already perform robust studies of their own, however, this bill recognized the excellent research that the LESC staff has been doing, and it will be interesting to see if this concept gathers strength in the future.

HB130 – *Increasing the number of instructional hours and other changes.* One of the key initiatives pursued during this session was to increase the number of instructional hours (and professional development time for teachers) to address the losses that occurred during the COVID-19 shutdown. Two bills were introduced, but HB130 garnered the most support, and was amended through Committee hearings. The bill increases learning time from the current minimums of 990 hours for elementary school and 1,080 hours for middle and high schools to 1,140 hours for all students, sixty hours of which can be used for professional development and planning in elementary school, but only 30 hours in

middle and high school. The bill also repealed the K-5 Plus program and created a K-12 Plus program to provide additional support to schools that implement more than 180 days of learning time. The net result is that elementary school students will receive at least 90 hours of additional learning time, and middle and high school students will receive at least 30 hours of additional learning time. See https://www.thinknewmexico.org/optimize-time-for-learning/ for more details.

HB127 – Education Assistant salary increase. This bill requires all school districts to increase the minimum salary for licensed educational assistants to at least $25,000/year. CESE has discussed in the past how valuable educational assistants are these days in the classroom to help to manage students and meet all of the paperwork requirements now placed on teachers.

New Mexico High School Graduation Rate Calculations Do Not Align with a School's Time-Opportunity to Impact Student Learning

Kim Johnson

The New Mexico Public Education Department (PED) uses a "Shared Accountability" method to calculate graduation rates for state high schools. This is a modification of the National Center for Education Statistics (NCES) prescribed way to do the calculation:

$$(1)\quad \frac{\text{On-time graduates by year X}}{[(\text{First time 9th graders in year X-4}) + (\text{Transfers in}) - (\text{Transfers out})]}$$

This indicator examines the percentage of U.S. public high school students who graduate on time, as measured by the adjusted cohort graduation rate (ACGR). In this indicator, the United States includes public schools in the 50 states and the District of Columbia. State education agencies calculate the ACGR by identifying the "cohort" of first-time ninth-graders in a particular school year. The cohort is then adjusted by adding any students who immigrate from another country or transfer into the cohort after 9th grade and subtracting any students who transfer out, emigrate to another country, or die. The ACGR is the percentage of students in this adjusted cohort who graduate within 4 years with a regular high school diploma. The U.S. Department of Education first collected the ACGR in 2010–11.1.

Not all states use this straightforward way to calculate graduation, including New Mexico. The New Mexico Public Education Department uses what it calls a "Shared Accountability Method" as defined in the "Graduation Technical Manual ." This method is an attempt to fairly assign partial graduation credits to each high school a student has attended in the state of New Mexico. It works like this:

1. Each school formally tracks its students by sending the state a list of each of its students as of the 40th, 80th,

Student	SchoolSnaps	StateSnaps	Outcome	SchoolFraction	SchoolNumerator	SchoolDenominator
1	2	2	W1	1	0	1
2	16	16	WG	1	1	1
4	4	4	E1	1	0	1
5	8	9	W1	0.888888889	0	0.888888889
6	3	15	WG	0.2	0.2	0.2
7	16	16	WG	1	1	1
				Grad Rate	0.43231441	

Table 1. Current Graduation Rate Calculation Method. The students who graduated are credited with the fraction of time they have been in the state modified by the time they have been at the school. Student #1 was in the state for one semester (2 snaps) and at the school for one semester, but did not graduate. The school receives no credit, rather the student deducts from the graduation rate as one, whole student—even though the student was only there for one semester. (This adds one to the denominator and nothing to the numerator, as the columns are labeled.) Student #2 has been at the state and in the school for the full 4 years of his tenure in high school (16 snaps.). This student did graduate and provides the same credit to the school (1 unit) as was deducted by the first student. All the credits based on how long the student has been in the state as modified by that fraction of time the student has been at the school are added together to for the for the denominator. Then the numbers of graduations as modified by the time the students were in the state and school are added together and that is used as the numerator. Then, dividing the numerator (modified graduate credit sum) by the denominator (modified number of students in the cohort) provides the graduation rate—43.2%.

Student	SchoolSnaps	StateSnaps	Outcome	SchoolFraction	SchoolNumerator	SchoolDenominator
1	2	2	W1	0.125	0	0.125
2	16	16	WG	1	1	1
4	4	4	E1	0.25	0	0.25
5	8	9	W1	0.5	0	0.5
6	3	15	WG	0.1875	0.1875	0.1875
7	16	16	WG	1	1	1
				Grad Rate	0.714285714	

Table 2. Proposed Graduation Calculation Method. Using the 16-snap baseline for all students means we can ignore the number of state snaps. The number of school snaps are divided by 16 for each student, and the results are shown the "SchoolFraction" column. Compare this to Table 1. The school fraction goes into the denominator and goes into the numerator only if the student graduates. The resulting graduation rate would be 71.4% as compared to the current way of calculating the rate of 43.2%.

120th, and end of the school year (EOY). Each of these submittals is called a snapshot or "snap."

2. Graduation calculations for a given year use students in the same "cohort." A cohort is defined by the students who started the 9th grade together. For example, any student who started the 9th grade in 2019 would be in a four-year cohort for 2023, a five-year cohort for 2024, and a 6-year cohort for 2025.

3. To calculate graduation rates for a school, the PED uses the number of snaps that a student has in the state and uses that as the baseline for that student. That is, if a student has been in the state for 4 snaps (one year), and two snaps were at one school with two snaps at another, each would get either credit or a deduction from their graduation rate based on whether the student graduated. Table 1 shows an example of how the rates are calculated. (This uses actual examples but with only 7 students to illustrate the process and the problem.)

What happens with a larger student base? One study district with four high schools in NM would have increased its graduation rate in 2020 as follows: NM calculations = 77.4%, recalculating based on 16 snaps baseline = 84.9%. One school with 74 seniors changed as follows: NM Calculations = 66.4%; recalculating based on 16 snaps baseline = 75.0%.

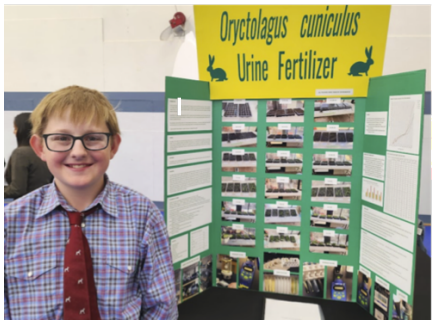
In summary, changing New Mexico's graduation rate calculations to be based on how long a student has been in each high school's rather than how long the student has been in the state better accounts for the school's time educating the student. This is far fairer to the school and to the state than is the current method. The bonus is that it appears that the graduation rates will probably increase, and with justification. It is difficult to see how the NCES could argue with this.

And the Winners Are...

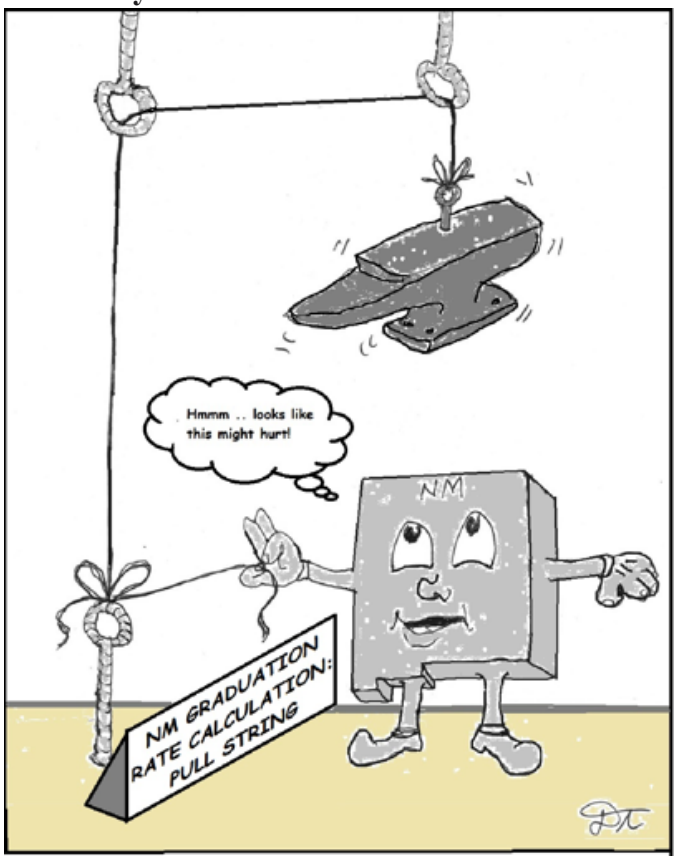
We are pleased to announce the 2023 Science Fair Winners. This year, students from Grants, NM took home both awards, congratulations to both!

Coalition for Excellence in Science and Math Education (CESE) Award for an Outstanding Senior Division Project ($250): F. Valdez, "American Sign Language Training Glove."

New Mexicans for Science and Reason (NMSR) Award for an Outstanding Junior Division Project ($250):H. Lee, "*Oryctolagus cuniculus* Urine Fertilizer"



A Toon by Thomas



A Note About CESE 2023 Annual Meeting..

The times they are a changing, and so is CESE. Instead of an annual meeting in June with a speaker, we are planning a 'meet and greet' at an Albuquerque restaurant that will be partially subsidized by CESE in July or August. An on-line poll will be sent out sometime soon. The presentation will be held later, possibly in the fall after people return from summer vacation. We hope to see you at both!

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TODOS: Mathematics for ALL
Excellence and Equity in Mathematics

CESE congratulates TODOS on its 20th anniversary!

TODOS: Mathematics for ALL is an international professional organization that advocates for equity and excellence in mathematics education for ALL students with special attention to Latina/o students. As articulated in its mission and goals, TODOS advances educators' knowledge, develops and supports education leaders, generates and disseminates knowledge, informs the public, influences educational policies, and informs families about education policies and learning strategies. All of these goals ultimately result in providing access to high quality and rigorous mathematics for ALL students. TODOS is a 501(c)(3) non-profit organization and an affiliate organization of the National Council of Teachers of Mathematics.

TODOS will be celebrating its anniversary during its biennial national conference this summer here in Albuquerque, June 21-23. The Conference will focus on Critical Actions in Mathematics Education. Come, share, and learn with others about the actions that TODOS and its members have taken on Critical Transformations in Mathematics Education. The conference will be held at the historic Hotel Albuquerque at Old Town, 800 Rio Grande Blvd. NW, in the heart of Old Town. Go to https://www.todos-math.org/conference for more information on the conference.