



# *The* **BEACON**

***News from The Coalition for Excellence in Science and Math Education***

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*Queries? email Rebecca Reiss (next page)*

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## **President's Message: Lisa Durkin**

### **Teaching and Learning Online in a New COVID-19 World**

COVID-19; who saw that coming? One week we were dealing with our usual struggles, like remembering the password to our Amazon account, and the next week we sat wide-eyed, isolated at home, listening to proclamations about quarantines and wringing our hands over the number of ventilators hospitals needed but didn't have. Parents are especially struggling with social distancing. Not only do they wonder how they're going to make ends meet in a looming recession accompanied by vast joblessness, but they must also contend with their own kids who have to learn online in the living room rather than in a classroom. Ask any teacher, and they will tell you that a few of those kids act like crazed monkeys. One mom ranted on YouTube, "If we don't die of Coronavirus, we'll die of home teaching!" Another mom gave a tearful testimony, "It's 11:15 and I'm hiding in my son's room. I feel like this is really hard." My favorite was the dad who explained to his son's teacher, "Remember when I talked with you earlier this year and said, 'you don't know my child?' Well, now I know, I don't either."

The world changed when Coronavirus shut down schools for over 50 million students. The minute a government official declared, "School is cancelled," by far, most students danced in jubilation, because to them, that meant starting summer vacation three months early. Some of these students and their parents have virtually dropped off the map, out of touch with schools. Truancy was an obstacle before the school shutdown, and now it's Mt. Everest. What will the graduation rate mean this year, or a diploma for that matter?

I've been involved in education for three decades, most of which has been in a science classroom. Kids in my district were fortunate, because this year they were provided individual computers. That meant our school didn't have to scramble for a month to purchase and distribute computers to our kids like other districts. My students were already well versed in our online teaching platform. A week after the school shutdown was announced, we were expected to have online lessons prepared. Our students didn't get to dance a jig for very long, it seems.

This unprecedented turn of events involved many surprises but also situations that Captain Obvious would have predicted years ago. After schools were canceled, classroom teaching had to be abruptly converted into distance learning. As a nation, we weren't ready for it. Teachers suddenly had to learn new computer applications to make their lesson plans engaging and meaningful. Many households didn't have the electronic capacity to handle Google Classroom platforms and Zoom virtual meetings. Some families are hard-pressed to provide their children food, much less high-speed Internet. Distance learning definitely doesn't level the playing field between haves and have-nots. As much as kids love their smartphones, completing assignments on handheld devices is ridiculously difficult.

As one might expect, students from challenging demographics are also the kids missing most of their assignments. These are the same at-risk kids who weren't turning in their work before the COVID-19 crisis. Students who were failing before are still failing. For students without Internet access, our district provides hot-spot locations where they can park and work in their cars. As a result, most of my students have logged on to our online learning

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platform. They can work on their assignments, but here's the catch. They don't. Depending on the course, anywhere from one-quarter to one-half of my students have neglected to turn in any assignments since the announcement. It isn't only at-risk kids who are ghosts. Plenty of affluent students have already trotted off to an early summer vacation. They make teen-age excuses. They complain they suddenly don't know how to log on to a computer or they are unfairly assigned more work than what they would have been expected to do in the classroom. When a kid has to motivate themselves, it probably seems like more work.

There are many legitimate reasons kids don't persist with online learning. Students who struggle with reading are deeply impaired when a computer is their only means to learn. Schools also provide many students with a source of emotional support and solace. It's astounding how many kids wrestle with demons like addiction, family dysfunction, and mental illness. The reality is far more tragic than many people would expect. School is a safe place for them. Another more subtle hindrance is that some children haven't learned the soft skills necessary for success, like conscientiousness or a work ethic. Finally, children may simply lack supervision.

For teachers, COVID shelter-in-place has its delights and challenges. Although we can now get up at 8:00 and teach in our jammies, producing every single lesson online involves a steep learning curve. Our district has supported its teachers with a daily email filled with a plethora of applications, instructions, clever pedagogical ideas, and websites. We have technicians at the ready to give a helping hand. Nevertheless, producing online lessons is frustrating, tedious and difficult.

A distance learning expert, Liz Kolb, advises that teachers need to use the 3-E model for student mastery. We need to first *Engage* students in mindful tasks that focus on learning outcomes. Students need to be active and socially engaged through cooperative learning. Next, instruction must be *Enhanced* by focusing on higher order thinking skills and knowledge gathering. Teachers must be mindful of connecting prior knowledge to acquired knowledge. Finally, teachers must *Extend* knowledge by providing opportunities for authentic tasks and contexts. This sounds great! I love it! Here's the reality: putting technology in the hands of students comes at a high cost. Students need interaction, and the "co-use" tools are mainly Zoom conferences, discussion boards and messaging services. There are games and simulations, and those are awesome. But, as one of my students told me, "I can't learn this way! I need a teacher to teach me, not a computer to teach myself." The instructional time, where a teacher visits individuals or groups of students who are working hard to master concepts and skills, cannot be replicated with a computer screen. Even fancy software that projects the teacher in

3-D, cannot mimic those vital conversations. We are not Vulcans and we are not on the Starship Enterprise.

The biggest reason that most educators are in the field is because they love kids. Even though we are no longer managing packs of wild monkeys in the classroom now, we also don't get to see our kids, talk with them, and entertain them with oh-so-witty teacher humor. Learning and laughing with kids is the heart and soul of classroom teaching. To do otherwise smothers the flame of what it means to teach. It kills me when my kids email with pleas about their confusion, fear and frustration, and I can't smile with encouragement, or high-five when they finally get it. Students can't raise their hands with clever questions and answers during most computer lessons. Gone are the hands-on activities and laboratory experiments. There is only so much a teacher can do to meet a variety of learning needs using a screen and keyboard. Although we are moving through the curriculum at a faster pace, it's mostly because I can't stop and check at the moment it's needed to see when the lesson is derailed and bring it back on track. Where working at your own pace sounds like a great idea, some kids are weeks behind. They need the pressure of keeping up with their peers. They need each other, and they need teachers. Students need relationships to learn and to grow into healthy, well-functioning adults.

Teaching is an art as well as a science, and it's also a sales job. How does one sell something so vitally important to anyone without talking with them? Amazon can sell Cheeze Doodles and flat screen TVs online, but education isn't a product. It's a means to experience the world in a meaningful way, and more importantly carry on the knowledge, skills, and values of our people. We can't expect anyone to learn in isolation, no matter how comfy the couch is.

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## **Distance Learning Challenges Teachers and Learners Alike**

Cindy Chapman

Almost overnight K-12 public schools from coast to coast have become institutions of distance learning. Schools are working hard to face the challenge of revisioning education to serve what is now a growing homebound population of students. There is no doubt that districts, teachers, students, and families are doing their best to keep learning going, but it is like building the airplane while flying it. However, challenges offer

opportunities that education can ultimately gain from.

### ***What is distance learning?***

Providers and researchers often distinguish between distance learning (full time virtual schools) and online or blended learning (basically traditional classrooms delivering content in multiple ways with a variety of digital resources). In distance learning, students work digitally, entirely from home, and instruction is entirely online. In general, there is no in-person interaction. For online, blended instruction, students can be together in a classroom with a teacher. There are in-person interactions between teacher and students on a regular basis. In such blended situations online instruction is often supplemental, used in combination with a variety of learning strategies.

### ***What are the advantages and disadvantages of distance learning and online/blended learning?***

Online instruction can increase student engagement when used as part of a blended learning approach. It delivers instruction in many ways, makes accommodating differing learning needs easier, and can save time in planning and in some cases, grading. Distance learning in fulltime virtual schools allows students to work at their own pace and at the time that is best for them. Learning in virtual schools is not interrupted by building closures and today continues as it was before the shut-down.

There are, of course, drawbacks. Access to technology in school on a regular basis is a must for online education and is certainly not a given across the country's schools. Screen time can be balanced with in-person instruction, although screen time does increase when students are in front of screens both at school and at home. There is concern that students may cheat using digital tools with online programs.

Distance learning has its disadvantages, as well. Virtual schools only function if students have dependable access to devices and the internet at home. Cheating is even easier in distance learning, and there is an even greater increase in screen time than in blended situations. Distance learning often requires a parent or learning coach who may end up being the actual primary teacher for the student.

### ***What are difficulties with today's unexpected distance learning?***

The sudden need for distance learning created by the onset of COVID19 left little time for preparation. Although teachers and schools may have used some



digital programs, most had not experienced virtual teaching. Some state or district school systems were able to provide teachers boot camp-like professional development in technology and online learning. Teachers may have had some school-based opportunities to meet with grade levels or subject areas for brainstorming and planning before they had to begin providing instruction. But everything from preparation to deployment had to be done within the span of about two to three weeks, which was likely similar for most U.S. brick-and-mortar schools.

Technical obstacles abound as teachers and students begin distance learning. Links do not work, computers freeze, apps will not open, submissions do not launch, math lessons end up on social studies pages, assignments seem to be hidden among apps and notes. It can take hours to complete an assignment that should only take an hour or two just dealing with these issues. If a family has more than one child in one grade level with one teacher, parents can be at the ends of their ropes keeping kids on task and navigating their different lessons and apps, while making sure everyone can attend scheduled real-time sessions.

Not all students have devices or wi-fi access, so it has been up to schools and business partners to provide those. Wi-fi hotspots have been set up in school parking lots or even in traveling school buses. Albuquerque Public Schools provides elementary school Language Arts and Math lessons on the Public Broadcasting System (PBS) channel each week, especially for students without internet access. Many schools or districts supply packets of lessons on paper to families who come by for food.

Still, some school districts report that nearly half their students are not participating (Goldstein *et al.*, 2020) and some families have become unreachable by phone or email or other communication methods. With parents deemed essential workers in areas such as sanitation, health, and food service, students do not always have an adult to help with and supervise learning. Families whose first language is not English may not be able to help their students with lessons even if they are home. Poverty is tied to these issues and they will likely exacerbate the existing achievement gap with effects that may last for years.

Teachers and students and families have a lot to learn about and through distance learning, and they are having to learn it quickly.

### ***What does the research say about distance learning vs face-to-face learning?***

The number of online learning programs and virtual schools has exploded but results for distance learning have not demonstrated much success in general. Distance education is cheaper than face-to-face education, so it is an attractive alternative. But for distance learning to be a wise choice for public schools, it should do at least as well as traditional instruction. Blended education with its expanded use of technology in a traditional setting, must prove to be superior because it is more costly than traditional instruction. Neither of these outcomes has occurred in general practice.

A 2010 meta-analysis of research into online learning showed some promise for the medium. The U.S. Department of Education report “Evaluation of Evidence-Based Practices in Online Learning, A Meta-Analysis and Review of Online Learning Studies” (Means *et al.*, 2010), found modestly better performance by students in online conditions on average than by those in traditional face-to-face conditions. However, the report warned that because teaching and learning conditions generally differed on multiple dimensions, including time on task, the advantage for the online learners may have been “a product of aspects of those treatment conditions other than the instruction medium, per se.”

Instruction that combined online and face-to-face elements had a larger advantage than did purely online instruction. In fact, effect sizes were larger for studies in which the online instruction was collaborative or instructor directed. The report concluded that although online learning is much more conducive to the expansion of learning time than face-to-face instruction, online learning was not shown to be a superior medium of instruction.

A study by Zhao *et al.* (2005) on research findings in the effectiveness of distance learning reinforces the impact of instructor involvement as a strong mediating variable. Distance learning outcomes were less positive when instructor involvement was low. They were more positive as there was more instructor involvement.

Another national meta-analysis was done in 2019 by the National Education Policy Center (Molnar *et al.*, 2019). It found that claims that online curriculum can be tailored to individual students more effectively than curriculum in traditional classrooms were not supported

by research evidence. From the Executive Summary, Section 1:

“School performance measures for both virtual and blended schools indicate that they are performing poorly.” (Molnar *et al.*, 2019)

Interestingly, virtual schools with for-profit management organizations dominate the poor performing sector. Highest performance was by district schools with the lowest performance by for-profit Education Management Organizations. Graduation rates were 50.1% for virtual schools (totally distance learning), 61.5% in blended schools, and 84% the national average.”

The report states that evidence in the literature consistently shows that students enrolled in virtual schools perform at lower rates compared to their face-to-face counterparts. Even advocacy organizations such as Public Impact and the National Association of Charter School Authorizers, as well as organizations that promote school choice initiatives (such as the Center for Education Outcomes) have all repeatedly found that virtual schools perform lower than brick-and-mortar schools.

A March 20, 2020 opinion article in Education Week (Loeb, S. 2020) reports: “In comparisons of online and in-person classes, however, online classes aren’t as effective as in-person for most students.” This finding is based on a study done by the American Institutes for Research and University of Chicago Consortium on School Research. Students who had failed Algebra 1 took credit recovery classes online or in face-to-face classrooms. Credit recovery success rates and algebra test scores were higher in face-to-face classrooms.

June Ahn of New York University and Andrew McEachin of the RAND Corporation conducted a state study in Ohio of nearly 1.7 million students per year for four academic years in Ohio and found that virtual school students did not do as well on standardized tests as did their traditional or charter school peers. This was especially true for students with weaker academic backgrounds.

**“E-school students score lower than students in charter schools and traditional public schools.** Across all subjects and grade spans, students in e-schools score significantly lower than students in traditional charter and public schools, even when controlling for prior achievement, previous school

attended, and student demographics. In particular, students in e-schools score worse in math and reading than students in both traditional public schools and face-to-face charter schools.” (Ahn & McEachin, 2017a)

“A more nuanced understanding is that online schools—in its current form as a largely independent learning experience—are not effective for K–12 learners. Instead, learners still need the presence of teachers, mentors, or peers to help them through the learning process.” (Ahn & McEachin, 2017b)

### ***How is education from afar, so far?***

Many teachers report feeling isolated from their students, from whom teachers get their energy and passion. Students miss the attention they were used to getting from their teachers. One student told me her teacher teaches math better than the online program. Parents worry that their children will fall behind or that their children are not getting desired socialization.

Yet, during this national pandemic, there is little alternative to distance education, even if solid evidence of its efficacy has not been shown. We are now in a unique position to improve distance and online/blended learning through serious study of today’s results. It is clear from the research that in-person instruction is important to good learning outcomes. We also know that documentaries, video reports and lessons from all over the world, and cartoons as well as games and interactive materials offer tremendous potential.

Some students do well working at their own pace independently and enjoy online learning. Although much assigned online work at this early time in national distance learning tends to be practice or review, some students report they are learning new things or that they are seeing things in a different way. Preparing lessons is never a trivial task for teachers, but with in-person classes mostly cancelled, teachers may have time to really explore the internet and find digital materials to support and enrich their instruction. Students have the time to enjoy and learn from supplemental sources their time in face-to-face classes did not allow. And we are all learning about how connected we really can be even when we are not together physically.

It is unlikely we will return to school exactly as it was before and that can be a good thing. As we investigate the results of this unexpected challenge, we can apply what we discover to improve learning for all students. Former Secretary of State Madelyn Albright, lamenting

the loss of her in-person teaching, nevertheless said of her students on MSNBC's Andrea Mitchell Reports (2020, April 21), "I think in the end it can be a good thing. I think they'll be better prepared for the future". We all benefit if they are.

*Cindy Chapman is a retired elementary classroom teacher and teacher educator. She is a Presidential Awardee for Excellence in Mathematics Teaching, a former Fellow for the Advancement of Mathematics Education, and a past member of the Board of Directors of the National Council of Teachers of Mathematics. She is currently a free-lance writer and developer of digital mathematics instructional materials.*

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### In Memoriam

We are saddened by the passing of CESE member and Nobel laureate Murray Gell-Mann on May 24, 2019 at the age of 89. He won the 1969 Nobel Prize in Physics for his research in elementary particles, including the discovery of quarks. In 1997, Gel-Mann defended science teaching standards in testimony to the NM House Education committee.

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### Notes from the editor

#### A dispatch from the Pre-CoViD (PC) world

It may seem like an eternity ago, but our last issue consisted of a single article; [A Day at School in New Mexico](#). I was pleased to receive several comments, including this one:

*I read a essay from a science teacher in rural NM. I found it interesting and informative. Teachers can't teach students that are not there. The learning curves described in the article probably replay over and over. How do we change a process that works poorly? I ask for solutions to problems in the classroom. Teacher/students ratio is one that comes to my mind.*

-Senator Pat Woods

District: 7, Curry, Quay and Union counties.

The issues raised in this article haven't gone away, they're just quarantined. One silver lining to the pandemic is that once students and teachers get back to real classrooms, there will be an better appreciation by parents regarding level of skills and the conditions necessary to teach effectively. It will be interesting to see the reaction of students when they return to school. Will parents become more engaged in encouraging their children to attend schools? Will there be an improvement in attendance now that students have experienced an alternative? Will a reduction in class sizes necessitated by social distancing regulations also benefit outcomes for at-risk students? Stay tuned, in future issues we will tackle effective data analysis in the pre- and post-COVID worlds.

Our annual meeting will be held on-line on June 27th, 1:30 - 3:00 and will feature Dr. Mark Boslough on the the importance of astronomical drama to humans. See the last page for details. CESE members may participate via Zoom, RSVP via e-mail to [kimber@comcast.net](mailto:kimber@comcast.net).



## A Toon by Thomas



School in the Pandemic Era: Not Quite There Yet

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The New Mexico Coalition for Science and Math Education  
is pleased to announce our 2020 annual meeting will feature

**Mark Boslough, Ph.D.**

Research Professor, University of New Mexico & Physicist, Los Alamos National Laboratory

## **The Importance of Astronomical Drama to Humans**



On August 10, 1972, I was a teenager on my last real family vacation. We happened to be visiting the Tetons that day, and arrived just after a UFO streaked across the sky. Even though we didn't see it, we heard excited accounts from everyone else who was there. It would be years before I learned that it was actually an asteroid, incandescent from the hot plasma it created as it skimmed through the atmosphere before returning to space. This chance encounter with astronomical drama stoked my fascination with asteroids, meteors, and everything space. I have no doubt that this experience influenced my own career trajectory.

Just after local noon on the summer solstice, 1257, an even more spectacular and unexpected event occurred over a large region of what is now southern Utah: a total solar eclipse. It was witnessed by many ancient Puebloans, who were undoubtedly affected as deeply and permanently as I was by the freak celestial display. There is some evidence that this event influenced their architecture and art on Cedar Mesa.

Twenty-nine million years ago, long before humans evolved, an asteroid exploded over the Sahara, turning sand to beautiful yellow-green glass with a chemical stability that allowed it to survive through the ages to be discovered by the ancient Egyptians. Oblivious to its catastrophic genesis, artisans were impressed by its beauty and fashioned a piece of it into an ornamental scarab that was buried with King Tut. Our sky usually changes slowly and predictably. But years, decades, and eons of familiarity can be shattered in seconds, with human consequences

**Join us on live on YouTube, Sat., June 27th, 1:30 - 300 pm [https://youtu.be/\\_SHmErasmn4](https://youtu.be/_SHmErasmn4)**