The Role of Technology in Reimagining School

Pandemic or no, states ought to press for better technology for personalizing learning and making staff and students safer.

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"Imagination," Albert Einstein famously observed, "is more important than knowledge." The COVID-19 school closures offered states and local school districts an opportunity to reimagine education—to tailor it to meet students' needs, support teachers and aid their professional development, keep schools safe, and better support families. Thus far, we do not see a lot of imagination on display. In particular, schools are not taking advantage of the tremendous opportunities that technology provides—or at least have not made them available to all students.

We predict that even if school looks more like "normal" in fall 2021, schools will at some point need to rely on virtual learning again. State boards of education should therefore start now to imagine and

plan for Virtual School 2.0. State boards have varying levels of authority to accomplish this task, yet all have the power of the question. We suggest five:

1. How well have students been served by remote learning, and are there significant gaps between groups?

Education policy conferences over the last decade have typically included a panel on "The Future of Schooling" that reflected a desire to move students to individualized, online learning—at some time in the distant future. And then last spring, schools shifted to online learning over a weekend, with so little advance warning that some families quickly regretted signing up for *that* weekend to take the class gerbil home. Instead of school-happens-in-classrooms, the model became school-happens-on-the-couch. Or, if the family had no access to high-speed internet, school happened in the parking lot of the local public library, where Wi-Fi was available.

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Clearly, that shift will in part be permanent. Whether by mutation of the COVID-19 virus, a new pandemic, natural disaster, or blizzard, schools are looking ahead to the next time they will rely on virtual learning. A recent Rand survey of school district leaders found that "remote learning is here to stay." It found that one in five districts was considering, planning to adopt, or had already adopted a virtual school or fully online option, while about one in ten had adopted or planned to adopt a blended or hybrid form of instruction.[1]

While these leaders expressed a commitment to future online learning, they also noted that their biggest worry was the disparities in student learning that online learning laid bare. Half of all respondents rated learning disparities as a significant challenge, with another 36 percent saying it was a moderate challenge.

They are right to worry. Disparities that existed before the pandemic were in many cases exacerbated. The shift to remote learning was a blow to many students who were already vulnerable, particularly students of color and low-income children and youth.

Data are still being collected, but there are some results that should concern state boards. In Houston, the seventh largest school district in the country, 42 percent of students received at least one failing grade in the first marking period. That compares with 26 percent in the fall of 2019.[2]

Fairfax County, Virginia, the nation's 11th largest school district, reported an 83 percent increase in the number of middle and high school students receiving an F in two or more classes. Students with disabilities, English learners, and economically disadvantaged students did even worse, with jumps of failing grades of more than 350 percent.[3]

2. Can technology help reduce disparities in student learning?

There are lessons to be learned from health care. In both education and health care, an accurate diagnosis is the critical first step in treating a problem. We believe that the first, most critical task for state boards should be to capture information on how students are engaged in learning, whether in a digital environment or not. Hundreds of millions of dollars have been spent over several decades on amassing data, yet much remains unknown about what captures students' attention, sparks their curiosity, or piques their interest. That information can lead teachers to design assignments for challenging content in ways that engage students: project-based learning, for example, or relating class content to real-life situations.

Students should also be engaged in policymaking. Many state boards have student members, who can add the student voice to policy decisions. Surveys, formal school visits, and even public comment time are other ways to engage students.[4]

State boards need a more nuanced picture of the whole learner. Social media companies can predict individual sentiment, online commerce companies can predict interest in products, and Netflix can recommend movies. But data systems in schools fall well short of providing meaningful insight about learners. Which students do not have high-speed access to the internet at home? What are the early-warning signs that students need help?

Differences among subgroups must also be analyzed. Virginia's Department of Education found that after one semester of at-home learning, nearly half of kindergarten English learners

and more than one-third of low-income kindergarteners in Virginia are at high risk of reading failure. Black students, students with disabilities, and Latino students were similarly struggling. Results for first graders were nearly the same. So the state board of education has been crafting a plan to help those most vulnerable students.[5]

State boards can also examine the differences between students who spent the entire school year in virtual learning versus those who were in classrooms. They should pay close attention to the data received this spring and summer, with a careful look at subgroup data. Where do students need the most support? Early reports from school districts show that students with disabilities may have faced particular learning challenges this year. State boards should then ask questions about plans to address these learning challenges. Is Recovery Act funding addressing the real learning needs?

At the same time, it is important to remember that online learning will not disappear in the fall. For some students, the option to learn at home will remain a pathway to success. For districts that cannot find a certified teacher in calculus, for example, an online class may allow students to enroll in a challenging class the district could not otherwise provide.

Since state boards are responsible for adopting state learning standards, they should also consider what the data reveal about what students have mastered. It may well be that students were never exposed to some of the standards. That information may be helpful when standards are up for revision. For example, a state board that was considering a reduction in the number of standards in order to increase the depth with which those standards were addressed might reduce the focus on what students already know in order to leave more time for other important topics.

NASBE has long been a strong supporter of expanding access to high-speed internet connectivity for every student.[6] But states do not always have the best information on where high-speed internet has not been deployed.

Current technology can determine not only when a student is signing on to a class, but where and how a device was used. This information could help crowd source a map of areas that still lack access to high-speed internet. (If students only sign on in the parking lot of the local public library, that indicates that they lack access to high-speed internet, because it does not reach their home or they cannot afford it.) Even when this technology is deployed, families may need training in its use. In Tennessee, public libraries administer a program known as Training Opportunities for the Public, offering citizens in underserved areas training in how to access and use the internet for everything from helping children with homework to applying for a job.[7]

There is no generation that has been learning online for so long. Plagiarism and students texting answers to each other have never been so prevalent and accessible. Parents are not always able to monitor children to make sure they are actively participating. This reality needs to be addressed, and there are tech companies that can assist in remote proctoring to give educators a greater degree of assurance on exam scores.

State boards should be vocal in their support for efforts to expand security, access, and affordability at the state level.

3. How can technology help teachers personalize learning?

Even before schools closed last year, students in the typical classroom spanned a wide range of grade levels. Those ranges expanded during the pandemic.

While personalized learning is effective, it is also time consuming. Technology exists to make that task easier. Software can automate much of the basic-skills practice and assessment that ordinarily takes up time better spent on designing lessons. Computer programs can identify weaknesses in a child's skills—adding and subtracting fractions, say, or conjugating Spanish verbs. Students can then get practice only in the areas they need, teachers can review outcomes daily, and follow-up lessons can build on what students are learning.

The technology can give teachers a bird's-eye view of how students are solving problems. If a student is missing a critical step—forgetting the order of operations in a math problem, for example—the teacher can focus on that content. Teachers used to have students turn in "exit slips" so they could assess whether students had mastered the day's lesson. Now technology can streamline the process so teachers know

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instantly whether their lesson worked or they need to reteach some content on the following day.

Technology also makes it easier for teachers to share the work of developing differentiated lessons. If every teacher is teaching two-digit multiplication, one can develop games for skills practice while another creates word problems, for example.

Technology can improve professional development. Anyone who has ever spent an hour on a silly icebreaker—like folding a newspaper page into a hat—will confirm that too many local efforts are uneven at best. New platforms would allow principals to tailor professional learning to teachers' needs, just as teachers can tailor learning to student needs.

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States set general requirements for the number of hours of professional development teachers need. However, state boards could assist local districts in identifying providers who can design and develop individual staff development plans. While professional development for digital learning is not new, some states are using open educational resources (OERs) to share teacher professional development resources. Virginia's #GoOpenVA was an early example. It continues to grow in popularity because educators across the state can contribute, comment, and use content that shares best practices. Teachers determine the content that is most valuable to them. Teachers save valuable time because they can rely on the ratings of a community of educators. Providing all teachers access to high-quality learning also supports equity.

The Utah State Board of Education is pioneering the use of microcredentials for teachers, as are others (see article, page 35). Created by educators and approved by the board, these credentials focus on content with immediate applicability—for example, on effective use of an assessment tool to give students more ways to demonstrate mastery of a new skill. Credentials can be developed quickly in response to an immediate need and earned by teachers in weeks rather than semesters.

4. How can technology keep teachers and students safe when they return to school?

When *Education Week* surveyed teachers last December about returning to in-person instruction, their number one concern was safety.[8] But while discussions of school safety used to involve magnetometers and school resource officials, the pressing worries today are physical health and cybersecurity. Data and technology will be critical to addressing both.

Schools do need personal protective equipment and plexiglass barriers for physical safety. Even if every staff member is vaccinated before schools reopen, staff may reasonably worry that students may be asymptomatic spreaders. Parents share that worry. In a 2020 survey of parents, only half said they have at least a "somewhat high" level of trust that their child's school would safeguard their health if in-person instruction were to occur during the pandemic.[9]

But there are also technology solutions. One is to institute COVID-19 contact tracing for everyone in a school building: teachers, students, staff, and volunteers. Universal testing is part of the guidelines from the Centers for Disease Control and Prevention (CDC) for safely reopening schools. Federal funds, including those from the Federal Emergency Management Agency, can help defray the cost.[10]

Some school districts mandated universal testing before the CDC issued recommendations. Hartford, Connecticut, Public Schools, for example, implemented self-reporting tracing applications to manage and monitor COVID cost effectively. Administrators, teachers, and parents are made aware of self-reported cases and can provide alerts to others in proximity. The system recognizes individuals who have received vaccinations as well—all while protecting privacy.

State boards have a responsibility to share accurate, disaggregated information with the public. Although state health agencies will have the primary responsibility for collecting, aggregating, and sharing COVID-19 information, state boards can play a role. They should prioritize helping schools that serve the communities most vulnerable to COVID-19 (box 1).

5. Are students and educators safe in a digital learning environment?

State boards also need to think about cybersecurity in a digital learning environment. This past year, all schools urgently issued devices and worked to ensure internet access to students and

Box 1. Which Schools Should Be Prioritized for COVID Testing?

If state resources for coronavirus testing are limited, the state board should work with health officials to prioritize the best settings for school-based testing. In its "Interim Considerations for Testing for K-12 School Administrators and Public Health Officials," the Centers for Disease Control and Prevention (CDC) offers this guidance:

Schools in communities disproportionately affected or that lack access to testing. Public health officials and school administrators may consider placing a higher priority for testing in schools that serve populations experiencing a disproportionate burden of COVID-19 cases or severe disease. These may include schools with moderate or large proportions of racial and ethnic groups that have experienced higher rates of COVID-19 relative to population size or schools in geographic areas with limited access to testing due to distance or lack of availability of testing.

Schools in communities with moderate, higher, and highest risk of transmission. The decision to initiate a school-based testing strategy for students, teachers, and staff should be made in consultation with the local health department. CDC recommends taking into consideration the level of community transmission and implementation of mitigation strategies when deciding on school-based testing. Testing in schools located in communities at moderate to high risk may provide the maximum balance of testing efficiency.

Schools with an active outbreak. Classrooms or schools experiencing an active outbreak may temporarily close for in-person learning. The local health department may facilitate testing for students, teachers, and staff in schools with active outbreaks. The health department will also conduct contact tracing in these situations. Schools can assist by providing information to identify close contacts (e.g., class rosters, seating charts, and student emergency contact information). Health departments can use a tiered approach in an outbreak setting to determine which close contacts and other potentially exposed persons could be tested or quarantined.

educators for remote learning, creating a global shortage in the supply chain as educational institutions competed to purchase Chromebooks, laptops, and various forms of mobile Wi-Fi (MiFi) "pucks."[11] One consequence of the rapid shift to remote learning was increased exposure to nefarious attacks.

As Doug Levin, director of the K12 Security Information Exchange and founder of the K-12 Cybersecurity Resource Center, put it, "With more teachers and students online, particularly if they're doing it from less controlled environments outside of the school, the attack surface of the school community is increased."[12]

The data back him up. Over 1,100 incidents involving cyberattacks on U.S. schools and districts have been publicly disclosed in recent years, according to the K-12 Cybersecurity Resource Center.[13] The number and severity of those incidents increases every year. Microsoft Security Intelligence found that 61 percent of nearly 7.7 million enterprise malware encounters in the past month were reported from the education sector, making it the largest target of any sector.[14]

While state education agencies engage in some form of cybersecurity risk management, protecting from threats like ransomware and

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phishing is increasingly urgent across K-12 districts. Key among the practices that districts need to embrace is participation in threat intelligence and sharing of best practices. Instead of trying to conceal a cyberattack, schools need to share information with trusted peers. Immediate outreach is critical to ensuring the mutual defense of schools and students.[15]

At a minimum, state boards should require that their departments of education hire a chief information security officer, and they should immediately adopt policies and guidance for local districts to address and minimize their cybersecurity risks. According to Verizon's 2020 Data Breach Investigations Report, "This industry [education] saw phishing attacks in 28% of breaches and hacking via stolen credentials in 23% of breaches. In incident data, Ransomware accounts for approximately 80% of Malware infections in this vertical. Educational Services performed poorly in terms of reporting phishing attacks, thus losing critical response time for the victim organizations."[16]

Many school districts do not have the information security personnel and budget to understand, diagnose, and stay abreast of evolving cyber threats.

Where state policy allows, state education agencies can work with other state and local agencies to develop cost-effective ways of strengthening security programs and resources. This is an important problem to address at the state level, as many school districts do not have the information security personnel and budget to understand, diagnose, and stay abreast of evolving cyber threats.

A possible answer might be to explore pursuing statewide contracts with cybersecurity providers who have compliance tools and monitoring services over the leading regulations and policies for IT security compliance in government and commercial markets including the National Institute of Standards and Technology and Department of Defense.

Digital learning is going to be a part of education's future. Now is the time for state boards to imagine—and help create—a better digital future. ■

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[10]The Rockefeller Foundation developed a workbook to help educators, leaders, and their public health partners design and implement effective COVID testing programs in schools. See "Covid-19 Testing in K-12 Settings: A Playbook for Educators and Leaders," N.d., https://www.rockefellerfoundation.org/wp-content/uploads/2021/02/The-RockefellerFoundation-Covid-19-K-12-Testing-Playbook-for-Educators-and-Leaders.pdf.

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[12]Jake Maher, "Coronavirus Compounds K-12 Cybersecurity Problems: 5 Areas to Watch," *Education Week*, March 17, 2020.

[13]A map of cyber incidents that is updated daily: https://k12cybersecure.com/map/.

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[15]The K12 Security Information Exchange was recently established to bring state, regional, and local education agencies into that world, https://www.K12six.org.

[16]Verizon, "2020 Data Breach Investigations Report," https://enterprise.verizon.com/resources/reports/2020-data-breach-investigations-report.pdf.