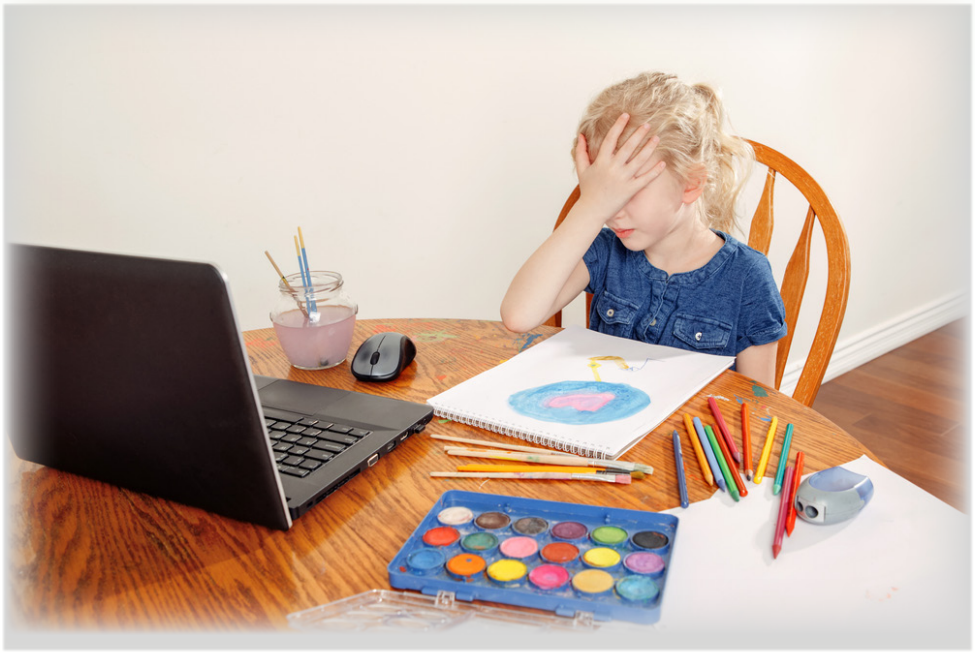
Issues to Consider Before Adopting a Digital Platform or Learning Program



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Introduction

The COVID-19 pandemic has given the entire country a crash course in virtual education and digital education platforms. As school buildings closed in the spring, education technology vendors immediately offered educators free products.[1] Additionally, such vendor corporations, as well as tech industry trade associations, venture capitalists and venture philanthropists who have been promoting virtual education for over a decade, all worked quickly to position digital programs and platforms as the obvious solution for schools that had to close buildings to avoid transmitting the virus.[2, 3] These actors are promoting digital options not only as schools' go-to response to the crisis, but also as a leap forward into the new normal for the core education infrastructure in a radically altered school environment when the crisis is over.[4]

Unfortunately, state policymakers, communities, and district and school administrators have little information other than marketing materials to use in evaluating the claims technology vendors and other promoters make about virtual learning. Such claims can be extravagant and promotional materials seductive, but reality often contradicts them.

Meanwhile, teachers, students, and parents have struggled with mixed success to adjust to virtual-education technologies. Many students and parents have been sidelined altogether because they lack access to broadband, computers, and other digital necessities. Parents also often lack the time, resources, and knowledge required to meaningfully engage in the technological programming offered. In addition, students' privacy is undermined by federal laws that allow technology companies to be legally defined as school officials and by state laws that exempt personalized or adaptive learning products from privacy protections.[5]

With the pandemic creating a surge in demand for virtual education, decision-makers face an urgent need to get digital platforms and programs up and running in schools. What re-

search evidence there is, however, does not support claims that virtual education produces desired student outcomes, as compared to conventional face-to-face approaches to teaching and learning. Online schools, in particular, have yielded very poor outcomes.[6] Moreover, the use of digital platforms and learning programs is tied to significant threats to the integrity of schools' curriculum and instruction programs, their student assessments, and their data collection and record-keeping practices.[7] Compared to the surface transparency of traditional textbooks, tests, and record books, there is a lot "hidden under the hood" of virtual technologies.

Purpose of This Collection

In this pandemic, school leaders are forced to consider a set of very imperfect options as they struggle to reopen their schools. This three-brief collection identifies key issues for school leaders to consider before adopting a digital platform or learning program that will impact curriculum and teaching, student assessment, and privacy/data security. We do not review specific programs, nor do we provide advice about which programs to adopt.

Each brief in this collection can be used alone or in conjunction with one or both of its companion briefs. To allow for such flexible use, each includes recommendations unique to its specific focus as well as recommendations common across the set.

The framing principle underlying all three briefs is that school leaders should ensure that any digital technology adopted reflects, rather than undermines or distorts, the school's stated values and goals. In the context of the COVID-19 pandemic, the best many school leaders can do is minimize any potential harm that may result from the need to hastily adopt digital technologies. With this in mind, we offer the following additional principles to guide decision-making.

Digital learning programs and platforms are less likely to harm students to the extent that they:

- Retain curriculum and teaching practices consistent with school goals and values;
- Have been reviewed for bias by independent experts;
- Maintain teachers' control of educational decisions rather than transfer those decisions to algorithms programmed into applications;
- Collect a minimal amount of student data; and
- Prevent the transfer of student data to vendors and other unknown parties.

These principles, in conjunction with the considerations detailed in each brief, can be used to help determine which products to choose, how to best use them in the current crisis, and which to abandon when the crisis has passed.

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Section I

Curriculum and Teaching Issues to Consider Before Adopting a digital Platform or Learning Program

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Even before the COVID-19 pandemic, the effort to provide students with meaningful curriculum and empower teachers to make the best use of their professional skills was under threat, as the result of two decades of test-heavy U.S. school reforms. The intense testing regime ushered in by No Child Left Behind rewarded students, teachers, and administrators when student memorization of facts translated, in the short term, into high test performance.[1] Against this backdrop, over the last decade, foundations and corporate interests have pushed aggressively to spread virtual technologies in schools.[2] Most recently, the push for virtual education has been coupled with a tech-friendly digitalized version of "personalized learning." California-based Summit Schools, for example, armed with almost $200 million from the Gates Foundation, the Chan Zuckerberg Initiative, and others, had by 2018-2019 signed up almost 400 "partner schools" to use its "Summit Learning Program."[3]

Without careful decision-making by school leaders, digital platforms and learning programs, with their focus on continuous assessment and testing, can undermine teachers' ability to organize curricula responsive to student needs and to adopt instructional approaches that encourage higher-level thinking among their students.[4] This problem is likely to worsen as larger numbers and more diverse groups of students are funneled into virtual education. The COVID-19 pandemic has dramatically increased the pressure on schools to quickly adopt virtual technologies and digital platforms despite a general lack of research evidence to guide their adoption.[5]

To help school leaders make thoughtful decisions about digital platforms and learning programs in general, and particularly in the current high-pressure environment, we discuss seven key issues to consider.

Pedagogical theories embedded in digital platforms and learning programs shape the student learning environment.

Many digital platforms implement some form of competency-based education (CBE, also known as competency-based learning or mastery-based learning). This approach has roots in the behaviorist psychology and "programmed instruction" popular in the 1950s and 1960s. These popularized the idea that knowledge could be chopped up and delivered, like a product or commodity, via "teaching machines." Advocates argued not only that students could "acquire" these bits of knowledge, but also that their ability to provide the required response to questions about each bit demonstrated their competency/mastery of it—and therefore their "learning."[6] Although analog teaching machines did not take off as their inventors hoped, the marketing of digital "teaching machines" has been better funded, more persistent, and more successful.[7]

Understanding learning as the acquisition of discrete bits of information and discrete skills limits how teachers, students, and administrators interact by defining what "counts" and what is important.[8] It encourages everyone in the school community to think and talk about students' schoolwork—including their social-emotional development—in the context of their individual mastery of specific skills that will be useful to them.[9] These days, that is almost always narrowed to skills that are perceived to be in some way test performance- and job-related. When teaching these skills is pre-loaded into a digital platform, it scripts the teaching and learning process. It crowds out the kind of unanticipated teaching moments that cannot be coded into any software, on which teachers can capitalize even when they are not in their lesson plan.

Schools can create environments—cultures of learning and thinking—that encourage meaningful learning as an integral part of daily life.[10] Researchers and program designers increasingly recognize that programs to teach thinking cannot just be "implemented," but rather must be established and cultivated within a social context.[11] This means that effective teaching is not limited to specific classroom lessons, but also takes place spontaneously in the classroom and school as teachers both create school and classroom environments that support student learning and also capitalize on situations that arise outside of planned lessons. This kind of teaching and learning may be undermined by digital products that shape the learning environment and structure learning opportunities to meet the requirements of that digital environment.

The more that teaching and learning are shaped by the collection and use of easily quantifiable data points, the more narrow and limited the curriculum and definitions of "achievement" will become, because boundaries of what is valued will be defined by those things that can best be captured and sorted electronically.[12]

"Personalized learning" in digital platforms and learning programs does not necessarily result in personalized learning.

"Personalized learning" has been aggressively promoted by the Gates Foundation and others for over a decade.[13] There is no common definition of what "personalized learning" means,[14]

although advocates for the approach tend to point to broad goals and assert that their pedagogical approaches will meet the needs, strengths, and interests of each learner.[15] Although not all personalized learning is digital, the idea of personalizing learning has been the dominant rationale supporting the use of digital platforms and learning programs. Such products allow for students to advance through materials at their individual pace—with the ability to move forward through lessons dependent on assessment data.

In contrast, common sense suggests that the term "personalized learning" implies a humane school and classroom environment and open, flexible teaching strategies. But this is a far cry from contemporary personalized learning programs, including the digital platforms designed to implement them, which often share the assumptions of competency-based education (CBE). That is, they conceptualize learning as a hyper-rational process of remembering facts and demonstrating specified skills according to a logically defined plan. Thus, digital "personalized" learning programs can limit students' learning by channeling it into the kind of narrow, logical pathways that can be easily assessed by digital platforms.[16]

The mastery-based approach to learning and the capability built into some digital platforms for students to set and achieve individual learning goals may appear on the surface to be child-centered. However, the choices students are allowed to make are not necessarily meaningful. In many cases, the truly meaningful choices are made by software designers and developers who determine the content that students must master and how they must demonstrate that they have mastered it.[17] Algorithms determine how assessments are scored and how students will be nudged in particular directions.

The Summit Learning Program, for example, embodies this type of hyper-rational, mastery-based approach not only to students' learning of facts (i.e. "content knowledge"), but also, explicitly, to their academic and social and emotional development (i.e., "cognitive skills" and "habits of success"). According to Diane Taverner, CEO of Summit Public Schools, which created the digital Summit Learning Program:

> ...if you think about going into the platform, this is...where you are going to interface with your courses and your grades and all of the learning materials and where you'll take and submit your work and your assessments and so it's a full comprehensive ... space where that happens and takes place.[18]

In other words, "personalization" in a program such as the Summit Learning Program is defined by its digital platform. Students in schools that adopt the program use the platform to choose their curricular materials (often from third-party websites), do their work, and take their tests.[19] They also set goals and interact with their teachers on the platform. In short, the platform still manages all aspects of the circumbscribed student experience and tracks the "measurable outcomes."

In this way digital programs such as the Summit Learning Program force students—regardless of their learning style—to engage with every aspect of their school life via the platform. It is not surprising that some students have expressed experiencing anxiety when their schools adopted the Summit Learning Program.[20] When a program or platform promises "personalized" learning for students, then, it woud be wise for school leaders to take a close look

at whether the term translates to any meaningful learning options for students with widely varying needs, interests, habits, and challenges.

Algorithms embedded in digital platforms and learning programs shape teaching and curriculum.

Algorithms represent theories about which pieces of information their authors consider valuable and how their authors believe those pieces of information should be assembled to draw conclusions. Therefore, it is essential to understand how algorithms in a particular product reflect inferences drawn about students and their learning.

Algorithms are central to the day-to-day functioning of digital platforms and educational programs. They implement the regular formative assessments designed to mediate between teachers and children, and to influence children's experience of the curriculum. In some programs, the assessment is straightforward and teachers decide what and how students learn. In other programs, the assessment is less transparent: Teachers may not see the questions that their students are asked to answer while they work within the program, or understand why students received the grades they did. Yet those programs require teachers to, "in real time," adjust their teaching to the assessment results that the algorithms report. Programs that feature "adaptive" or "personalized" learning bypass teachers completely and automate the instructional decision-making that teachers would ordinarily control.

The more that a digital platform or learning program inserts itself into the relationship between students and teachers, the more opportunities there are for its output to be flawed, and the greater the influence of those flaws is likely to be on how students are taught and assessed. The less that it is programmed to do, the less problematic it has opportunity to be.

Cultural and other biases may be embedded in digital platforms and learning programs.

Like any textbook or other physical curriculum or assessment material, algorithms may reflect values or assumptions that may be second nature to the social demographic of their writer but not to members of other demographic groups. Biased descriptions, examples, or test questions are easier to identify on a written page, however, than in a digital platform or learning program where they disappear quickly from the screen. Biased decision-making by an algorithm embedded in a learning program (for example, one that marks as "incorrect" answers written in dialects other than standard American English) are completely hidden. Teachers, students, parents and community members are, therefore, less able to identify problems with them.[21]

Machine-learning algorithms, in particular, reflect any bias in the data used to "train" them. For this reason, they have been found to have different accuracy rates for different demographic groups, and to make different decisions when applied to different populations.[22] A 2016 *ProPublica* investigation, for example, found that algorithms purported to predict prison inmates' likelihood of recidivism were more likely to be inaccurate when they assessed

Black as compared to White inmates.[23] In another example, Safiya Noble found that even seemingly objective Google search algorithms perpetuate harmful stereotypes about women and minorities.[24] Other authors have explored the dangers of relying on opaque algorithms to make consequential decisions about people's lives in such domains as employment, career advancement, health, credit, and education.[25]

Although independent algorithmic audits can identify algorithmic bias, technology companies are disincentivized from doing them because such audits may reveal the need for costly and time-consuming revision of their programs, and might cost them customers.[26] Without independent audits of the opaque algorithms that run digital platforms and learning programs, school leaders are forced to accept on faith that the conclusions those algorithms generate are valid. For these reasons, school leaders should ask questions about the algorithms that run the digital platforms and learning programs they are considering. Programs that have gone through an algorithmic audit are preferable to those that have not.

Digital platforms and learning programs may socialize children to accept surveillance.

It becomes "common sense" to children who have been raised under constant surveillance that such surveillance is normal and natural, and that it is a fair price for getting services they want—especially because they cannot avoid it even if they wanted to. Two corollary tendencies accompany the assumption of ubiquitous surveillance. One is to trust the providers of digital services and not balk at giving away their private information to people or entities they do not know for uses they cannot identify. The other is to conform—to become self-conscious in the presence of recording devices and suppress, rather than give voice to and develop—ideas or viewpoints that they suspect may not be normative.[27] Social psychological research suggests that surveillance makes people less open to new ideas, more anxious, less creative, and generally more conservative in their thinking.[28] Much of that research was conducted on young adults in relatively transient settings, not on developing children over long periods of time. The prospects of how the effects might multiply in latter settings are very concerning.

All children, including teens, are more susceptible than adults to having their affinities shaped by marketers exploiting their vulnerabilities. Because they believe that what their schools do and parents allow is in their best interest, children are growing up experiencing constant surveillance as a norm to be accepted and even welcomed into their academic and social lives, as it brings them both what they need and what they want from the Internet.

Digital platforms and learning programs may expose students to marketing and behavioral tracking.

While it is true that a lot of online advertising to children takes place outside the school setting, schools serve as a portal to and reinforcer of digital marketing media and messages.[29] Let's follow an imaginary high school student, D.J., to see how this might happen.

D.J.'s schoolwork puts her online for much of her day, where she seamlessly transitions between school-assigned and commercial websites. How might this affect her? It starts with D.J. preparing an assignment for a class, let's say a presentation about a book she read for her English class. As she moves in and out of the protected applications that are part of Google's G Suite for Education, marketing companies quietly but persistently track her activity.

YouTube is not one of the "core" products in Google's suite of education applications. However, this matters very little since it is one of the most popular third-party sites to which students are sent by educational products.[30] Accompanied by an application that identifies tracking, we surfed through other sites students might be likely to visit. We found 16 companies tracking us from dictionary.com and over 35 from Sparknotes.[31] With the information they collect about her, these companies—or other companies to whom they sell her data—determine what kinds of ads D.J. might respond to, and serve them to her on those sites and on others she visits.

By feeding children ads and other content personalized to appeal specifically to them, and also by choosing what not to show them, marketers influence children's thoughts, feelings, and behaviors.[32] As they do, they also test, adjust, and perfect their models of influence—and then track and target some more.[33] They do it repeatedly from the time D.J. or any student starts using the Internet. Unless schools are vigilant, schoolwork will help marketers hold children in an environment in which their interests, attitudes, and anxieties are shaped carefully over time by repeated exposure to commercial messages in a virtual environment that surrounds them with products and ideas not designed to promote their healthy development, but rather to push them to purchase something.[34]

Digital platforms and learning programs offered by public sources may be preferable to those offered by private vendors.

It is a given that a for-profit corporation will focus on its bottom line—and that the programs it provides to schools must benefit that bottom line. The tension between the educative mission of schools and the corporate imperative to earn profits means that when corporations enter the schools, there is going to be pressure to create student experiences and shape student attitudes in ways that support, or at least do not undermine, corporate profitability.

An important goal of corporations that promote digital educational products is to create a consumer base for their commercial products. Another is to generate data that can be sold to advertisers and others. As software tracks children, it creates opportunities for companies to develop profiles on them that may be used for targeted marketing while at the same time accustoming students to take being tracked for granted.[35]

Districts that have developed their own digital learning approaches are not motivated to create a consumer base for their products or to generate data from which they may profit. They are therefore less likely to integrate consumer-culture values into their platforms and educational programs or to promote consumption, and more likely to limit and to better safeguard the data they collect.

Research Landscape Related to Digital Platforms and/or Learning Platforms in a Virtual Environment: Curriculum and Teaching

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Research on virtual education is very limited.[36] What little exists often focuses on comparisons between the virtual school environment and face-to-face settings. One such comparison, for example, consistently found that most virtual schools had a student-teacher ratio that was two to three times the national average for brick-and-mortar schools.[37] Because of the high student-teacher ratios in virtual schools, they tend to rely on algorithms built into digital platforms to organize content, structure pedagogy, and administer and evaluate student assessments. Further, they generally rely upon parents/guardians not only to supervise, but also to play a significant role in the preparation and delivery of instruction.[38]

The parents' role begins with the time they must spend preparing and planning the next day's instructional material for their students, and it continues throughout the day.[39] A 2006 Wisconsin Appeals Court decision noted the various activities required of parents forces them to devote four to five hours per day to educating their child.[40] Gerald Bracey neatly summarized the situation when he wrote that although the students are enrolled in a virtual school, most children are homeschooled.[41] This situation creates an increased reliance on both the digital platform's algorithms and the online content that it delivers.

Very little is known about the daily life of students attending virtual schools, because the information available is usually both dated and provided by either the corporate educational management organizations themselves or secondhand reviews.[42] There has been no public external review of the nature of virtual schools' curriculum in over a decade. In 2001, Trotter described the online curriculum as "typical worksheet-style computer lessons, with brief bits of animation or sound effects as rewards."[43] In 2004, Bracey concluded that "the curriculum is not interesting and it promotes a one-size-fits-all approach. The instruction is mechanical and the system does not encourage creativity."[44] In 2005, Baker and his colleagues indicated that the online curriculum "emphasizes phonics-based reading and a great book approach in literature [and an early foundation in basic arithmetic]. In social studies, Western culture and history is emphasized."[45] Such descriptions led Ohanian to conclude in 2004 that the online curriculum of many virtual schools contradicts the commonly accepted understanding "that children learn more effectively in environments that allow them to work independently and with each other to construct their own knowledge."[46] It would be expected that over the past 15 years the online curriculum has improved, but anecdotal evidence suggests otherwise.[47] However, it is important to note that beyond these cited works conducted when full-time virtual schools first began operating, there continues to be an absence of independent research into the instructional exchange and the online curriculum of these virtual schools.[48] Some have speculated this absence is due to the for-profit nature of the corporations that operate the virtual schools serving the majority of students.[49]

Some research has suggested that students engaged in supplemental virtual schooling have better outcomes than students engaged in full-time virtual schools.[50] There are a few intertwined explanations for this difference. The student-teacher ratio in most supplemental virtual courses is similar to that of brick-and-mortar classrooms.[51] While this hardly ensures that teachers will rely less on the online curriculum and the restrictions imposed by a digital platform, it creates the possibility that they might. Also, because the online curriculum of supplemental virtual education is more frequently designed by a teacher or team of teachers,[52] it tends to have less of a behaviorist approach than the curriculum of full-time virtual schools.

Conclusion

Adopting commercial digital platforms and learning programs can pose real risks to the integrity of schools' curriculum and teaching. School and district leaders can minimize the risks by judiciously choosing and using products they adopt. To minimize risks, it is important that the values and goals of school educational programs frame the decision-making process. Digital platforms and learning programs should not drive the curriculum, pedagogy, assessment, or data collection and record-keeping practices of the schools. We recommend that school and district leaders:

- Define the pedagogical values, goals, and practices they hope to achieve before considering the adoption of a particular digital educational product;
- Clarify the ways in which any digital educational product would advance their self-defined values, goals, and practices;
- Identify potential negative consequences—in this case, for curriculum and teaching—that may be associated with the use of that product and devise strategies for avoiding them;
- Determine which of their defined values, goals, and practices can be best achieved by non-digital means and which require digital means;

As they assess the suitability of any particular product, we recommend that they consider:

- How the product shapes the learning environment for students;
- What terms such as "personalized learning" mean in practice in the context of the product;
- The impact of algorithms embedded in the product on teaching and curriculum;
- Cultural and other biases that may be embedded in the algorithms;
- Whether and how the product teaches critical thinking;
- How the product may socialize children to accept surveillance;
- How the product may expose students to marketing and behavioral tracking; and
- If the product was produced by a public source or a private vendor.

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Section II

Assessment Issues to Consider Before Adopting a Digital Platform or Learning Program

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The passage of No Child Left Behind in 2002 helped frame the virtual education choices schools now have. Promoted by the lobbying efforts of tech-friendly foundations such as the Bill and Melinda Gates Foundation and corporations such as Pearson, the emphasis on standardized tests and continuous student assessment contributed significantly to the demand for "ed tech" in schools. It takes computers to process the massive amount of test data schools are required to collect and report.

The tech industry and a host of self-interested vendors and corporations have further stoked the demand for computers by aggressively promoting virtual education over the last decade and a half.[1] The Gates Foundation and Chan Zuckerberg Initiative, in particular, have spent hundreds of millions of dollars to promote digital "personalized learning," a data-friendly approach to pedagogy that also demands continuous assessment.[2]

The No Child Left Behind testing regime is now widely considered to have been ill-advised and there is little, if any, credible research that indicates digital learning programs or virtual education are effective. Nevertheless, the COVID-19 pandemic has supercharged efforts to use digital technologies to reshape school programs.[3] Despite the public relations effort that presents digital technologies as the common-sense solution to the dilemmas posed by the pandemic,[4] it is important to recognize that digital technologies also pose significant threats to the schools and school communities that adopt them. The assessments programmed into digital platforms and learning programs may negatively shape student learning, subtly alter the curriculum, de-professionalize teachers' role, and appropriate and misuse student data unless school leaders make careful decisions.

To understand the nature of the problem, it is important to recognize that digital platforms and learning programs implement particular theories of learning and child development.

The learning opportunities these platforms offer to students are, therefore, necessarily determined by these theories, as are the assessments used to evaluate students' accomplishments.

Digital platforms and programs provide a variety of features that streamline assessments and save teachers time. For example, they may offer assessments, coordinated with content units, that automatically evaluate and record student performance. This is a mixed blessing, because the more that platforms and learning programs automate assessment and record-keeping, the more they limit teachers' ability to assess students based on their direct observation and impede teachers' ability to critique or correct judgments made by the software. At the same time, built-in assessment programs generate data that often flows back to parent companies that may use it for unknown purposes. To help school leaders make sound decisions, we have identified six key digital assessment-related issues for them to consider. Below we discuss the importance of each.

Pedagogical theories embedded in digital platforms and learning programs shape the student learning environment.

Many digital platforms and learning programs rely on the same behaviorist theory of learning as did the "teaching machines" promoted for school use over 70 years ago.[5] In essence, the approach relies on the assumption that there is a uniform set of facts or skills that students must master, and that knowledge of these facts or skills can be broken into small elements and presented bit by bit to students, who can then learn each element and be tested on it. Students' ability to provide the required responses to assessment questions about each element is assumed to demonstrate their competency/mastery of the element, and therefore, "learning" is a process that repeats itself continuously until a student has "mastered" the presented elements.[6] While this kind of approach allows for students to move through the program at their own pace, it also assumes that children do not require a meaningful context for their learning.[7]

"Competency-based education" (CBE),[8] based on this hyper-rational behaviorist approach, is programmed into many digital learning platforms and programs, particularly so-called "personalized learning" programs. These programs embody tacit assumptions. The first is that their designers and programmers can effectively organize the fragments of information students are expected to master and program the assessment tools to measure whether or not they have been mastered. The second is that this programming "personalizes" learning for all the students. Given the diversity of students' backgrounds, needs, and learning contexts, these assumptions are unwarranted. While it is true that some children may quickly demonstrate "mastery" of the facts and skills defined in these programs by learning how to answer assessment questions correctly, it is also quite possible that because they have not learned those facts and skills in a personally meaningful context, they will not be able to apply their "mastery" in real-world situations. As a result, what they learn may be of little or no use to them—except to pass tests.[9] For example, a high school student who appears to have mastered all the required math competencies may not understand how the interest owed on their credit card debt compounds.

In contrast, when teachers help students contextualize learning through classroom tasks and discussions of their experiences, their understanding can deepen because they engage with the curriculum in a personally meaningful way. To the extent that a digital platform or learning program minimizes teachers' ability to contextualize learning for their students, assessment evidence of student learning may be illusory. Products that encourage teachers to contextualize students' learning and to conduct their own assessment of students' understanding may require more teacher time and effort than products that provide content and assessment. They are more likely, however, to facilitate meaningful learning and assessment.

Assessments programmed into digital platforms and learning programs can shape and narrow the curriculum.

The assumptions of digital, competency-based education—that knowledge can be broken into logically structured elements, that student mastery of each of those elements must be continuously assessed, and that constant data reporting is necessary to ensure children's progress—inevitably narrows the curriculum and limits teachers' options. The assumption that acquiring a collection of small bits of discrete information and numerous discrete skills is the essence of learning necessarily also tends to exclude anything that cannot be reduced to a quantifiably measurable standard. The more that teaching and learning are shaped by the collection and use of easily quantifiable data points, the more limited the curriculum and definitions of "achievement" become, and the more likely that success will be defined by those things that can best be captured and sorted electronically.[10] Necessarily, students will focus their efforts to strive to succeed at those things.

In contrast, educators have for years developed approaches to curriculum to help children cultivate a wide variety of interests and skills difficult or impossible to quantify. To imagine alternatives and find creative solutions to problems. To interpret information based on sound reasoning. To develop personal identity and use knowledge in personally meaningful ways. And, to develop the interpersonal and social skills necessary to participate in and contribute to democratic civic life.[11]

It is obvious that children can learn much more in school than predefined skills. They can, for example, learn to be part of a classroom community in which academic knowledge, technical competence, social skills, and personal identity are also developed in the context of genuine engagement with other people.[12] For instance, children who learn about plant growth by cooperatively designing and cultivating a class garden and then eating the resulting fruits and vegetables have a vastly different learning experience than children who acquire information about photosynthesis in programmed bits and pieces, even if those facts are delivered by an amusing, gamified educational application.

Since human learning is often not sequential or even logical, narrowing children's education to the acquisition of one skill, fragment of information, or concept after the other in an apparently logical progression not only constrains their experiences, it can also undermine their ability to integrate what they have learned in real world situations (that is, to transfer their learning) and inhibit their achievement of broader educational goals.[13] Digital learning

programs define how teachers, students, and administrators interact—by defining how they understand what "learning" means, what "counts," and what is important.[14] They also increasingly script the teaching and learning process, crowding out the kind of unanticipated teaching moments sparked by a student question or comment on which teachers capitalize even if it means detouring from their lesson plans. Such unplanned opportunities cannot be coded into any software.

Finally, the reality of forcing all children to learn and be evaluated via technology-mediated relationships with their teachers contradicts the rhetoric associated with personalizing education and responding to children's unique needs and interests—the rhetoric that has been used to promote digital platforms and programs. In other words, forcing all children to learn via digital means, with constant focus on assessment data and "mastery" as the definition of learning, can reasonably be seen as the opposite of child-centered or personalized. Digital programs that provide for more teacher latitude in organizing their curriculum and developing their assessements are likely to be better than those giving teachers less latitude.

Opaque algorithms that may be biased run the assessments programmed into digital platforms and learning programs.

Any test reflects the values, assumptions, social positions, interests, or biases of its creators. In a simple example, a teacher described how seemingly innocuous language in a test question reflected the culture of the test creator and was incomprehensible to his students. The question asked students to identify which of a series of pictures was a "casserole." The teacher noted that although casseroles might be common in Iowa, where that particular test originated, his young students in inner city Texas had never seen one and could not answer the question.[15] Concerns that the language or examples used in standardized tests may discriminate against minority group students have dogged standardized testing for years.[16] They have led to calls for standardized tests to be replaced by locally derived assessments.[17] They have also caused parents nationwide to refuse to allow their children to take end-of-year summative examinations.[18]

Assessments built into digital platforms and learning programs magnifiy these concerns. Much like standardized tests, the assessment algorithms built into educational software are presented as "neutral" and "scientific," and to embody "truth" or fact.[19] They cannot be neutral, however, because they are created by people—and people are not neutral.[20]

Algorithms are much more problematic than standardized tests because they are central to the day-to-day functioning of the digital educational program. They are not limited to end-of-year summative assessments, but rather implement the regular formative assessments designed to mediate between teachers and children, and to influence children's experience of the curriculum. Algorithms are also less transparent than any physical assessment document. Unlike the example in which the teacher was able to flag the question about the casserole as inappropriate for his students, teachers may not even see the questions that their students are asked to answer. Yet some programs require teachers to, "in real time," adjust their teaching to the results that the algorithms report. Programs that feature "adaptive" or "personalized" learning bypass teachers completely and automate the instructional deci-

sion-making that teachers would ordinarily control.

Embedding instructional and other educational decisions in digital learning programs also reduces parents' ability to advocate for their children. Unlike with summative standardized testing, parents cannot opt out of the assessments embedded in the digital learning program the school has chosen. And unlike a traditional class in which parents can question teachers' decision-making if they have concerns, the more that instructional decisions are transferred to algorithms, the less parents are able to question. The teacher may not be able to explain how the algorithm works. To be clear, marketing materials for digital platforms and educational programs portray the role of their algorithms in determining what and how a child is taught as an advantage—but it is not.

Far from being "objective," algorithms reflect the myriad choices their developers make. They are vulnerable to significant and difficult-to-correct error.[21] An algorithm that assesses a student's level of understanding based on, for example, his or her pattern of responses, response times, and keystrokes generates conclusions based on a theoretical mathematical relationship between those raw data points and the student's psychological state of understanding. The key word here is *theoretical*. For example, essay scoring algorithms implement a theory that high-quality essays are characterized by grammatical features such as sentence length, vocabulary, spelling, and subject-verb agreement. Researchers analyzed automatic essay scoring programs (e.g., the Educational Testing Service's "e-rater" that is used to grade several statewide assessments, the Graduate Record Examination (GRE), and the Test of English as a Foreign Language [TOEFL][22]) by having them score nonsense essays composed of strings of sophisticated words and sentences that made no sense. The nonsense essays consistently received high, sometimes even perfect, scores.[23]

Companies' proprietary assessment algorithms are rarely, if ever, offered to external reviewers to analyze.[24] Therefore, the validity of the content and of the assessments those algorithms generate cannot be challenged by the students who are subjected to them. It must simply be accepted as "true."[25] The students' role is simply to "master" what is presented to them and accept the rulings generated by the algorithms.

Far from being "objective," algorithms reflect the myriad choices their developers make.

Automated grading and record-keeping are promoted as ways to decrease drudgery and increase teacher time with students. However, digital platforms and learning programs actually marginalize teachers by taking the critical matter of assessment and the content of conversations about learning largely out of their hands. For example, teachers may be unable to see how their students earned the designation of mastery of a skill or achieved a goal in some applications because the software, not the teacher, has determined the questions asked and the grades assigned. If the software and its assessments are biased and have limited validity, the teacher would never know. Neither would the children, their families, school administrators, employers, or anyone else who later gets access to the software's output. The more that a digital platform or learning program inserts itself into the relationship between students and teachers, the more opportunities there are for its output to be biased or flawed, and the greater the influence of those biases and flaws is likely to be on how students are taught and assessed. The less that it is programmed to do, the less problematic it is.

Assessments in digital platforms that use predictive analytics, artificial intelligence, and machine learning can harm students in difficult-to-identify ways.

As companies experiment with artificial intelligence and machine learning to provide schools with predictive analytics, the dangers associated with the opacity of algorithms intensify. For example, in 2019, Instructure CEO Dan Goldsmith was discussing a new feature of the company's popular Canvas learning management system when he promised the ability to

> start making recommendations and suggestions to the student or instructor in how they can be more successful. Watch this video, read this passage, do problems 17-34 in this textbook, spend an extra two hours on this or that. When we drive student success, we impact things like retention, we impact the productivity of the teachers, and it's a huge opportunity.[26]

In fact, this "opportunity" puts children, parents, and teachers in a horrible bind. They have no way of knowing how the platform derives its recommendations, or how to evaluate their accuracy or worth. Their only option is to comply.

Georgia State University uses "big data" predictive analytics to identify students who may be at risk for dropping out. The *Hechinger Report* profiled a student who the software flagged as unlikely to achieve the 3.5 average he would need to apply to his chosen major, nursing, at the end of his sophomore year.[27] Although his average was close to the cut in his freshman year, his similarity to other students who had not made the cut led the algorithm to mark him as at risk of dropping out. As a result of counseling based on the algorithm's conclusion, he chose a related but less demanding major. At the time of the writing of the *Hechinger Report*'s article, he was on track to complete his degree in respiratory therapy. He did not drop out, but he also was pushed to abandon his original life and career goals.

The programming of predictive analytics may very well contain "equity blind spots."[28] As the *Hechinger Report* notes, these blind spots may reinforce historical inequities and direct low-income students or students of color into easier majors. It is also hard to know how students will respond to the predictions offered by the algorithms. How many students, rather than lowering their goals, completing their degrees, and leading happy lives (albeit with lower levels of accomplishment and income than they would have had if they had achieved their original goal), become discouraged by the dashing of their hopes and drop out?

In the Georgia State example, the university student made the final choice of his major. In K-12, the algorithm decides for students. For example, critics have questioned the validity of the predictions that replaced actual test scores on Britain's spring 2020 A-level exams, arguing that they discriminated by race and class and caused universities to withdraw offers of admission.[29]

Leaders of education technology companies are bullish about their growing ability to offer predictive analytics and to influence student behavior and outcomes. Instructure's former CEO, cited above, responded to concerns about his company's algorithms by asking, "Should we take those fears of what could go wrong and completely cast aside the potential to im-

prove the teaching and learning experience?" he asked. "Or should we experiment and move forward?"[30] Given the far-reaching implications of predictive analytics on students' life outcomes, school leaders should avoid programs that use them.

The economics of proprietary digital platforms and learning programs incentivize opacity and discourage adequate testing of their algorithms.

Raising questions about how a given piece of software actually works is a potential threat to its profitability.[31] An external audit of programming could, for example, flag serious problems that throw into question the ability of the software to do what its creators claim it can do. This could significantly delay, if not prevent altogether, schools from adopting it.

The proprietary nature of algorithms allows companies to conceal their programming. It also allows them to make stronger statements about the validity of the results they report than are necessarily warranted. Sara Marie Baker, former research director for a private healthcare consultancy, explained how this works: "The level of confidence with which you [as a business] can make statements or draw conclusions is greater because the data is proprietary and no one will see it. Your standards of scientific rigor are less. Even though the trendy term is 'predictive analytics,' it's not so much causality as a reliable correlation.[32] " This is an important warning for school leaders to consider when reviewing claims made about educational software. Digital platforms and learning programs that have undergone third-party algorithmic auditing—especially because of the economic incentives to avoid such review—are less likely to contain flaws that would negatively impact students.

Digital platforms and learning programs may not adequately protect the student assessment data they gather and store.

In addition to whatever educational purpose they may serve, digital instruction and assessment by their nature function as mechanisms of behavioral record-keeping. Since assessment and other school-related data are extremely valuable, there are incentives to try to exploit any data not properly safeguarded. In one example with far-reaching implications, the state of New Mexico sued Google in 2020, accusing it of using personally identifiable student information it obtains from school-assigned Chromebooks and G-Suite for Education accounts to inform its advertising business.[33] In another example, an October 2019 breach of the Naviance college planning platform led to theft of 6,000 Montgomery County students' personal information, including their GPAs and SAT scores.[34]
Given the inadequacy of current safeguards, it is not surprising that threats to student data continue to increase,[35] despite voluntary guidelines supported by the tech industry,[36] legislation in some states,[37] and federal legislation in the form of the Children's Online Privacy Protection Rule (COPPA),[38] Protection of Pupil Rights Amendment (PPRA)[39] and the Family Educational Rights and Privacy Act of 1974 (FERPA).[40] FERPA, in particular, was weakened in 2008 and 2011 to allow schools to name technology companies as "school officials" and thereby to provide data to them without parental consent.[41] Contracts with companies serving as school officials may allow for them to share data with third parties, to send students to

third parties without adequate data provisions, or to use student data for purposes outside their specified education purpose.[42] Rather than simply accept reassurances that a company collecting student data complies with technology industry self-regulation or relevant legislation, school and district leaders would be wise to carefully examine the contracts, terms of service, and privacy policies to which they are asked to agree in the name of their students. They should also ask specific questions about what the companies they contract with do with their students' data and how they protect it.

Research Landscape Related to Digital Platforms and/or Learning Programs in a Virtual Environment: Assessment

Michael K. Barbour, Touro University California

In a review of the research on the nature and quality of the curriculum and student experience of virtual education, Barbour found "almost a complete absence" of research.[43] This is particularly true about the nature of assessment in virtual education. We therefore have to rely on limited and dated evidence, and on anecdotal reports. The existing evidence paints a picture of digital assessments that is less personalized than appears in marketing materials for virtual education.[44]

For example, in 2006, Klein found that the mastery-based curriculum used by the California Virtual Academy required students to achieve 80% on lesson assessments.[45] If they did not pass, they were returned to the lesson in order to retake the exam. She also found, at the time, that the student's "learning coach" (i.e., the parent/guardian) was responsible for determining if the student had successfully completed the outcomes of a specific lesson. Fourteen years later, features like these are built in to digital platforms' algorithms.[46] Ohanian found the same type of assessment in her 2004 evaluation of the K12 history curriculum for kindergarten through second grade:

Furthermore, the claim that lessons are adapted to the needs of each student is not borne out by the facts. If a student misses more than 20 percent of a lesson assessment, the parent is told the student must repeat the lesson. If the student again misses more than 20 percent, the instruction is to repeat the lesson again. And again. The so-called "needs of each student" is an endless loop of repetition of the same material.[47]

The same approach to assessment of content knowledge is described as part of the Summit Learning Program, a nationally marketed "personalized learning" program. Students take 10-item, computer-generated assessments on each section of content, which they repeat until they answer eight items correctly.[48]

The problematic nature of assessment in virtual education has been raised in the literature with both full-time and supplemental settings. For example, in a 2016 study of an online credit recovery program in North Carolina, Stallings and his colleagues found little difference in short-term success rates (as represented by, for example, end-of-course exam scores) between the online credit recovery students and other credit recovery students in the state.[49] When they examined graduation rates as a measure of longer-term success, they found that online credit recovery students were less likely to graduate than other credit recovery students. Those online students who did graduate were more likely to graduate within four years, however.[50] Further, Heppen and her colleagues' 2016 study of Algebra 1 credit recovery in Chicago Public Schools found students in an online credit recovery to report lower confidence in their mathematical skills than students in face-to-face credit recovery classes.[51]

The deficiency on long-term measures of success and the lack of confidence among online students suggests that the process of presenting small elements to students bit by bit may have helped some of them pass a mastery-based assessment immediately following the virtual instruction, but had little lasting impact on their knowledge or understanding of the overall curriculum.

Conclusion

The adoption of commercial digital platforms and learning programs poses real risks to the integrity of student assessment. School and district leaders can minimize the risks by judiciously choosing and using products they bring into their schools. To minimize the risks, it is important that school educational programs properly frame consideration of any technology considered for adoption by ensuring that digital platforms and learning programs do not drive the curriculum, pedagogy, assessment, or data collection and record keeping practices of the schools. In order to properly determine whether and in what manner to adopt a digital platform or learning program, we recommend that school and district leaders consider:

- The pedagogical values, goals, and practices they hope to achieve before considering the adoption of a particular digital educational product;
- The ways in which any digital educational product would advance their self-defined values, goals, and practices;
- The potential negative consequences—in this case, for assessment—that may be associated with the use of that product and devise strategies for avoiding them;
- Which of their defined values, goals, and practices can be best achieved by non-digital means and which require digital means;

As they assess the suitability of any particular project, we recommend that they consider:

- The pedagogical theories built into the product's assessments;
- The ways that the product's assessments may shape and narrow the curriculum;
- Cultural and other biases that may be embedded in the algorithms that run the product's assessments;
- The dangers associated with predictive analytics, artificial intelligence, and machine learning;
- How the economics of digital platforms and learning programs may increase their opacity and discourage appropriate pre-implementation testing of them; and
- How the product gathers, stores, and protects student data created as a function of its assessments.

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Section III

Privacy and Data Security Issues to Consider Before Adopting a Digital Platform or Learning Program

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When schools import proprietary digital technologies, there is a risk that the companies involved may exploit student data. Any app or website can easily incorporate technology to collect IP addresses and other information, including which pages, content or ads children see or click on; what they download; what games they play; what device a child is using, with what operating system and settings, and so on. Educational technology platforms, particularly those from companies with contracts defining them as "school officials," can access even more data, including data from school data systems.[1] Given the economic value of data in the surveillance economy, any bit of information that can be collected *is* collected.[2] Such comprehensive information facilitates behavioral tracking, which can be used in current and future product-related research, as well for other unspecified purposes.[3]

Schools and districts now routinely collect, store, and report data for state longitudinal data systems on such things as attendance, tardiness, test scores and grades. Teachers record student behavior in classroom management applications and use "personalized" or "adaptive" learning technologies that record student keystrokes, answers, and response times as they work their way through the curriculum or take assessments.[4] The U.S. Department of Education actively encourages the use of massive student data sets (commonly referred to as "big data"[5]) to facilitate technological "innovation" on the largely unsubstantiated premise that it will lead to "deeper learning" and better assessment and support systems.[6]

While such massive amounts of specific and personal data are being collected about children at school, it is rarely clear how all this information may be used in the future. It may be used to support student learning or direct students to resources. It may also be used to manipulate students, cultivate them as current and future consumers, or sort and evaluate them for purposes unknown and unapproved by their schools or parents.[7] Corporations that gather

information from children in an educational context may claim not to use it for commercial gain, but there are no guarantees.[8] A 2018 Fordham Law School study of data brokers' sale of student lists found a wide variety of student information for sale—including a list of 14- and 15-year-old girls for family planning purposes.[9] The researchers were largely unable to discover the sources of the data for sale.[10] Moreover, the Federal Trade Commission noted that the resale of data is so common that it may be virtually impossible for consumers to determine the origin of any commercially available information about them.[11]

School contracts with digital vendors often include provisions that prohibit selling or transferring data, or using the information for purposes other than its stated educational use. However, those provisions can often be insufficient to actually protect the data from misuse by the companies that collect it or by their partners.[12] And, since data are fungible, it would be surprising if some companies do not collect and conserve data in order to, for example, increase the company's value to a prospective buyer.

Data security is also a concern.[13] High-profile breaches and hacks demonstrate that many education technology applications lack adequate data security to protect the student data collected.[14] In a 2018 report, the Federal Bureau of Investigation (FBI) noted that the "widespread collection of sensitive information by EdTech could present unique exploitation opportunities for criminals," and that education technology connected to the internet could facilitate criminals' access to data children's devices collect for education purposes.[15]

Given the massive amounts of student data collected and the threats to student privacy that virtual technologies pose, it is essential for school leaders to carefully review the privacy implications and data safeguards of any digital platform or learning program being considered. Six key issues related to student privacy are discussed below.

Digital platforms and learning programs may share student data with third parties for unknown purposes, or in other ways fail to adequately protect student data.

It is this simple: Data that are not collected and/or stored are not available for misuse or theft. For this reason, a product that collects minimal data is preferable to a product that collects more. Consider carefully whether the analytics a product offers are really necessary. Avoid the temptation to purchase a product that offers analyses that you do not want to use now, but "might" want in the future. To protect student privacy, it would be preferable to choose a product that avoids collecting any data that you do not have a specific, immediate, interest in having. As a side benefit, a "no-frills" product may be less expensive than a product containing bells and whistles you probably won't use and that puts your students at greater risk.

Private vendors may have the slickest marketing materials, but they are not necessarily the best choice to provide virtual learning strategies. In their 2019 study of virtual schools, Miron and Elgeberi found that districts have been increasingly creating their own virtual and blended schools, and that those schools' students perform better on state assessments than students attending charter virtual schools—especially compared to charter schools managed

by for-profit education management organizations.[16] Also, unlike private companies, school districts have no financial incentive to collect and store excess student data.

How proprietary digital platforms and learning programs operate is rarely, if ever, transparent.

Algorithms are procedures for solving a mathematical problem in a finite number of steps.[17] In software applications they are the formulas that collect, sort, and organize data. The programming of privately developed algorithms is largely hidden from the public behind the legal veil of "proprietary information." As a consequence, there is no way for either the individuals or the institutions to know what data are being collected or what is done with those data, except as the provider may choose to share that information.[18] Until regulators require that the programming in software products used by schools be transparent and reviewable, the ability of school leaders to learn how a product works is limited to their power to walk away from a deal unless they get the information and protections they demand. It is nonetheless important that school leaders make transparency an issue in any negotiation of the purchase of a digital platform or learning program.

The contract language associated with digital platforms and learning program requires expert review.

In 2017, the Electronic Frontier Foundation researched the privacy policies of 152 education technology services used in schools. They found that only 118 of the 152 had published privacy policies. Especially important with respect to data security, of that 118, only 78 mentioned data retention policies and only 46 reported using encryption (and in the latter case, encryption tended to be mentioned with respect to billing information and not necessarily with respect to other stored student data).[19]

When privacy policies and terms of service do exist, they may contain clauses that sound reasonable on the surface but actually present a risk to students. The Terms of Service for the Summit Learning Program, for example, warn schools that their use of the services is entirely at their own risk, that there are no warranties whatsoever, and that they waive any right to a class action suit and agree in advance to binding arbitration.[20]

Our examination of platform privacy policies found vague disclosures of how the vast amounts of information collected from children and teachers would be used. The company Instructure, for example, uses the information collected from its virtual learning platform, Canvas, to improve websites, apps, and services, and to "personalize and improve" users' experience with the platform. Companies may also share aggregated and so-called "de-identified" data without notice to users, despite evidence that such de-identified data is easily re-identified.[21] Pearson's Schoolnet is designed to collect and hold data on every assessment children take in their classes and for district and state testing purposes, with no published privacy policy for parents to evaluate.[22] How data collected by these digital platforms may be used in the future is unknown.

We do have some hint, however, of the extent of the possibilities for exploiting student data. Companies using predictive analytics are already collecting and combining data from assorted sources (including insurance claims, digital health records, housing records, and personal information about a person's friends, family and roommates) for use in algorithms that produce "risk scores" to identify individuals at risk of opioid addiction or overdose. These scores are sold to doctors, insurers and hospitals to be used in their decision-making.[23] Further, several hundred education technology companies partner with Amazon Web Services (AWS) in an initiative called EdStart. Marachi and Quill noted that although these companies may promise compliance with U.S. data privacy laws, once data are collected and combined across international borders, companies may no longer be held to the laws of the country where the data were originally gathered. Stored in international servers, the data may be transferred or sold without any oversight.[24]

Digital platforms and learning programs often send students to third-party sites whose content and privacy policies have not been adequately vetted.

When children enter the Internet environment, even if they enter from a responsible site with a thorough and transparent privacy policy, they are quickly exposed to other commercial sites that may be less concerned about their privacy. As they move around the Internet, using educational sites and jumping off from them to surf or play on other sites, their activity is constantly tracked and recorded for future use.[25] Because these data are not part of the "educational record" protected under the Family Educational Rights and Privacy Act of 1974 (FERPA), they may be used to target marketing to children and their families, or to build profiles that would be of interest to such potential purchasers as colleges, universities and businesses that seek to market products to students, as well as to potential employers or military recruiters.[26]

Digital educational technology provides the opportunity for students to take breaks by shifting to additional sites. But some products actively direct students to other sites.[27] Summit Learning and Canvas, for example, connect children to third-party sites (such as YouTube) that collect data for advertising purposes. Both Summit Learning and Instructure (Canvas's parent company) deny responsibility for any use a third party might make of children's or teachers' data. YouTube is not part of the educational suite of applications that Google offers to schools. The implication is that YouTube tracks users, regardless of whether they arrived at YouTube from an educational site or even from one of Google's educational applications. Parents are thus in the impossible position of being responsible for reviewing the lengthy and often incomprehensible privacy policies of the numerous third-party sites or agreeing to their terms with no understanding of the implications. They are then further responsible for independently negotiating with their schools and districts if they are unwilling to have their children be subject to policy provisions. This is literally impossible for virtually all parents.

Thus, when a cloud-based learning management system, such as Canvas, sends students to multiple third-party sites, multiple vendors gain access to student browsing information (e.g., what the students view and metadata about their interactions). This creates such a

complex set of dynamic relational data drawn from multiple sources that it is impossible for students or their families to verify or even be aware of data being circulated about them.[28]

"De-identified" student data can be easily re-identified.

As noted above, the digital technology industry promotes data de-identification (also called anonymization) as the solution to concerns about tracking.[29] Even if student data is de-identified, however, students' personally identifiable information (PII) may not be fully or permanently protected.

Using only de-identified behavioral tracking data, marketers can target a given computer's user with advertisements and other communications geared specifically to appeal to and influence that user. Google, for instance, has repeatedly been accused of doing exactly this. The state of New Mexico sued Google in February 2020 for violating the Children's Online Privacy Protection Act (COPPA). [30] The suit accuses Google of using school-assigned Chromebooks and "G Suite for Education" accounts to illegally collect information including students' online behavior, location, voice recordings, contact lists, and passwords. It further accuses Google of using the personal information it illegally collects for advertising purposes. When the child is the primary or only user of the device (as is certainly the case when that device is a school-assigned Chromebook, for instance),[31] marketers do not need student identification at all in order to target specific students.

This being the case, the editor of the trade publication *Advertising Age*, Ken Wheaton, bluntly called data de-identification "a load of horseshit . . . a clever bit of technical and verbal misdirection used by marketers and tech people to keep regulators at bay." [32] He explains, "You might not know my name (but you probably do), but that hardly matters if you know every move I make, every breath I take."[33]

Computer scientists and data experts have known for over a decade that complex de-identified datasets—such as student datasets—can easily be re-identified.[34] If a handful of datapoints in an de-identified dataset match a handful of datapoints in another, identified dataset, the de-identified data are no longer anonymous. For these reasons, school leaders should not be reassured by promises that student data is de-identified. Instead, they should ask questions about the nature and amount of de-identified data held by the vendor of any product they are considering, what those data are used for, how they are protected from misuse and theft, and how and when they will be destroyed.

Digital platforms and learning programs may not adequately secure student data.

It is more effective, but more expensive and therefore less common, to incorporate security into technology development from the beginning of a project rather than at its end.[35] It is also expensive, and therefore less common, to correct issues that may be unearthed by an algorithmic audit. For these reasons, the number of security breaches in public schools is growing. The Cybersecurity Research Center counted 348 cybersecurity incidents in 2019

alone, nearly three times as many as were reported in 2018.[36] Approximately half of these incidents resulted from the actions of insiders to the school community, primarily education technology vendors.[37]

Current legal protections for student privacy are extremely limited.[38] Federal law theoretically prohibits the use of data held by private companies for purposes unspecified in their contracts,[39] and over 425 companies have signed onto a self-regulatory pledge that bans "behavioral targeting of advertisements."[40] Companies are, however, unlikely to be held to account for security breaches or for misuse of children's data. The Family Educational Rights and Privacy Act (FERPA) threatens to withhold funding to schools as a result of data misuse, but this punishment has never actually been imposed.[41] A November 2018 audit found not only a two-year backlog in the Department of Education's Privacy Office's processing of FERPA complaints, but also that the Privacy Office is unable to resolve many of the complaints because of "significant control weaknesses" and unresolved policy questions about FERPA.[42]

Citizens may bring complaints to the Federal Trade Commission (FTC) if they believe a signatory company has violated the Student Privacy Pledge. Like the U.S. Department of Education, however, the FTC seems disinclined to act decisively to censure technology companies. For example, it still has not acted on the 2015 complaint brought against Google by the Electronic Frontier Foundation.[43] It did, however, rule against Google in September 2019 for collecting personal information from children on YouTube in violation of the Children's Online Privacy Protection Act (COPPA). In that case, the amount of the fine levied was the equivalent of less than three months of the advertising revenue Google makes from children's videos, prompting critics to note that in effect, Google would not be discouraged from violating COPPA in the future.[44]

In many cases, state legislation designed to protect student privacy by prohibiting commercial use of student data explicitly exempts data collected from students for "adaptive" or "personalized" student learning purposes.[45] Such language nullifies other clauses of these bills designed to prevent tracking of students, because tracking is an essential aspect of "personalized" student learning. In other words, school and district leaders should hold any product they adopt to a higher standard than compliance with relevant state or federal privacy laws requires.

Current legal protections for student privacy are extremely limited.

Because of the ease with which de-identified data may be re-identified, data experts refer to "Five Safes" by which data can and should be secured: Data should de-identified. Data collected should be analyzed only by trained and accredited specialists. Data analyses should be done in a secure setting. Data should be secured in a way that prevents unauthorized removal of any data. Data analyses done should be checked and confirmed as non-disclosive.[46] This framework used in government and research settings is designed to provide comprehensive and long-term integrity of any data collected. There is no legal requirement for private companies to use this framework, but to the extent that they do, students' data will be more effectively protected.

Research Landscape Related to Digital Platforms and/or Learning Programs in a Virtual Environment: Data Privacy

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There has been no research in the field of K-12 distance, online, and blended learning focused on student data privacy practices beyond that of Boninger and her colleagues in 2019 and 2020.[47] The only other information available is from educational bloggers, investigative reporters, and whistleblowing teachers.

For example, in 2008, Arizona-based blogger David Safier revealed that the Arizona Virtual Academy (a K12, Inc.-managed virtual school) had outsourced the grading of middle school, and a year later high school, student papers to a private company based in India in an effort to cut costs.[48] According to Safier's reports, the practice was revealed when parents began to question the nature of comments on the students' work, and then began to complain to the virtual charter school (which appears to be when Safier first began investigating the issue). Safier questioned whether commenting on and/or scoring student work constituted direct or indirect teaching duties (Arizona law required that those with teaching duties had to obtain a Fingerprint Clearance Card or Fingerprint Criminal History Check).

In a follow-up to his original blog entry, Safier reported that in addition to the Arizona Virtual Academy, nine additional virtual charter schools operated by K12, Inc. (in California, Colorado, Idaho, Illinois, Minnesota, Ohio, Pennsylvania, and Washington) also outsourced grading.[49] As a part of his second entry, he outlined exactly how the process worked, based on the evidence he was able to piece together. Several months later the story was picked up by *Education Week*,[50] but the story was not distributed by the media specifically in any of the affected states.

Five years later Travis Manning, a teacher activist, wrote a letter to the editor of the *Idaho Press* noting that the Idaho Virtual Academy was one of the nine other online charter schools operated by K12, Inc. that Safier had referred to in his original piece.[51] At the time of Manning's letter, the legislature in Idaho was debating K-12 virtual learning policy. In the months that followed, officials from both the Idaho Virtual Academy and K12, Inc. confirmed the story.[52]

Interestingly, the officials claimed that it had been a small pilot project that ended rather quickly. However, Safier's original investigation of the outsourcing detailed that the grading practice existed for at least 10 different K12, Inc.-operated virtual charter schools for at least two school years, and it also included tutoring services in four states (California, Colorado, Idaho, and Pennsylvania) for an unknown amount of time.

More recently, a group of teachers attempting to organize on behalf of the California Teachers Association lodged a number of complaints against the California Virtual Academies (virtual charter schools operated by K12, Inc.),[53] including that the cyber charter school "permitted overly wide staff access to sensitive student data, such as psychological reports and special education status."[54] However, the California Department of Education did not conduct an investigation and closed the matter due to a lack of data on the part of the complainants.[55] In 2016, the California Virtual Academy (2016) reported to their employees that they had "learned of an incident that might affect the security of your personal information,"[56] although there was no mention or additional coverage indicating that this breach may have impacted student data.

These kinds of reports are similar to those described in the Network for Public Education's 2018 guide, *Online Learning: What Every Parent Should Know*, as a part of a section entitled "Is Privacy Sufficiently Protected When Students Learn Online?"[57] The section details how in Pennsylvania, K12 Inc. was violating "federal privacy law by requiring parents who enroll their children to waive their rights to have their children's personal information protected from unrestricted disclosure and/or commercial use,"[58] as well as data breaches by companies like Schoolzilla and a growing number of schools and districts. However, beyond these isolated reports, there is no empirical research into privacy within the virtual education literature. Given this situation, it is incumbent on school leaders to thoroughly assess the potential risks to student privacy posed by any digital platform and/or learning program they are considering for adoption.

Conclusion

Unfortunately, there are real risks to students' privacy posed by any collection of data about them. School and district leaders can minimize the risks by making judicious choices of platforms and programs. To avoid introducing significant privacy threats, we recommend that a school's educational program be the framework used to consider of any technology for adoption. In other words, technology and applications should not drive the curriculum, pedagogy, assessment, or data collection and record-keeping practices of the schools. We recommend that school and district leaders consider:

- The pedagogical values, goals, and practices they hope to achieve before considering the adoption of a particular digital educational product;
- The ways in which any digital educational product would advance their self-defined values, goals, and practices;
- The potential negative consequences—in this case, for student privacy—that may be associated with the use of that product and devise strategies for avoiding them;
- Which of their defined values, goals, and practices can be best achieved by non-digital means and which require digital means;

As they assess the suitability of any particular project, we recommend that they consider:

- The extent to which, and for what purposes, the product collects, stores, and shares student data;
- The transparency of the product's operation;
- The details of privacy-related contract language associated with the product;
- Whether and to which third-party sites the product directs students;
- What the product does with de-identified data; and
- How the collected data are secured.

Notes and References Section III

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