NEPC
NATIONAL EDUCATION POLICY CENTER

Section I

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

Faith Boninger and Alex Molnar
University of Colorado Boulder

September 2020

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

Michael K. Barbour, Touro University California

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.

Notes and References Section I

1 Jones, M. Gail, Jones, B.D, & Hargrove, T.Y. (2003). *The unintended consequences of high-stakes testing*. Lanham, MD: Roman and Littlefield.

Nichols, S.L., Glass, G.V, & Berliner, D.C. (2005). *High-stakes testing and student achievement: Problems for the No Child Left Behind Act*. Tempe, AZ: Education Policy Research Unit, Education Policy Studies Laboratory. Retrieved July 13, 2020, from https://nepc.colorado.edu/publication/high-stakes-testing-and-student-achievement-problems-no-child-left-behind-act

2 Donnelly, K. (2018, January 13). Foundations and venture capitalists vie to reform funding for educational technology. *Media Impact Funders*. Retrieved July 10, 2020, from https://mediaimpactfunders.org/foundations-and-venture-capitalists-vie-to-reform-funding-for-educational-technology/

Independent journalist Audrey Watters tracked venture capital funding for education technology from December 2015 through December 2018:

Watters, A. (2017, July 18). 'Personalized learning' and the power of the Gates Foundation to shape education policy [blog post]. *Hack Education*. Retrieved July 10, 2020, from http://hackeducation.com/2017/07/18/personalization

Watters, A. (2018, December). Who's Funding Education Technology? *Hack Education*. Retrieved July 10, 2020, from http://funding.hackeducation.com/archives.html

3 For grants to Summit Public Schools, a single personalized learning initiative, see:

Boninger, F., Molnar, A., & Saldaña, C. (2020). *Big claims, little evidence, lots of money: The reality behind the Summit Learning Program and the push to adopt digital personalized learning platforms* (Appendix A), Boulder, CO: National Education Policy Center. Retrieved July 13, 2020, from http://nepc.colorado.edu/publication/summit-2020

For information about Summit Learning Program "partner schools," see:

Barnum, M. (2019, May 23). Summit Learning, the Zuckerberg-backed platform, says 10% of schools quit using it each year. The real figure is higher. *Chalkbeat*. Retrieved February 9, 2020, from https://chalkbeat.org/posts/us/2019/05/23/summit-learning-the-zuckerberg-backed-platform-says-10-of-schools-quit-using-it-each-year-the-real-figure-is-higher/

4 Jones, M. Gail, Jones, B.D, & Hargrove, T.Y. (2003). *The unintended consequences of high-stakes testing*. Lanham, MD: Roman and Littlefield.

Law, C. & Kaufhold, J.A. (2009, spring). An analysis of the use of critical thinking skills in reading and language arts instruction. *Reading Improvement, 46*(1), 29-34.

McNeil, L. & Valenzuela, A. (2001) The harmful impact of the TAAS System of testing in Texas. In G. Orfield & M.L. Kornhaber (Eds.) (2001), *Raising standards or raising barriers? Inequality and high-stakes testing in public education*. New York: The Century Foundation Press.

Nichols, S.L. & Berliner, D.C. (2005). The inevitable corruption of indicators and educators through high-stakes testing. Tempe, AZ: Education Policy Research Unit, Education Policy Studies Laboratory, Arizona State University. Retrieved April 20, 2011, from http://nepc.colorado.edu/publication/the-inevitable-corruption-indicators-and-educators-through-high-stakes-testing

Nickerson, Raymond S. (2010). How to discourage creativity in the classroom. In R.A. Beghetto and J.C. Kaufman (Eds.), *Nurturing Creativity in the Classroom* (pp. 1-5). Cambridge, England: Cambridge University Press.

Wenglinsky, Harold (2004, November 23). *Closing the racial achievement gap: The role of reforming instructional practices.* Education Policy Analysis Archives, 12(64). Retrieved April 20, 2011, from https://epaa.asu.edu/ojs/article/view/219

5 Williamson, B., & Hogan, A. (2020, July). *Commercialisation and privatisation in/of education in the context of Covid-19*. Brussels, Belgium: Education International. Retrieved August 18, 2020, from https://issuu.com/educationinternational/docs/2020_eiresearch_gr_commercialisation_privatisation?fr=sZDJkYjE1ODA2MTQ

6 Stephen Petrina (2004) explains the inherent contradiction embedded in the "teaching machines" of the 20th century: although they individualized students by providing them with individual feedback, they were also authoritarian and "normalizing": they regulated students by demanding that they discipline themselves within the structure imposed by the machine.

Petrina, S. (2004, April). Sidney Pressey and the automation of education, 1924-1934. *Technology and Culture, 45*(2), 305-330. Retrieved July 13, 2020, from https://www.researchgate.net/publication/236827543_Sidney_Pressey_and_the_Automation_of_Education_1924-1934

Skinner, B.F. (1958, October 24). Teaching machines. *Science, 128* (3330), 969-977.

7 See:

Watters, A. (2018, April 26). Teaching machines, or how the automation of education became 'personalized learning.' Hack Education [blog]. Retrieved Septemer 15, 2020, from http://hackeducation.com/2018/04/26/cuny-gc

8 Both Audrey Watters and Ben Williamson explore the ideologies, "imaginaries," and business interests that are embedded in education technologies. Their analyses inform our discussion of how education technologies frame education and influence students.

Watters, A. (2016, December 19). Education technology and the ideology of personalization. *Hack Education* [blog]. Retrieved April 12, 2017, from http://hackeducation.com/2016/12/19/top-ed-tech-trends-personalization

Williamson, B. (2016, January 19). *Educational data, Pearson and the 'theory gap.'* Pearson. Retrieved May 22, 2017, from https://www.pearson.com/corporate/news/blogs/CompanyBlog/2016/01/educational-data-pearson-and-the-theory-gap.html

9 See, for example:

Summit Public Schools (n.d.). *The science of Summit*. Retrieved July 13, 2020, from https://summitps.org/wp-content/uploads/2018/09/The-Science-of-Summit-by-Summit-Public-Schools_08072017-1.pdf [The document is not dated, but the filename appears to have a date of August 7, 2017]

10 Molnar, A., Boninger, F., & Fogarty, J. (2011). *The educational cost of schoolhouse commercialism--The fourteenth annual report on schoolhouse commercializing trends: 2010-2011* (pp. 6-9*)*. Boulder, CO: National Education Policy Center. Retrieved July 10, 2020, from http://nepc.colorado.edu/publication/schoolhouse-commercialism-2011

11 Ritchhart, R. & Perkins, D.N. (2005). Learning to think: The challenges of teaching thinking. In K.J. Holyoak and R.G. Morrison (Eds.), The Cambridge Handbook of Thinking and Reasoning (p. 792). Cambridge, England: Cambridge University Press.

Scardarmalia, M.. Bereiter, C., & Lamon, M.. (1994). The CSILE Project: Trying to bring the classroom into World 3. In K.McGilly (Ed.), Classroom Lessons: Integrating Cognitive Theory and Classroom Practice (pp. 201-228). Cambridge, MA: MIT Press.

Schoenfeld, A.H. (1988). Mathematics, technology, and higher order thinking. In R.S. Nickerson and P.P.

Zodhiates (Eds.), Technology in education: Looking toward 2020 (pp. 67-96). Mahwah, NJ: Lawrence Erlbaum Associates, Inc.

12 Watters, A. (2016, December 19). Education technology and the ideology of personalization. *Hack Education* [blog]. Retrieved July 13, 2020, from http://hackeducation.com/2016/12/19/top-ed-tech-trends-personalization

Zeide, E. (2017, March 1). The limits of education purpose limitations. *University of Miami Law Review, 71*(2), 494-527 (pp. 521-523). Retrieved July 13, 2020, from http://repository.law.miami.edu/umlr/vol71/iss2/8

13 Watters, A. (2017, July 18). 'Personalized learning' and the power of the Gates Foundation to shape education policy [blog post]. *Hack Education*. Retrieved July 10, 2020, from http://hackeducation.com/2017/07/18/personalization

14 Herold, B. (2018, November 6). What does personalized learning mean? Whatever people want it to. *Education Week*. Retrieved July 13, 2020, from https://www.edweek.org/ew/articles/2018/11/07/what-does-personalized-learning-mean-whatever-people.html

Office of Educational Technology, U.S. Department of Education (2017, January 18). What is personalized learning? *Medium*. Retrieved July 13, 2020, from https://medium.com/personalizing-the-learning-experience-insights/what-is-personalized-learning-bc874799b6f

Phillips, K. & Jenkins, A. (2018). Communicating personalized learning to families and stakeholders: Terminology, tools and tips for success. ExcelinEd and Education Elements. Retrieved July 13, 2020, from https://www.excelined.org/wp-content/uploads/2018/04/Communicating-Personalized-Learning-to-Families-and-Stakeholders.pdf

Watters, A. (2016, December 19). Education technology and the ideology of personalization. *Hack Education* [blog]. Retrieved July 13, 2020, from https://hackeducation.com/2016/12/19/top-ed-tech-trends-personalization

Wright, C., Greenberg, B., & Schwartz, R. (2017, August). *All that we've learned: Five years working on personalized learning* (p. 7). Silicon Schools. Retrieved July 13, 2020, from http://www.siliconschools.com/wp-content/uploads/2017/09/All-That-Weve-Learned-Silicon-Schools-Fund-1.pdf

15 Bill & Melinda Gates Foundation, Afton Partners, Eli & Edythe Broad Foundation, CEE Trust, Christensen Institute, Charter School Growth Fund, EDUCAUSE, iNACOL, The Learning Accelerator, Michael & Susan Dell Foundation, Silicon Schools (2014). *A working definition of personalized learning*. Retrieved July 13, 2020, from https://assets.documentcloud.org/documents/1311874/personalized-learning-working-definition-fall2014.pdf

Patrick, S., Kennedy, K., & Powell, A. (2013, October). *Mean what you say: Defining and integrating personalized, blended and competency education* (p. 4*)*. International Association for K-12 Online Learning (iNACOL). Retrieved July 13, 2020, from http://www.aurora-institute.org/wp-content/uploads/mean-what-you-say-1.pdf

16 Boninger, F., Molnar, A., & Saldaña, C.M. (2019). *Personalized learning and the digital privatization of curriculum and teaching*. Boulder, CO: National Education Policy Center. Retrieved July 13, 2020, from https://nepc.colorado.edu/publication/personalized-learning

Zeide, E. (2017, March 1). The limits of education purpose limitations. *University of Miami Law Review, 71*(2), 494-527 (pp. 521-523). Retrieved July 13, 2020, from http://repository.law.miami.edu/umlr/vol71/iss2/8

17 See, for example:

Boninger, F., Molnar, A., & Saldaña, C. (2020). *Big claims, little evidence, lots of money: The reality behind the Summit Learning Program and the push to adopt digital personalized learning platforms* (Appendix A), Boulder, CO: National Education Policy Center. Retrieved July 13, 2020, from http://nepc.colorado.edu/publication/summit-2020

Tabor, N. (2018, October 11). Mark Zuckerberg is trying to transform education. This town fought back. *New York Magazine* (nymag.com). Retrieved October 30, 2018, from http://nymag.com/intelligencer/2018/10/the-connecticut-resistance-to-zucks-summit-learning-program.html

18 Diane Tavenner's description of the platform begins at 31:45.

Harvard Graduate School of Education (2016, April 28). Engineering Personalized Learning: The Story of Summit Schools and Facebook [YouTube]. Retrieved February 7, 2020, from https://www.gse.harvard.edu/news/16/04/engineering-personalized-learning-story-summit-schools-and-facebook

19 The use of third-party websites drew particular fire from parents in Cheshire, CT, who demanded that their school discontinue the Summit Learning Program after students were exposed to obscene material on a third-party site that Summit Public Schools had not adequately vetted.

Tabor, N. (2018, October 11). Mark Zuckerberg is trying to transform education. This town fought back. *New York Magazine* (nymag.com). Retrieved July 13, 2020, from http://nymag.com/intelligencer/2018/10/the-connecticut-resistance-to-zucks-summit-learning-program.html

20 Tabor, N. (2018, October 11). Mark Zuckerberg is trying to transform education. This town fought back. *New York Magazine* (nymag.com). Retrieved July 13, 2020, from http://nymag.com/intelligencer/2018/10/the-connecticut-resistance-to-zucks-summit-learning-program.html

21 Saltman, K.J. (2018). *The swindle of innovative educational finance*. Minneapolis, MN: University of Minnesota Press.

22 Heilweil, R. (2020, February 18). Why algorithms can be racist and sexist. Vox. Retrieved July 13, 2020, from https://www.vox.com/recode/2020/2/18/21121286/algorithms-bias-discrimination-facial-recognition-transparency

23 Angwin, J., Larson, J., Mattu, S. and Kirchner, L. (2016, May 23). Machine bias. Propublica. Retrieved July 13, 2020, from https://www.propublica.org/article/machine-bias-risk-assessments-in-criminal-sentencing

24 Noble, S. U. (2018) *Algorithms of oppression: How search engines reinforce racism*. New York, NY: New York University Press.

25 O'Neil, C. (2016). *Weapons of math destruction: How big data increases inequality and threatens democracy*. New York, NY: Crown.

Pasquale, F. (2015). *The black box society: The secret algorithms that control money and information*. Cambridge, MA: Harvard University Press.

Pasquale's *Aeon* article offers an abridged version of his discussion:

Pasquale, F. (2015, August 18). Digital star chamber. *Aeon*. Retrieved July 13, 2020, from https://aeon.co/essays/judge-jury-and-executioner-the-unaccountable-algorithm

26 The American Civil Liberties Union, together with researchers from business and academia, founded the AI Now Initiative, a project to "identify and highlight" algorithmic bias. The German advocacy organization AlgorithmWatch analyzes the effects of algorithmic decision making processes on human behavior and identifies ethical conflicts. Cathy O'Neil, who detailed the problems with algorithms in *Weapons of Mass Destruction*, founded a company to audit algorithms for companies concerned about the possibility of bias.

Knight, W. (2017, July 12). Biased algorithms are everywhere, and no one seems to care. *Technology Review*.

Retrieved July 13, 2020, from https://www.technologyreview.com/s/608248/biased-algorithms-are-everywhere-and-no-one-seems-to-care/

O'Neil, C. (2016). *Weapons of math destruction: How big data increases inequality and threatens democracy*. New York, NY: Crown.

Spielkamp, M. (2017, June 12). Inspecting algorithms for bias. *Technology Review*. Retrieved July 13, 2020, from https://www.technologyreview.com/s/607955/inspecting-algorithms-for-bias/

27 Kaminski, M.E. & Witnov, S. (2015, January 1). The conforming effect: First amendment implications of surveillance, beyond chilling speech. *University of Richmond Law Review, 49*, 465-518; Ohio State Public Law Working Paper No. 288. Retrieved April 20, 2017, from https://ssrn.com/abstract=2550385

Zeide, E. (2017). (2017, March 1). The limits of education purpose limitations. *University of Miami Law Review, 71*(2), 494-527 (pp. 517-518). Retrieved July 13, 2020, from http://repository.law.miami.edu/umlr/vol71/iss2/8

28 Kaminski, M.E. & Witnov, S. (2015, January 1). The conforming effect: First amendment implications of surveillance, beyond chilling speech. *University of Richmond Law Review, 49*, 465-518; Ohio State Public Law Working Paper No. 288. Retrieved July 13, 2020, from https://ssrn.com/abstract=2550385

29 Molnar, A., Boninger, F., Wilkinson, G., & Fogarty, J. (2009). *Click: The twelfth annual report on schoolhouse commercialism trends: 2008-2009*. Boulder and Tempe: Education and the Public Interest Center & Commercialism in Education Research Unit. Retrieved July 13, 2020, from http://nepc.colorado.edu/publication/schoolhouse-commercialism-2009

30 LearnPlatform, Inc. (2019). EdTech top 40: 2018-2019 school year. Retrieved July 10, 2020, from https://learnplatform.com/edtech-top-40

31 Ghostery. https://www.ghostery.com/ [website]. Accessed July 13, 2020.

32 Zittrain, J. (2014, June 1). Facebook could decide an election without anyone ever finding out. *New Republic*. Retrieved July 13, 2020, from https://newrepublic.com/article/117878/information-fiduciary-solution-facebook-digital-gerrymandering

33 Tufekci, Z. (2014, July). Engineering the public: Big data, surveillance and computational politics. *First Monday*. Retrieved July 13, 2020, from https://firstmonday.org/ojs/index.php/fm/article/view/4901

34 Cf.,

Thaler, R.H. & Sunstein, C.R. (2009). *Nudge: Improving decisions about health, wealth, and happiness*. New York, NY: Penguin Books.

35 Sell, N., & Zolotova, R. (2016, September 21). Kids need to reclaim their data and security… especially at school. *TC*. Retrieved July 13, 2020, from https://techcrunch.com/2016/09/21/kids-need-to-reclaim-their-data-and-security-especially-at-school/

36 Molnar, A., Miron, G., Elgeberi, N., Barbour, M.K., Huerta, L., Shafer, S.R., & Rice, J.K. (2019). *Virtual schools in the U.S. 2019*. Boulder, CO: National Education Policy Center. Retrieved July 18, 2020, from https://nepc.colorado.edu/publication/virtual-schools-annual-2019

37 Miron, G., & Gulosino, C. (2016). *Virtual schools report 2016: Directory and performance revie*w. Boulder, CO: National Education Policy Center. Retrieved July 20, 2020, from http://nepc.colorado.edu/publication/virtual-schools-annual-2016

Miron, G., Shank, C., & Davidson, C. (2018). *Full-time virtual and blended schools: Enrollment, student characteristics, and performance.* Boulder, CO: National Education Policy Center. Retrieved July 20, 2020, from http://nepc.colorado.edu/publication/virtual-schools-annual-2018

Molnar, A., Miron, G., Elgeberi, N., Barbour, M.K., Huerta, L., Shafer, S.R., & Rice, J.K. (2019). *Virtual schools in the U.S. 2019* (p. 52). Boulder, CO: National Education Policy Center. Retrieved July 20, 2020, from https://nepc.colorado.edu/publication/virtual-schools-annual-2019

Molnar, A., Miron, G., Gulosino, C., Shank, C., Davidson, C., Barbour, M.K., Huerta, L., Shafter, S.R., Rice, J.K., & Nitkin, D. (2017). *Virtual schools in the U.S. 2017.* Boulder, CO: National Education Policy Center. Retrieved July 20, 2020, from http://nepc.colorado.edu/publication/virtual-schools-annual-2017

38 Klein, C. (2006). *Virtual charter schools and home schooling*. Youngstown, NY: Cambria Press.

39 Ohanian, S. (2004). *The K12 virtual primary school history curriculum: A participant's-eye view*. Tempe, AZ: Education Policy Studies Laboratory Education Policy Research Unit. Retrieved July 18, 2020, from https://nepc.colorado.edu/publication/the-k12-virtual-primary-school-history-curriculum-a-participants-eye-view

40 Johnson v. Burmaster (2006). 2006AP1380 (2008 WI APP 4)(pp. 3-4). Retrieved July 18, 2020, from https://www.wicourts.gov/ca/opinion/DisplayDocument.html?content=html&seqNo=31069

41 Bracey, G.W. (2004). *Knowledge universe and virtual schools: Educational breakthrough or digital raid on the public treasury?* Tempe, AZ: Education Policy Studies Laboratory Education Policy Research Unit. Retrieved July 18, 2020. from https://nepc.colorado.edu/publication/knowledge-universe-and-virtual-schools-educational-breakthrough-or-digital-raid-public-t

42 Molnar, A., Miron, G., Elgeberi, N., Barbour, M.K., Huerta, L., Shafer, S.R., & Rice, J.K. (2019). *Virtual schools in the U.S. 2019* (p. 53). Boulder, CO: National Education Policy Center. Retrieved July 18, 2020, from https://nepc.colorado.edu/publication/virtual-schools-annual-2019

43 Trotter, A. (2001, May 30). Bennett's online system needs work, critic contends. *Education Week*. Retrieved July 18, 2020, from https://www.edweek.org/ew/articles/2001/05/30/38bennett.h20.html

44 Bracey, G.W. (2004). *Knowledge universe and virtual schools: Educational breakthrough or digital raid on the public treasury?* (p. 22). Tempe, AZ: Education Policy Studies Laboratory Education Policy Research Unit. Retrieved July 18, 2020, from https://nepc.colorado.edu/publication/knowledge-universe-and-virtual-schools-educational-breakthrough-or-digital-raid-public-t

45 Baker, J.D., Bouras, C., Hartwig, S.M., & McNair, E.R. (2005). K12, Inc. and the Colorado Virtual Academy: A virtual charter school (p. 138). In Z.L. Berge & T. Clark (Eds.), *Virtual schools: Planning for success* (pp. 133-142). New York, NY: Teachers College Press.

46 Ohanian, S. (2004). *The K12 virtual primary school history curriculum: A participant's-eye view* (p. 13). Tempe, AZ: Education Policy Studies Laboratory Education Policy Research Unit. Retrieved July 18, 2020, from https://nepc.colorado.edu/publication/the-k12-virtual-primary-school-history-curriculum-a-participants-eye-view

47 See the *Education Week* investigation that included an interactive map of full-time virtual school (which they refer to as "cyber schools") media coverage at https://www.edweek.org/ew/section/multimedia/cyber-charters-widespread-reports-of-trouble.html

Many of these news stories detail the lack of teacher interaction and the rote nature of the curriculum.

48 See the "Research" sections of:

Molnar, A., Miron, G., Elgeberi, N., Barbour, M.K., Huerta, L., Shafer, S.R., & Rice, J.K. (2019). *Virtual schools in the U.S. 2019* (p. 52). Boulder, CO: National Education Policy Center. Retrieved July 20, 2020, from https://nepc.colorado.edu/publication/virtual-schools-annual-2019

Molnar, A., Miron, G., Gulosino, C., Shank, C., Davidson, C., Barbour, M.K., Huerta, L., Shafter, S.R., Rice, J.K., & Nitkin, D. (2017). *Virtual schools in the U.S. 2017.* Boulder, CO: National Education Policy Center.

Retrieved July 20, 2020, from http://nepc.colorado.edu/publication/virtual-schools-annual-2017

49 Barbour, M.K. (2017). K-12 online learning and school choice : Growth and expansion in the absence of evidence. In R.A. Fox & N.K. Buchanan (Eds.), *School Choice: A Handbook for Researchers, Practitioners, Policy-Makers and Journalists* (pp. 421-440). New York, NY: John Wiley & Sons Ltd.

50 Molnar, A., Miron, G., Elgeberi, N., Barbour, M.K., Huerta, L., Shafer, S.R., & Rice, J.K. (2019). *Virtual schools in the U.S. 2019*. Boulder, CO: National Education Policy Center. Retrieved July 18, 2020, from https://nepc.colorado.edu/publication/virtual-schools-annual-2019

51 Barbour, M.K. (2019). *E-learning class size*. Canadian E-Learning Network. Retrieved July 18, 2020, from https://k12sotn.ca/wp-content/uploads/2019/08/e-learning-class-size.pdf

52 Barbour, M.K. (2005). The design of web-based courses for secondary students. *Journal of Distance Learning, 9*(1). 27-36.

Barbour, M.K., Morrison, J., & Adelstein, D. (2014). The forgotten teachers in K-12 online learning: Examining the perceptions of teachers who develop K-12 online courses. *International Journal of Online Pedagogy and Course Design, 4*(3), 18-33.

Barbour, M.K., Adelstein, D., & Morrison, J. (2018). Still forgotten teachers in K-12 online learning: Examining the perceptions of teachers who develop K-12 online courses. In R.C. Sharma (Ed.), *Innovative applications of online pedagogy and course design* (pp. 88-107). Hershey, PA: IGI-Global.

Friend, B. & Johnston, S. (2005). Florida Virtual School: A choice for all students. In Z.L. Berge & T. Clark (Eds.), *Virtual schools: Planning for success* (pp. 97-117). New York, NY: Teachers College Press.