The Promise and Perils of Personalized Learning:
Keeping Students at the Center of the Ed Tech Revolution

by

Francesca M. Schembri

B.S. Writing

Massachusetts Institute of Technology, 2017

SUBMITTED TO THE PROGRAM IN COMPARATIVE MEDIA STUDIES / WRITING IN
PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF SCIENCE IN SCIENCE WRITING
AT THE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
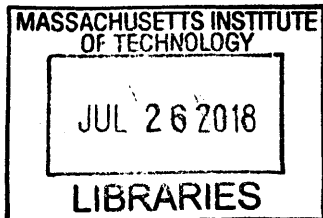
September 2018

Signature of Author: **Signature redacted**

Program in Comparative Media Studies / Writing
May 25, 2018

Signature redacted

Certified by:

Thomas Levenson
Signature redacted Professor of Science Writing
Thesis Supervisor

Accepted by:

Seth Mnookin
Professor of Science Writing
Director, Graduate Program in Science Writing

The Promise and Perils of Personalized Learning: Keeping Students at the Center of the Ed Tech Revolution

by

Francesca M. Schembri

Submitted to the Program in Comparative Media Studies / Writing on May 25, 2018 in Partial fulfillment of the requirements for the Degree of Master of Science in Science Writing.

ABSTRACT

As access to education technology - high-speed Internet connectivity, lower-cost computers, and online learning programs – has increased over the past five years in K-12 schools in the United States, the debate over technology's place in the classroom, specifically its ability to usher in a new era of education personalized to meet the needs of every individual student, has raged on. Much of the narrative perpetuated by technology companies around educational reform has centered on an idea that outside, tech-driven "disruption" is needed in order for real transformation. However, many school districts have found more success moving towards personalized learning when the disruption is homegrown, scaled carefully, involves all community stakeholders, and is driven by pedagogy, not technology. This thesis examines in depth one school district, Kettle Moraine School District in Wisconsin, and their success in creating personalized learning experiences for their students, as a case study for how other districts might approach homegrown disruptions of their own.

Thesis Supervisor: Thomas Levenson
Title: Professor of Science Writing

Table of Contents

Acknowledgements

To my thesis advisor, Tom Levenson:

Thank you for all of your guidance, support, and care throughout the writing of this thesis. I came to the GPSW because of the opportunities it offered for real, meaningful mentorship in science journalism, and the experience I have had working with you only served to reaffirm that decision. You helped me see the beauty and strength in the work we choose to do as writers, and for that I will always be grateful.

To Seth Mnookin, head of the GPSW:

Thank you for your honesty, encouragement, and fierce support throughout my young writing career. I will never tire of chatting about writing, music, baseball, or really anything with you. Thank you for your tireless work in helping more students afford the opportunity to attend this program and receive the important education that the GPSW offers, especially in a world where journalism and science are changing by the second.

To all of my professors in the GPSW:

Thank you for your guidance and instruction, and for being the most helpful editors with whom I have ever worked. It has been a privilege to learn from you.

To Shannon Larkin:

Thank you for always keeping your door open, for being a champion for the success and happiness of the students in this program, for always having the difficult conversations, and for lifting my spirits when times were tough.

To my classmates in the GPSW:

It is a huge honor to be a part of your class. Thank you for always challenging me to be a better writer, reporter, person, and friend. I look forward to seeing where your careers as communicators of science will take you.

To my sources, especially Pat Deklotz and everyone at Kettle Moraine:

Thank you for taking the time and energy to speak with me. This work would not be possible without the valuable work you do each day, and your trust in sharing it with me.

To my family:

Thank you for your unwavering love, support, and enthusiasm for my decision to pursue science writing as a career. You are everything to me, and I hope through the work I do, I can make you proud, and pay forward all the kindness you've shown me.

In 2013,[1] the Los Angeles Unified School District,[2] the United States' second-largest,[3] famously announced it would spend over $1 billion to put iPads preloaded with the Pearson curriculum in the hands of every one of its 600,000 students.[4] The plan, billed as bringing "an individualized, interactive, and information rich educational experience" to each student through the devices,[5] was quickly co-opted as a high-profile test[6] by both sides of the longstanding debate over technology's role in U.S. classrooms. More specifically, it was hinged on a question – could technology radically reshape the classroom as we know it, and usher in a new era of education personalized to meet the needs of every individual student?

The program folded less than two years later.[7] Several managers from LAUSD's senior leadership – including Superintendent John Deasy[8] – resigned,[9] and the district launched a lawsuit against Pearson.[10] What went wrong? Less than a week into the program, hundreds of students at one of the district's high schools hacked past the devices' firewall – intended to block non-academic websites and content.[11] Within the first year, teachers and students complained that the Pearson e-learning software wasn't ready to be used in the classroom, leading to a delay in the program's full roll-out.[12] When the FBI showed up at the district headquarters in late 2014 and confiscated 20 boxes of materials, they discovered that Deasy had been emailing with Pearson executives long before the contract opened for competitive bidding,[13] and the iPad program spiraled into a full-on fiasco.

The district formally halted its contract with Apple in 2014.[14] The program continues to be held up as a cautionary tale of ed tech evangelism and the dangers of parachuting technology into classroom.[15] Educational technology scholars are often quick (and correct) to point out that the conversation around "ed tech" is as old as the U.S. education system itself.[16] But as the technology itself has become more powerful, and the companies building the devices and software now possess unprecedented resources for pushing their products into the classroom, the long-simmering debate has bubbled over onto the front pages of newspapers and news sites.[17]

In that debate, the narrative that U.S. schools are broken, stuck in the past, and failing to deliver quality education, and are therefore in need of a "disruption" to jolt them into the 21st century, has received increased media attention in the past several years.[18] It's a story often pushed by politicians, technologists, reform advocates, even educators themselves. Implied, but unasked, are questions like is the system truly broken? In what way? And if it is, what kind of transformation is needed to repair it? And what should be the role of technology – and inherently, the technology sector – in shaping the scope and direction of this transformation?

After the iPad debacle, LAUSD's new superintendent formed a task force to sort through the wreckage and come up with a new plan,[19] and asked Frances Gipson, superintendent of another L.A. school district, to lead it.[20] The sixty-person task force, made up of teachers, parents, administrators and principals, met every week for two years to map out an approach for personalized learning that kept the students at the center.[21] To help them, they contacted International Society for Technology in Education (ISTE),[22] a nonprofit that advises educators interested in using technology.[23]

"They said hey, we got this wrong," said Richard Culatta, ISTE's CEO. [24,25] In response, ISTE consultants introduced the district to their standards, a comprehensive framework that provides instructions for students, teachers, and administrators to roll out technology programs in their schools.[26] "So they adopted, dove into it," said Culatta, "and they've seen a huge shift in the way things are going as they start to focus on preparing teachers. They were able to turn an ugly situation into an example for others to follow."[27]

The ISTE framework outlines specific goals and tasks for each member of the school community related to using technology.[28] According to the standards, administrators must "inspire and facilitate among all stakeholders a shared vision of purposeful change that maximizes use of digital age resources to meet and exceed learning goals."[29] Teachers must take time to master digital tools and stay abreast of new approaches in order to properly integrate technology into their classrooms.[30] Students must be active in articulating their learning goals and how they want to use technology to achieve and demonstrate them.[31]

Gipson, now chief academic officer at LAUSD, said that collaboration with ISTE's allowed them to step back, "to put kids at the center of the program and work outwards from there."[32] Gipson said that the partnership allowed for a more thoughtful approach for integrating technology into the classroom, one that always considers "how does this technology help amplify the student voice?"[33]

If the U.S. education system is truly closing in on a digitally-mediated shift towards personalized learning, educators are faced with a central question: how to properly leverage technology to create genuinely individual experiences tailored to each member of their class. How can they capitalize on the learning resources made possible by connectivity, devices, and software, while keeping the student and their success at the heart of the curriculum?

<p style="text-align:center">***</p>

It's 2 p.m. on a cold Wednesday,[34] and the 75 students of Kettle Moraine's Create House[35] are scattered throughout the classroom. Some lie on the carpet in small groups, with their Chromebook tablets angled so the screens are visible to one another. Others are cutting and folding construction paper to add links to a multicolored chain that runs along the classroom's walls. It is March 14, Pi Day, and the chain represents the value of pi, the color of each link signifying a different digit, says Amy Gerhke,[36] a Create English teacher.[37] Still others are gathered like puffins in various cushioned nooks and surfaces, each reading a book of their choice, turning their heads in unison as Gerhke announces the end of the period.

Create operates as a "school within a school" at the Kettle Moraine Middle School in Waukesha County, Wisconsin.[38] The larger school is home to 896 students in grades six to eight,[39] but Create students don't follow grade-level curricula.[40] Instead, they manage their own learning goals and progress with an assist from their teachers, and a variety of tools on their Google Chromebooks, including progress-tracking software called My Learning Collaborative.[41]

But the software doesn't drive the learning, says Gerhke. The students do. She is always blown away by how her students "can articulate themselves as learners and human beings even. They know who they are. They know their strengths. They know their weaknesses."[42] Teaching students to understand how they approach their own learning is a key part of helping them succeed down self-directed paths, says Pat Deklotz, Kettle Moraine's superintendent.[43,44] At Create, students know, in each of their subjects, whether they are waiters (who wait until the teacher prompts them), hoverers (dependent on the teacher for the next step), or drivers (those who take the lead in moving on to the next step).[45]

For example, Betsy, a 13-year-old Create student,[46] says she likes "leading things and just kind of taking charge of situations," and bounces with excitement as she talks about the chance to help teach part of the science curriculum on genetics with her classmate Andrea.[47] The pair also help younger Create students with their math lessons. Teaching and mentoring have taught Andrea "the ability to improvise," she says, because things go wrong and that's just how life works ... but you have that power inside of you to fix it or make it somehow okay."[48]

The students say they use their Chromebooks to test their math skills, to collaborate on projects with Google Docs, to annotate articles, and to schedule their daily tasks.[49] Gerhke uses her laptop to balance the goals and track the progress of all her students. "I have sixth grade literacy targets, seventh grade literacy targets, eighth grade literacy targets and we even have some of our kids working on high school level, ninth, tenth grade literacy targets," says Gerhke.

"The technology piece helps me put all those different targets together in a way that's manageable."[50]

When Andrea became interested in the story of a Hawaiian queen for a history project, she says she was able to find one of the monarch's descendants online, and connected with them via email. Betsy adds that Create classes sometimes have video chats via Skype with experts in whatever subject they're studying.[51] For the students at Create, technology is just one tool, albeit an important one putting each student in the driver's seat of their own educational experience. This kind of personalization – built with a bottom-up, grassroots approach – has been the Deklotz's goal for over a decade.

From multi-age classrooms, group projects, student-led classes, testing students on a learner continuum rather than by grade level standards, to place-based learning, and community outreach and partnerships, Kettle Moraine's educators have a full toolkit for personalizing their students' learning. Technology is just one compartment. But, if filled properly, it can bring tools that can facilitate the personalization process by granting greater access to content, making educators more powerful and accessible, connecting students to each other and their communities. Up until the government took action five years ago, this tech compartment was out of reach for many districts.

<p style="text-align:center">***</p>

On the morning of June 6, 2013, R. David Edelman was aboard Air Force One, sitting across from President Barack Obama, who he was accompanying to Mooresville, North Carolina.[52] That afternoon, in a sweaty gymnasium at the Mooresville Middle School, Obama announced the beginning[53] of ConnectED[54] – an initiative to "to make sure that virtually every child in America's classrooms has access to the fastest Internet and the most cutting-edge learning tools."[55] After all, said Obama, "in an age when the world's information is a just click away, it demands that we bring our schools and libraries into the 21st century."[56]

A senior advisor in the White House's Office of Science & Technology Policy, Edelman was ConnectED's chief architect.[57] "It was a four-pillar initiative," said Edelman of the plan to bring updated technology into U.S. classrooms. "Connectivity, devices, content, and teacher training."[58]

The first step was getting more schools connected to high-speed Internet, since, in 2013, only one in three K-12 schools in the U.S. could provide students with such access.[59] In his

remarks at Mooresville, Obama called on the U.S. Federal Communications Commission (FCC) to take steps to get 99 percent of U.S. students in K-12 schools connected to high-speed, broadband Internet within five years by making access more affordable for all schools.[60] A year later, FCC Chairman Tom Wheeler issued official orders to modernize a Clinton-era program known as E-Rate, which provides rebates to schools and libraries to help them purchase telecommunications and internet access.[61] Wheeler's proposal for raising E-Rate's budget from $2.4 billion to $3.9 billion to give schools the monetary support to purchase broadband connections passed on December 11, 2014.[62]

Although the term "information superhighway" now seems laughably outdated, the Internet at its core works by sending information down a highway of sorts from one computer to another.[63] The movement of this information can be described using two parameters: speed and bandwidth. Speed is easy to conceptualize – a car travelling down a highway at 60 miles per hour will deliver a packet faster than one going 40 miles per hour. Bandwidth, on the other hand, describes the carrying capacity of the material through which the information moves, or, by analogy, how many lanes the highway has. With more lanes, you can have more cars moving at once. Three cars going 40 miles per hour down a three-lane road will deliver more packets in total than one car going 60 miles per hour.[64]

The term *broadband* therefore denotes a broad bandwidth, or a road with multiple lanes to transmit packets. How much band is broad enough changes as the content transmitted via the internet changes. To load simple websites with no graphics or interactive features in a browser window is light data transmission, and can generally be done quickly even with little bandwidth. But start using interactive apps or programs like math games that demand a constant stream of heavy data, and much more bandwidth is required.[65]

Bandwidth needs are also affected by how many devices are going to be demanding packets of information simultaneously. If four hundred students are waiting on packets to be delivered to their laptops or tablets by our metaphorical cars and our highway is just three lanes wide, many of the students will be staring at loading screens for several minutes.

The most reliable way to supply high-speed broadband Internet access is through fiber optic technology, which converts the electrical signals carrying information to light, and sends then the light through transparent glass fibers about the diameter of a human hair.[66]

When the E-Rate policy was updated in 2014, schools from all over the country began applying to have new fiber laid to connect their schools to the backbone-wires operated by major

internet service providers, and routers installed inside their buildings to provide Wi-Fi access for computers and devices.[67] Schools sent a report estimating their Internet needs, service providers bid on the contracts, and the government partially reimburses the schools for the cost of the contract. Subsidies ranged from 20 to 90 percent of the cost of the contract, with higher discounts for schools in low-income or rural locations.[68] The program worked: as of 2017, 87 percent of U.S. students now have access to high-speed broadband, according the non-profit EducationSuperHighway, and are now meeting the FCC's minimum Internet access goal of 100 kilobytes of data per second per student.[69]

To achieve the other three pillars of ConnectED, the Department of Education arranged partnerships between technology companies and schools for subsidized or donated laptops, tablets, and desktop computers.[70] The ConnectED team also arranged for content like software programs and e-books to be donated to the schools from publishers and developers. A sub-program called Future Ready also convened superintendents, principals and teachers from across the country for several conferences where they discussed the best way to train teachers on all this new technology.[71]

Colin Rogister, strategic partnerships coordinator in the Department of Education,[72] organized the private-sector partnerships, which combined with the E-Rate subsidies, brought ConnectED's funding to $10 billion.[73] AT&T, Verizon, and Sprint agreed to offer free internet access. Apple, Microsoft, and Adobe donated free tablets, computers, and software. The nation's biggest textbook publishers, including Macmillan and Simon & Schuster, offered free access to their e-book catalogs.[74] "For the companies, I think they were excited about having an avenue to give back," said Rogister.[75]

For all of the infrastructure changes brought about by ConnectED, the officials involved in the program said that the technology's transformative potential has yet to be fully realized. According to Culatta, also the former director of the Office of Educational Technology, getting the schools online and equipped cannot singlehandedly improve learning.[76]

"It's a little bit like saying, 'Great, schools have electricity. Can we show that electricity is closing equity gaps?' said Culatta. "You're like, 'Well, no, you really can't.' It has to be there, because you can't start to close equity gaps if you don't have lights on in your school."[77]

***

The equity gaps educational reformers have long sought to close exist in multiple dimensions of a child's life. Students can face inequity at their schools: low-income

9

neighborhoods have smaller budgets for everything from laptops to desks to teachers' salaries. They can face linguistic inequity if they aren't taught in their first language. They can face programmatic inequity in which they become stuck in "cycles of low expectation" where stereotypes about the academic performance in certain groups are perpetuated because they are held to lower academic standards. They can face instructional and assessment inequity where they have difficult completing lessons due to learning disabilities, physical disabilities, or different learning styles.[78]

Cognitive development researchers have long established that children learn in many different ways. This finding was presented most explicitly in the foundational 1978 "Learning Styles Model" developed by education scholars Rita and Kenneth Dunn.[79] Some thrive by reading instructions, others prefer to hear them spoken out loud, while still others learn best by using their hands.[80] Beyond individual learning styles, recent estimates state that approximately one in every six school-aged children in the U.S. suffer from some sort of learning disability – from ADHD to dyslexia (trouble with letters) to dyscalculia (trouble with numbers).[81] Given that the average student to teacher ratio is around 22 to one in U.S. elementary schools,[82] there's a good chance that a few kids in every classroom will struggle to keep up with the teacher's lesson.

Enter personalized learning. The approach has been touted by policymakers, educators, and tech companies alike as a solution to the equity gaps that occur when students fall behind because of their learning styles and abilities.[83] Definitions vary, but James Rickabaugh, former school superintendent and director of the Institute for Personalized Learning, puts it this way: "an approach to learning and instruction that is designed around individual learner readiness, strengths, needs, and interests. Learners are active participants in setting goals, planning learning paths, tracking progress, and determining how learning will be demonstrated."[84]

Technology can certainly help personalize learning. Software programs loaded onto laptops and tablets can direct the student through the lesson, asking questions along the way, and modifying the way information is rolled out based on their answers. Concepts can be presented visually, aurally, and symbolically. If the devices are linked to a central network, the teacher can access the students' responses to the questions and monitor their progress through the curriculum at an unprecedented level of detail.[85]

ConnectED fostered a number of partnerships between tech companies and K-12 school districts to pursue this vision of a technology-driven classroom. Apple donated iPads to every student in 114 schools across the country, which could be loaded with their suite of personalized

learning apps.[86] Microsoft gave over 3 million students free access to its Office software suite, provided technology training to 150,000 educators, and worked with partners to get 2.9 million Windows-based devices into classrooms.[87] Verizon partnered with non-profit Digital Promise to launch "Verizon Innovative Learning Schools," which gives each student in its 74 member schools a tablet, learning software and a free two-year data plan.[88]

Beyond the partnerships coordinated directly through ConnectED, other players in the tech industry began to muscle themselves into position as essential to ushering in the new age of connected learning and, in some cases, personalized learning. Beginning in 2013, Google made a major marketing push to get their lower-cost tablet – the Chromebook – into more K-12 schools.[89] Today, Chromebooks account for roughly half of school's mobile device orders, and over 30 million children use Google's suite of education apps, according to company representatives.[90]

Giants like Facebook and Microsoft have even taken their role a step further in launching their own networks of charter schools that follow their version of the K-12 curriculum. The Chan/Zuckerberg Initiative (CZI), the for-profit philanthropic organization owned by Mark Zuckerberg and his wife, Priscilla Chan,[91] worked with Summit Public Schools, a 2,500-student charter school network in California to develop and test a new digital learning platform called Summit Basecamp.[92] In late 2017, The Bill and Melinda Gates foundation pledged $1.7 billion to build its own networks of charter schools and partner with more existing schools, all with a tailored curriculum.[93]

In addition to existing companies positioning themselves at the center of the U.S. educational system, a new swath of ed tech start-ups have received billions in investor funding for everything from charter schools to personalized learning software to teacher training models.[94] The disruption narrative is pervasive in all of the efforts, with companies planning to "upend," "shake-up," and altogether "take over" the classroom.[95] But many scholars and educators argue that this narrative both minimizes and erases the work of the hundreds districts striving to create personalized learning experiences without the influence of large tech companies. In addition, this narrative also supports a version of educational transformation that is controlled, end-to-end, by technologists, not educators.

**

"Generally speaking, the public has a high bar for replacing something that works, especially when their children are concerned,"[96] said Jack Schneider, an assistant professor of

education at the College of the Holy Cross.[97] Proponents of the Big Tech version of the disruption narrative are so quick to call the education system broken, because "when it comes to replacing something broken ... the bar for intervention is much lower." As the public is told that doing something is invariably better than letting a sinking ship go down, tech companies are given more free reign to try out "half-baked plans," said Schneider.[98]

As companies' influence stretches further into every step of the educational process, from providing devices to opening their own charter schools, Larry Cuban, an emeritus professor of education at Stanford University,[99] said there are few checks and balances to ensure the goals of the tech companies are in the best interest of the students.[100] "It's a very monopolistic approach to creating reform," said Cuban.[101]

Faith Boninger, a researcher on commercial activities in schools with the National Education Policy Center[102] said that tech companies are taking advantage of schools' inability to say "no" to free tools in order get free brand exposure and are mining student data to improve their products.[103] "They can store data and sell it to advertisers – they're essentially commercializing every aspect of a student's experience," said Boninger.[104]

Such privacy concerns and the use of student data aggregated by certain kinds of software and personalized learning platforms is also murky territory,[105] said Sophia Cope, staff attorney with the Electronic Frontier Foundation, a civil liberties advocacy group.[106] The Foundation recently released the results of a survey of 1000 parents, students, teachers, and administrators on ed tech data privacy issues.[107] 45 percent of the respondents said that their schools did not provide parents with written disclosure about student data collection.[108] "Students, parents, teachers, and even administrators have lots of concerns—and very little clarity—over how ed tech providers protect student privacy," said Cope.[109]

Audrey Watters, once dubbed the "Cassandra of Ed Tech," has covered the field for nearly a decade,[110] mostly on her blog "Hack Education."[111] She argues that it isn't even clear if the technology providers actually understand the concept of personalized learning. "They sell it as this rallying cry against the one-size-fits-all model for education," said Watters. "But if you look at what their tools are doing, they're not challenging the status quo at all. They're just giving students different paths through standardized content."[112]

Technology is never neutral, Watters said, and is always imbued with the values of the company that produced it. When Big Ed Tech has influence over which skills and content are prioritized, they have the opportunity to push their own agendas.[113] "It would be possible to

frame "everyone learning to code," as a sort of civic endeavor, right?" said Watters. "That's not how it's framed. It is very much framed in the worker of the future."[114]

Watters compares the current state of platforms to Netflix's model for movie recommendations, upon which an actual personalized learning program has been built.[115] "Why does Netflix always recommend crappy movies?" said Watters. "Because their catalogue is full of crappy movies. But somehow it's now a personalized list of crappy movies – and you're empowered because you get to choose. You get to choose your crappy movies."[116]

Watters also said that Big Ed Tech has a very specific definition of personalized learning, and teachers have long been working hard to "individualize education," before the influx of tech into the classroom. "For some people, they don't think of personalization as being technological," said Watters. "They really think about encouraging students to pursue their own interests, right, to be able to follow their own lines of inquiry."[117] But that isn't what she sees in much the software being marketed for the classroom. "Very little of it is inquiry-based," said Watters. "Very little of it is hands-on. Very little of it is oriented toward civic life. Very little of it is project-based. Or if it's project based, it's pre-prescribed projects. If it's inquiry-based, the track of inquiry has already been dictated."[118]

At the center of Big Ed Tech's disruption narrative is the assumption that radical, outside influence is the only way to fix a system those same parties argue has long been broken. But educators and reform advocates are pushing back against this version of the disruption.

<p style="text-align:center">***</p>

The ten schools that make up the Kettle Moraine School District[119] are scattered across Waukesha County, Wisconsin, about 30 miles west of Milwaukee. The district is named for its rolling hills, carved out by the glaciers as they inched across the region some 27,000 years ago.[120] Driving through them, superintendent Deklotz recalls a meeting in May 2005 with Kettle Moraine's school board in which one of the members stood up and said, "I move that we charge the administration to transform our educational delivery system to better and more efficiently meet the needs of all students."[121]

In practical terms, this meant that Kettle Moraine needed to change in a way that would allow it to improve students' learning while cutting costs to hit a strict budget cap.[122] When Deklotz, then an assistant superintendent, and Bob Davidovich, principal of the district's elementary school, were tapped to lead the transformation committee, she was at first overwhelmed by the enormity of the task.[123] Then, Deklotz recalls, she and Davidovich looked at

each other and said "if this isn't why we come to work every day, maybe we should get into a different profession."[124]

For the next year-and-a-half, Deklotz led a task force of 25 educators, parents and community members centered on the idea of turning Kettle Moraine's schools into an environment that supported three pillars of education: academic excellence, citizenship, and personal development.[125] When Deklotz first introduced the idea of personalized learning at a community forum, she was met with puzzled expressions. "Some people saw changing as saying 'we aren't good enough,'" said Deklotz. "But it's the opposite. We're changing because we can do better, not because we are failing."[126]

Having the community buy into and inform the direction of the district's transformation was a major key in making the disruption a success. Deklotz and her team spent hundreds of hours building trust within the greater community. They did so, she said, by involving teachers, parents, and students every step of the way. The committee soon understood that concept of personalized curricula turned on identifying and embodying the values and culture of the community context to which the district's students belonged.[127]

Excellence in the arts has long been central to Kettle Moraine, said Deklotz. "Our district built its reputation by developing such a strong band program that they were going to the Rose Bowl Parade and they were going to New York, and they were going all over because of their excellent musicianship." Also important: international relations and global leadership, collaborative group projects, and public health and safety.[128]

The team started small, conducting feasibility studies for micro-classrooms at the elementary, middle, and high school levels, eventually scaling up to fully functioning charter schools within Kettle Moraine's existing schools.[129] Kettle Moraine High School, the district's only high school, now has three charter schools on its campus: KM Global (61 students, with a focus on community leadership); High School of Health Services (58 students, health and safety services); and KM Perform (145 students, arts).[130]

The Kettle Moraine Middle School is divided into seven "Houses," one of which is KM Create, a multi-age classroom for 75 students with a focus on project-based learning.[131] Within the campus of Wales Elementary School, one of the district's four elementary schools, KM Explore is a multi-age charter for students from kindergarten to grade 5, in which students create a personalized curriculum and also participate in a yearly whole-school project.[132] Last year, said Deklotz, the KM Explore community had their curiosity sparked by a certain insect, so they dug

into every aspect of the creature's biology and use in many parts of the world as a major source of protein.[133]

Before launching the charter schools, the community agreed upon a set of principles for personalized learning: all learners are held to clear, high expectations, but each student follows a customized path that adapts based on learning progress, motivations and goals, and that learners have an active voice in defining success and making connections in and out of the classroom.[134] On a typical afternoon at the High School of Health Services (HS[2]),[135] students are spread out across several open classrooms and labs, working on different subjects and projects. Rebecca Ladsten, HS[2]'s math teacher,[136] bounces across the rooms, checking in on the students, but never pausing for long. The students, spanning 9th to 12th grade, often prefer to ask each other for help instead of heading immediately to the instructor, Ladsten says. "I'm not the keeper of all the knowledge," she says. "They are able to learn even though I'm not sitting next to them."[137]

Many of the HS[2] students aren't even on campus in the afternoons, but they're still learning, says Ladsten. [138] One student is at a local hospital shadowing physicians in the delivery room, while another group is in Costa Rica where they are working with locals to set up a dental hygiene clinic. Since HS[2] assists students in setting up partnerships with local organizations to get real-life experience in their areas of interest, the curriculum has to be flexible enough to allow them to spend time off-campus.[139]

"Every class here, you can make it self-paced," says Jordan,[140] a junior at HS[2] who spends his Fridays at the Lake Country Fire and Rescue station, training to be a firefighter and a paramedic.[141] "There's always an opportunity to do the work ahead. The AP classes are a little bit harder, but the teachers are very, very, very helpful with that."[142]

Jordan's class visited the station during his freshman year and he immediately saw firefighting as something he wanted to pursue. "Things can change in a heartbeat," says Jordan of the adrenaline rush that emergency response gives him. "You're never doing the same thing every day." He and fellow junior Adam have been working at the station for the past two years, and the two have built an important bond that allows them to help each other catch up on schoolwork.[143]

The pair have also secured internships with Lake Country after they graduate, which will put them on the path to becoming fully certified firefighter paramedics. Beyond riding along and helping respond to emergency calls, Jordan and Adam help organize the equipment at the station, and assist in workshops to train younger students. Jordan's proudest accomplishment from his

experience at HS^2 is "the trust and respect that I've built up with Lake Country," he says, playing with the strings of his hoodie. He says that he knew he and Adam had earned the firefighters' respect when the pair were entrusted with crucial tasks like inventorying the medicine and equipment on the trucks each day.[144]

Deklotz says that every student at Kettle Moraine, in a charter or not, works with teachers to create "a learner profile" for themselves in which they explain their learning interests, strengths and weakness, and their plan for meeting the curriculum requirements. Then, the profile is used to chart a path for the student through their classes that is personalized to ways in which they learn, the topics they choose to investigate for project-based assignments, and the amount of support they receive from their teacher. One of the challenges now, says Deklotz, is to scale up personalization and give each of the district's 4117 students more opportunities for a learner-guided curriculum.[145]

<div align="center">***</div>

Although Kettle Moraine began their discussion around personalized learning long before ConnectED was launched, superintendent Pat Deklotz said that being invited into Digital Promise's "League of Innovative Schools,"[146] a collective of school districts working to bring technology into their classrooms "was like finding fresh water to drink."[147] At the League's biannual meetings and many times in between, Deklotz and her team would swap ideas, success stories, and opportunities for improvement with other educators on the same mission.[148]

"I mean it was absolutely like finding our people," said Deklotz. "Because they have committed to this work of innovation, and of using digital tools to provide better opportunities for students."[149] Once Kettle Moraine's homegrown disruption had taken hold in their schools, technology could be used strategically to enrich and scale opportunities for personalization, says Deklotz. The first step was upgrading the district's internet connectivity, which was accomplished by installing a new fiber network, and was financed mostly by state funds since it occurred several months before the E-Rate policy changes, said Bob Boyd,[150] director of technology at Kettle Moraine.[151]

In order to allow more students to access the new broadband, Kettle Moraine launched a device program in 2014, giving each student the opportunity to have a Google Chromebook, or, at the high school, a Windows Laptop.[152] But these devices weren't donated through a partnership with Google. "Our partnership is with our parents," said Boyd.[153] Parents pay half the cost of the device when the student first enters a Kettle Moraine school, and pay the other

half over the course of the student's time in school. When the student graduates, they and their family own the device.[154]

In addition to cutting district costs, the program "provides the ownership to the student and family," which is a powerful incentive to ensure students treat their Chromebooks with care, said Boyd. "In addition, that takes a lot of burden off the technology department of ending up having to recycle or refurbish equipment after it's been used for three or four years at our middle school and high school."[155]

Holly Myhre, Kettle Moraine's Director of Digital Learning,[156] is quick to point out that although the Chromebooks and their software are now used to help support personalized learning across the district, the personalization is never dependent on the technology. "Goal setting, learner profiles, really, truly understanding where that student is, setting goals and attaining them," said Myhre. "that happens without technology. You can do that on a piece of paper. It's communication."[157]

Myhre and Boyd both understand, however, how the right technology can help to support Kettle Moraine's principles for personalized learning, as well as the fact that learning about the proper use of technology is a critical component of growing up in the 21st century. From sending inappropriate emails to accessing inappropriate websites to altering someone's work on a collaborative document or project, "all of those provide really great learning opportunities for kids about digital citizenship and what it means to be a positive participant online," said Myhre.[158]

"There's also the digital literacy piece that comes alongside of it," she said. "Understanding your digital footprint, understanding how to participate and create in a positive way towards something, rather than just consuming whatever is being delivered to you."[159]

Last year, Benjamin Fronk, a KM Explore teacher, was ready to supply his students with paint and a large sheet of paper for their assignment to create a map of Milwaukee, but his students requested instead that they use Minecraft, a video game in which players can build and shape their own playing environment, instead.[160] Fronk said he was initially skeptical about the prospect of two dozen nine-year-olds working on the same Minecraft space at the same time without deleting or modifying each others' contributions, but the project ended up providing an important lesson in digital collaboration in addition to the intended geography lesson.[161]

The map project is emblematic of how personalization works at Kettle Moraine. The learning structure, goals, and personal paths are decided first – with each student taking on an

area of the map that interests them – and the technology comes in afterwards, oftentimes adding a new dimension to the experience. This sequence of steps is critical to the district's success in enabling its students to use technology in the classroom, and without being used by it.

There is ample anecdotal evidence that Kettle Moraine's students are benefiting from, or at least enjoying, their experiences with personalized learning. But any new legislation and government funding to support the expansion of personalized learning, as well as public opinion of its worth, rests on a billion-dollar question: does it actually close equity gaps and provide better learning outcomes?

<p align="center">***</p>

The obvious question proponents of personalized learning – like the Kettle Moraine leadership – must face is whether or not it works: do students working through individualized curricula do better by the standard metrics of educational achievement? Recent research suggests that the approach offers only modest improvements. The RAND Corporation has conducted several studies on personalized learning and student learning outcomes, as measured, in addition to survey responses and case studies, by the student scores on the Northwest Evaluation Association's Measures of Academic Progress (MAP) Test, a computer-based standardized test for measuring proficiency in reading comprehension, science, and math.[162]

The most recent RAND study, published in 2017, stated that student who would have had average test scores in a traditional school scored 3 percentile points above average at a school that included some instruction via personalized learning.[163] The gains in reading were too small to draw conclusions, the researchers said. The 40 schools included in the study were also not required to use a standard method for personalized learning, instead, the researchers wrote "each school had the flexibility to implement a PL model that would work best with its context, students, and goals."[164] The study was funded in part by the Bill and Melinda Gates Foundation.[165]

Some educational reformers argue against relying on such metrics. Culatta, is one of many policymakers who caution against using test scores as the de-facto metric for how much students are learning. "There are all these different approaches [to personalized learning]," said Culatta. "None of them are the same." This makes results and benefits hard to measure with standardized tests, said Culatta.[166]

John F. Pane, a senior research scientist at RAND[167] and the lead author of the study, largely agrees, writing in an article related to the results that education research "commonly finds

that when innovations are spread to new contexts and scaled up to serve larger samples, they produce smaller effects than were seen among the earliest adopters."[168] He also wrote that it is common for innovations to "even produce a dip in achievement the first year implemented, before maturing to show more positive effects."[169] In an interview, Pane said that the RAND findings show that "personalized learning could really be something big if it's not impeded," but educators and tech companies "have to do the scale-up in a way that's cautious and thoughtful."[170]

The results from Kettle Moraine suggest that Pane is correct on both counts. Last year, its students performed above state averages in reading and math, according to state-issued Accountability Report Cards.[171] Deklotz has also introduced the Organization for Economic Co-operation and Development (OECD)'s student assessment test in order to determine how Kettle Moraine's high school compares to schools across the U.S. and the globe.[172] Recent results show Kettle Moraine students testing well above the U.S. national average in math, science, and reading. The results also state that students within Kettle Moraine's charters, and therefore with more access to a personalized curriculum, perform better than their peers, data that Deklotz says will serve to inform scaling up personalized learning for all students across the district.[173]

Any success Kettle Moraine may show in creating homegrown disruption and scaling personalized learning should, however, factor in the district's particular demographics.[174] As far as school districts go, Kettle Moraine is tiny, and its students come from, on average, middle or upper middle class households who can generally afford to purchase the Chromebooks. Over 90 percent of the student population is white.[175] The Kettle Moraine school board's trust in Deklotz also enables her to create charters within larger schools, a kind of flexibility that many other superintendents aren't afforded.

Efforts towards home grown disruption and a more community-focused approach to personalized learning are not, however, restricted to school districts with the same make-up at Kettle Moraine. They are taking place in other districts from Brooklyn to Miami to Los Angeles, and many places in between.

<center>***</center>

At first pass, the Brooklyn Laboratory Charter School (Brooklyn LAB for short),[176] might seem like another school engineered by tech giants, paid for with huge donations from tech philanthropists and investors. But while its co-founders, Erin Mote and Eric Tucker, received $100 million from the XQ Institute as part of its Super School Project, funded by Laurene Powell

<center>19</center>

Jobs, widow of Apple co-founder Steve Jobs,[177] the school's approach to personalized learning is, like Kettle Moraine's, grounded in its community, with a strong focus on place-based learning, and community partnerships.

The school is located in the heart of Brooklyn, and Mote and Tucker set out to recruit an equal or greater percentage of low-income students, students with disabilities, and English Language Learners than the district in which it is located.[178] Of the school's 458 students enrolled during the 2016-2017 school year, 65 percent were from low-income households, 12 percent were in temporary housing, and 28 percent had disabilities. 83 percent of the student body identified as black and 19 percent as Hispanic (the demographic survey allowed for mixed race identifications to be counted twice).[179]

Students at LAB's middle school receive Chromebook tablets, high school students use Apple MacBook laptops, and both schools use a software program developed by Mote and her team called Cortex to track student's progress through the curriculum. But since education is a human enterprise with hundreds of moving pieces, the work she's doing at Brooklyn LAB is, Mote says, "the hardest public service I've ever done."[180]

Personalized learning at LAB occurs far beyond the work students do on their devices, says Mote. Learning isn't just about progress through a curriculum and meeting testing goals, "it's about restorative justice and restorative practice," says Mote. "It's about creating a global voice for our young people." Developing this global voice begins with understanding the community and cultural context to which LAB's students belong, and building place-based projects into the curriculum. For example, gun violence is an important issue for the community, so 100s of LAB's high school students recently worked to develop programming around the national school walk-out day on March 14. In addition to organizing walk-outs, the high school students also led hundreds of middle school students in workshops and presentations on how to be advocates in their communities.[181]

Similar approaches to educational reform are happening at the large district level as well. In 2008, the Miami-Dade School District,[182] which serves over 370,000 students at nearly 400 schools in southern Florida, was facing a budget crisis, low graduation rates, and high rates of students dropping out. That same year, Alberto Carvalho became superintendent of the district and began a massive overhaul that culminated in Miami-Dade being rated as one of the nation's highest-performing urban school systems.[183] Carvalho also received recognition for his approach in bringing personalized learning to the districts' schools.

"We were not enticed by the shiny, sexy look of the iPad, as if it was the cure for everything," said Carvalho about the beginning of Miami-Dade's personalization program in a speech to a Chicago conference of education technology leaders in April 2017. "We took our time …and allowed ourselves to study the mistakes that others made before we would repeat them ourselves."[184]

Classrooms at a number of schools were redesigned with fewer rows of desks and more open space with interactive white boards to encourage student and teacher collaboration. The district also moved to a new curriculum for math instruction called iPrep Math, which allowed each student to plan and schedule their own math curriculum.[185] The devices also allow for more project-based learning and opportunities for students to have moments of discovery in their learning, says Marissa Dominguez, a high school social sciences teacher at Miami-Dade. "I set up little tidbits," says Dominguez of the way she now approaches her lessons. "and they go out and put the pieces together for themselves."[186]

The graduation rate across Miami-Dade schools reached an all-time high of 80.4 percent during the 2016-2017 school year,[187] and the district received no "F" ratings on its Department of Education school report cards for the first time in history.[188]

Carvahlo's efforts, in addition to Deklotz's work and that of the leaders of Brooklyn Lab, highlight the importance of superintendent leadership as a tenant in crafting a successful personalized learning program. Devin Vodicka, former superintendent of the Vista Unified School District in California whose work in education technology earned him the Association of California School Administrators' "California Superintendent of the Year" in 2015, said that his role was unique in its capacity to bring about major change in the schools.[189]

"Fundamental to my responsibilities were ensuring that we had a shared vision, mission, values, common goals, clear roles and responsibilities," said Vodicka, "and a strategic plan that was going to move us in the direction of our vision and help us actualize the mission, and the values, and meet our goals." Vodicka said that the superintendent must work closely to with principals, teachers, students, and the community in order to make sure everyone's goals were aligned.[190]

<p style="text-align:center">***</p>

If any kind of disruption is to fundamentally alter the ways students learn in U.S. schools, the success of Kettle Moraine and other districts has demonstrated that it must come from within

the school communities themselves. New technology can greatly assist in creating personalizing learning environments, by opening up access to new ways of presenting and collecting information, connecting students to each other and to their communities, and helping educators track students progress. Scaling up personalized learning to reach the millions of students across the country will no doubt depend in part on new devices and digital innovations. It is always tempting to dream of a clean-cut disruption where the right tool acts a silver bullet to help each and every student succeed in their learning. But education is a profoundly human enterprise, disruption and reform will always be social, not technological, at its core.

Many school districts have already demonstrated the power of homegrown disruptions. With strong superintendent leadership, trust and transparency at every step, the learner at the center, the values and goals of the greater community built into the plan, and the thoughtful use of technology to assist in the plan, personalized learning can succeed. "It's like the difference between remodeling and redecorating," said Deklotz. "If you want us to redecorate, we can make it look clean and pretty, but it's going to be the same thing. If we're going to remodel, that means it's dirty, and you tear things down ... It's going to look different when we're done."[191]

Educational reform and transform is a very "American issue," said Watters. "To have all children between the ages of five and now 17 go through a public school system that is in some way standardized in terms of what we expect them to know. So there's a tension between that mass system and very American belief in the importance of the individual."[192]

For all the shortcomings and successes of the U.S. educational system, said Schneider American technologists and educators have never been short on innovation. What makes educational transformation so tricky "is the twofold challenge of complexity and scale."[193]

"American schools are charged with the task of creating better human beings," said Schneider. "And they are expected to do so in a relatively consistent way for all of young people. It is perhaps the nation's most ambitious collective project; as such, it advances slowly."[194]

References:

1. Howard Blume. "LAUSD launches its drive to equip every student with iPads," *Los Angeles Times*, August 27, 2013, http://www.latimes.com/local/la-me-lausd-ipads-20130828-story.html

2. Los Angeles Unified School District Home Page. Los Angeles Unified School District. https://home.lausd.net/

3. "Enrollment, poverty, and federal funds for the 120 largest school districts, by enrollment size in 2013: Selected years, 2012-13 through 2015," *Digest of Education Statistics 2015*. National Center for Education Statistics. https://nces.ed.gov/programs/digest/d15/tables/dt15_215.30.asp

4. Blume. "LAUSD."

5. "COMMON CORE TECHNOLOGY PROJECT UPDATE." Los Angeles Unified School District. February 12, 2013. https://webcache.googleusercontent.com/search?q=cache:hnf5FTC87KIJ:https://achieve.l ausd.net/site/handlers/filedownload.ashx%3Fmoduleinstanceid%3D16015%26dataid%3 D15223%26FileName%3DA9%2520CCTP%2520Plan%25202-12-13.pdf+&cd=4&hl=en&ct=clnk&gl=us

6. Craig Clough. "Report on iPad program effectiveness gives mixed results," *LA School Report*, September 18, 2014, http://laschoolreport.com/report-on-ipad-programs-effectiveness-gives-mixed-results-lausd/

7. Lily Hay Newman. "L.A. School District Terminates iPad Program and Seeks Refund From Apple," *Slate*, April 16, 2015, http://www.slate.com/blogs/future_tense/2015/04/16/l_a_school_ipad_program_ends_wit h_district_demanding_refund_from_apple.html

8. Motoko Rich. "Deasy Resigns as Los Angeles Schools Chief After Mounting Criticism," *The New York Times*, October 16, 2014, https://www.nytimes.com/2014/10/17/us/lausd-john-deasy-resigns-superintendent-los-angeles.html

9. Howard Blume. "Technology chief for Los Angeles Unified School District resigns," *Los Angeles Times*, October 31, 2014, http://www.latimes.com/local/education/la-me-lausd-technology-20141101-story.html

10. Howard Blume. "L.A. Unified to get $6.4 million in settlement over iPad software," *Los Angeles Times*, September 25, 2015, http://www.latimes.com/local/lanow/la-me-ln-la-unified-ipad-settlement-20150925-story.html

11. Howard Blume. "LAUSD halts home use of iPads for students after devices hacked," *Los Angeles Times*, September 25, 2013, http://www.latimes.com/local/lanow/la-me-ln-lausd-ipad-hack-20130925-story.html

12. Benjamin Herold. "Curriculum Prompts New Concerns in L.A. iPad Plan," *Education Week*, October 25, 2013, https://www.edweek.org/ew/articles/2013/10/25/10pearson_ep.h33.html

13. Howard Blume, Victoria Kim, and James Rainey. "FBI seizes LAUSD records related to troubled iPad program," *Los Angeles Times*, December 2, 2014, http://www.latimes.com/local/education/la-me-lausd-ipads-20141203-story.html

14. Howard Blume. "L.A. Unified halts contract for iPads," *Los Angeles Times*, August 25, 2014, http://www.latimes.com/local/education/la-me-deasy-ipads-20140826-story.html

15. Issie Lapowsky. "What Schools Must Learn from LA's iPad Debacle," *Wired*, May 8, 2015, https://www.wired.com/2015/05/los-angeles-edtech/

16. Audrey Watters. "The History of the Future of Education," *Hack Education*, February 19, 2015, http://hackeducation.com/2015/02/19/the-history-of-the-future-of-education

17. Natasha Singer. "The Silicon Valley Billionaires Remaking America's Schools," *The New York Times,* June 6, 2017, https://www.nytimes.com/2017/06/06/technology/tech-billionaires-education-zuckerberg-facebook-hastings.html

18. Natasha Singer. "How Google Took Over the Classroom," *The New York Times,* May 13, 2017, https://www.nytimes.com/2017/05/13/technology/google-education-chromebooks-schools.html

19. Julia McCandless. "LAUSD Making a Comeback with Instructional Technology," *The Center for Digital Education*, September 11, 2017, http://www.centerdigitaled.com/lausd-making-a-comeback-with-instructional-technology.html

20. "LAUSD's chief academic officer recognized for use of technology," *Park Labrea News, Beverly Press*, September 14, 2017, http://beverlypress.com/2017/09/lausds-chief-academic-officer-recognized-for-use-of-technology/

21. "Instructional Technology Initiative Task Force RECOMMENDATIONS." Los Angeles Unified School District. June 2016. https://achieve.lausd.net/cms/lib/CA01000043/Centricity/Domain/21/RECOMMENDATIONS.pdf

22. Corinne Lestch. "L.A. Unified School District finds success in new ISTE standards," *Ed Scoop,* June 27, 2016, https://edscoop.com/l-a-unified-school-district-finds-new-technology-track-after-botched-ipad-rollout

23. International Society for Technology in Education Homepage. https://www.iste.org/

24. Interview with author. January 29, 2018.

25. https://www.iste.org/about/Team-ISTE/rculatta

26. ISTE Standards. https://www.iste.org/standards

27. Interview with author. January 29, 2018.

28. ISTE Standards. https://www.iste.org/standards

29. ISTE Standards for Administrators. https://www.iste.org/standards/for-administrators

30. ISTE Standards for Educators. https://www.iste.org/standards/for-educators

31. ISTE Standards for Students. https://www.iste.org/standards/for-students

32. Jennifer Snelling, "Total turnaround: How LAUSD's troubled rollout became a model for tech success," *ISTE Empowered Learner*, March 18, 2018, https://www.iste.org/explore/articleDetail?articleid=2160

33. Jennifer Snelling, "Total turnaround: How LAUSD's troubled rollout became a model for tech success," *ISTE Empowered Learner*, March 18, 2018, https://www.iste.org/explore/articleDetail?articleid=2160

34. Waukesha, Wisconsin Weather: March 14, 2018. Weather Underground. https://www.wunderground.com/history/airport/KUES/2018/3/14/DailyHistory.html?req_city=Waukesha&req_state=WI&req_statename=Wisconsin&reqdb.zip=53186&reqdb.magic=1&reqdb.wmo=99999

35. Chris Sturgis. "The Sound of Learning at Create House at Kettle Moraine Middle School," *Competency Works*, December 13, 2017, https://www.competencyworks.org/case-study/the-sound-of-learning-at-create-house-at-kettle-moraine-middle-school/

36. Interview with author. March 14, 2018.

37. Kettle Moraine Middle School Staff list. https://www.kmsd.edu/domain/223

38. Chris Sturgis. "The Sound of Learning at Create House at Kettle Moraine Middle School," *Competency Works*, December 13, 2017, https://www.competencyworks.org/case-study/the-sound-of-learning-at-create-house-at-kettle-moraine-middle-school/

39. KM QUICK FACTS. Kettle Moraine School District. https://www.kmsd.edu/Page/314

40. Chris Sturgis. "The Sound of Learning at Create House at Kettle Moraine Middle School," *Competency Works*, December 13, 2017, https://www.competencyworks.org/case-study/the-sound-of-learning-at-create-house-at-kettle-moraine-middle-school/

41. Amy Gerhke interview with author. March 14, 2018.

42. Interview with author. March 14, 2018.

43. Interview with author. March 14, 2018.

44. Superintendent Homepage. Kettle Moraine School District. https://www.kmsd.edu/domain/256

45. Interview with author. March 14, 2018.

46. Names of students have been changed for privacy.

47. Interview with author. March 14, 2018.

48. Interview with author. March 14, 2018.

49. Interview with author. March 14, 2018.

50. Interview with author. March 14, 2018.

51. Interview with author. March 14, 2018.

52. Interview with author. December 15, 2017.

53. "Remarks by the President at Mooresville Middle School -- Mooresville, NC." The White House, Office of the Press Secretary. June 6, 2013. https://obamawhitehouse.archives.gov/the-press-office/2013/06/06/remarks-president-mooresville-middle-school-mooresville-nc

54. ConnectED. The White House Archives. https://obamawhitehouse.archives.gov/issues/education/k-12/connected

55. "Remarks by the President at Mooresville Middle School -- Mooresville, NC." The White House, Office of the Press Secretary. June 6, 2013. https://obamawhitehouse.archives.gov/the-press-office/2013/06/06/remarks-president-mooresville-middle-school-mooresville-nc

56. "Remarks by the President at Mooresville Middle School -- Mooresville, NC." The White House, Office of the Press Secretary. June 6, 2013. https://obamawhitehouse.archives.gov/the-press-office/2013/06/06/remarks-president-mooresville-middle-school-mooresville-nc

57. R. David Edelman. *Techonomy.* https://techonomy.com/people/r-david-edelman/

58. Interview with author. December 15, 2017.

59. "2017 State of the States: Fulfilling Our Promise to America's Students." EducationSuperHighway. September 2017. https://s3-us-west-1.amazonaws.com/esh-sots-pdfs/educationsuperhighway_2017_state_of_the_states.pdf

60. "Remarks by the President at Mooresville Middle School -- Mooresville, NC." The White House, Office of the Press Secretary. June 6, 2013. https://obamawhitehouse.archives.gov/the-press-office/2013/06/06/remarks-president-mooresville-middle-school-mooresville-nc

61. Summary of the E-Rate Modernization Order. Federal Communications Commission. July 11, 2014, https://www.fcc.gov/general/summary-e-rate-modernization-order

62. "FCC CONTINUES E-RATE REBOOT TO MEET THE NEEDS OF 21st CENTURY DIGITAL LEARNING." Federal Communications Commission. December 11, 2014.

https://www.fcc.gov/document/fcc-continues-e-rate-reboot-meet-nations-digital-learning-needs

63. Jonathan Strickland. "How does the Internet Work?" HowStuffWorks.com. 2010. https://computer.howstuffworks.com/internet/basics/internet.htm

64. "Types of Broadband Connections." Federal Communications Commission. https://www.fcc.gov/general/types-broadband-connections

65. "Types of Broadband Connections." Federal Communications Commission. https://www.fcc.gov/general/types-broadband-connections

66. "Types of Broadband Connections." Federal Communications Commission. https://www.fcc.gov/general/types-broadband-connections

67. "2017 State of the States: Fulfilling Our Promise to America's Students." EducationSuperHighway. September 2017. https://s3-us-west-1.amazonaws.com/esh-sots-pdfs/educationsuperhighway_2017_state_of_the_states.pdf

68. "2017 State of the States: Fulfilling Our Promise to America's Students." EducationSuperHighway. September 2017. https://s3-us-west-1.amazonaws.com/esh-sots-pdfs/educationsuperhighway_2017_state_of_the_states.pdf

69. "2017 State of the States: Fulfilling Our Promise to America's Students." EducationSuperHighway. September 2017. https://s3-us-west-1.amazonaws.com/esh-sots-pdfs/educationsuperhighway_2017_state_of_the_states.pdf

70. ConnectED. The White House Archives. https://obamawhitehouse.archives.gov/issues/education/k-12/connected

71. Future Ready. The Office of Educational Technology. https://tech.ed.gov/futureready/

72. Colin Rogister. LinkedIn Profile. https://www.linkedin.com/in/colin-rogister-a469713/

73. ConnectED. The White House Archives. https://obamawhitehouse.archives.gov/issues/education/k-12/connected

74. ConnectED. The White House Archives. https://obamawhitehouse.archives.gov/issues/education/k-12/connected

75. Interview with author. January 12, 2018.

76. Interview with author. January 29, 2018.

77. Interview with author. January 29, 2018.

78. Jaekyung Lee. "Multiple Facets of Inequity in Racial and Ethnic Achievement Gaps," *Peabody Journal of Education*, November 18, 2009. 79:2, 51-73, DOI: 10.1207/s15327930pje7902_5

79. Rita Dunn and Kenneth Dunn, *Teaching students through their individual learning styles.* 1978. Reston, VA: Reston Publishing Company, Inc.

80. Dunn and Dunn. *Learning Styles.*

81. "Children and Youth with Disabilities." National Center for Education Statistics. April 2018. https://nces.ed.gov/programs/coe/indicator_cgg.asp

82. "Teacher Trends: Fast Facts." National Center for Education Statistics. https://nces.ed.gov/fastfacts/display.asp?id=28

83. Heather Staker and Michael B. Horn. "Classifying K-12 Blended Learning," Innosight Institute, May 2012, https://files.eric.ed.gov/fulltext/ED535180.pdf

84. James Rickabaugh. *Tapping into the Power of Personalized Learning.* Alexandria, VA: ASCD, 2016. Pg. 6.

85. Heather Staker and Michael B. Horn. "Classifying K-12 Blended Learning," Innosight Institute, May 2012, https://files.eric.ed.gov/fulltext/ED535180.pdf

86. "Apple and ConnectED." Apple. https://www.apple.com/connectED/

87. "Answering the ConnectED Challenge." Microsoft. https://www.microsoft.com/en-us/Government/EmpoweringUS/education_EDU12

88. "Verizon Innovative Learning Schools." Digital Promise. http://digitalpromise.org/initiative/verizon-innovative-learning-schools/

89. Natasha Singer. "How Google Took Over the Classroom," *The New York Times,* May 13, 2017, https://www.nytimes.com/2017/05/13/technology/google-education-chromebooks-schools.html

90. Natasha Singer. "How Google Took Over the Classroom," *The New York Times,* May 13, 2017, https://www.nytimes.com/2017/05/13/technology/google-education-chromebooks-schools.html

91. Chan Zuckerberg Initiative Homepage. https://www.chanzuckerberg.com/

92. Natasha Singer and Mike Isaac. "Facebook Helps Develop Software That Puts Students in Charge of Their Lesson Plans," *The New York Times*, August 9, 2016, https://www.nytimes.com/2016/08/10/technology/facebook-helps-develop-software-that-puts-students-in-charge-of-their-lesson-plans.html

93. Valerie Strauss. "Bill Gates has a(nother) billion-dollar plan for K-12 public education. The others didn't go so well," *The Washington Post*, October 19, 2017, https://www.washingtonpost.com/news/answer-sheet/wp/2017/10/19/bill-gates-has-another-plan-for-k-12-public-education-the-others-didnt-go-so-well/?noredirect=on&utm_term=.7b12a3f9aa72

94. Natasha Singer. "The Silicon Valley Billionaires Remaking America's Schools," *The New York Times,* June 6, 2017, https://www.nytimes.com/2017/06/06/technology/tech-billionaires-education-zuckerberg-facebook-hastings.html

95. Eric Sheninger. "Education Is Ripe for Disruption," *The Huffington Post*, August 30, 2016, https://www.huffingtonpost.com/eric-sheninger/education-is-ripe-for-dis_b_11767198.html

96. Jack Schneider. "America's Not-So-Broken Education System," *The Atlantic*, June 22, 2016, https://www.theatlantic.com/education/archive/2016/06/everything-in-american-education-is-broken/488189/

97. "Jack Schneider." The College of the Holy Cross. https://www.holycross.edu/academics/programs/education/faculty/jack-schneider

98. Jack Schneider. "America's Not-So-Broken Education System," *The Atlantic*, June 22, 2016, https://www.theatlantic.com/education/archive/2016/06/everything-in-american-education-is-broken/488189/

99. "Larry Cuban." Stanford University Graduate School of Education. https://ed.stanford.edu/faculty/cuban

100. Natasha Singer. "The Silicon Valley Billionaires Remaking America's Schools," *The New York Times,* June 6, 2017, https://www.nytimes.com/2017/06/06/technology/tech-billionaires-education-zuckerberg-facebook-hastings.html

101. Singer. "Billionaires."

102. "Faith Boninger." National Education Policy Center. http://nepc.colorado.edu/author/boninger-faith

103. Faith Boninger, Alex Molnar, and Kevin Murray. "Asleep at the Switch: Schoolhouse Commercialism, Student Privacy, and the Failure of Policymaking." National Education Policy Center, August 2017, http://nepc.colorado.edu/files/publications/RB%20Trends%202017_2.pdf

104. Faith Boninger, Alex Molnar, and Kevin Murray. "Asleep at the Switch: Schoolhouse

Commercialism, Student Privacy, and the Failure of Policymaking." National Education Policy
    Center, August 2017,
    http://nepc.colorado.edu/files/publications/RB%20Trends%202017_2.pdf
105. Sophia Cope and Nate Cardozo, "It's Time to Make Student Privacy a Priority," Electronic
    Frontier Foundation, January 29, 2018, https://www.eff.org/deeplinks/2018/01/its-time-
    make-student-privacy-priority
106. "Sophia Cope." Electronic Frontier Foundation. https://www.eff.org/about/staff/sophia-cope
107. Frida Alim, Nate Cardozo, Gennie Gebhart, Karen Gullo, and Amul Kalia. "Spying on
    Students: School-Issued Devices and Student Privacy," Electronic Frontier Foundation,
    April 13, 2017, https://www.eff.org/files/2017/04/13/student-privacy-report.pdf
108. Alim et al. "Spying."
109. Sophia Cope and Nate Cardozo, "It's Time to Make Student Privacy a Priority," Electronic
    Frontier Foundation, January 29, 2018, https://www.eff.org/deeplinks/2018/01/its-time-
    make-student-privacy-priority
110. "Audrey Watters." http://audreywatters.com/
111. Hack Education. http://hackeducation.com/
112. Audrey Watters. "Current Trends in Education and Technology." Presentation at the
    Disruptive Media Learning Lab at Coventry University, May 10, 2017.
    https://www.youtube.com/watch?v=IrVnLFYd4iU&t=127s
113. Interview with author. March 30, 2018.
114. Interview with author. March 30, 2018.
115. Chris Weller, "Netflix's CEO backs a math education program that works like the streaming
    service," *Business Insider*, June 6, 2017, http://www.businessinsider.com/netflixs-ceo-
    backs-math-education-program-2017-6
116. Audrey Watters. "Current Trends in Education and Technology." Presentation at the
    Disruptive Media Learning Lab at Coventry University, May 10, 2017.
    https://www.youtube.com/watch?v=IrVnLFYd4iU&t=127s
117. Interview with author. March 30, 2018.
118. Interview with author. March 30, 2018.
119. Kettle Moraine School District Home page. https://www.kmsd.edu/kmsd
120. "History of the District," Kettle Moraine School District. https://www.kmsd.edu/Page/315
121. Interview with author. March 14, 2018.
122. "KM 2004-2005 Annual Budget Report." Kettle Moraine School District. June 2004.
    https://www.kmsd.edu/cms/lib/WI01919005/Centricity/Domain/259/2004-2005.pdf
123. Interview with author. March 14, 2018.
124. Interview with author. March 14, 2018.
125. Interview with author. March 14, 2018.
126. Interview with author. March 14, 2018.
127. Interview with author. March 14, 2018.
128. Interview with author. March 14, 2018.
129. Interview with author. March 14, 2018.
130. KM QUICK FACTS. Kettle Moraine School District. https://www.kmsd.edu/Page/314
131. Chris Sturgis. "The Sound of Learning at Create House at Kettle Moraine Middle School,"
    Competency Works, December 13, 2017, https://www.competencyworks.org/case-
    study/the-sound-of-learning-at-create-house-at-kettle-moraine-middle-school/
132. "About KM Explore." Kettle Moraine Explore. https://www.kmsd.edu/domain/63
133. Interview with author. March 14, 2018.

134. Chris Sturgis. "Kettle Moraine: How They Got Here and Where They are Going," *Competency Works,* December 4, 2017, https://www.competencyworks.org/case-study/kettle-moraine-how-they-got-here-and-where-they-are-going/

135. "High School of Health Sciences." Kettle Moraine School District. https://www.kmsd.edu/hs2

136. Rebecca Ladsten LinkedIn Profile. https://www.linkedin.com/in/rebecca-ladsten-b32b284b/

137. Interview with author. March 14, 2018.

138. Interview with author. March 14, 2018.

139. Interview with author. March 14, 2018.

140. Names of students have been changed for privacy.

141. Interview with author. March 14, 2018.

142. Interview with author. March 14, 2018.

143. Interview with author. March 14, 2018.

144. Interview with author. March 14, 2018.

145. Interview with author. March 14, 2018.

146. "League of Innovative Schools." Digital Promise. http://digitalpromise.org/initiative/league-of-innovative-schools/

147. Interview with author. February 22, 2018.

148. Interview with author. February 22, 2018.

149. Interview with author. February 22, 2018.

150. Interview with author. February 22, 2018.

151. "Kettle Moraine Technology Services Department." Kettle Moraine School District. https://www.kmsd.edu/domain/264

152. Interview with author. March 14, 2018.

153. Interview with author. February 22, 2018.

154. Interview with author. March 14, 2018.

155. Interview with author. March 14, 2018.

156. "Kettle Moraine Technology Services Department." Kettle Moraine School District. https://www.kmsd.edu/domain/264

157. Interview with author. March 14, 2018.

158. Interview with author. March 14, 2018.

159. Interview with author. March 14, 2018.

160. Interview with author. March 14, 2018.

161. Interview with author. March 14, 2018.

162. "Measures of Academic Progress: A Comprehensive Guide to the MAP K – 12 Computer Adaptive Interim Assessment." Northwest Evaluation Association. https://www.nwea.org/content/uploads/2014/07/Comprehensive-Guide-to-MAP-K-12-Computer-Adaptive-Interim-Assessment

163. John F. Pane, Elizabeth D. Steiner, Matthew D. Baird, Laura S. Hamilton, and Joseph D. Pane, "Informing Progress: Insights on Personalized Learning Implementation and Effects." Santa Monica, CA: RAND Corporation, 2017. https://www.rand.org/pubs/research_reports/RR2042.html.

164. Pane et al. "Informing."

165. Pane et al. "Informing."

166. Interview with author. January 29, 2018.

167. "John F. Pane," RAND Corporation. https://www.rand.org/about/people/p/pane_john_f.html

168. John F. Pane. "What emerging research says about the promise of personalized learning," *Brookings*, August 15, 2017, https://www.brookings.edu/blog/brown-center-chalkboard/2017/08/15/what-emerging-research-says-about-the-promise-of-personalized-learning/

169. John F. Pane. "What emerging research says about the promise of personalized learning," *Brookings*, August 15, 2017, https://www.brookings.edu/blog/brown-center-chalkboard/2017/08/15/what-emerging-research-says-about-the-promise-of-personalized-learning/

170. Benjamin Herold. "Personalized Learning: Modest Gains, Big Challenges, RAND Study Finds," *Education Week*, July 11, 2017, http://blogs.edweek.org/edweek/DigitalEducation/2017/07/personalized_learning_research_implementation_RAND.html

171. "Kettle Moraine, Accountability Report Cards." Wisconsin Department of Public Instruction. https://apps2.dpi.wi.gov/reportcards/home

172. Alan J. Borsuk. "Wisconsin High Schools Learn from New PISA Test," *Education Next*, Fall 2015, http://educationnext.org/wisconsin-high-schools-learn-new-pisa-test/

173. Alan J. Borsuk. "Wisconsin High Schools Learn from New PISA Test," *Education Next*, Fall 2015, http://educationnext.org/wisconsin-high-schools-learn-new-pisa-test/

174. "Kettle Moraine School District, WI, Demographics." Census Reporter. https://censusreporter.org/profiles/97000US5503510-kettle-moraine-school-district-wi/

175. "Kettle Moraine School District, WI, Demographics." Census Reporter. https://censusreporter.org/profiles/97000US5503510-kettle-moraine-school-district-wi/

176. Brooklyn LAB Home Page. https://www.brooklynlaboratoryschool.org/

177. Elizabeth A. Harris. "$100 Million Awarded in Contest to Rethink U.S. High Schools," *The New York Times*, September 14, 2016, https://www.nytimes.com/2016/09/15/nyregion/100-million-awarded-in-contest-to-rethink-us-high-schools.html

178. Monica Disare. Without 'grit' or 'no excuses,' how one charter high school is preparing to send high-needs students to college," *Chalkbeat*, July 6, 2016, https://www.chalkbeat.org/posts/ny/2016/07/06/without-grit-or-no-excuses-how-one-charter-high-school-is-preparing-to-send-high-needs-students-to-college/

179. "Brooklyn LAB Charter School, Student Population and Characteristics." 2016-17 School Quality Guide – Online Edition. NYC Department of Education. https://tools.nycenet.edu/guide/2017/#dbn=84K803&report_type=EMS

180. Interview with author. March 12, 2018.

181. Interview with author. March 12, 2018.

182. Miami-Dade County Public Schools Home page. http://www.dadeschools.net/

183. Kyra Gurney. "White House recognizes Miami-Dade schools for innovation," *Miami Herald*, November 15, 2016, http://www.miamiherald.com/news/local/education/article114962073.html

184. Wyatt Kash. "Schools should focus on digital learning, not seat time, says Miami-Dade schools chief," *EdScoop*, April 4, 2017, https://edscoop.com//schools-should-focus-on-digital-learning-not-seat-time-says-miami-dade-schools-chief

185. "Miami-Dade's iPrep Math Classroom of the Future." Carnegie Learning. https://www.carnegielearning.com/why/customer-stories/miami-dades-iprep-math-classroom-of-the-future/

186. "Bringing learning into 21st Century through digital convergence at Miami Dade County Public Schools," K-12 Blueprint, August 18, 2015, https://www.youtube.com/watch?v=dg2EIUsOZsg&t=57s

187. Kyra Gurney. "Miami-Dade schools reached an all-time high of 80.4 percent during the 2016-2017 school year," *Miami Herald*, December 16, 2016, http://www.miamiherald.com/news/local/education/article121405438.html

188. Kyra Gurney. "Miami-Dade school grades mark a milestone: no F schools," *Miami Herald*, June 29, 2017, http://www.miamiherald.com/news/local/education/article158601459.html

189. "Devin Vodicka." The Center for Digital Education's Converge. http://www.centerdigitaled.com/supsgroup/Devin-Vodicka.html

190. Interview with author. February 12, 2018.

191. Interview with author. March 14, 2018.

192. Interview with author. March 30, 2018.

193. Jack Schneider. "America's Not-So-Broken Education System," *The Atlantic*, June 22, 2016, https://www.theatlantic.com/education/archive/2016/06/everything-in-american-education-is-broken/488189/

194. Jack Schneider. "America's Not-So-Broken Education System," *The Atlantic*, June 22, 2016, https://www.theatlantic.com/education/archive/2016/06/everything-in-american-education-is-broken/488189/