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Jasmine's Day: An AI Education Story

Rob Weil

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I t's Tuesday, Jasmine's phone alarm rings at 8:00 a.m. sharp.

As Jasmine prepares for school, in a corner of her bathroom mirror an abbreviated schedule of her school day is displayed. A flashing yellow warning appears on the mirror's display. Jasmine thinks she knows what that means. But it's a "real-school" day and she must be ready to go by 8:45.

Sixteen-year-old Jasmine walks up the main sidewalk to her high school a little after 9:15. Facial recognition software on the school's artificial intelligence (AI) computers recognizes her and quickly flashes, "Welcome Jasmine!" on the video board just outside the main entrance. Some of her friends show up before she does, others show up a little later; there is no set starting time at Jasmine's school. For continuity, class schedules and computer-based work operate on fifteen-minute intervals. Although the school's scheduling computers do not need the fifteen-minute intervals, students are more accepting of fifteen-minute intervals. Moreover, the school building has only a set number of classroom-based terminals that have interactive facial recognition capability, high-quality virtual reality (VR), and other limitations that make the fifteen-minute intervals necessary for efficient scheduling. Students can connect to the school's computers using their laptops while at school, and many do. But if students attend "real school," they are expected to be in class or in specific rooms set aside for online work and not wandering the halls.

For the school to transition to its many evening activities, Jasmine and all her classmates must complete all in-school work by 5:00 p.m. Regardless, students have access to the school's learning portal 24/7. Students can do their work anywhere, anytime, just not in the school's hallways. Like Jasmine, most of the students attend many of their classes in person so they can see their friends in "real life." But it is not uncommon for some of her peers to rarely attend "real school" during the year.

So much of life is online and orchestrated by AI, why would education be any different? Students who complete their education fully online receive the same diploma as those who attend in-person classes. The school's use of blockchain technology ensures that classes taken online are secure and have the same rigor as real-school classes. The reality these days is that learning is lifelong. The students all know that in today's world, once they leave formal education, throughout the rest of their lives they will need to constantly learn new skills to stay relevant and employable. Lifelong learning is the only way to remain competitive in an environment where knowledge and expertise are redefined every day.

Jasmine doesn't come to real school every day. Every so often, "school" is working in her community. The school's computers, matching available openings with students' personalized lesson plans, set up "mini-internships" where students work at businesses or nonprofits for a day or two, maybe even a week. These short internships provide students with hands-on opportunities to experience different settings and to get a more realistic view of their future. They are not random assignments. The carefully selected internships match the students' current schoolwork and learning goals with opportunities in the community. The work each student is asked to do during these mini-internships is directly related to a recently learned concept or skill.

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There is no formal schedule for mini-internships; they come up when a student reaches a predetermined level of proficiency on a specific task and there is a matched opening in the community.

These mini-internships are not required; students and their parents must opt in. Most do. Although the schools' computers help coordinate the logistics, some opportunities require the students or their parents to make open commitments. Because making such a commitment can be hard for some families, some question the equity of these mini-internships.

For Jasmine, however, today is a real-school day.

As Jasmine enters the front door, thermal scanners check her temperature and other scanners estimate her height, stride, and other biometric measures that instantly compare the results to her digital profile. As she continues, additional scanners and electronic sniffers analyze her and her backpack for banned items or substances. The health screening and security check are just part of the process students must complete as they enter real school. It is, of course, an invasion of privacy, but the level of safety it provides is readily accepted by the school community. You cannot attend real school if you don't accept these "minimum" safety checks.

Instantly, the school's AI-based computers adjust Jasmine's personalized learning plan and daily schedule. They know Jasmine, they know her strengths, they know her challenges. When it comes to today's lessons, the computers have already adjusted her schedule in response to yesterday's work and today's arrival time.

In a couple of seconds, a big yellow check starts flashing next to her name on the video board just inside the school's main door. Why is the check not green, indicating Jasmine is clear to make her way to homeroom? When Jasmine used one of the computer terminals just inside the front entrance, her prediction was correct. She received a yellow check rather than a green because the school's AI computer flagged a few of her posts on social media last night, and one in particular. The computer determined that this post could potentially be Jasmine doxing another student. Any potential online bullying or doxing automatically triggers a warning response from the school's computers. In this case, Jasmine used her considerable computer skills to create a deep fake of another student saying some things that, let's say, are not acceptable. Although most computers today can easily identify most deep fakes, if they are exceptionally good, they can still slip by the filters. And this one was exceptionally good. Jasmine was caught because she mentioned creating the deep fake in one of her chat rooms last night. The school's AI system found the deep fake and Jasmine's yellow check was ensured. She knows the school's AI surveillance programs constantly monitor all students' social media to head off any school-related issues. After she chatted about the post online, AI made the connection.

Those "questionable" posts, especially the deep fake, had to be discussed before she could start her day. Jasmine must stop by the main office for clearance. "What a hassle." Luckily, this was only her third warning for social media posts this semester; two more and the computer would flash a red check—suspension of all real-school activities until she and her parents attend a meeting with the school's administration.

Once she sits through "the speech" about online bullying and using social media "in ways that are in violation of the school's policies" (ironically, a recorded message viewed online) and electronically acknowledges she won't do it again, Jasmine receives her green check. An automatic message is sent to her parents saying Jasmine has arrived at school. The message indicates that the entrance screening detected "no abnormalities." But it included a computer-generated note explaining the concerns about her online "behavior," and this was her third warning for the semester.

Her parents are not the only ones alerted to Jasmine's arrival. An entire set of computers loaded with the school's curriculum, directed by the schools AI-based instructional system, move into action. They have a full day of online, live class, and individual work planned for Jasmine. As on every real-school day, the moment she receives her green check, today's schedule and lessons are sent to Jasmine's phone, her parents' email, and her homeroom coach.

An alert on her phone reminds Jasmine she must log on in her homeroom by 9:45.

As soon as she enters her homeroom, Mrs. Ricky, her homeroom coach, mentions the three yellow checks this semester. "You have to be careful, Jasmine; you don't want to be shut out of real school," she warns.

It's 9:44 and it's time to log on.

Once online, Jasmine sees a more detailed list of her personalized learning objectives for the day. It is a mixture of math, logic training, climate science, technical writing, advanced art analysis, beginning entrepreneurial thinking, and her favorite, computer programming. And as if she needed one more reminder, a warning banner about her online behavior is flashed across her homepage.

Although she has not fully completed a computer-generated survey that measures her interests and aptitude, the computers have enough data from her class work, measured interactions, and other sources to adjust each day's lessons. Drawing on Jasmine's previous work and the personality profile created by the AI software, the school's computers have updated today's learning goals and lessons.

Math lessons, which Jasmine completes in her homeroom, are statistics, digital geometry, applied trigonometry, and gamified nonlinear algebra rolled up into one daily online adventure. Using the mathematical skills she previously mastered, she navigates her way through a virtual city using a mixture of multidisciplinary concepts. Along the way Jasmine must stop, learn, and apply new math constructs that will help her complete her virtual journey. Every now and then, Jasmine meets another "traveler" and they discuss how they got to this point and where they are going next. These online conversations are benchmarking assessments that help the computer's adaptive learning programs design Jasmine's next adventure. Jasmine, and everyone else, knows the other travelers are computer-generated avatars and the questions are the computer's way of checking for understanding, but she thinks they are kind of fun. These little in-program social diversions help keep her going throughout the lesson.

One Jasmine arrives at virtual City Hall, today's goal, the math lesson is done. The computer tells her to log off and she has ten minutes to walk to Mr. Brown's entrepreneurial thinking class on the second floor.

As she leaves homeroom, she spots her friend Haley down the hall. She must tell Haley about last night's posts, the deep fake, and getting another yellow check. But Mr. Brown's classroom is in the other direction. Jasmine knows the school's computer-based surveillance system will send an alert to the main office if she goes down the wrong hallway, but some things cannot wait. As Jasmine and Haley talk, they each get another alert on their phone saying they have only a few minutes to make their next class and that administration has been alerted. The alert even sends them directions to their next class—as if they don't know.

These alerts are an everyday occurrence. Throughout the school a plethora of digital video cameras monitors hallways, common areas, and every classroom. The system collects vast amounts of data that is fed into the school's computers, where AI creates a digital assessment of interactions and student movement at the school. These assessments are combined with other metadata and used to measure staff effectiveness, to monitor student movement and contacts, to inform the school's personalized lesson plans, and to maintain a high level of on-campus security.

Jasmine makes it to Mr. Brown's room a few minutes late. Again, she logs on to the school's instructional system. It reminds her that she will lose her place in line if she is late again—she will have to schedule a session on Saturday, the only day the innovative entrepreneurial-thinking VR system will be available. The school has only a limited number of high-quality VR machines and headsets for entrepreneurial thinking and the schedule is tight. Some students have VR setups at home that allow them to access these lessons and others online, but these systems are never as good as the high-tech systems at real school. Most students don't have the money to continually update their home systems to the ever-changing technology requirements. Jasmine has some VR at home that works, but it does not have the same functionality as the school's top-of-the-line VR.

Today's lesson is on interbusiness collaboration and the theory of efficient partnerships.

To Jasmine, her entrepreneurial thinking class is boring. It involves participating in a bunch of phony virtual conversations and completing a bunch of silly tasks. She has no intention of starting her own business or "whatever?" She wants to attend an "in-person" college and explore her opportunities—she's not ready to commit to entrepreneurial work. Jasmine knows building an independent business may be necessary down the road.

For now, she is much more interested in medicine, whatever that will mean in a few years. Healthcare changes so fast these days. But she knows, regardless of the changes, studying medicine will require a lot of computer programming skill using the latest medical-based technology. That's where she wants to spend her time, not listening to an avatar businessman talking about mutual profit centers and the pros and cons of online product placement.

After only twenty minutes, Jasmine starts to lose interest. She looks at her phone, rolls her eyes, and tries to get the attention of another student. In less than a minute, Jasmine's terminal flashes, the eye-tracking camera built into the computer has detected she is wandering and not on task. And she knows what that means—Mr. Brown will be alerted that she is not engaged.

Here he comes, time for another "lecture" about the importance of entrepreneurship thinking in an economy fueled by casual work. "People today must pull together a career as an independent contractor to numerous businesses. Each day you must cobble work together," he says. Jasmine has heard it all before. But at least this time, the warning came from a real person and not on her phone or a yellow check on the wall.

It's almost noon, and Jasmine has a thirty-minute break. She doesn't have to be at her next class, logic, until 12:30. She won't miss that one. It's real students interacting with a real teacher. On her break, Jasmine uses her phone's medical scanning functions connected to her wearables to pull up healthy recommendations for lunch. The school provides a service that allows students to sync their health scans with its computers and to help them make smart choices for lunch. Jasmine's parents, concerned about data privacy, chose not to participate. Some parents want to know as much as they can about physical and emotional health of their kids during the school day. Jasmine's parents thinks that goes a little too far. And there have been issues with students' data finding its way to data brokers and online marketers.

It's half past noon and Ms. Sherman leads a discussion on the logical and ethical considerations of home-based cobots. Jasmine finds this class fun and pretty "deep." In addition, it is talking and laughing with real kids! The best part of her day at real school. No avatars, chatbots, virtual travelers in this class. It's all real, a rarity these days. Ms. Sherman uses something she calls the Socratic method. Jasmine is not sure what that means, but Ms. Sherman asks lots of questions, questions that make you stop and think. It's cool.

After class, Jasmine wonders, What if all classes still worked this way? How did they get through all the content and information? Those days are long gone. But, she thinks it would have been fun.

It's almost 1:45 and Jasmine's next class is computer programming. She "wants" this. She knows this is a critical part of her future—it's an essential part of everyone's future. It's the new core curriculum. Mastering computer languages like Python—her favorite—LISP, the old JavaScript, and "CAPEK," a new language that is being used in robots and other AI-driven machines, will open lots of doors. Like her first two classes, programming is mostly computer-based and adaptive. The classroom "coach" is a nice guy, but he not an expert in Python or even LISP. He is an old "C++ guy."

Jasmine writes draft code, and the computer measures the quality of her submissions using advanced analytics. It scores her on how quickly she completed that task, the efficiency of the code, and few other things Jasmine does not really understand. All she knows is that she likes computer programming. Before she knows it, her time on the programming terminal at school is up. She will have to log on later tonight to do more—one task has her confused, and she will have to learn how make her code work using her after-hours access. This extra, after-hours work is common. They used to call it homework, but today there is very little difference between schoolwork and homework.

Jasmine notices that her technical writing class has been cancelled and the school's scheduling computer moved her to art analysis at 3:00. Time to go. She thinks to herself, "The computer just shifted my schedule and I bet I know why." She would learn later that she was right.

Her fine arts class, art analysis, is designed to build and explore Jasmine's creativity. It's a hybrid class that is part computer-based and part hands-on classwork. The computer shows Jasmine a series of artwork and asks her to develop a working theory on the differences and similarities. She is then asked to present her theory to the other students in her class—face-to-face. She knows some of the students in the class from her other "real classes," but others are new, and like her, were directed to art analysis "off schedule" at 3:00. It's a little weird talking about her thoughts to other real students. It is not easy for Jasmine. She likes talking online but talking face-to-face is frightening. She doesn't want to say something that will go "all cosmic" on social media after school.

Even though technical writing class was cancelled, Jasmine has work to do. Just like the end of snow days long ago, a cancelled class means that the work is completed online at home. The school's computers tell her she must submit her technical writing homework before midnight. The school's computers will review and grade her work before school starts tomorrow. She will get a report and an AI-corrected response before she arrives at school tomorrow.

After a short break, it's time for climate science. This class is PBL, or project-based learning. In this class students select a task and create a solution to a problem related to climate change. It's a popular class because private businesses have donated a tremendous amount of sophisticated equipment and superfast computers to the class, including the latest VR equipment and modeling software. All the businesses ask in return is access to the students' work. Students' names and all personal information is protected, but the students' classwork is stored on one of the company's computers.

Climate science is the only one of Jasmine's regular classes that has full-time cobots. These little robots, which look a little like fire hydrants on wheels, run around the class and help students work on their projects. Jasmine can just click the "Call a Cobot" button on her screen and one of the cobots will make its way to her station. Because the cobot is connected to the school's

computers and can see Jasmine's computer screen and knows the project she is working on, it helps by suggesting a few ideas to consider. It's a little weird partnering with a hydrant, but the cobots helped her on her last project. She and the other students are comfortable working with cobots; they are common at home and almost everywhere else. The good ones are not cheap, but they can do a lot of things and are essential to most businesses.

Jasmine is asked to select another climate-based challenge from a bank of options listed on the computer. Her last task, minimizing plastics in food packaging, received a high score from the computer and one of the private partners. She heard the businesses looked at her work for possible future development, but that was just a rumor.

Mr. Smithwick, her climate teacher, has asked Jasmine to consider one of the more difficult tasks. He says the computer recommended her for the task because she has strong computer skills and shows emerging creativity. Of course, her programming skills will prove useful, but her commitment to entrepreneurial work was flagged as a concern. She reluctantly says yes. But she knows it will require more time and effort than her last task. Nevertheless, she opens the task's problem statement and starts to learn the scope, parameters, timeline, and measures of success for the task. It's going to be a bear. And she is going to make friends with more cobots.

It's almost 5:00 p.m. and Jasmine's time at school is over. But learning is not. As she collects her things, she receives a message that summarizes her work for the day. The school computer tells Jasmine she did a good job today, especially in her computer programming class. The computer also tells Jasmine she has fifteen minutes to exit the school and reminds her to be extra careful on social media tonight (she knows why). As she walks out the front door, "Good Job Jasmine!" flashes on the video board. And she knows what that means. Her parents will instantly get the report.

As soon as she walks out the school door, the school's AI-based computers send a comprehensive summary of Jasmine's school day to her parents, including a "productivity score." The report includes, if her parents choose to select them, a class-by-class summary. And an optional part of the report that Jasmine hates is the "interaction tracking summary"—a rundown of the other students Jasmine interacted with during the day. Parents don't have to sign up for it, but hers did. Her mom and dad want to know whom she is hanging around with when she is at school. The summary includes optional video clips for some of the interactions. It has been an ongoing point of disagreement with her parents since the first day of school.

Luckily, Jasmine does not have after-school work today. Three times a week and almost every Saturday, Jasmine works at her neighborhood grocery store. She helps stock shelves and fill online orders. The store was thinking about using robots to do some of this work, but robots are expensive; it is much cheaper to pay the local students a few bucks to do the work. So much for every job being automated.

When Jasmine gets home, her school's learning software app uses her phone's location services to send an alert reminding her that she has until midnight to submit her work for tech writing. She rolls her eyes and whispers to herself, "I know!" She will do it, but first Jasmine is going to work on that computer programming assignment she was working on when time ran out. She quickly grabs something to eat and logs on to the school's after-hours portal and navigates to her computer programming class, opens it up, and starts to rework some of her code.

As she starts to log off, she gets another message reminding her about her tech writing homework, "Are you sure you want to leave the After-hours Portal? Do you want me to open your homework in technical writing?" She clicks on "No." She's done—for now.

She picks up her phone and starts what could almost be called a daily ritual—scrolling through her favorite of the social media sites. She follows only about eight sites every day; some of her friends follow many more. Jasmine also has an app that brings the posts from multiple social media sites into one place. But every week or so, she must change the settings—lots of new sites all the time.

It's almost 11:30. Jasmine has spent the past four hours chatting online, reading, and posting on social media, making plans for the weekend, and watching some of her favorite programs. She knows she will be unable to complete her tech writing assignment, and she will receive a yellow check when she walks into school tomorrow, but she is not going to waste her life on some "stupid" busy work.

She has only a couple of hours before she goes to bed. She knows some of her closest friends don't join the online conversations until well after midnight. First things first, and this is the only time they really get a chance to talk.

It's Wednesday, Jasmine's phone alarm rings at 8:00 a.m. sharp.

Reflections on "Jasmine's Day"

The first concept described in "Jasmine's Day" is the seamless connection between Jasmine's home life and school. Before school and after school are just extensions of the same "school day." The lines become so blurred the concept of a school day is lost. This ability to always be connected is one of technology's most valuable assets and at the same time an individual's biggest challenge. Technology and AI overcome place and time and make what was once personal time no longer personal. Jasmine may turn off her phone, but to technology that action is just another data point.

The fifteen-minute intervals are not for the school's computers; they can schedule and reschedule to the second. The intervals are necessary for the students and for the school's resources. Now and in the future, interactions between humans and computers will always be based on compromise. The limitations of humans and the limitations of technology are not aligned, and this misalignment will be as much a part of the future as it is today.

The description of Jasmine's arrival at school undoubtedly raises the question of privacy. Facial recognition, scanners, and sophisticated AI-computers are seemingly everywhere. The amount of data collected on Jasmine as she arrives at school and throughout the day is the price society is willing to pay for security and safe human interaction. The possibility that society is going to aggressively limit its security because of privacy concerns is unlikely and it's not what we see today. Most people have very little idea how much data is collected when they simply take their phone with them on a trip to the store, let alone when they call someone. The ability to collect personal data inconspicuously—that is one of technology's most powerful characteristics. Technology will continue to create more discreet data-mining capacity every day. To believe there will be clear limits to the amount of personal data will be collected in the future is to not understand the awesome power that technology can and will develop. The efforts to limit AI's ability to develop and process massive amounts of data is more likely to be limited by the computers' capacity than by any set of laws or regulations. The collection and processing of personal information is very profitable, and the focus will remain on "Can we?" as opposed to "Should we?"

Beyond simple data collection, AI and leaps in quantum computing will take data matching to a new level. Data brokering will become even larger and more profitable in the technology sector. Regulations meant to keep personal data safe will be no match for the power to create huge profiles of individuals using available data and the power of AI computing to match and create

additional data points. It is said that before a child is born, a data file is created. Day by day, all through their lives, children will be part of the data brokers' world. And by the time they are sixteen years old, like Jasmine, their file is huge and covers all aspects of their lives.

The yellow check that Jasmine must deal with as she walks into school shows how computer-based instructional practice and supervision-based technology are inherently linked. Monitoring her social media presence may seem excessive, but the connection between Jasmine's school work and her social media posts are necessary because so much of her school life and personal life have merged. The transition to online computer learning, in school and out of school, makes a student's entire online presence part of the education process. The blurring of lines of the school day are not limited to time. Productive education requires that all Jasmine's online interactions conform to standards that protect the online environment, even when the exchanges are meant to be personal. For example, the online bullying and endless doxing that is common today will be addressed by powerful technology-based monitors that automatically flag and address potential problems. The scope of this surveillance will have few limits.

One of the most promising developments in "Jasmine's Day" is the concept of mini-internships. These internships are possible only because AI-based algorithms can sort through huge amounts of data and make instant matches based on real-time data. They are an important step in the process of merging education with "real world," productive work. The days of students asking the question, "When am I ever going to use this?" will be replaced with, "What else do I need to learn to do this?" Making learning more directly connected to a student's needs and aspirations is a benefit of AI in education. It shows the unmatched power of personalized learning.

Like so many other aspects of technology and AI in education, the pros are often connected to the cons. The equal access to these community learning experiences, though unparalleled in value, will likely lead to more inequity in education. Opportunities found in one community may not be found in another. The best hope is that many of these opportunities are available online, making them accessible beyond community borders.

As Jasmine enters homeroom for math class, for the first time, one of the most consequential impacts of AI on education becomes clear. There is no math teacher, just a homeroom coach to help her through her online class. Her homeroom coach is not a teacher as we see them today but someone to help make sure Jasmine's class goes well. He helps facilitate Jasmine's and the other students' learning. The future of education is filled with examples where AI and other technologies have replaced many aspects of education. Static academic standards have been replaced by an ever-changing electronic curriculum that is updated almost daily. And the role of teacher in many situations as the primary source of instruction has shifted to a more supportive role, especially in those academic areas where there is less subjectivity. Jasmine's math class is a good example— most of the instruction is provided by AI using constantly changing instructional strategies that are refined every time Jasmine logs in.

The gamified math curriculum reflects the scenario-based education that will be standard for most education in the future. AI and its ability to instantly adapt to the student's interactions, academically and physically, helps adjust the pace of the learning program in real time. If Jasmine shows she is mastering the content, the program moves faster; if she shows less understanding, the program offers several other instructional approaches and slows down to makes sure she is ready for the next concept.

Mr. Brown's entrepreneurial thinking class shows that, though reading, writing, and arithmetic still have a place in the future, schools must provide content that is more thought-provoking and less computational. Classes that reflect the new tech-based world have become the

new core curriculum. Although math and language arts are still on students' schedules, other core subjects such as science have significantly changed. And, unfortunately, some subjects are only found infused into other parts of the curriculum or not at all. We see this phenomenon today in schools as testing has narrowed the curriculum in some schools in the pursuit of test scores. The redefining of core learning is another aspect of technology-based education that needs to be transparent. For many and for very sound reasons, this is one of the most problematic aspects of this new age of education.

Whether Jasmine enjoys the class or not, it shows that schools will become more focused on the skills need for success. In this case, schools will provide more personalized learning, just as work in the future will be much more independent. To have secure fulltime employment, employees need to work on numerous projects for different employers at the same time. Just as the school's computers can organize lessons for each individual student, workplace computers will organize workflow and bring the work of independent individuals together into a completed task. Each person's potential contribution will be determined by AI and contracts will be awarded to the lowest bidder who the computer's algorithm determines has the necessary skills and work ethic to complete the job on time. Entrepreneurialism will become an essential part of the core curriculum.

An interesting part of the class is the heavy use of VR. The use of VR in the future in all aspects of life will be commonplace. Having Jasmine learn the concepts of entrepreneurial thinking through VR prepares her for the interactions she will have online with her future co-workers, many who may not be human. A considerable number of tomorrow's workplaces will be virtual environments created to recreate a real office or conference room. Moreover, like the avatars in the math program, many of Jasmine's future colleagues will not be human.

The monitoring of Jasmine's engagement by the computer's facial recognition cameras and the measuring of the pace of her keystrokes are more than classroom management. These data are captured and used to refine Jasmine's learning profile. Today's lack of enthusiasm for entrepreneurial thinking is used to adjust her personalized learning plan. Tomorrow's lessons will be slightly different because she was off task today. Whether she enjoys entrepreneurial thinking or not is important to the school's computers. The computer's AI will ensure she masters all the content before she moves up to the next level of entrepreneurialism.

Like the mini-internships, the access to high-quality VR equipment and to many other tech-based opportunities will create a framework for educational inequity. The shift to a more AI-based education is not necessarily a step to reduce inequity in education. Unless there is a major shift in the way educational technology is designed and implemented, that inequity in education will very likely grow significantly in the future. Even more than we see today, students with more advanced equipment at home will have a distinct advantage over their peers who cannot afford expensive technology. The belief that technology will provide equal access to education in the future ignores the fact the future of education goes well beyond the computer screen. The more you merge education with the outside world, the more inequity will come to education.

Again, at lunchtime we see the depth to which technology is part of everyday life at school. The amount of information that is available to students if they and their parents share information with the school's computers is well beyond traditional education. Even when permission is not granted, the vast power of data matching and machine learning make anonymity almost impossible. All the cameras and object-recognition software combined with powerful AI computing ensures Jasmine little if any privacy at school.

Jasmine's 12:30 class shows that the importance of human interaction and social emotional growth are not lost in the future. Although these classes allow students to openly interact with each other, they are designed to overcome what is seen as a critical flaw in technology-based education—the development of a sense of community and shared understandings. The lack of technology in the class is not an oversight. This part of Jasmine's school day is designed to ensure that she has meaningful contact with other students. The topic, logic and ethics, could be taught by an AI teacher online, but the purpose of not doing so is to develop more than an understanding of ethical behavior, that is, the important skills of compassion, compromise, and collaboration. Teaching skills by a computer using digital friends, avatars, or cobots seems hypocritical.

Like entrepreneurial thinking, computer programming is a new core subject. All jobs will require at least basic understanding of how computer coding works. But like so many other subjects in Jasmine's school, it involves a continuum. Some students will learn enough to get by and use AI-led computer programs that internally write computer code when given parameters by the user. Others will challenge themselves by digging deeper into AI-decision algorithms and working to make them more efficient and effective. Regardless, computer programming will become one of the new core subjects, if not the core subject. Very little in the future will not be controlled by the language of computers and the only way to be a part of that future is to become conversant in that language.

One of the things that makes Jasmine's computer programing class interesting is how small a role the human teacher plays. As in her math class at the start of the day, the assignments, instruction, and assessment of her work is done by AI. This use of AI demonstrates the level of independent work that will be required from students in the future. When the computer determines the curriculum, selects instructional methods, and provides formative assessment, schools have essentially swapped algorithms for the decisions traditionally made by teachers. The impact of this shift has serious consequences for the future.

The cancellation of Jasmine's technical writing class is an example of how AI-driven education shifts to meet the needs of students. Replacing her writing class with art analysis on a moment's notice demonstrates the power of AI in education. Rather than having her spend an hour working online during the school day on a writing task, the computer has instantly rescheduled her into another class that fits her education goals. Far from a fixed day-to-day schedule, high school student schedules are modified to leverage the best opportunities every day. Class changes, mini-internships, and countless other opportunities are continually reviewed to provide the best personalized education plan. This is the power of AI in education on full display.

In art analysis Jasmine is again asked to share her thoughts with her peers. The inclusion in her education plan of several daily interactions with other real students shows the importance of face-to-face communication, compromise, and collaboration. Although so much can be done online, these "soft" skills are more important than ever before and are emphasized throughout the year. When technology limits students' social interactions at school, these skills must be actively developed inside and outside school. The most successful individuals will have the technology skills employers require and the soft skills they need.

Not surprisingly, the cancelled technical writing class assignment is shifted to homework. Although Jasmine usually works on her writing assignment at school in one of the many rooms set aside for independent work, moving it to homework is not a big deal. And the school's AI learning computer knew it. That's why it rescheduled Jasmine into art analysis. The AI algorithm decided that Jasmine's learning goals, especially her social skills, would be better served by her attending art analysis than by her logging on and doing an independent writing assignment that can be done

after school. The computer also knew Jasmine had a little extra time, since she did not have to work after school—perfect fit.

Jasmine's climate science class shows that three core subjects still exist—math, language arts, and science—yet they have adapted to the current needs of society. The sense of urgency of climate issues has focused much of science education on the understanding and solving of this existential threat. The scale of resources that Jasmine's climate science class has compared with her other subjects shows society's commitment to this issue. The partnership with private business, the cobots, the latest VR equipment and software, the best computers all indicate the importance of this subject. And that commitment is not lost on the students. Like Jasmine, they understand this is where the future is going and were they need to focus much of their effort.

But all those resources come at a cost. The partnership allows private business to access the students' work. Is this a commitment to Jasmine's education or a commitment to gather ideas and data that will help organizations increase their bottom line? The sense that Jasmine's teacher helped steer her toward a project selected by the computer helps answer the question. The computer, or more accurately the people who programmed it, clearly want the stronger students to tackle the toughest challenges. To think these challenges are not set in partnership with the school's expert partners is naïve.

More than any other class, climate science shows that education will shift because of technology. And in more ways than most people think. The shift in education due to the technology revolution will also usher in an age of education that moves more toward the will of private business and away from the needs of society. The new privatization of schools is less overt, but its impact will have significant consequences for the decades to come.

At the end of the day, as would be expected in the age of constant communication, Jasmine receives her end-of-the-day summary and reminders of the work she has left still to do. The productivity score and the automatic communication with her parents are part of everyday life. The review of all of Jasmine's interactions is just another example of the endless collection and analysis of data that is an accepted part of the new age of security and safety. The invasion of privacy is a constant. And even if Jasmine's parents choose not to see the interactions activity report, the data still is collected, stored, and used by the school's and others' computers.

The unending communication between school and Jasmine's phone is yet another example of the blurred lines between home and school. These alerts and warnings are not new technology, but the expansion of their use and AI's ability to capture data on Jasmine's home devices demonstrate that the expansion of educational technology is limitless.

What is not described in "Jasmine's Day" is as important as what is. The lack of foreign language, social studies, and other electives such as music have become a casualty of time and technology. While some of the content from these subjects, especially social studies, is infused into other subjects, the decision to lessen their role was made necessary by the ascension of more technology-heavy content into the core curriculum. Some subjects are still available and are being provided by a thriving private sector of education enrichment. The rise of computer programming and entrepreneurial studies as core subjects has squeezed these subjects out of the schools. The same is true of extra-curricular activities. Sports, band, and other student clubs have moved to the private sector. Just as the way schools operate has changed, so has what schools do and who is in charge. Because of the continually increasing focus on tech-driven academics in formal school, many of the more social and emotional aspects of students' development have moved beyond the school. The transition to educational technology is not as simple as bringing computers to the

classroom; it means recasting the role of schools in society and the role of society in children's well-being.

Another aspect of school not mentioned in "Jasmine's Day" is social services. This omission is not meant to imply these services no longer exist. They do. But the computer's AI programming makes many of the decisions regarding these services. As students do their work online, the computer monitors the physical and mental health of the students. If "red flags" appear, social services and the student's parents are notified in real time. If the parents approve, the school's computers immediately match students to service providers. This early warning approach is seen as a step forward in the effort to prevent bigger issues from developing if the warning signs are not addressed. Again, the role of human staff has changed. But a real challenge remains: lots of children need support, and there are too few resources.

Although Jasmine is not a special needs student, many others in her school are, and her school's AI-based technology easily develops the personalized lesson plans and the adaptive learning environments that meet the needs of most students. Special education is as much a part of the school's learning computers as regular education. Similarly, gifted education is just the school's computer adjusting and adapting to the students as they do their work. Students who excel have daily learning plans that push them to higher levels of achievement.

The lack of standardized and college board testing is not an oversight. With all the data that is being collected every day, these assessments are no longer needed. The system is able to run a report of all students' current achievement levels on many different subjects and to complete it in seconds. There is no need for test-prep days or endless class time lost to testing. Deeper, more authentic assessment is a fundamental part of personalized learning. The connection between learning and assessment has finally been institutionalized.

The days of paperwork and filling out progress reports are gone. What today's educators say is one of the most difficult parts of their job, the endless paperwork, is no longer an issue. Achievement reports, report cards, and other required reports are automatically generated by the school's AI computers. Parents and school administrators can receive daily updates on progress. The number of reports a school's computers can generate is virtually endless.

The shift we see in staffing throughout "Jasmine's Day" shows what technology and AI will bring to schools. Simply put, not only do you need fewer teachers and support staff but the people who are in the schools are not all actively teaching or supporting students. The role of teacher that we see in Jasmine's ethics class still exist, but many educators' roles have developed into coaching or facilitating learning. And some classes, such as Jasmine's math and writing classes, both core subjects, have minimal educator involvement.

The reduction in the number of teachers and support staff does not mean school budgets are decreased; it means resources that were once dedicated to salary are now dedicated to technology. Moving to a heavily technology-based education system is not a cost saver, it is a cost shifter. Reductions in staffing will not offset the high cost of continually updating software, buying new, more powerful computers, and ensuring that schools have the latest VR equipment and the best AI. The spiraling costs of technology slowly force an even greater reduction of school staff. But as we see in "Jasmine's Day," schools still need adults in classrooms with students. They may not play the same role as before, but they are still an important part of school's success. Moreover, the schools will need to hire an entire team of highly skilled computer specialists to keep the system safe, working, and up-to-date. Those who believe infusing technology into schools will save money are not thinking long term. It is simply a gradual shift of money from people to technology and it must be thoroughly understood.

The high cost of technology, combined with the inherent biases that plague AI computing, make the claims that technology-based education will bring more equity to schools, at best, hopeful. Many of the main drivers of inequity in schools will continue to exist after schools adopt more technology. Wealthy schools will continue to have more resources than schools that serve more vulnerable students. The racial and economic barriers that drive inequity today will manifest themselves in the new technology. Most likely, the standard of "good enough" will become a substitute for equity in schools. Schools in underserved communities will have older, less capable computers and equipment. They will be told it is "good enough" to educate their students. Jasmine's school has advanced technology, but at what cost?

Another important point "Jasmine's Day" raises is the dependency that is created when schools move to technology-based education. The power that private-sector companies will have over the schools, teachers, parents, and students will be enormous. The entire school system will be at the mercy of a private, for-profit organization. The profit motivations of that organization will play an outsized role in educational decisions. Schools will not be able to reject cost increases or the need to purchase more costly, updated technology. The system will be dependent on the will of their technology partners. This fact alone should cause everyone to reflect on the future of technology-based education.

The last part of "Jasmine's Day" shows that regardless of the technology, people are people. In this case, teenagers will be teenagers. The need to communicate with friends at all hours of the day and night is not going to change. The assumption that all this new technology will fundamentally change who we are and what we do gives humans too little credit. We will use different tools, we may change the way we interact, and technology may make a lot of decisions, but in the end human nature will always prevail.

Discussion

"Jasmine's Day" is a work of fiction. It is an estimation of the impact that powerful data gathering, data matching, and AI will have on education in the future. More important, it is a prediction of the effect advanced technology will have on people, young and old, in the coming decades. And in turn, the effect on society.

All the technology described in "Jasmine's Day" is available today. It may not be used in schools or applied in the way described in this fictional account of education's future but reaching that future will require only that currently available technology become more readily available and repurposed for education. In a sense, "Jasmine's Day" is less fiction and more adaptation.

Some may want to challenge the assumptions described in "Jasmine's Day," raising technical arguments that may prove to be valid. But the fact remains not only that AI, advanced computing, and increased surveillance are the future of learning but they are everyone's future. For this discussion of the future of education, debating the capabilities of technology is a waste of time. The only debate worth having is how to ensure that the infusion of technology is done in a way that is best for students, teachers, communities, and society as a whole. That debate has not yet started in earnest.

The question of who is at the debate on the role of technology in education is important. To ensure that the decisions generated by that debate favor the whole community, it must include the whole community: parents and students, educators and their representatives, elected officials, and other stakeholders. Allowing unchecked power to shape the future has never worked well.

Any discussion of the effects of AI on education must take into account the power and the danger of personalization and the effect of shifting a public-led institution to the private sector.

Undoubtedly, AI has the power to personalize learning. The ability to adjust lessons for each individual student in real time is clearly a breakthrough for education. Students can work at their own pace and have lessons that are matched to their skills and aspirations. With AI-based learning, every student's class size is one. But with this awesome power comes a warning.

If there are fewer classes with students interacting and helping each other, what happens to the part of education that creates the backbone of democracy—working together? Allowing students to work alone on their personal goals is not an effective way to instill a sense of the collective good. It threatens the cornerstone that makes democracy work—compromise. If you no longer have a need for compromise to achieve your goals, your role in society has changed. The world becomes less interdependent and self-achievement replaces cooperation. Personalization is powerful and important but allowing it to supplant the need for the collective good is a real danger.

That danger extends also to the individual student's well-being. With many human interactions replaced by technology, even technology that imitates humans, the quality and depth of the social and emotional growth of students will suffer. And in a future world where social skills will be at a premium, this shift will take an unfortunate toll. As we have seen during the recent pandemic, a reduction in social interaction can have a devastating and lasting effect on many students. Shifting to more AI in education will create a large challenge when it comes to students' social and emotional health.

The second challenge in shifting to AI and advanced technology in education is the requirement that schools hand over what was once part of the public good to the manufacturers of technology. In a real sense, school systems will lose their independence and become dependent on organizations that will leverage the data for advantage and profit. Advanced technology not only requires that workers constantly update their skills but creates a high level of dependency on the private sector that makes traditional public institutions subsidiaries of their technology providers. This new level of dependency is an important concern. The responsibility for education that was granted to the public and its elected leaders will shift to a few private companies that have a completely different set of priorities and goals.

The use of technology in schools received an unscheduled boost when the COVID-19 pandemic spread around the world. Most schools experienced a seismic shift in their reliance on technology. And though most educational experts believe online learning during the pandemic was a disaster for most students, the shift foretold a revolution that is only a few years away. The future of education, like that of so many other sectors, is synonymous with the future of technology and AI.

It's important to note that most educational technology developers saw the use of technology during the pandemic somewhat differently than the general public, even differently than most educators. They saw an opportunity that would never have been possible without a global pandemic.

First, what educational experts label a disaster for students, educational technology developers see as a first attempt at transitioning to a more tech-based system. Revolutions are never neat, clean, or easy. They are long journeys of failed initial efforts that, with each subsequent attempt, provide more data for further efforts. The lack of success in meeting the needs of students has helped to inform the developers' work and to answer questions in a way that may not have been possible without the pandemic. In short, educational technology did not hope for a pandemic, but the pandemic did help them recalibrate and focus their efforts.

Second, most of the online learning during the pandemic was basic video communications. Whether classes were held using Zoom, Google Meet, or Microsoft Teams, most of it was not

computer-based or AI-led instruction. In a real sense, what failed was the effort schools made to reproduce in-person classes over the Internet. Re-creation of the traditional classroom is not the vision of most educational technology developers. They believe the future of learning is not classrooms full of twenty-five students but individual students using technology to target instruction to their specific needs. They know AI will improve education by personalizing learning, increasing flexibility, and adapting every lesson instantly as the student interacts with the computer. The future of education is not a bunch of boxes on the screen, it is a unique relationship between the student and AI-enabled technology.

Educational technology developers, and many others, believe the current system is unable to adapt to rapidly changing educational demands. For example, classes scheduled into eighteen-week semesters and curricula designed years in advance are relics of a system incapable of meeting the learning needs of the future. The future of learning requires a system that is personalized but also has the capacity to rapidly change what is taught, how it is taught, and when it is taught. Though today's teachers do their best to adjust their lessons to meet their students' needs, it is impossible for them to make all these adjustments every day, every minute of the day.

Finally, the inability of schools to organize effective online classes, to create robust, diverse, and personalized learning opportunities, to adequately address chronic inequity, and to employ the necessary number of teachers and staff to meet the needs of all students are the precise issues educational technology using AI is designed to solve. The problems that have plagued schools for decades, and still do today, provide the leverage educational technology needs to catapult education into a new age of learning based on individual needs and limitless flexibility.

The discussion is no longer about whether technology should play a role in education. It is not even about whether AI should have some decision-making power in education. Almost overnight, it has moved to how large a role should educational technology play and how can we limit the decision-making power computers will have in the lives of learners, young and old? These questions and who gets to answer them will determine how students are educated for the next fifty years.

Understandings

1. The core premise of technology and AI is that they are tools to replace human labor and decision making. In schools, they replace some of the labor and decision making of administrators, teachers, and support staff. We are not going back, and we must accept technology and AI as powerful forces that will shape the future. Educators and their unions must aggressively engage with the developers of educational technology and AI—it is not a choice. Replacing some labor and decision making may not necessarily be a bad thing, but it must be done in partnership with teachers, school staff, and their representatives. The key will be who or what makes which decisions.

2. AI is addictive and its capacity for unchecked expansion and influence over people's lives is substantial and often not readily apparent. It should be subject to laws, regulations, and educational policies that are regularly updated as technology advances. This will be a huge challenge. Innovation in technology happens fast, laws and polices change slowly. Unless a new more expedient way to regulate technology is developed, the ability of society to monitor and control technology will fall woefully short. The rules must be fair and must balance the rights of students, teachers, and the school community with the remarkable power of these emerging technologies. Unless the necessary guardrails are developed,

negotiated, and enforced by all stakeholders, technology and AI will have a detrimental effect on education and large parts of society.

3. Sometimes lost in discussions related to advanced technology and, most important, AI is developed and programmed by humans. Technology and AI are not ordained or predetermined. They are the products of human effort. Often, they mirror the imperfections and tolerance for error of their creators. Schools, teachers, parents, and students should never blindly accept any decision made by technology. Moreover, how AI makes educational decisions must be transparent and subject to human guidance and oversight. Proprietary protections must never supersede the quest for high quality, equity, and basic human rights in education or any other part of society.

4. The desire to innovate in education is important and should be encouraged. But innovation must not be the goal of education or of educational technology. The fact that something can be taught a new way does not mean it should be taught that way. The question whether to develop a new way of using advanced technology and AI must never end with "Can we?" More important questions that require a broader set of answers and diverse set of stakeholders involved must start with the question "Should we?" Innovation is helpful only if it moves education forward for all in ways that ensure dignity, equality, and increased opportunity.

5. The best time to engage with educational technology is before it is developed. The first question that must be asked is the Tom Kochan question, "What problem are we trying to solve and is technology or AI the best, safest, and the only way to solve it?" We should never use technology or AI to solve problems that do not need or should not use technology or AI to solve them. There is no shortage of challenges in education where technology and AI should be applied. Schools should be exceedingly reluctant to use technology to supplant educators or educator judgment with technology and AI.

6. Before any hardware or software is on the table, tech developers, practicing classroom teachers and their representatives, and school officials should work together to design what the new system should and can do. In addition, students and their parents should be ongoing participants in the development process. The best way to use advanced technology to solve education's most difficult problems is to ensure that the end users play a significant role in the development process. All stakeholders, including teachers, students, parents, unions, school leaders, and the community, should be clear on the required inputs, desired outputs, limitations, and potential abuses of the new technologies.

7. As technology and AI are implemented in schools, the most important implementers must be the students, teachers, and school staff. At every step of the process, the end users should help determine the next steps. And one of those steps may be to end the use of technology for some aspects of education. Engaging students and teachers may take a little more time, but it is the best way for the final product to be productive, well received, and widely used in schools and the best way to avoid many of the failures and negative consequences that have plagued educational technology for years. Educational technology developers who engage with students and teachers today will be the most successful educational technology developers tomorrow.

8. The use of technology and AI does not always lead to an increase in quality and student performance. Although technology has an unlimited capacity for quantity, that power can lead to compromise in quality and a mindset that can be characterized as "good enough." Too often the desire for efficiency and expedience in education leads to the acceptance of

technology that is just "good enough." This willingness to provide a lower-quality educational experience using technology leads to inequity. Decisions made that involve compromise must be transparent, fully defined, and reviewed by educators and other stakeholders whenever technology and AI are involved.

9. Technology and AI create a paradox for teachers and other school staff. Although technology and AI are labor-replacing tools, they also require an increased effort by those who use them. The need for continual learning and upskilling for teachers and staff who use the ever-changing technology and AI will only grow as they become a larger part of education. Continual education has always been a requirement for teachers and staff. But now we are seeing an acceleration of continual learning that will be hard for teachers and school staff to keep up with. Soon, keeping up may not be possible.

10. Technology and AI cannot replace teachers. But many of the problems schools are facing today are partially solved by technology. The shortage of teachers, the shortage of teachers in specific content areas, and issues of equal access are some of the problems that AI can help to solve, but never at the expense of school workers. If educators and their unions are included in decision making, the solutions to many of the toughest problems in education can be answered without creating a win-lose situation. Educational technology may help solve several of these problems, but real people working in the schools must never be seen as a problem.

11. The transition to education that relies too much on technology and AI will leave a large hole is what some call "soft skills." The development of the ability to work with others, to compromise, and to collaborate effectively should not be neglected in the name of personalization or flexibility. These are the skills that will propel students to higher success. Too many people undervalue these essential skills, but they are the skills employers say are most important for the success of their businesses. Soft skills are extremely hard to quantify and measure well. That makes them difficult for technology to effectively teach and replicate. Although the use of more and more technology in education will cause a seismic shift, failure to ensure that there are strong soft-skills programs for all students will ensure the failure of their education.

12. It is a fallacy to think people will maintain their privacy while advanced technologies and AI influence grows in schools and society. The lack of privacy and the growth of technology and AI in education are inherently linked. Passing new laws or regulations in an effort to ensure privacy will, at best, only limit some of the privacy concerns. Educators, parents, students, and everyone else should assume that technology and AI will have unfettered access to all data. Moreover, the power of these tools to match data and create additional personal data without the knowledge or consent of the individual is unlimited. Most people will never know the scope of what technology has gathered and AI has determined or created regarding their lives. This is the reality of an AI world.

Closing

"Jasmine's Day" is fiction. It is meant to be controversial. But at best, it will light a fire and start the conversation on the role technology will and should play in education. That conversation should have started more than a decade ago. All stakeholders must be at the table and must understand what is at risk for them, schools, students, and society. This is not hyperbole. It is a necessary first step if we are going to see the power of technology and AI add to society and not determine it.

Schools will become more focused on preparing students not simply for their future but for their working future. The industrial modeling that permeates today's schools will give way to an individualized model that prepares children for the world of work and lifelong learning just to stay employable. In a real sense, the failures of today's system will be replaced with a new set of challenges focused on individual relevance. Moreover, the new system has the potential to create even greater educational inequality than we see today—an outcome that must be avoided at all costs.

Like so many things in education, the role for technology and especially for AI will not be easy to articulate. The infusion of technology and AI into education is not a simple matter of bringing tools to the classroom. AI has the power not only to supplement education but to supplant it. We know it will bring fundamental shifts to curricula, instructional strategy, and assessment, but the other shifts that technology will bring to education are unclear. AI in schools will create an entirely new structure of power and control. If left unchecked, private corporations will have unmatched power to control education and, by extension, society in ways that may be hard to grasp or understand. The days of school systems that are run by the local public through democratic institutions will give way to a future in which decisions are made in boardrooms and by stockholders. Although privacy will be discussed and governments will pass laws and regulations to control this new power, the shift will favor the new leaders of the system to have even more access to personal data.

The best way to bring balance to the technological future is to bring everyone to the table. We must create social compacts that provide workers, governments, community members, and businesses with equal opportunities to determine the future. Though not perfect, they are the best hope for the future of education. Failure to create the balance is a guarantee for hardship.

Ironically, the best way to ensure that technology and AI play an appropriate role in education and our future is for everyone to come to the room, turn off their screens, and talk.