The 2014 Social Enterprise Leadership Forum

Fulfilling the Promise of Education Technology

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Featured Speakers

In order of agenda

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Introduction

By Professor Ray Fisman

We live in a world that has, over the past few decades, been transformed by information technology. Innovations in computing power, big data, and algorithmic design have been put forth as holding the potential to solve many of the world’s many ills. Education is no exception.

But, as with so many other fields, there has been a troubling gap between technology’s promise and the results they have delivered. This is partly because there often seems surprisingly little interest in careful evaluation of computer-driven instruction; and where evaluations have been done, the results have often been disappointing.

Many would argue that this is more a statement on the mis-deployment of technology rather than proof of its limited value. If, for example, hanging smart boards at the front of a classroom or putting a tablet on every desk fails to produce improvements in student outcomes, it may be because we are thoughtlessly using technologies, not because the technologies themselves are fundamentally useless.

The forum we hosted at Columbia University was aimed at bringing evidence-minded education practitioners together to focus on the key problems facing schools today, and how technology can fit with the broader questions around designing and delivering an effective educational system.

Technology will play an increasingly prominent role in American classrooms, and our goal was to foster a discussion by the New York education community on how it can be put to use to the greatest benefit of students.
Computing and the Science of the Individual

The traditional model of classroom instruction is failing students. Reformers often focus on improving teachers, but the problem may stem from the model itself. New Classrooms’ model combines teacher-led instruction, student collaboration, and online tutoring in an attempt to provide students with an individualized education.

If asked to picture a typical classroom, most people will come up with a similar image: one teacher, about 30 students. The teacher stands at the front, and the students sit at individual desks, arranged in aisles and rows.

The image is the same whether the classroom is in Michigan or Mississippi, and whether it exists today or a hundred years ago. Since its introduction in the nineteenth century by the educational reformer Horace Mann, the model of US public school instruction has remained almost unchanged.

However, at least in recent decades, the model has failed both students and teachers. Studies have shown that about one-third of students drop out of high school. Another third manage to graduate, but are not prepared for college and must enroll in remedial classes to make up for the gaps in their education. Teachers, facing these challenges, often burn out quickly. Almost half leave the profession after five years (figure 1).

In discussions of how to reform education, the focus is often on teachers: how to improve the quality of instruction and how to close the performance gap between the most and the least successful teachers. New Classrooms Innovations Partners, a nonprofit based in New York, posits that the problem derives from the model itself. If so, the answer lies in reimagining the classroom. Joel Rose, New Classrooms’ cofounder and CEO, discussed his vision for redesigning the learning environment in his presentation, “Computing and the Science of the Individual.” In the past two years, New Classrooms has partnered with 15 urban schools to introduce its instructional model, which melds teacher-led instruction, student collaboration, and online tutoring in an attempt to provide students with an individualized education.

Rose started his career as a public school teacher in Houston. Fresh out of college at the age of 22, he was in many ways typical of a newly minted teacher: full of ambition, eager to see his students succeed, and confident that his efforts would pay off.

Three years later, he had reined in his enthusiasm. “I was responsible for teaching the fifth-grade curriculum,” he said. “And I was also told to meet the students where they are—despite their differences in ability and background.” Some of his students were performing at a second-grade level, others as well as eighth graders. There were also vast differences in interests, temperament, and social skills. “You do your best, but you wind up teaching to the middle. And you go home feeling guilty, knowing that some of your students are bored, and that you’re not reaching them” (figure 2).

The experience gave Rose insight into issues that he would explore later in his career. At New York City’s Department of Education, he led an initiative to bring a mix of traditional teaching, collaborative learning, and online tutoring to students. That program, known as School of One, informed the creation of New Classrooms. School of One continues to operate in five New York schools, powered by New Classrooms.

His goal was to design a new teaching paradigm. “In the 21st century, we know that live, teacher-led instruction is one way of delivering instruction, but it’s not the only way,” he said. “Kids can also learn collaboratively. They can learn from virtual tutors located anywhere around the

Figure 1. When confronted with the many ways the current education system fails its students, a half of teachers end up leaving the profession.
world. And they can learn by themselves, either with software or printed material.”

These different ways of delivering instruction, or modalities, can be combined in a single environment to form a multi-modal classroom. “With a multi-modal classroom, teachers can deliver the personalization that is largely missing from the current model,” Rose said. “It is a system designed with the student in mind.”

In the New Classrooms model, the classroom is an open space divided into as many as thirteen stations. In some stations, students work with a teacher, while at others, they work collaboratively on problems or projects. Students also work individually at computers, assisted by online tutors.

Students move from station to station throughout the class period, guided by a customized schedule generated the day before. At the end, each student takes a short assessment. The data is transmitted to New Classrooms’ New York office, which creates each student’s schedule for the following school day based on the results. “If you do well, you move on to something more advanced,” Rose said. “If not, you get the same skill in a different way. This allows a kid who is performing at a second-grade level to get second-grade content and a kid who is performing on an eighth-grade level to get eighth-grade content. The teacher can only be in one place, but at each table, students can be learning something different.”

The results have been encouraging, Rose argued. A study conducted by the Center for Technology and School Change at Columbia University’s Teachers College found that New Classrooms’ model for middle-school math—known as Teach to One: Math—delivered student gains of 1.2 times the national average during the 2012–13 school year (figure 3). New Classrooms has expanded from its base in New York and introduced its model to schools in Chicago, Washington DC, New Jersey, and Charlotte, North Carolina, reaching a total of about 6,000 students.

![Figure 2. Despite being in the same grade level, students have varying degrees of academic proficiency.](image)

![Figure 3. Early results of studies evaluating the outcomes of New Classrooms’ model appear promising.](image)

About 80 percent of those students receive free lunch, and about 90 percent are minorities.

Greater gains will come not from high-tech products and tools, but from more research and development into instructional models, Rose concluded. “We know what the very best teachers can deliver, but even that isn’t enough to change the trajectory of our kids,” he said. “It’s not that teachers don’t matter. But they can’t be everything.”

In the question-and-answer session, Rose was asked if New Classrooms’ model allows for any input or modifications from teachers. Rose explained that teachers get to see a draft version of their students’ schedules for the following school day, and they can make changes based on their observations of student performance. “We know that our recommendations are only as good as the data we have,” Rose said. “What’s good is when they match what teachers are seeing on the ground.”

Rose was also asked about New Classrooms’ less successful interventions. Sometimes, he conceded, the new model is not a good fit for a school’s culture. “The program requires kids to be self-directed learners, and it requires teachers to collaborate with each other every day,” he said. “It asks teachers to not be a fifth-grade math teacher, but to be a math teacher who teaches skills at different levels.” New Classrooms’ successes, he added, have outweighed the failures. “Our experience has been that most teachers can do this,” Rose said. “They can come together and make a transition, and after a year or two, it becomes sustainable.”
The Role of Technology in Teacher Development

Many reformers argue that increasing teacher effectiveness is the key to improving student performance. If so, we should focus our efforts on supporting and retaining the most promising teachers. The New Teacher Center aims to support new teachers through face-to-face and online mentoring programs by accelerating their effectiveness to improve student learning.

As Joel Rose argued in his presentation, the current model of US public school education is failing both students and teachers. But unlike most students, teachers have a way out: almost half quit after five years. Often, the teachers who quit are those who entered the profession full of ambition and those working with the most marginalized student populations. After a few years of pressure to raise student performance in an extremely challenging environment, they leave disappointed and disillusioned.

The end goal of all educational reform is to improve student outcomes, whether the focus is on reimagining the classroom or improving the quality of instruction. Ellen Moir, the founder and CEO of the New Teacher Center, described her mission to increase student achievement through teacher retention in her presentation, “The Role of Technology in Teacher Development.” While she agreed with Joel Rose’s claim that teachers cannot solve all of the current system’s problems, she argued that improving teacher effectiveness—by retaining and developing teachers—is the key to raising student performance. “There is no replacement for teachers: they can lift the lives of young people,” Moir said. “If we catch great teachers early, and give them the preparation and support they need, we can help them develop the habits of mind and the capabilities that will last them throughout their careers.”

The New Teacher Center, a national nonprofit based in Santa Cruz, California, supports new teachers through both in-person and online mentoring programs. “Our goal is to reach every single new teacher,” Moir said. “By helping new teachers get on the right path, we can move them from good to great to excellent. And by leveraging technology, we can reach teachers in cities and in rural areas across the country.”

The need to improve teacher retention is clear. “The most underserved kids in this country are getting new teachers every year, and it’s just not acceptable,” Moir said. “Those kids feel abandoned. Which leaves us trying to figure out how to deal with abandonment while we’re trying to build social and emotional resilience.”

There are many challenging careers—why do so many teachers quit? Moir attributes it to a fundamental lack of support. While some teachers receive adequate support in adjusting to their school and students, most are left to sink or swim, often while finding themselves in front of thirty children from a socioeconomic background very different from their own. By providing new teachers with mentors who observe their classrooms on a weekly basis and offer targeted feedback and coaching, the center hopes to keep teachers from giving up (figure 4). “We’re talking about real mentorship, not feel-good support,” Moir emphasized. “This is a two-year instructional program, with rich feedback every single week.”

The New Teacher Center selects its mentors by visiting participating schools and identifying its best performers. “We go into the schools and ask,” Moir said. “People always know who the best and most talented teachers are.” The

Ellen Moir, founder and CEO of the New Teacher Center, discusses her organization’s teacher mentor model.
The New Teacher Center aims to provide new teachers with direct support through mentoring systems.

center then trains these teachers to assume a mentorship role. Each mentor serves fulltime in that capacity for three years, and then returns to regular teaching. “We’re trying to build capacity into the system,” Moir explained. “Not only are the new teachers improving, but we’re building a cadre of experts among the mentors themselves. We are re-inspiring teachers who have taught for 10 or 15 years, and giving them opportunities for learning and growth they haven’t received before—to become principals, or other instructional leaders.”

The mentors develop expertise in delivering personalized instruction. Each mentor has a caseload of 15 new teachers, and has to regularly identify their mentees’ strengths, growth areas, and the types of interventions that will improve their teaching. “With mentors, we’re seeking out the same qualities that we look for in classroom teachers,” Moir said. “They need to be learners. They need to be on the cutting edge of how we use technology in the classroom. They have to deliver positive instructional messages to help these new teachers become more resilient and capable. And they have to feel a sense of urgency about improving student performance in their teachers’ classrooms.”

The feedback from new teachers has been positive, she said. In its most recent survey of participants, out of 1,877 new teachers 93 percent said working with their mentor had significantly advanced their teaching practices. In Tulsa, Oklahoma, for example, 83 percent of new teachers who participated in the program remained in the profession, compared with 53 percent of new teachers who did not participate.¹ “We’re trying to change the system so that teachers are valued,” Moir said. “Ultimately, the primary beneficiaries are children.”

¹ Data from Palm Beach County, FL, from Teacher Induction Program Grant Final Report (2011). Palm Beach Public Schools. Research funded by MetLife Foundation.
Getting Teachers, Parents, and Technology Working Together for Student Learning

Blended-learning models seek to improve student performance through a mix of student-driven and teacher-led instruction. Underlying CFY’s model is an online platform that offers free digital content to students and teachers.

CFY, formerly known as Computers for Youth and a national education nonprofit, like both New Classrooms and the New Teacher Center, offers ways of coping with the wide distribution curve of student performance in the typical American classroom. By the time students are in high school, the outcomes of this range are clear: about one-third drop out and another third leave school unprepared for either college or the job market.

Comparing the performance of US students with those of other industrialized nations is just as discouraging. The 2012 Programme for International Student Assessment (PISA) assessment, an international study conducted by the Organisation for Economic Cooperation and Development, found that US students ranked 36 out of 65 countries in math—far behind countries like Finland, Canada, and Poland (ranked 12 through 14) and Shanghai-China, at No. 1. Yet while Shanghai is an outlier—a graph of its PISA scores suggests that many Shanghai students found the test “too easy”—the distribution curve of US scores resembles those of Finland, Canada, and Poland. The only difference is the US distribution curve peaks on the left side of the chart (figure 5).

But can technology move the left tail of that curve to the right? Elisabeth Stock, cofounder and CEO of CFY, discussed her organization’s effort to achieve that goal in her presentation, “Getting Teachers, Parents, and Technology Working Together for Student Learning.” “We’re trying to reduce variability in student outcomes,” Stock said. “And the only way to do that is to increase the variability in the inputs. If you can challenge every student just where they need to be challenged (increase the variability in the inputs), you can have all students achieving at a high level (reducing the variability in outcomes).”

In the 15 years since its launch, CFY has experimented with many ways of using education technology to offer personalized education and encourage student-driven learning. “As the technology landscape has changed, so have we,” Stock said. In recent years, CFY has focused its efforts on three key strategies: working directly with schools to implement blended learning, exploring ways to scale its successes, and determining which digital content is most effective. Underlying all of these efforts is CFY’s free platform, PowerMyLearning, which offers the best digital content curated from across the web—such as videos, games, interactives, and quizzes—to students, teachers, and parents. PowerMyLearning’s content can be used individually or combined into playlists and assigned to students.

Three years ago, when CFY started working more deeply with teachers to implement blended learning, Stock and others at the organization sought to define the ideal blended-learning model. Was it station rotation, lab rotation, or flipped classrooms? What they concluded was that the answer was “it depends”, the ideal model depended on the needs of the specific teacher and his or her classroom of students. So because there was no ideal model that fit all situations, CFY decided to build a construct that could fit all situations. They wanted their construct to hold no matter the school, the teacher or the students. They wanted it to hold from kindergarten through 12th grade. And they wanted it to be simple and elegant. In the end, they devised a construct, represented by two interlocking gears, with personalized instruction on the left and student-driven learning on the right (figure 6). “Personalized instruction can be driven by either parents or teachers,” Stock explained. “The student-driven learning cycle is just like how we learn to walk: we take a step, and fall down. We process that data. And then we take another step.”

While the left gear has a stronger role in a student’s early years, the right gear should take over well before graduation. “Students need to get the skills to drive their own learning early on,” she said. “If students leaves high school with stellar test scores, but they’ve never done any of their learning on their own, they’re going to have a hard time when they go off to college.” Adaptive technology (that moves a student to new levels based on an algorithm) should be thought of as a sort of scaffolding that should
eventually fall away, she argued. “If a student is struggling, and his teacher or a computer program moves him down to a different level where he is now learning, that’s great. But eventually the student needs to do that for himself—move himself up or down to the appropriate level of content.”

CFY’s construct has been used successfully in schools across the country, she said. A study of seven schools that used CFY’s construct showed an average increase of 10 percentile points in their state math score rankings from 2011 to 2012. Prior to working with CFY, all but one of these schools ranked in the bottom tenth percentile in their states. All the schools were located in disadvantaged communities, with at least 75 percent of students receiving free or reduced-cost lunch.

CFY is now facing the question of how to scale these results. One way is through growth driven by teachers. With the rollout of the Common Core, teachers are seeking content with a clear and direct correspondence to the new standards, a recent Gates Foundation survey of 3,100 teachers showed. The same survey showed that teachers view free products as just as useful as those purchased by their school or district. Given these findings, CFY is hoping more teachers will use PowerMyLearning to access content. “We have over 800 publishers on the site, and we’re tagging it by Common Core standards,” Stock said. “We’re doing all of the taxonomy work, so that teachers can find what they need immediately.”

Moving forward, CFY is experimenting with ways of improving digital content by testing its effectiveness. Last fall, it started including quiz packs in some of PowerMyLearning’s playlists. The scores indicate how well a particular video or exercise teaches a specific concept. The results have been revealing: in one case, CFY found that a product was so confusing that students in the control group scored better than those who had viewed it. Eventually, CFY plans to release these results so that users of educational content nationwide will have a way to compare the seemingly endless options. “If teachers can tell that one product works better than others, it will force all of the publishers to raise their game,” Stock said. “We’ll start seeing better content,” which should translate to better student outcomes.

In the question-and-answer session, Stock was asked about one of the seven schools that showed a decline in student performance after adopting CFY’s program, according to its recent study. The school had a high percentage of English language learners, who were disproportionately affected by the switch to the Common Core, Stock replied. CFY is still working with that school, she said, and expects its performance to improve this year.

Stock concluded by responding to a question about the organization’s long-term vision. How can they sustain growth when PowerMyLearning is offered for free? “We don’t want PowerMyLearning to be fully dependent on philanthropy,” she said, adding that they are already garnering fees for training services and are exploring related areas of their work that could provide additional fees in the future. Stock said the organization wants to stay true to its roots of providing a platform with free content; those early adopters who came for the no-fee content are a large part of why CFY has been able to grow. “It’s a promise we’ve made to our users and funders and ourselves,” Stock said. “There will always be free, high-quality content on PowerMyLearning.”
Jocelyn Leavitt ’07 founded HopScotch, an iPad app dedicated to helping children learn to code.
What We’ve Learned (and Need to Learn) about Education Technology

Teaching technology in the classroom—from the earliest grades through high school—may have benefits that are only beginning to be explored. Proponents argue that learning coding might motivate some students who would otherwise drop out.

Technology enables ways to reimagine the classroom, to provide teacher mentorship and development, and to extend access to seemingly endless supplies of digital content. Given the increasing reliance on technology in education, should technology itself become a subject in the classroom, earning a slot on the schedule like art, science, and gym? In New York and other cities, some reformers are seeking to have coding taught from the earliest grades through high school. And perhaps that is not surprising, at least in New York, where technology is one of the fastest-growing sectors.

Emary Aronson, the managing director of the Robin Hood Foundation, championed the benefits of teaching computer science in her presentation, “What We’ve Learned (and Need to Learn) about Education Technology.”

“Writing code is by nature a process of trial and error that requires students to apply critical thinking skills,” Aronson said. “And computer science may develop skills that are important for college or career, such as problem solving, collaboration, and perseverance. While the formal research is still nascent, this training may engage students who would otherwise be at high risk of dropping out of school.”

With technology as part of their education, children would graduate high school with tangible prospects, she argued. “At Robin Hood, as a poverty-fighting organization, we want to know whether this is the type of intervention that will move a student who is unlikely to be successful to one who graduates from high school and gains meaningful employment or goes on to college,” Aronson said. “Because that’s how you break the cycle of poverty.”

As both New Classrooms and CFY have shown, technology can upend the traditional classroom model and offer targeted content. “Online videos may replace physical textbooks and here-today, gone-today lectures,” Aronson said. “We can have collaborative learning, social learning, student-driven learning.” Just as important, technology provides ways of embedding evaluation and analytics into daily instruction, with software that captures student performance in real time. Yet perhaps its greatest potential application is in personalizing instruction. “Talented teachers know how to differentiate instruction,” Aronson said. “But technology holds the promise that even average teachers will be able to personalize instruction.”

New York’s Bronx Arena High School, for example, is using technology to deliver student-driven, personalized instruction to older students who lack the credits to graduate. “As a transfer school, Bronx Arena takes in students who have already had one unsuccessful high school experience,” Aronson said. “Why did they drop out? Often because high school was a large, impersonal experience, and as the students foundered, no one noticed.” Students at Bronx Arena spend their entire day with one teacher and use laptops that allow them to work at their own pace.

As discussed by the New Teacher Center’s Ellen Moir, the use of technology in professional development is also promising. “Professional development is the mirror of personalized learning for students,” Aronson said. “The shift to the Common Core requires teachers to master new content and teaching techniques. Technology can give teachers the training they need.” And by freeing teachers from tasks that are time- and labor-intensive, such as the data entry that is often a part of student evaluation, technology allows teachers to focus more on teaching, which may in turn boost retention.

While technology offers great benefits, there are also some pitfalls, Aronson cautioned. “No one knows yet what will become of the explosive rise in technology education options. Some may prove positively transformative. Others may prove merely stylish.” The pace of change poses additional problems. “You’re afraid to bet on one thing because the next might be better,” she said. “And what sort of metrics do you use to measure success, and in what time horizon?” Furthermore, even a great product won’t help students unless it is used correctly. Aronson gave the example of electronic whiteboards, which allow math teachers to illustrate geometry problems with a wave of a finger. Yet the boards are often used as a surface for projecting slides, or simply as decoration, she noted, adding, “Just having a computer gathering dust in the back of a classroom doesn’t help anyone.”

In the end, what matters is not the quantity, or even necessarily the quality, of technology in the classroom, Aronson concluded. “Technology in and of itself is not the solution; it is the use of technology that is the solution.” Joel Rose, Ellen Moir, and Elisabeth Stock demonstrated many new and different ways of harnessing technology, yet the goal of each of their efforts is essentially the same: improving student outcomes. “By implementing technology, they are all disrupting education,” Aronson said. “And that is a good thing.”