

The Human Factor: The Promise & Limits of Online Education

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The idea that online learning might revolutionize higher education, lowering the cost of high-quality learning opportunities for students with limited access to traditional higher education, follows similar hopes for earlier technologies, including radio and television. If such a revolution is to come, it is still far from a reality. Strong evidence indicates that students with weak academic backgrounds and other risk factors struggle most in fully online courses, creating larger socioeconomic gaps in outcomes than those in traditional classroom environments. The central problem appears to be the lack of adequate personal interaction between students and instructors, as well as among students. Hybrid learning models do not exhibit the same problems and there is potential for online learning to develop strategies for overcoming these difficulties. Meanwhile, narrowing gaps in educational opportunities and outcomes requires considerable skilled human interaction.

Since the beginning of the twentieth century, there have been several attempts to revolutionize higher education on the basis of innovations in communications technology. The most recent and best known of these is the provision of widespread online learning. In its “pure” form of courses whose content is delivered directly to students with no face-to-face contact between teachers and students, online learning has become widespread in for-profit higher education, as well as in some broad-access public and private nonprofit universities.

Long before computers, let alone the Internet, made their appearance, broadcast radio offered the promise of an innovative instructional technology with vast scale at low cost. In the mid-1920s, one commentator reported “visions of radio producing ‘a super radio orchestra’ and ‘a super radio university’ wherein ‘every home has the potentiality of becoming an extension of Carnegie Hall or Harvard University.’”¹ Many universities established radio

stations on their campuses and “the enthusiasm for radio education during the early days of broadcasting was palpable.”²

The enthusiasm was short-lived: by 1931, the number of educational stations had fallen from 128 to 49, most with only a small geographic reach.³ Apparently, a big problem was simply getting students to tune into the programs. Even listeners who clamored for educational programs actually preferred to listen to comedians.⁴

In the late 1950s, visions of the potential impact of educational television were even more grandiose than those of the radio had been. Educational television pioneer John Schwarzwalder argued that any subject, including physics, manual skills, and the arts, could be taught by television. He predicted that:

Educational Television can extend teaching to thousands, hundreds of thousands and, potentially, millions. . . . As Professor Siepman wrote some weeks ago in *The New York Times*, “with impressive regularity the results come in. Those taught by television seem to do at least as well as those taught in the conventional way.” . . . The implications of these facts to a beleaguered democracy desperately in need of more education for more of its people are immense. We shall ignore these implications at our . . . national peril.⁵

Educational television has had a continuing life mainly as a substitute for traditional forms of education for those who live in isolated environments.

Public radio and television have continued to play a powerful role – often, in fact, an educational one – by providing culturally rich and often highly informative programming in forms that appeal to audiences in ways that lectures from college professors rarely do. But they did not revolutionize college education.

Anytime innovators attempt to replace an existing product or service with a more technically advanced one, they must decide which features of the product or service they aim to replace and which will remain crucial. For example, designers of cell phones judged from the outset that the central activity of telephoning was a person conversing with a distant other. So, whatever else they had, cell phones needed an earpiece to hear a distant speaker and a mouthpiece to speak to her.

Televisions and radios speak to their audiences, but they are not designed to enable the listeners to talk back. If one considers the affordances of educational radio and television, it is pretty clear that the enthusiasts for these new educational services judged that the central activity of higher education was lecturing: teachers speaking and students listening. The model of learning that fits best with lecturing is that of transmission of information, with the teacher actively sending the information and the students passively receiving it, with the hope that they will be able to recall the information later.

Even though lecturing remains the predominant mode of instruction in undergraduate education, most serious students of learning and teaching in higher education – including several authors in this issue of *Dædalus* – now recognize that this mode of instruction and its accompanying conception of learning have serious limitations, many of which are related to student engagement. An inspiring or charming lecturer can certainly get students to pay more attention, but there is a lot of evidence that students retain information better and – much more important – come to understand it better when they work actively with the material they are trying to master than when they merely try passively to absorb it.

It is especially challenging to impart skills or know-how through lectures. Simply displaying or describing an expert performance of a skill is a poor substitute for working with a student to help develop the skill. Imagine, for example, trying to teach someone how to drive a stick-shift car through lecture.⁶

In retrospect, television and radio suffered from several important obstacles in their quest to become large-scale suppliers of higher education. One was the tyranny of schedules: a broadcast had to be tuned into at a fixed time; in current lingo, the instruction was synchronous. A second obstacle was how to get people to cover the costs of providing the lectures. Broadcast shows on radio or television are public goods, available to all; there is no straightforward way to limit access to the program to those who will pay for it. Both of these limitations have been overcome to some degree, the first through videotaping and its more up-to-date equivalents; the second through cable television and other forms of subscription.

The third obstacle is more fundamental: the experience of watching television or listening to the radio is one-way and mostly in isolation. In university settings, even in very large lecture halls, students often have some opportunity to ask questions or even (shudder) to be called on. Lecture courses usually provide some organized opportunity to meet together with a section leader in smaller groups. And, significantly, in-person lectures provide a shared public experience in the sense that they are heard and seen together by a group of people.

How does delivering education online differ from delivery through television or radio? As long as live interaction is not included in the instructional program, the problem of synchronicity is easily solved, with students logging in whenever it is convenient for them. Colleges can restrict access to their online courses so that only registered students can log in. But providers of MOOCs (massive open online courses) and related online education have solved the payment problem less by restricting access to their courses than by providing credits and degrees only to those who register and pay.

What about the problem posed by the one-way and essentially private characteristics of television and radio instruction? After all, the big contrast between the Internet and other media channels has been its high level of interactivity. Yet so far, the delivery of online education to large numbers of undergraduates, which started out as largely one-way, has proved slow to change.

When MOOCs burst onto the national scene in 2012 (*Time* magazine's "Year of the MOOC"), courtesy of two Google spin-offs (Coursera and Udacity), classes consisted largely of lectures taped in the studio, interrupted by brief quizzes designed to verify that students were still watching. The centrality of lectures and the model of learning as passive receipt of knowledge survived the move from television to the Internet.

But MOOCs, as attention-getting as they have been, have never been the main source of online education. For-profit, career-oriented institutions and large public universities have been the major providers at the undergraduate level, although several private nonprofit institutions now enroll thousands of online students.⁷ Today, more than 40 percent of all undergraduate students take at least one course that is offered purely online; 11 percent – including 12 percent of those in bachelor's degree programs – study entirely online.⁸ Although rich descriptions of online course delivery are hard to come by, the lecture model still appears to predominate.⁹ As a result, the effectiveness of online coursework to date is likely far below its potential.

The availability of online courses and majors offers several advantages to both for-profit and nonprofit university providers: it extends an institution's geographical reach; it serves a population, especially adults, who are not able to travel to attend a college; and, in many cases, it increases revenue by allowing institutions to charge as much or more for an online course, with lower overhead at an increased scale, as for the on-campus equivalent.

One of the most compelling arguments about the value of online learning for students is that this mode of delivery has the potential to increase access to postsecondary education among students facing constraints that make classroom work infeasible. Older students with work and family obligations, those in rural areas who do not have the option to relocate, and those whose employment responsibilities do not fit with college schedules stand to benefit significantly from the geographical and scheduling flexibility of online coursework. But supporting these students, who frequently face an uphill battle to earn college degrees, requires a clear understanding of the strengths and weaknesses of online coursework for improving their learning experiences. Narrowing gaps in educational opportunities and outcomes across demographic

groups requires understanding and developing the environments and pedagogical methods that will best allow students with weak academic preparation to overcome the barriers they face.

The evidence about learning in online versus classroom environments is mixed. Some studies show similar test scores regardless of the setting. Educational psychologist Mary Tallent-Runnels and colleagues' review of research on online teaching and learning, which includes primarily descriptive and qualitative studies, found a consensus that online learning outcomes appear to be the same as in traditional courses, although students with prior training in computers are more satisfied than others with online courses.¹⁰ But studies that focus on course completion rates as opposed to test scores generally show weaker outcomes when courses are entirely online.¹¹ Moreover, recent randomized controlled trials of semester-long college courses have found lower test scores for students in fully online courses than for similar students in traditional classroom settings – but no significant difference in outcomes between those in settings that mix technology with classroom experience and students in fully face-to-face courses. Economist David Figlio and colleagues compared a fully online course to a classroom course; economists William Bowen and Ted Joyce each had teams comparing traditional courses to those replacing some live instructor time with online learning; and labor economist William Alpert and colleagues studied all three models.¹² The results of these studies are consistent. Classroom instruction time can be reduced without a negative impact on student learning. But eliminating the classroom and moving instruction entirely online appears to lead to lower course completion rates and worse outcomes, even when guidelines are followed for best practices for generating online discussion. The weaker results for students listening to lectures online instead of in a classroom with other students suggests that it may not be just personal attention, but being in a social environment that contributes to student learning. It is also possible that the more structured scheduling of classroom courses is important for some students.

Regardless of the overall success of students studying online, the potential for technology to break down barriers to educational opportunity and reduce the gaps in educational attainment across socioeconomic groups depends on how well at-risk students fare in this environment.

Unfortunately, a growing body of evidence suggests that moving coursework fully online increases gaps in success. Outcomes for students with weak academic backgrounds suffer most from the loss of personal contact with faculty and other students.¹³

Comparisons of online and in-classroom outcomes rarely focus on the actual pedagogical methods embodied in the courses, either in the classroom or

online. Many compare a single classroom course to one with the same content offered online. Others focus on groups of courses. It would be surprising if the results were not affected by the course design. Synchronous online courses with intense faculty involvement bear little resemblance to courses consisting entirely of recorded lectures; classroom courses range from large, anonymous lecture halls to small, interactive seminars. Nonetheless, the findings of these studies raise a red flag about assuming that easy access to online courses and programs will reduce the persistent inequality in educational opportunities and attainment.

In some environments, grades and other outcome measures may be similar overall for purely online and classroom courses, but less-prepared students and those from underrepresented groups can be at a significant disadvantage in the absence of the classroom structure. Not surprisingly, students with more extensive exposure to technology and with strong time-management and self-directed learning skills are more likely than others to adapt well to online learning.

Two rigorous large-scale studies of community college students by the Community College Research Center (CCRC) found lower course persistence and program completion among students in online classes.¹⁴ These studies found that students who take online classes do worse in subsequent courses and are more likely than others not only to fail to complete these courses, but also to drop out of school. Males, students with lower prior GPAs, and Black students have particular difficulty adjusting to online learning. The performance gaps that exist for these subgroups in face-to-face courses become even more pronounced in online courses.

According to the CCRC, the differences are even greater for developmental courses than for college-level courses. In a study of online developmental English courses, failure and withdrawal rates were more than twice as high as in face-to-face classes. Students who took developmental courses online were also significantly less likely to enroll in college-level gatekeeper math and English courses. Of students who did enroll in gatekeeper courses, those who had taken a developmental education course online were far less likely to pass than students who had taken it face-to-face.¹⁵

Another community college study focused on Latino students. Educational leadership scholar Raymond Kaupp found that in California community colleges, Latino students in fully online courses experienced particularly large drops in success rates, grades, and completion relative to their performance in face-to-face sections of the same classes, increasing the gaps between their outcomes and those of White students. In interviews, Latino students identified the absence of a strong student-instructor relationship

as the key difference between their face-to-face and online educational experiences.¹⁶

Similarly, demographers Hans Johnson and Marisol Cuellar Mejia found larger gaps in success across racial and ethnic groups in online courses than in face-to-face courses at California community colleges. They found that younger students, African Americans, Latinos, males, students with lower levels of academic skill, and part-time students were all likely to perform markedly worse in online courses than in classroom courses. The success gaps were smaller for students who already had a college degree, those who were following paths to transfer to a four-year institution, and students with GPAs above 3.0.¹⁷

These findings are not limited to community colleges. A large study of students at a for-profit institution that offered courses with the same syllabus, instructors, requirements, and assessments found consistently worse outcomes for students taking the courses online. The online classes reduced grades by more for students with below-average GPAs prior to the course.¹⁸

At a major research university, when students in a large introductory microeconomics course were randomly assigned to either live lectures or watching these same lectures in an Internet setting, the performance of those with low GPAs suffered in the online context. Instruction, supplemental materials, and other course elements were the same for both groups. Figlio and colleagues found no significant difference for students with high GPAs coming into the course. Negative results, however, were particularly strong for Hispanic students, male students, and lower-achieving students, confirming other research finding at-risk students particularly likely to suffer from fully online courses.¹⁹

Not all of the news about online learning is discouraging. As noted, hybrid learning models, in which technology supplements in-person interaction rather than replacing it, yield much more positive results. Sophisticated individualized learning models that can respond to the particular issues facing students hold great potential. And despite lower success rates in fully online courses, the availability of these courses may well ease the path to degrees even for the at-risk students who struggle with this mode of learning.

Johnson and Mejia have suggested that, contrary to the findings from the CCRC, online coursework may increase degree completion. Educational theorist Peter Shea and educational psychologist Temi Bidjerano have also found evidence supporting this idea.²⁰ Using data from the Beginning Postsecondary Student Survey, a nationally representative sample of students who began college in 2003–2004, the authors found that in the nation as a whole, controlling for relevant background characteristics, students who enrolled in

some online courses during their first year at a community college were more likely than similar students who did not take any of these courses to complete a credential within six years. Online courses can provide needed flexibility, particularly to students struggling to combine school with family and work responsibilities. Even if success rates are relatively low in online courses, the availability of these courses may allow students to enroll in more courses each term, leading to the accumulation of more credits.

Online technology and pedagogy have developed considerably over time and this progress is almost certain to continue. There is every reason to be optimistic that outcomes will improve over time as faculty and institutions have more experience. But progress requires both confronting existing shortcomings in online learning and improving the quality and economic and social value of online credentials.

Understanding the problem. Online courses, particularly those in which students can do the work on their own schedules, require more self-discipline and time-management skills than traditional classroom courses. They are also likely to limit opportunities for networking and interacting with peers, mentors, and instructors, potentially weakening the educational experience.²¹ These realities make it unsurprising that students without strong academic skills and preparation struggle without the classroom structure, even if some students thrive.

These problems do not arise from integrating technology into coursework, but from relying on it too much, and from removing the mechanisms for external structure. Negative findings about outcomes in online learning come from fully online courses, not from hybrid courses, which do not eliminate the course structures and components that support students. Hybrid courses that integrate technology into face-to-face classrooms generally yield similar or improved outcomes relative to standard classrooms.²²

Taking an asynchronous class without an engaged instructor requires high levels of self-motivation, self-regulation, and organization, but incorporating the strengths of online classes for weaker students – such as the opportunity for students lacking self-confidence to participate in online discussions and some of the individualization facilitated by technology – into courses and programs that maintain a significant level of face-to-face interaction has the potential to generate much more positive outcomes.²³

Some of the better news about online programs comes from efforts targeting students who have already proved their ability to succeed in advanced academic work. Georgia Tech's widely cited computer science master's degree program is getting very positive reviews and appears to be opening opportunities to new students, rather than diverting them from face-to-face

programs.²⁴ Since this is a graduate program, all of the students have already earned bachelor's degrees and, in the case of Georgia Tech, passed rigorous admission standards. Evidence about success in MOOCs confirms the reality that students from higher-income and more-educated backgrounds are most likely to participate and succeed in these courses.²⁵ These positive findings create important opportunities, but they do not solve the problem of supporting underprepared students with limited resources in their efforts to compensate for the disadvantages with which they arrive at the door of postsecondary education.

It is not easy to disentangle learning outcomes, the paths to postsecondary degrees and certificates, and the completion of these credentials. As proponents of increasing the focus on online programs have argued, this framework can provide needed flexibility, particularly to students struggling to combine school with family and work responsibilities. Even if success rates are relatively low in individual online courses, the availability of these courses may allow students to accumulate more credits. In other words, low pass rates might not be inconsistent with increases in the number of at-risk students earning degrees.²⁶

Quality. Even if students complete credentials, it is important to monitor the quality of the online credentials they earn. Numerous surveys document significant skepticism about the value of online education among faculty, academic administrators, employers, and the public. While traditional faculty members are resistant to change, they are also well positioned to monitor quality. Faculty have been and remain apprehensive about the promise of online learning.²⁷ Less than one-third of chief academic officers surveyed by the Babson Survey Research Group from 2002 to 2015 reported that faculty accept the value and legitimacy of online education, with no upward trend over time in positive reactions.²⁸

In a 2012 survey of a nationally representative sample of more than 4,500 faculty, two-thirds reported that online learning outcomes are inferior or somewhat inferior to face-to-face courses, compared with just 6 percent who said they were superior or somewhat superior. Less than half agreed that online education can be as effective in helping students learn as in-person instruction.²⁹

The general public also remains skeptical about online education, believing that it provides lower quality instruction and less rigorous grading and testing, and is less credible to employers.³⁰

Negative perceptions may be disproportionately influenced by visible examples of fraudulent institutions and programs, which are not representative of the potential of technological innovation. A 2011 U.S. Government

Accountability Office undercover investigation of fifteen online for-profit colleges found that most of the institutions admitted students with fake high school diplomas and many failed to respond to seriously substandard student performance.³¹ But even highly respected institutions have faced difficulties with their online programs. For example, in a 2016 lawsuit against George Washington University, a group of former online students argued that they had paid a higher price but received a lower quality education than their on-campus peers, citing a lack of instruction by and limited interaction with faculty.³²

Arguably, employers are the ultimate arbiters of the value of online education since they are better positioned to compare the skills and knowledge of online graduates, and ultimately decide whom to hire. The consensus of a number of studies investigating the perceptions of employers is that they view online credentials as inferior to those from traditional classroom programs. The primary concern cited by employers about online learning is the lack of interaction and, in particular, face-to-face communication between students and faculty. Employers do appear to be more accepting of online degrees for lower-level positions than for upper-level positions.

These unfavorable perceptions likely contribute to weaker employment prospects and lower rates of return on their education among online students.³³ Consistent with the results from surveys of employers, a 2016 experimental study of the value of online degrees in the labor market found that job applicants with bachelor's degrees in business from a for-profit online institution were much less likely to receive a callback than those from a nonselective public institution.³⁴ Regardless of the actual quality of the learning in fully online programs, students who earn these degrees will have limited labor market opportunities as long as these strong views persist among employers.

Some students, particularly older students with work and family responsibilities and those in rural areas, may be choosing between purely online education or no postsecondary education at all. But there is a real risk that both cost-cutting efforts and well-intentioned moves to expand access to higher education could lead to greater numbers of disadvantaged students being relegated to cheap and ineffective online instruction.

The availability of online courses – either exclusively online or with some face-to-face component – may make it easier for some of these students to complete their programs. But entirely online *degree* programs are likely to be another matter altogether. A college education is more than the sum of a specified number of independent courses. The findings about particularly poor outcomes for at-risk students in online coursework raise concerns about efforts like California's new wholly online community college, which has been

designed for adults seeking new labor market opportunities and will offer only certificates and short-term credentials. It will take careful and innovative planning and design if there is to be a reasonable prospect of delivering meaningful college-level work – as opposed to just the transmission of information – through this route. Without thoughtful innovation, moving vulnerable students online may be more likely to widen attainment gaps than to solve the seemingly intractable problem of unequal educational opportunity.

Behind the successive would-be revolutions in the technology of delivering college education seems to lie a desire to minimize, if not eliminate, the need for messy, often inconvenient, and always costly human interaction in the college-going experience. This desire is particularly evident when the concern is for mass higher education. A purely automated delivery system for much of higher education would appear to be very cheap and efficient, and perhaps even higher quality than traditional higher education because everyone could be exposed to the best lecturers. Unfortunately for this dream, developments in psychology and learning theory over the last two decades have made ever more clear how central the social, emotional, and interactional dimensions of learning are.

Any model of teaching and learning that focuses on the one-way transfer of information from teachers to students risks underestimating the value of student-teacher and student-student interaction in the learning process. This can be a major challenge in traditional face-to-face classrooms, as well as in online settings, especially in courses in which **the student-to-teacher ratio is very high, as in many introductory courses**. There are at least two broad purposes for creating opportunities for interaction, whether virtual or face-to-face.

One purpose is to create a supportive and effective learning environment that can encompass both emotional support and the development of good study habits. This kind of support can be vital to student success across a wide range of course content. Charles Isbell, the chief architect of the very successful online master's program in computer science at Georgia Tech, a program whose students are carefully selected as capable and successful undergraduates, was recently asked at a conference what the biggest stumbling block for students in the program was. His answer did not address inadequate preparation or the pressure of other work and responsibilities. Rather, he said the biggest cause of failure was a feeling of isolation. Leaders in this purely online program provide online discussion opportunities, virtual communities, and other ways for students to connect. How well these strategies substitute for actual personal interaction is an open question. Students can avoid these

opportunities, missing the chance to see that most students struggle with the material, need to ask for help, and show resilience in the face of these difficulties. An isolated student is more likely to blame himself for his struggles, and may find it hard to develop a positive mindset about the program.

Students at the undergraduate level, particularly those who are first generation or have attended weak high schools, may struggle with developing good study skills. This is especially important if there are not strong structures in place to ensure that students are keeping up. Some habits of mind that are essential to success in learning can be taught directly: show up on time, take good notes, stay on top of assignments, work steadily without cramming, and so on. But it is also valuable, and maybe more so, for students to see these habits in practice. These “noncognitive skills” or dispositions are critical to academic success, but they can also be of great value both for career success and in accomplishing personal or community goals.

The second, more directly instructional element to preserving some faculty-student and student-student interaction is that a substantial portion of the valuable learning in college is best – and sometimes only – developed through interaction with other people.

At least for most people, developing the ability to reason well does not occur in isolation. Harvard physicist Eric Mazur pioneered a teaching technique that illustrates the power of students reasoning together. He uses “clickers,” simple handheld devices that let students select among multiple choices. Mazur presents a puzzle or problem to the class and asks them to vote on the correct answer. If the class is sharply divided on the answer, Mazur invites the students to argue with one another about what the right answer is. This exercise makes students think and practice judgment. The class comes abruptly to life and tends to converge quickly on the right answer.

Much of the content of college – what is to be learned – inherently involves interpersonal engagement. Much of human problem-solving is a team activity. Skill at reasoning is developed in conversation or disputation with others. (The great economist Jacob Viner used to comment on the “nonsense people can come to believe if they think too long alone.”)³⁵ In many fields, including the natural sciences, research relies heavily on teamwork. Creating project teams for undergraduates allows them to develop both practical teamwork skills that will be of use in later life and an understanding of how scientific advancement proceeds.

Creative writing and studio art programs tend to rely heavily on an instructional practice called “critique,” in which a piece of student work is the object of criticism and advice from other students. These exercises can be powerful learning experiences, not only helping students doing creative work to receive

criticism constructively, but also helping students develop their own sensibilities and capacity for judgment. It is important to appreciate that these and other interactive educational practices are not incidental, but are integral to learning. Whether or not these collaborative learning experiences can be successfully replicated online, where students do not know each other and have not actually met their instructors, is an open question.

As technology plays an increasingly central role, gaining further understanding of the ways in which personal interaction affects learning and student persistence is critical for the future of higher education. As is the case for brick-and-mortar classrooms, online coursework can be designed in a variety of ways. Incorporating meaningful interaction among students and between students and faculty may be more challenging absent physical proximity, but it is surely possible.

While rigorous evidence about the significant characteristics of the personal interaction that most effectively fosters learning is scarce, numerous surveys and studies strongly suggest that the absence of meaningful connections contributes to weaker outcomes for students in online courses compared with traditional classrooms.³⁶ Some of the evidence comes from student responses to questions about the shortcomings of online classes.³⁷ The consensus is that frequent and constructive student-instructor interaction increases student satisfaction.

Reviews of the literature on the effectiveness of online coursework consistently cite the importance of faculty-student interaction, although they shed little light on the exact mechanisms through which this interaction facilitates learning and course completion. The general conclusion is that student-faculty interaction must be frequent and substantive. Instructors must communicate clearly about the content of the course material, not just provide moral support.³⁸

Students' ability to learn is affected by their environments and by the messages they get from those around them. The notion of "cognitive frames" as a factor in learning success has become increasingly prominent. This line of thinking started with psychologist Claude Steele's influential work on "stereotype threat," in which an individual's performance in a field is hampered by a socially induced belief that his or her type of person is bad at this work.³⁹ There is now strong evidence supporting psychologist Carol Dweck's widely influential idea that people's ability to learn is significantly improved if they believe that their performance is determined by their own efforts, rather than just by inherent, immutable traits.⁴⁰ This is the difference between saying "I'm just not a math person" and saying "my roommate is more successful because she manages her time better." A great deal of work in elementary and

secondary schooling has shown that seemingly small interventions can lead to students developing such positive mindsets.

Fostering a positive, encouraging environment for learning is important for students at all levels, and especially so for students who have encountered discouragement in their past school experiences. There is good evidence that well-informed, timely, and energetic – even “intrusive” – advising can help keep students on a path to success. At Georgia State, a pioneer in using big data to identify key signals that a student may be headed for academic trouble, computers play a major role in identifying when a student needs attention, but for the most part, the intervention is conducted by a person.

There is, in short, no way that an effective college education can escape from the need for productive human interaction as a core part of the instructional process. That is true in virtual as well as traditional settings, and it provides reason for doubt that online education, absent some spectacular improvement in technology, can be cheap. Human interaction is inherently expensive.

But this need not imply that all of that human interaction needs to be face-to-face. Virtual teams can be fashioned. The professor in a course can hold virtual office hours. Other staff can schedule online discussion groups for students. Certainly students can be induced to enter into arguments and debates online. Some, but perhaps not all, elements of student advising can be handled through virtual communications. But none of this is free. **And none of it is yet well-developed, particularly for meeting the needs of underprepared students who lack both the skills and the self-confidence to succeed without personal support from people they perceive as caring about them.**

Classrooms are not perfect either. It is important to acknowledge that traditional classroom teaching will not always skillfully handle the need for emotional and intellectual engagement. The shortcomings we worry about in online education may be evident in many brick-and-mortar classrooms. It is not appropriate to compare the average online course to the best and most expensive education available. In many traditional settings, lecturers and section leaders have little training in teaching and sometimes little interest in it. Students working in large, impersonal settings can easily become isolated or disaffected.

Residential colleges certainly have a built-in advantage in having students spend more time together and in creating opportunities for teachers to interact with students outside the classroom. But getting good educational results out of a residential environment is far from automatic, and there are many ways for things to go off the rails.⁴¹ And most students studying in traditional classrooms are not actually in residential environments, which are simply not compatible with the life circumstances of many students.

The painful truth is that many of the colleges and universities that disadvantaged students attend are woefully underresourced. There is growing evidence that relatively modest increases in expenditures per student in these schools can yield significant increases in student success.⁴² There is a good case to be made for making significant investments in our colleges and universities, especially those that disproportionately serve disadvantaged students. This would pay off in economic terms, in strengthening our democratic functioning, and in enriching our cultural life.

As economists Michael McPherson and Lawrence Bacow have argued: “If technology is used in broad access institutions to drive cost down without regard to quality, and at the same time is used in elite higher education to further increase the cost and restrict the availability of the “best” education, we will wind up with a society both more unequal and less-productive than it could be.”⁴³

Continuing efforts to strengthen educational opportunities and learning outcomes for underprepared students and to reduce the cost of offering high-quality experiences are critical. Technology has the potential to greatly expand the options for achieving these goals. But the evidence is clear that much of the existing online coursework is moving this effort in the wrong direction. Students need access to education – which involves meaningful interaction with faculty and other students – not just provision of information and the promise of credentials. They need meaningful learning opportunities that engage them with instructors and other students, and support the development of self-discipline, time management, problem-solving, and learning skills in addition to in-depth knowledge of their chosen fields.

Taking advantage of the potential for the flexibility of online learning to expand meaningful educational opportunities and reduce inequality of outcomes across socioeconomic groups will require developing cost-effective, individualized, and adaptive learning strategies for integrating the strengths of technology with the unique qualities of the social process of education.

Much of the potential cost reduction of technology is based on the idea that a single professor can reach a large number of students with the same investment of time and energy normally expended in a standard classroom. Recording lectures is the most obvious example. Putting lectures and simple materials online can be done without a big investment. Eliminating the need for classroom space and other physical facilities is a cost-saver. Unfortunately, this has not proven to be an effective instructional strategy.

Predictions of a revolution quite clearly exaggerated the near-term prospects for change. But that does not mean we should give up on technology’s

potential to enhance college learning opportunities. It does mean we should be cautious about proponents of innovation who overpromise. We must carefully analyze the results of new strategies that are implemented with the goal of broadening access and/or reducing costs. At least for now, a focus on using technology to minimize costs (and potentially prices for students) is likely to lead to large-scale, simple, and easy-to-produce programs. It is not likely to generate creative, personalized, and up-to-date courses that are part of programs that involve a high-quality mix of online and face-to-face interactions.

Bret Stephens of *The New York Times* recently observed that the reason “technology so often disappoints and betrays us is that it promises to make easy things that, by their intrinsic nature, have to be hard.”⁴⁴ Effective teaching, whether online or in traditional settings, is hard.

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ENDNOTES

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