

# Promises and pitfalls of online education

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## Executive Summary

Online courses have expanded rapidly and have the potential to extend further the educational opportunities of many students, particularly those least well-served by traditional educational institutions. However, in their current design, online courses are difficult, especially for the students who are least prepared. These students' learning and persistence outcomes are worse when they take online courses than they would have been had these same students taken in-person courses. Continued improvement of online curricula and instruction can strengthen the quality of these courses and hence the educational opportunities for the most in-need populations.

Online courses offer the promise of access regardless of where students live or what time they can participate, potentially redefining educational opportunities for those least well-served in traditional classrooms. Moreover, online platforms offer the promise, through artificial intelligence, of providing the optimal course pacing and content to fit each student's needs and thereby improve educational quality and learning. The latest "intelligent" tutoring systems, for example, not only assess students' current weaknesses, but also diagnose *why* students make the specific errors. These systems then adjust instructional materials to meet students' needs.<sup>1</sup>

Yet today these promises are far from fully realized. The vast majority of online courses mirror face-to-face classrooms with professors rather using technology to better differentiate instruction across students. As one new study that we completed with our colleagues Lindsay Fox and Eric Taylor shows, online courses can improve access, yet they also are challenging, especially for the least well-prepared students. These students consistently perform worse in an online setting than they do in face-to-face classrooms; taking online courses increases their likelihood of dropping out and otherwise impedes progress through college.<sup>2</sup>

Online college courses are rapidly growing. One out of three college students now takes at least one course online during their college career, and that share has increased threefold over the past decade.<sup>3</sup> The potential for cost savings and the ease of scaling fuels ongoing investments in online education by both public and private institutions.<sup>4</sup> Online courses have grown in the K-12 sector as well. Florida, for example, requires each high school student to take at least one online course before graduation and the Florida Virtual School offers over 150 classes to students across the state.<sup>5</sup> An estimated 1.5 million K-12 students participated in some online learning in 2010,<sup>6</sup> and online learning enrollments are projected to grow in future years.<sup>7</sup>

Non-selective and for-profit higher education institutions have expanded online course offerings particularly quickly. These institutions serve a majority of college-aged students, and these students typically have weaker academic preparation and fewer economic resources than students at other more selective colleges and universities. As such, their ability to provide useful course work, engage students, and build the skills necessary for economic success is particularly important. Their use of online coursework is promising to the extent that it can reach the most students in need and serve them well.

While online course-taking is both prevalent and growing, especially in non-selective higher education institutions, relatively little evidence has examined how taking a course online instead of in person affects student success in college. Our new study is the first of which we are aware to provide evidence on the effects of online courses at-scale at non-selective four-year colleges. It is also the first to assess the effects of online course taking at for-profit institutions. Nearly 2.4 million undergraduate students (full-time equivalent) enrolled at for-profit institutions during the 2011-12 academic year, and the sector granted approximately 18 percent of all associate degrees.

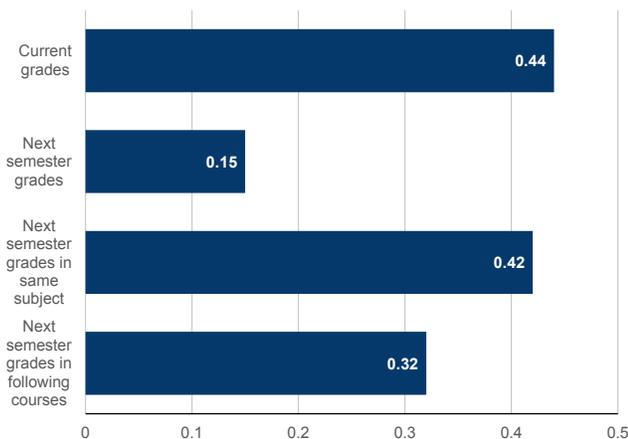
Our study uses data from DeVry University, a large for-profit college with an undergraduate enrollment of more than 100,000 students, 80 percent of whom are seeking a bachelor's degree. The average DeVry student takes two-thirds of her courses online. The remaining one-third of courses meet in conventional in-person classes held at one of DeVry's 102 physical campuses. The data include over 230,000 students enrolled in 168,000 sections of more than 750 different courses.

DeVry University's approach to online education makes it particularly well suited for estimating the effects of taking online courses. Each DeVry course is offered both online and in-person, and each student enrolls in either an online section or an in-person section. Online and in-person sections are identical in most ways: both follow the same syllabus and use the same textbook; class sizes are approximately the same; both use the same assignments, quizzes, tests, and grading rubrics. Many professors teach both online and in-person courses. The contrast between online and in-person sections is primarily the mode of communication. In online sections, all interaction—lecturing, class discussion, group projects—occurs in online discussion boards, and much of the professor's "lecturing" role is replaced with standardized videos. In online sections, participation is often asynchronous while in-person sections meet on campus at scheduled times. In short, DeVry online classes attempt to replicate traditional in-person classes, except that student-student and student-professor interactions are virtual and asynchronous.

Using variation in course-taking that arises both from changes in course offerings at particular campuses in a particular term and from variation across students in the distance that they have to travel to take in-person courses, we find that taking a course online reduces student grades by 0.44 points on the traditional four-

point grading scale, approximately a 0.33 standard deviation decline relative to taking a course in-person (See Figure 1). To be more concrete, students taking the course in-person earned roughly a B- grade (2.8) on average while if they had taken it online, they would have earned a C (2.4). Additionally, taking a course online reduces a student's GPA the following term by 0.15 points; and, if we look only at the next term GPA for courses in the same subject area or courses for which the course in question is a pre-requisite, we find larger drops of 0.42 points and 0.32 points respectively, providing evidence that students learned less in the online setting.

**Figure 1. Benefit of in-person course taking**

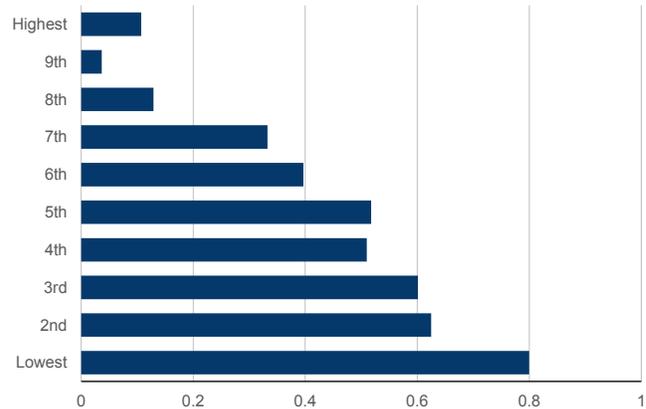


We also find that taking a course online, instead of in person, increases the probability that a student will drop out of school. In the semester after taking an online course, students are about 9 percentage points less likely to remain enrolled. This reduction is relative to an average of 88 percent of students remaining enrolled in the following term. Moreover, taking a course online reduces the number of credits that students who do reenroll take in future semesters. While this setting is quite different, we can compare the effects on online course taking to other estimates of effects of on college persistence. For example, the literature on financial aid often finds that \$1000 in financial aid increases persistence rates by about three percentage points<sup>8</sup> and college mentorship increases persistence rates by five percentage points.<sup>9</sup>

The negative effects of online course taking are concentrated in the lowest performing students. As shown in Figure 2, for students with below median prior GPA, the online classes reduce grades by 0.5 points or more, while for students with prior GPA in the top three deciles we estimate the effect as much smaller and, in fact, we cannot tell whether there is negative

effect at all for this higher-achieving group. Thus, while online courses may have the potential to differentiate coursework to meet the needs of students with weaker incoming skills, current online courses, in fact, do an even worse job of meeting the needs of these students than do traditional in-person courses.

**Figure 2. Benefit of in-person course taking by prior GPA**



These analyses provide evidence that students in online courses perform substantially worse than students in traditional in-person courses and that experience in these online courses impact performance in future classes and their likelihood of dropping out of college as well. The negative effects of online course-taking are far stronger for students with lower prior GPA. The results are in line with prior studies of online education in other settings such as community colleges and highly competitive four-year institutions that also show that online courses yield worse average outcomes than in-person courses.<sup>10</sup>

The current negative effect of online course taking relative to in-person course taking should not necessarily lead to the conclusion that online courses should be discouraged. On the contrary, online courses provide access to students who never would have the opportunity or inclination to take classes in-person.<sup>11</sup> As one indication, of the 5.8 million students taking online courses in the fall of 2014, 2.85 million took all of their courses online.<sup>12</sup> Moreover, advances in AI offer hope that future online courses can respond to the needs of students, meeting them where they are in their learning and engaging them in higher education even better than in-person courses are currently able to do.<sup>13</sup> Nonetheless, the tremendous scale and consistently negative effects of current offerings points to the need to improve these courses, particularly for students most at risk of course failure and college dropout.

<sup>1</sup> Graesser, Arthur C., Mark W. Conley, and Andrew Olney. 2012. "Intelligent tutoring systems." In *APA Educational Psychology Handbook, Vol. 3: Application to Learning and Teaching*, edited by Karen R. Harris, Steve Graham, and Tim Urdan. Washington, DC: American Psychological Association.

<sup>2</sup> Bettinger, E., Fox, L., Loeb, S., & Taylor, E. (Forthcoming). Changing Distributions: How Online College Classes Alter Student and Professor Performance. *American Economic Review*.

<sup>3</sup> Allen, I. Elaine, and Jeff Seaman. 2013. *Changing Course: Ten Years of Tracking Online Education in the United States*. Newburyport, MA: Sloan Consortium.

<sup>4</sup> Deming, David J., Claudia Goldin, Lawrence F. Katz, and Noam Yuchtman. 2015. Can Online Learning Bend the Higher Education Cost Curve? *American Economic Review, Papers & Proceedings*, 105 (5):496-501.

<sup>5</sup> Jacob, B., Berger, D. Hart, C. & Loeb, S. (Forthcoming). "Can Technology Help Promote Equality of Educational Opportunities?" In K. Alexander and S. Morgan (Editors), *The Coleman Report and Educational Inequality Fifty Years Later*. Russell Sage Foundation and William T. Grant Foundation: New York.

<sup>6</sup> Wicks, Matthew. 2010. "A National Primer on K-12 Online Learning. Version 2." Vienna, VA: International Association for K-12 Online Learning.

<sup>7</sup> Watson, John, Amy Murin, Lauren Vashaw, Butch Gemin, and Chris Rapp. 2012. "Keeping Pace with K-12 Online Learning: An Annual Review of Policy and Practice 2011." Durango, CO: Evergreen Education Group. And Picciano, Anthony G., Jeff Seaman, Peter Shea, and Karen Swan. 2012. "Examining the Extent and Nature of Online Learning in American K-12 Education: The Research Initiatives of the Alfred P. Sloan Foundation." *The Internet and Higher Education* 15(2): 127-35.

<sup>8</sup> Bettinger, Eric P. 2004. "How Financial Aid Affects Persistence." In Caroline Hoxby (Ed.), *College Choices: The Economics of Where to Go, When to Go,*

*and How to Pay for It*. University of Chicago Press.

<sup>9</sup> Bettinger, Eric P., and Rachel B. Baker. 2013. "The Effects of Student Coaching: An Evaluation of a Randomized Experiment in Student Advising." *Educational Evaluation and Policy Analysis*, 36 (1):3-19.

<sup>10</sup> See for examples: Figlio, David, Mark Rush, and Lu Yin. 2013. "Is It Live or Is It Internet? Experimental Estimates of the Effects of Online Instruction on Student Learning." *Journal of Labor Economics*, 31 (4):763-784; Couch, Kenneth A., William T. Alpert, and Oskar R. Harmon. 2014. "Online, Blended and Classroom Teaching of Economics Principles: A Randomized Experiment." University of Connecticut Working Paper; Xu, Di, and Shanna Smith Jaggars. 2014. "Performance Gaps Between Online and Face-to-Face Courses: Differences Across Types of Students and Academic Subject Areas." *The Journal of Higher Education*, 85 (5):633-659; Hart, Cassandra, Elizabeth Friedmann, and Michael Hill. 2014. "Online Course-Taking and Student Outcomes in California Community Colleges." Working Paper; and Streich, Francie E. 2014. "Online and Hybrid Instruction and Student Success in College: Evidence from Community Colleges in Two States." University of Michigan Working Paper.

<sup>11</sup> See, for example, Joshua Goodman, Julia Melkers, and Amanda Pallais, "[Can Online Delivery Increase Access to Education?](#)" National Bureau of Economic Research working paper 22754, October 2016.

<sup>12</sup> *Online Report Card – Tracking Online Education in the United States*, the 2015 Survey of Online Learning conducted by the Babson Survey Research Group and co-sponsored by the Online Learning Consortium (OLC), Pearson, StudyPortals, WCET and Tyton Partners.

<sup>13</sup> See, for example, the Open Learning Initiative at Carnegie Mellon University.