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Can behavioral tools improve online student outcomes? Experimental evidence from a massive open online course[☆]



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ABSTRACT

In order to address poor outcomes for online students, I leverage insights from behavioral economics to design three software tools including (1) a commitment device, (2) an alert tool, and (3) a distraction blocking tool. I test the impact of these tools in a massive open online course (MOOC). Relative to students in the control group, students in the commitment device treatment spend 24% more time working on the course, receive course grades that are 0.29 standard deviations higher, and are 40% more likely to complete the course. In contrast, outcomes for students in the alert and distraction blocking treatments are statistically indistinguishable from the control.

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People frequently fail to follow through on the plans they make: they fail to meet deadlines at work, finish assignments for school, go to the gym, and deposit money in their savings accounts. In higher education, only 59% of students complete the degree programs they begin,¹ and completion rates are often much lower in online programs and courses. For example, the graduation rate at the University of Phoenix, the largest provider of online degrees in the United States, is only 19%² and in massive open online courses (MOOCs), which allow thousands of students to simultaneously access course material, completion rates are often less than 10% (Perna et al., 2013).

The standard neoclassical economic model assumes that people make plans that maximize their intertemporal utility and that they will only deviate from their plans when doing so improves their overall well-being. Evidence from psychology and behavioral economics, however, suggests that people may systematically deviate from their plans in ways that significantly decrease their well-being. In particular, procrastination (Laibson, 1997), forgetting (Mullainathan, 2002), and limited willpower (Baumeister et al., 1998) may lead to detrimental deviations from long-run plans. In environments such as online education, where behavioral factors are likely to keep people from following their plans, interventions such as commitment devices and reminders may significantly increase plan completion and improve well-being.³

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¹ Source: http://nces.ed.gov/programs/digest/d13/tables/dt13_326.10.asp, 10/29/2014.

² Source: <http://nces.ed.gov/ipeds/datacenter/institutionprofile.aspx?unitid=aeb2adadacae>, October 12, 2014.

³ While little work has been done to investigate the impact of commitment devices and reminders in education, there is evidence of the effectiveness of commitment devices and reminders in other settings. Commitment devices have been shown to significantly improve effort at work, savings behavior, and health behaviors (Ashraf et al., 2006; Bryan et al., 2010; Kaur et al., 2011). Additionally, recent studies have found significant positive impacts of reminders on savings behavior (Karlán et al., 2010) and health outcomes (Austin et al., 1994; Calzolari and Nardotto, 2012; Krishna et al., 2009).

In this study, I design time-management software tools for online students and experimentally test the impact of these tools in a statistics MOOC hosted by Stanford University. These tools include a commitment device, which enables students to pre-commit to daily time limits on distracting Internet activities; an alert tool, which generates an on-screen reminder that is triggered by distracted web browsing; and a distraction blocking tool, which allows students to block distracting websites for up to an hour when they go to the course website. If students struggle with time-management issues, the software treatments may improve student performance and well-being.

My results indicate that the commitment device significantly improves course outcomes relative to the control, alert, and distraction blocking treatments. I find that the commitment device increases course completion by 40% (11 percentage points), improves overall course performance by 0.29 standard deviations, and increases the amount of time students spend on the course website by 24% (5.5 h) relative to the control. Estimates for the impact of the distraction blocking treatment on course outcomes are also positive but smaller in magnitude than the commitment device and are not statistically significant. The alert treatment, however, has no measurable impact on course outcomes. I also find that the differences between the commitment and control are most pronounced in the first weeks of the course and are largest among students who were predicted to do well in the course, given their observable characteristics. In all, this study suggests that time-management issues play a significant role in poor performance among online students, and that commitment devices can have a significant impact on student performance.

This study contributes to the existing literature in several ways. First, this is one of the first studies to test whether tools from behavioral economics can improve completion rates in online education. Second, this study adds insight into the mechanisms driving poor outcomes for online students. Third, by simultaneously testing multiple behavioral tools, this study informs the relative efficacy of interventions intended to address different sources of time-management issues.

1. Background and motivation

1.1. Online education

Online courses are quickly becoming a mainstay in higher education. Between 2002 and 2012, the percentage of universities offering online courses grew from 72% to 87%, the percentage of students taking online courses grew from 9% to 34%, (Allen and Seaman, 2013) and the percentage of undergraduate students enrolled in distance or online-only degree programs grew from 2% to 11% (Ginder and Stearns, 2014). In addition to online courses becoming a large component of accredited degree programs, a number of selective universities, such as Harvard, Stanford, and Cornell now offer Internet-based massive open online courses (MOOCs) to a global population. MOOCs are designed to accommodate thousands of students and have the potential to dramatically broaden access to high-quality instruction. MOOCs typically have open enrollment, are free to join, and have no penalty for dropping out. To date, nearly 8 million students have enrolled in MOOCs to learn about a range of subjects; including science, business, mathematics, information technology, arts, and humanities (Waldrop, 2013).

While the potential benefits of online education are large, completion rates are often very low. For example, Xu and Jaggars (2011) find that observationally equivalent community college students are 10–15 percentage points less likely to complete online courses than traditional courses. At the University of Phoenix, the largest provider of online degrees in the United States, the graduation rate for full-time online students is only 19%.⁴ In MOOCs, completion rates are often even lower. Perna et al. (2013) examined the completion rates for approximately 1 million students from 16 University of Pennsylvania MOOCs and found that only 6% of students completed the course in which they enrolled.⁵

Although the low completion rates in MOOCs and other online courses are striking, they do not necessarily indicate that students are behaving irrationally. With no cost of enrollment and no penalty for dropping out, many students may be enrolling in courses they do not intend to finish. However, there is evidence that suggests that many students drop out of courses they would have liked to finish and that behavioral factors may contribute to high dropout rates. For example, Wilkowski et al. (2014) examine completion behavior in a MOOC hosted by Google, and find that less than 25% of students who report a goal of earning a certificate of completion ultimately finish the course. Additionally, a number of studies find that students report self-regulation and time-management problems as primary reasons for failure in online courses (Doherty, 2006; Winters et al., 2008). While issues of self-regulation and time-management are likely to impact all students, aspects of the online learning environment may make students particularly susceptible to issues with time-management. Specifically, characteristics of the online course environment, such as anonymity (e.g. Kast et al., 2012) and unstructured scheduling (e.g. Ariely and Wertenbroch, 2002), make students prone to behaviors that could limit their ability to achieve their course goals. Given the disparity between desired and realized outcomes for online students, identifying and addressing behavioral barriers to online academic success could provide significant benefits to students.

⁴ This graduate rate accounts for all graduations within 6 years. Source: <http://nces.ed.gov/ipeds/datacenter/institutionprofile.aspx?unitid=aeb2adadaca>, October 12, 2014.

⁵ Perna et al. (2013) define completion by scoring at least an 80% in the course. The authors also find that only 9% of students accessed the last lecture in the course in which they enrolled.

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