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The better blend? Flipping the principles of microeconomics classroom



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ABSTRACT

This study provides a comprehensive analysis of an experiment that attempts to cut costs and improve learning outcomes through a “flipped-blended” class. We discern effects of this pedagogy on learning outcomes in principles of microeconomics courses. We control for key background variables and use differences-in-differences with a matching estimator to test whether students in the flipped-blended classes learn economic concepts and tools better than students in classes with interactive lectures and online homework, but no online lectures. Findings suggest that average student improvement is significantly higher in flipped classes than in non-flipped classes, though the difference in improvement is modest.

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1. Introduction

Amidst increasing pressure to achieve higher levels of measurable student learning with fewer resources, faculty in higher education are redesigning their curricula and/or course delivery to incorporate technology. Among the strategies gaining popularity are blending and flipping. Blending is commonly defined as redesigning a class such that part of the coursework is completed online and the remainder occurs in a traditional face-to-face setting. Because less classroom time is required, blending has the potential to reduce operating costs for universities. Flipping is inverting the activities traditionally conducted during face-to-face class time with activities students complete after class.

Blending is becoming a common delivery mode in higher education because of its success in achieving student learning outcomes while increasing flexibility for students. While data on the prevalence of blending are scant, “it is generally believed that blended learning has reached well into the mainstream of American higher education” (Picciano et al., 2013, 3)¹ and one survey found that 80% of all higher education institutions and 93% of doctoral institutions offer hybrid or blended learning courses (Arabasz et al., 2003). The success of blended classes is largely attributable to increased student engagement with the material and expanded access to multi-media offerings. However, students in blended classes in economics have not shown significant improvements in achievement compared to students in traditional classes (Brown and Liedholm, 2002; Terry and Lewer, 2003; Olitsky and Cosgrove, 2013; Cosgrove and Olitsky, 2014). Moreover, students in

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E-mail addresses: neal.olitsky@umassd.edu (N.H. Olitsky), sarah.cosgrove@umassd.edu (S.B. Cosgrove).¹ Picciano et al. (2013) offers several explanations for the lack of data on blending including: many faculty are blending but do not label the mode as such, colleges and universities collect data on fully online courses but not blended courses, and there is no single widely accepted definition of blending.

blended classes have shown lower levels of knowledge retention than students in traditional classes (Cosgrove and Olitsky, 2014).

Another pedagogical approach that is becoming more prevalent is “flipping” the classroom. With this approach, students are introduced to course material before attending a face-to-face class on that material (Walvoord and Anderson, 2011), using class time to achieve higher levels of learning. Flipping goes by other names, such as “inverting the classroom” (Lage et al., 2000) and “peer instruction” (Crouch and Mazur, 2001) and can take different forms, but it is an approach under which introduction to the material that is traditionally done in the classroom is completed by the students independently before the class and the traditional homework is done during class time. Under this approach, students become familiar with the material and achieve the low levels of Bloom’s taxonomy (Anderson et al., 1994), knowledge and some comprehension, before attending class, leaving class time to focus on the more difficult tasks of applying, analyzing, synthesizing, and evaluating. This approach has been shown to be highly effective at improving student achievement, particularly in quantitative subjects such as math and physics (Hake, 1998; Crouch and Mazur, 2001; Deslauriers et al., 2011).

We conduct an experiment that attempts to simultaneously cut costs and improve student achievement in principles of microeconomics classes by combining blending and flipping. The goal is to achieve the gains from blending found in other disciplines that have eluded economics thus far by flipping the course and blending the course more aggressively while also reducing the costs of course delivery. The cost reduction is achieved by doubling the enrollment in the flipped class without changing the teaching load or requiring additional classroom resources.

This study advances the literature in three ways. First, it is the only experimental study comparing a flipped-blended class to a modestly blended class. Previous studies showed no significant gains (or losses) in student learning outcomes from modestly blended principles of economics classes. We hypothesize that the degree to which a class is blended may affect the outcomes. The combination of flipping and blending allows us to design the class with the more basic work taking place online and the most challenging work conducted in a face-to-face setting. Second, our methodology controls for selection bias, found in previous studies of online versus face-to-face learning, using differences-in-differences with a matching estimator developed in Heckman et al. (1998). This method allows us to estimate the relationship between flipped coursework and changes in student achievement, controlling both for individual characteristics and for differences between the flipped and non-flipped classes. Third, our data include numerous control variables lacking in the means-only analysis presented from the math and physics disciplines, providing, to our knowledge, one of the only controlled studies on flipped coursework.

The results show no evidence that students in flipped-blended classes perform worse than their non-flipped modestly blended counterparts, despite having less face-to-face class time during the semester, and suggest that students in flipped classes do significantly better. Overall, students in the flipped classes showed a larger improvement between the pretest and the posttest, improving their score on average by 7% points more than students in the non-flipped class. Because students in flipped classes show larger differential gains than those in the control group and because flipped-blended classes can accommodate twice as many students as a traditional course, our results support the implementation of the flipped-blended format as a cost-reducing, outcome-improving alternative to the traditional face-to-face course.

The paper proceeds as follows. Section 2 provides some background, placing the present study in the context of the existing literature concerning blended and flipped course work. Section 3 describes the design of our experiment. Sections 4 and 5 present, respectively, the empirical strategy and a descriptive analysis of the collected data. Section 6 presents the estimation results, and Section 7 discusses the results in the context of the extant literature and Section 8 concludes.

2. Background and literature review

In recent years, there has been a shift toward more blended and fully online learning in higher education. Traditional lecture-based courses are being replaced with varying degrees of online learning, requiring less physical capacity from the universities and providing more flexible schedules to students (Allen et al., 2007). Faculty and students alike are finding ways to leverage technology to improve their effectiveness and efficiency (Goldstein and Katz, 2005; Roblyer et al., 2010). Blending has been shown to be effective at achieving student learning outcomes and increasing course completion rates. Vaughan (2007) provides a thorough survey of the literature on blending, citing a large-scale program for course redesign to a blended format. Of the 30 participating institutions, 20 reported improved learning outcomes and 10 reported no significant difference. Moreover, 75% of the participating institutions that measured changes in drops, failures, and withdrawals saw a reduction compared to the face-to-face classes.

This shift comes at a time when public funding for higher education is declining and enrollment is increasing. While public colleges, universities, and community colleges enroll over 70% of all college students, state funding for these institutions decreased between AY1990–91 and AY2009–10 by “an average of 26% in real terms—even as operating costs increased” (Mettler 2014). Moreover, from 1990 to 2012, enrollment in degree granting post-secondary institutions increased by more than 49% (National Center for Education Statistics, 2013). Colleges and universities are attempting to teach more students in larger classes to reduce the need for classroom space and faculty hours. Further fueling the shift toward blending, some large meta-analyses concluded that blending leads to better student learning outcomes. A major study conducted by the US Department of Education found evidence of better achievement of student learning outcomes in blended and online environments, with a larger advantage in blended classes relative to face-to-face than in fully online classes (Means et al., 2009).

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