

# THE BENEFITS OF ASYNCHRONOUS DISCUSSION IN A HYBRID COURSE: EVIDENCE FROM A LARGE ENROLLMENT ECONOMICS COURSE

Travis Roach, Texas Tech University

## ABSTRACT

*As improvements in technology continue to be integrated within the collegiate classroom it is important to study the benefits, or costs, that are associated with adopting new pedagogical practices. This paper focuses on the role that asynchronous discussion can play in furthering student development within a hybrid economics course. Specifically, this paper finds that encouraging online discussion of articles, podcasts, and videos that are related to course material results in better academic performance.*

**Keywords:** *current events, blended-learning, asynchronous-learning, asynchronous-discussion, hybrid course*

## INTRODUCTION AND BACKGROUND

The prestigious ivory towers that come to mind when one thinks of taking and attending college classes are slowly being replaced by their digital counterparts. While there is still a place for the time-honored tradition of lecturing and conventional face-to-face teaching methods, pedagogical research has begun to highlight the very interesting world of technology in the classroom. Blended learning, as it is often referred to, is the conscientious integration of online learning experiences with established face-to-face practices. Garrison and Kanuka (2004) conclude their article on the transformative potential of blended learning by saying that, “blended learning can begin the necessary process of redefining higher education institutions as being learning centered and facilitating a higher learning experience” (Garrison & Kanuka, 2004). Blended learning has a special connection to economics education because of the ease at which economic principles can be applied to news from around the world. As many economists have taken to the internet to write blogs for both their classrooms and the public, more classes have started to tend towards the “hybrid” course format; perhaps without even meaning to do so. Despite the volume of literature focusing on the pedagogical potential of online learning in a blended or “hybrid class”, little has been done to test the efficacy of these practices. This paper contributes to the literature by testing whether or not online asynchronous discussion of current events truly furthers student learning of core concepts. This is achieved by considering data on 311 students enrolled in principles of microeconomics across two semesters and testing whether

or not contributing to an online discussion improved performance on a standard subject test. The data show that asynchronous learning has in fact improved student cognition when test grades are considered as the dependent variable, while controlling for other factors that may affect student performance.

The term “hybrid course” has been used by many authors to distinguish courses that use both face-to-face and distributed (distance) learning tactics. For the purpose of this paper a hybrid course is one which combines face-to-face instruction with computer-mediated instruction (Graham, 2006; Reay, 2001; Rooney, 2003; Sands, 2002; Young, 2002). The practice of using technology in the classroom has been the study of many authors (Lin, 2007; Martyn, 2003; Massoud, et al., 2011). In fact, many have found that in a technology-rich learning environment, learner-centered and active-learning techniques are more commonly used (Graham, 2006; Hartman, Dziuban, and Moskal, 1999). The increased use of active-learning due to technology is a boon to cognitive development *a la* Bloom (1956) because blended learning environments are able to foster interaction and allow students to connect with the learning materials and each other. In Bloom’s seminal work, which has since sparked entire areas of educational research, the cognitive domain is separated into six tiers – knowledge, comprehension, application, analysis, synthesis, and evaluation. Active-learning activities and exercises are easily able to target the upper tiers of Bloom’s taxonomy because they compel students to become active participants and *apply* knowledge they have learned and *evaluate* outcomes. Yamarik (2007) studied the use of active learning in the economics classroom and found that students who were exposed to an active-learning environment performed better on tests than those who did not. Active-learning does not need to be confined to classroom instruction; it can easily be utilized in an online environment. For instance, many authors have found that when asynchronous text-based discussion is used, students can carefully reflect on and provide evidence for their claims. The resulting discussion contribution allows for deeper, more thoughtful reflections on the part of the learner (Graham, 2006; Mikulecky, 1998; Benbunan-Fich & Hiltz, 1999).

Recently, Bloom’s taxonomy and its applications to active and cooperative learning have been discussed in the context of technology-rich environments (Kenney & Newcombe, 2011; Chang & Fisher, 2003). In fact, Kausar et al. (2003) developed a study that rated computer assisted learning against lecture based learning in terms of Bloom’s taxonomy. The authors found that computer assisted learning was indeed superior to traditional lecture based teaching. A key to the success of a hybrid course is the integration of online materials within the lecture. Even in the early years of the internet teachers began realizing the many different learning opportunities that were available (Simkins, 1999). In-class discussion is an excellent way to incorporate online materials. Allowing students to apply the stories they read or hear to classroom concepts during a discussion certainly approaches the top tiers of Bloom’s taxonomy - synthesis and evaluation.

In addition to classroom discussion, which is regarded by Brookfield (2005) as a tool for fostering critical thinking skills, online discussion is an excellent way to develop critical thinking skills and include different learning styles and personalities. Online discussions which progress

at the pace that students post to a forum or discussion board is often referred to as “asynchronous learning.” Many authors have noted that knowledge sharing in an online discussion has the potential to improve student learning (Brewer & Brewer, 2010; Kienle, 2009). Bassett (2011) studies how students view asynchronous learning and finds that “the collaborative nature of the online discussions facilitated an inclusive learning experience for all students.” Also speaking to the inclusive nature of online learning, Miyazoe and Anderson (2011) found that “online writing assignments using pseudonyms can be an effective teaching strategy that induces higher online participation, especially among students who are hesitant to participate in a traditional classroom setting.” Similarly, Gerbic (2010) finds that timid students who may not want to discuss in a classroom setting are less inhibited when discussing online. Gerbic also points out that international students view online discussion as a safer environment in which to participate. The potential for attracting students who would normally not contribute in a classroom situation helps ensure that multiple learning styles and personality traits are reached

Speaking to economics in particular, a few authors have taken the task of assessing online learning and hybrid classes. Harter and Harter (2004) consider a similar topic as this paper and find that teaching with technology does not improve student scores on tests. Gratton-Lavoie and Stanley (2009) find that strictly online courses, as compared to traditional or hybrid courses, may have insignificant and sometimes negative impacts on student learning. On the other hand, Navarro and Shoemaker (2001, 2000b) found that online learning benefitted students.

## **COURSE AND ONLINE COMPONENT DESCRIPTION**

This study was conducted using data from students in an introductory-level principles of microeconomics course. The course design is such that students receive face-to-face instruction for three hours a week, but also use online resources outside of class in the form of “current events” that can be found on a blog prepared by the author.

### **The Current Events Blog**

The current events blog of online resources was used to compliment course reading by linking to various news articles, podcasts, and videos that applied to the material currently being discussed. For brevity’s sake, the various different media that students used will be referred to as “stories” here forward. In fact, designating articles, podcasts, and videos as stories truly describes the aim in this project of using outside resources to compliment the teaching of a concept. Creating a narrative to accompany complex theories or concepts is a form of experiential learning (Dalton 2011). Itin (1999) defines experiential learning as any instance in which an individual derives meaning from personal direct experience. The importance of experience is being considered in other scenarios than education. Pine and Gilmore (1999) describe the “experience economy” as being the next step in the evolution of consumer

preference. If education is to be tailored to the needs of today's consumers, then experience is in high demand. In a related article, Gilmour (2003) pointed out that the average consumer is willing to spend more money on compelling experiences that connect and inspire them in a personal and unforgettable way than a bland alternative. In order to incorporate the idea of the experience economy within Itin's definition of experiential learning, the hybrid-course variant proposed is that experiential learning occurs when an individual derives meaning from indirect experience through online media. Moreover, experiential learning is not only what we as educators ought to sell to our students; it is what they want to buy from us.

The online stories that are used are not to be viewed as homework in the traditional sense because they are introduced to students in such a way that online instruction occurs. Each story can be found on a blog that is prepared by the instructor. Along with the link to the story, each post is accompanied with a short discussion of the story and a few open-ended questions that are intended to help start online discussions or direct the student's attention. The following is an example of a current events post from the second semester that received numerous posts to the discussion thread:

*"Here's a quick supply and demand problem. The officials at Foxconn (The main hub of Apple manufacturing) are going to increase the wages paid to their workers. What do you expect to happen to the price of iPhones and iPads? I assume that Foxconn's decision to increase wages came from pressure by Apple who has recently been under scrutiny for how foreign labor has been treated. Do you think, though, that Americans would still be pressuring Apple to pay the people who manufacture their products more if they knew what this would do to the price of Apple products?"*

In response one student posted,

*"I think that, once the issue of inhumane work conditions are raised, people tend to hold that banner over a large corporation without the realization of what that cost will be. However, I don't think the insistence for better care of workers will stop when the prices go up. I'm not sure most people will even connect the two. Instead, they will become two tallies against Apple, instead of a cause and effect as Apple tries to fix the former by bringing about the latter."*

This post in turn solicited many other thoughtful comments. It is clear from the above comment that when students are given the time and relaxed environment of online learning they can consider a basic concept like supply and demand at very high levels. In terms of Bloom's taxonomy, this student has taken a basic supply and demand problem and answered it at the evaluation level.

Another aspect of the course design is that materials are easily available to students by mobile device or tablet computer. By designing the website and blog in such a way that it is

easily viewed on a small mobile device, students are able to read, listen, or watch the assigned current events at their leisure.

## **RESEARCH DESIGN & EMPIRICAL ANALYSIS**

In order to separate the effects that asynchronous interaction has on student performance several attributes of the course had to be kept similar between the two semesters. For both semesters the class met on Mondays, Wednesdays, and Fridays at close to the same time. Also, both classes had a large class size with 175 students and 136 students for the fall and spring, respectively. The amount of posts and the type of content posted to the current events blog was similar for both semesters as well. In order to enforce that students follow the blog, both semesters of students were given a quiz over the current events material. Although the stories associated with the quiz were different for each semester, the format of the quiz was particularly alike between semesters. Finally, to accurately control for any bias caused by students leaving the class at mid-semester only the time span from the beginning of the semester to the first test has been considered.

The difference between both semesters was that students in the spring semester were told at the beginning that they would need to contribute to the blog by posting one comment and one response to a comment for the story of their choice. To motivate students to fulfill this requirement a total of 10 points were allocated on each quiz covering the current events. In other words, if students failed to make comments the best grade that could be received on the current events quiz was a 90. The comments were graded based solely on participation, though students were told that each comment should be at least 2-3 sentences in length. Finally, students in the spring semester were asked to post under the pseudonym of their student ID number. This allowed for all posts to be anonymous to others. Interestingly, some people chose not to remain anonymous and posted using their names. Of the students who chose to identify themselves they were mostly male, and if it was done by a female student she would use her last name instead of her full name. This finding motivates the use of gender as an explanatory variable in the following section, although we will see that there are not any differences due to gender in the returns to discussing asynchronously.

Because everything, except for the emphasis that students post to the current events blog in the spring semester, was held constant we can deduce that improvements in student performance are a result of asynchronous discussion participation. As a measurement of student performance, test scores on the first test are used. For both semesters this test was standardized in such a way that they were the same length with very similar, and in many cases identical, multiple choice questions. Leaking of the test was prevented as well.

## Empirical Analysis

A priori, it is expected that more interaction and discussion of the course and its concepts via asynchronous discussion will translate to higher grades on tests. To test this hypothesis the following linear regression model is considered,

$$Grade_i = \beta_0 + \beta_1 Business_i + \beta_2 Attend_i + \beta_3 Under_i + \beta_4 AsyncLearn_i + a_i$$

where: Grade is the student's test grade on the standardized first test; Business is a dummy variable measuring if the student is a business major or not, Attend measures the students attendance percentage; Under is a dummy variable measuring if the student is a freshman/sophomore; AsyncLearn is the amount of comments to articles that the student made. Summary statistics for all variables can be seen in table one, and correlation coefficients can be seen in table two.

| Table 1 – Summary Statistics |          |          |           |
|------------------------------|----------|----------|-----------|
| Variable                     | Mean     | Median   | Std. Dev. |
| Test1                        | 71.9191  | 72.2222  | 14.2666   |
| AsyncLearn                   | 0.797428 | 0.000000 | 1.11332   |
| Business                     | 0.450161 | 0.000000 | 0.498312  |
| Attend                       | 78.6446  | 88.8889  | 24.1275   |
| Under                        | 0.755627 | 1.00000  | 0.430407  |
| Notes: 311 observations      |          |          |           |

| Table 2 – Correlation Coefficients |            |          |        |         |            |
|------------------------------------|------------|----------|--------|---------|------------|
| Test1                              | AsyncLearn | Business | Attend | Under   |            |
| 1.0000                             | 0.1762     | 0.1397   | 0.2925 | -0.0165 | Test1      |
|                                    | 1.0000     | 0.0291   | 0.2648 | 0.0795  | AsyncLearn |
|                                    |            | 1.0000   | 0.1403 | 0.1857  | Business   |
|                                    |            |          | 1.0000 | 0.0724  | Attend     |
|                                    |            |          |        | 1.0000  | Under      |

The course is one of a few options in the core curriculum for arts and sciences majors and is mandatory for all business majors. Hence, the concentration of business majors in the class is high. The variable, Business, was introduced not only to capture the large amount of business majors, but also to proxy for innate ability. Ability is clearly not observable, but by separating the autonomous effect of being a business major it is assumed that those who are inclined to “think economically” have been accounted for. Along the same lines, the variable for attendance was included to proxy for student motivation. Gratton-Lavoi and Stanley (2009) study the effects of online learning for microeconomics students as well. A concern that their paper raises is that selection bias may occur when choosing the method of instruction – online, hybrid, or traditional upon registration. For this study, however, students were not aware of any difference in

instruction method when registering for the course. Hence, selection bias, of this nature, is not perceived to be a problem.

A few other variables were considered for the regression analysis including a dummy variable for gender, and a dummy variable for whether or not the student had taken any economics course at the collegiate level previously. The variable for gender was omitted in the final analysis because it did not aid the predictability of the model and was statistically insignificant. This too departs from Gratton-Lavoi and Stanley (2009). In their study they find that male students do on average 7.5 points better than their female classmates in a hybrid class. The variable that measured past experience in collegiate economics courses was also omitted because it was insignificant and not necessarily needed theoretically. 72 students had been previously enrolled in an economics course out of the 311 observations, and most of them were repeating the course in order to replace a low grade. It cannot be determined, then, how much was gained from the student's previous experience in a collegiate economics course.

It is supposed that asynchronous discussion is beneficial to the student but not confirmed through previous studies. If the coefficient for AsyncLearn is positive, and significant, this will signify that asynchronous discussion has in fact increased the student's comprehension of subject material. If it is negative, then asynchronous discussion has been detrimental to subject material comprehension. Because business is a closely related field to economics, it is expected that business majors will perform better on tests than their non-business classmates. The coefficient for Attend is expected to be positive implying that the more often a student attends class, the better their grade will be. Finally, it is expected that underclassmen will not be as successful on tests as older students are.

To estimate the linear model proposed above, the method of ordinary least squares (OLS) is used. Many authors consider the potential for selection bias with OLS results. In this study, selection bias could occur because students who would benefit from discussing material online may not be accounted for because all second semester students were required to make two comments. Some students, though, contributed more than the mandatory amount of comments in the spring, or made voluntary comments in the fall semester. For these students, the benefit to grades could be biased because they have a pre-disposition to this type of learning. In consideration, a Heckit model was estimated using a binary variable that measured whether or not a student contributed more than the mandatory amount. Heckman (1979) originally proposed this methodology to account for sample selection bias when the wages of workers are considered. This bias is overcome, if it exists, by estimating two equations: a selection equation - did the student contribute more than the mandatory amount; and an outcome equation - test grade. The variable, spring, is used in the selection equation because the amount of effort required to post an extra comment is very low for spring semester students. In other words, while a student is already on the blog studying and posting comments it is not odd for the student to post again in the midst of many other comments whereas a post by a student in the fall semester would likely be the only comment associated with that story. In the results for the Heckit model

(found in table 2), lambda, which can be interpreted as the correlation between the error terms in the grade equation and the selection equation, was positive but insignificant. Hence, selection bias is not of concern for this paper and the OLS regression results can be interpreted in the traditional way. In order to estimate the Heckit model the traditional two-step process was used. Mostly, this is due to the strong assumptions necessary for maximum likelihood estimation of the Heckit model (Greene, 2008; Wooldridge, 2002). A detailed table of the Heckit model results can be found in table three. Regression results from the OLS model can be found in table four.

| <b>Table 3 – Heckit Estimation</b>                                                                                                           |                    |                   |          |                |     |
|----------------------------------------------------------------------------------------------------------------------------------------------|--------------------|-------------------|----------|----------------|-----|
| <b>Outcome equation</b>                                                                                                                      |                    |                   |          |                |     |
| <b>Variable</b>                                                                                                                              | <b>Coefficient</b> | <b>Std. Error</b> | <b>z</b> | <b>p-value</b> |     |
| const                                                                                                                                        | 52.4467            | 13.9774           | 3.7522   | 0.00018        | *** |
| Business                                                                                                                                     | -9.12105           | 6.68098           | -1.3652  | 0.17218        |     |
| Attend                                                                                                                                       | 0.241546           | 0.15965           | 1.5130   | 0.13029        |     |
| Under                                                                                                                                        | -4.35489           | 5.28507           | -0.8240  | 0.40994        |     |
| AsyncLearn                                                                                                                                   | 2.51429            | 2.57365           | 0.9769   | 0.32860        |     |
| lambda                                                                                                                                       | 9.37771            | 9.21434           | 1.0177   | 0.30881        |     |
| <b>Selection equation</b>                                                                                                                    |                    |                   |          |                |     |
| const                                                                                                                                        | -1.78329           | 1.03191           | -1.7281  | 0.08396        | *   |
| Business                                                                                                                                     | -0.830667          | 0.742058          | -1.1194  | 0.26297        |     |
| Attend                                                                                                                                       | -0.00600933        | 0.0137039         | -0.4385  | 0.66102        |     |
| Under                                                                                                                                        | -0.6031            | 0.576632          | -1.0459  | 0.29561        |     |
| AsyncLearn                                                                                                                                   | 3.11023            | 0.524648          | 5.9282   | <0.00001       | *** |
| Spring                                                                                                                                       | -5.76886           | 1.24267           | -4.6423  | <0.00001       | *** |
| sigma                                                                                                                                        | 10.78168           |                   | rho      | 0.869782       |     |
| Notes: Heckit - 2-Step method, QML standard errors, 311 Observations, 289 censored observations, * $p < .05$ ; ** $p < .01$ ; *** $p < .001$ |                    |                   |          |                |     |

| <b>Table 4 – Regression Results (OLS)</b>                                                        |                    |                   |                |                |     |
|--------------------------------------------------------------------------------------------------|--------------------|-------------------|----------------|----------------|-----|
| <b>Variable</b>                                                                                  | <b>Coefficient</b> | <b>Std. Error</b> | <b>t-ratio</b> | <b>p-value</b> |     |
| const                                                                                            | 59.027             | 3.16827           | 18.6307        | <0.00001       | *** |
| Business                                                                                         | 3.23862            | 1.6569            | 1.9546         | 0.05154        | *   |
| Attend                                                                                           | 0.150909           | 0.0363452         | 4.1521         | 0.00004        | *** |
| Under                                                                                            | -2.13974           | 1.78182           | -1.2009        | 0.23073        |     |
| AsyncLearn                                                                                       | 1.42597            | 0.688895          | 2.0699         | 0.03930        | **  |
| R-squared                                                                                        | 0.110136           | Adj. R-squared    | 0.098466       |                |     |
| F(4, 305)                                                                                        | 9.928666           | P-value(F)        | 1.45e-07       |                |     |
| Notes: Heteroskedasticity corrected standard errors. * $p < .05$ ; ** $p < .01$ ; *** $p < .001$ |                    |                   |                |                |     |

The estimated values for all variables are consistent with the expected sign for each variable. According to the estimates, business majors do in fact perform better on tests than non-business majors by approximately 3 points. Also as expected, the attendance rate is very significant in determining a student's grade. The estimates show that if a student increases their

attendance by 10%, their test grade will increase by about 1.5 points, all else constant. The main variable of interest is AsyncLearn which is both positive and significant at the 5% level. The estimates show that for each additional comment on the current events blog a student raises their grade by about 1.4 points. Or in other words, if the only difference between two students is that one student was more involved in discussing course related material outside of class, i.e. posting comments to the blog, the student who discussed asynchronously will perform better on the test.

The R-squared statistic for the OLS model is approximately .11 which is on the low side of acceptable. For this reason, a least absolute deviation (LAD) model is estimated and presented in table three. Least absolute deviation regression is an estimation technique that is more robust than OLS when data that have many observations at the low or high end are considered. As one might expect in a large freshman level class, test grades are approximately normally distributed but with a “non-normal” amount of observations on the low end. The data in this study are no exception.

| <b>Table 5 – Regression Results (LAD)</b>               |                    |                    |                |                |     |
|---------------------------------------------------------|--------------------|--------------------|----------------|----------------|-----|
| <b>Variable</b>                                         | <b>Coefficient</b> | <b>Std. Error</b>  | <b>t-ratio</b> | <b>p-value</b> |     |
| const                                                   | 59.9722            | 4.37352            | 13.7126        | <0.00001       | *** |
| Business                                                | 3.0000             | 1.82204            | 1.6465         | 0.10069        |     |
| Attend                                                  | 0.131944           | 0.0463575          | 2.8462         | 0.00472        | *** |
| Under                                                   | -1.86111           | 2.04112            | -0.9118        | 0.36259        |     |
| AsyncLearn                                              | 2.54839            | 1.01307            | 2.5155         | 0.01240        | **  |
|                                                         |                    |                    |                |                |     |
| Sum absolute resid.                                     | 3175.863           | Sum squared resid. | 56496.33       |                |     |
| <i>Notes: *p &lt; .05; **p &lt; .01; ***p &lt; .001</i> |                    |                    |                |                |     |

The estimates from the LAD model are quite similar to the OLS results. Still, as attendance increases, so too does the expected test grade. Business majors are still predicted to have higher test scores on average, but this can only be said with about 90% confidence. The measure for asynchronous learning, however, has increased both quantitatively and statistically. Before, each additional discussion post garnered an expected 1.4 points on the test, but the LAD model predicts that each additional post will increase a student’s test grade by about 2.5 points. To put this in context, if a student completed 2 discussion posts their test grade is expected to be about 5 points higher than students who did not post. Hence, both regressions support the hypothesis that asynchronous discussion of course-related online materials increase student performance on standard subject tests.

## CONCLUSION

This paper has shown that asynchronous discussion of course-related materials has in fact improved student comprehension of course material. This is likely due to the higher levels of

thinking that can occur when students interact with each other and go beyond answering simple multiple choice type questions. By actually applying and evaluating concepts learned in class to real life examples, and by furthering this knowledge with original contributions to a comment thread, students have elevated their learning of lecture material. The results of this paper are encouraging to the development of hybrid classes, but should be met with a little reservation. Because asynchronous learning has worked in this principles of microeconomics classroom does not mean that it will necessarily work with other subjects or fields of economics. The method of online dissemination, the types of materials used online, and the environment in which students discuss are all major variables to consider. Hence, more study on the efficacy of asynchronous discussion in a hybrid class is still needed to fully support its use pedagogically.

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