

A Quick Argument for Active Learning: The Effectiveness of One-Minute Papers

Kristin Stowe¹

Abstract

While lecture is the dominant means of delivering content in an economics class, the use of active learning techniques is slowly growing. This article focuses on the effectiveness of in-class writing. Consistent with prior research, this study finds that writing improves student performance on exams. Advances over prior research are offered in the particular usage of one-minute papers and in the availability of student data from the university's Registrar. In particular, the use of one-minute papers is found to have a significant positive impact on student grades in a Principles of Macroeconomics course. Other key variables include a student's attendance and prior academic record.

Key Words: Active learning, Pedagogy, Student performance, Writing

JEL Classification: A22

Introduction

Faculty members at many business schools are working to revise curriculum and update their pedagogy. The energy to do so may come from a directive of the senior administration of the institution, or from accrediting agencies, or from the faculty member's own sense that students are not learning as much as they should. Regardless of the motivation, professors face uncertainty that raises a litany of questions: Why do I have to change? This has worked before, why isn't it working now? Where do I go from here?

Economics faculty are among those whose major is losing ground. Siegfried (2009) provides information on the major. From 1991 to 2008, the number of economics degrees awarded grew by 19.5 percent while the total number of undergraduate degrees awarded grew by 41 percent. The percentage of economics degrees earned by women rose from 30.6 percent to 31.2 percent in a period in which the share of all undergraduate degrees earned by women rose from 53.9 percent to 58.5 percent. This decline in economics market share is due in part to a failure to attract more female students. Changing the balance of class time from lecture to active learning may help recruit and retain students who learn in different styles.

In lecture, the instructor is active and the student passive. Pedagogical techniques to engage the student, and hopefully improve learning outcomes, shift the focus from the instructor to the learner. The student is given the opportunity to engage the material as it is being presented. Watts and Becker (2008) find that the use of alternative teaching methods has been slowly growing. In economics principles classes, instructors lecture during 83 percent of class time. There is more use of cooperative learning, classroom experiments, and classroom discussions between students than in prior years. In 1995, the median time spent on these activities was zero; in 2005, time spent on each averaged 6 percent.

¹ Assistant Professor of Economics, School of Business, Wingate University, Wingate, NC 28174.

Trading some lecture time for active learning can have value if people learn in a variety of ways. Lage and Treglia (1998) provide a review of studies indicating that females and males have different learning styles. Studies have found women tend to learn through experiences; men through conceptualization. Active learning is most effective for students who tend to take in information through experiences while lecture can be effective for people who learn through conceptualization.

Review of the Literature on Writing in Economics Courses

Numerous studies have covered factors that impact student performance in an economics course. Many of the factors are based on the individual student: aptitude, time spent studying, absences, choice of major, etc. Other factors include entering GPA, cumulative hours, transfer status, gender, age, race and personality.² Recently, Elzinga and Melaugh's (2009) study of 35,000 principles of economics students at the University of Virginia found that math SAT scores and gender (males score higher) are significant grade predictors. In addition, fourth year students outperformed students with less college experience; athletes and Virginia residents earned lower grades than non-athletes and out-of-state students.

While the aforementioned studies focus on student characteristics, factors controlled by the instructor do impact student performance. As far back as 1974, Anderson noted that the way in which concepts are organized can impact student retention of the material. Miller and Westmoreland (1998) find mixed results as to the effect of selective homework grading on test performance. Sewell (2004) found that the policy of dropping a lowest test grade during the semester leads to lower performance on comprehensive final exams.

The professor's use of writing in a course may influence student learning. The use of writing may have two goals. Some professors want students to learn to write; others want students to write to learn. In an economics curriculum, both are important. Outside of academe, employers prefer that college graduates be able to communicate effectively. As one example, the National Commission on Writing collected cost data from 64 large corporations affiliated with the Business Roundtable. According to the 2004 report, firms may spend as much as \$3.1 billion annually to remediate their employees' writing deficiencies.

Faculty may use writing outside of class to build both writing and economic skills. This need not be a formal research paper, although such papers do have value. Instructors may use student journals and reflection papers as informal writing assignments (Brewer and Jozefowicz 2006). Greenlaw (2003) taught Principles of Macroeconomics as a writing intensive course in which students wrote eight to ten short papers. Compared to a section taught with the traditional lecture approach, writing improved student's attitude toward the subject and led to higher scores on exams at the end of the course. Dynan and Cate (2005) find that writing assignments during the course lead to higher grades on student exams, which can help an institution demonstrate student learning for AACSB or other accrediting agencies. They later find that writing assignments help with lower order exam questions, such as those on knowledge and comprehension, but not necessarily with assessments of the higher order skills of analysis, synthesis and evaluation. Dynan and Cate (2009) suggest that adding structure to writing assignments boosts student learning.

² Studies include Borg and Stranahan (2003), Anderson, Benjamin and Fuss (1994), Borg, Mason and Shapiro (1989), and Siegfried and Strand (1977).

In a minute paper, students are asked one or two simple questions at either the beginning or end of class. Minute papers focus on writing to learn, not learning to write. Many professors avoid writing assignments because of the time required to assess the work, but keeping the question(s) short and succinct lessens the instructor's burden of grading. Pre-class papers may ask questions such as "What do you know about . . . ?" to assess prior understanding of the day's concept. Post-class papers could include questions such as "What was most confusing about class today?" Students can also be shown a chart or table with data, then asked to provide a written interpretation. Other prompts could ask students to state the advantages and disadvantages of a theory discussed in class.

One minute papers have been used in settings as varied as chemistry courses (Harwood 1996), art history courses (Steele 1995) and multicultural seminars (Ludwig 1995). Almer, Jones and Moeckel (1998) found that accounting students who wrote one-minute papers scored better on subsequent essay quizzes but not on multiple-choice quizzes. Students whose one-minute papers were graded did not score better than those non-graded. Grading was done by an outside instructor; questions were not used in the class. Chizmar and Ostrosky (1998) conducted a study in which the economics instructor began class with review of questions from the prior meeting's one-minute papers. The control groups did not write papers and did not hear a review at beginning of class. Students in class that wrote one-minute papers scored higher on the TUCE (Test of Understanding of College Economics) at the end of the semester.

Despite these studies, self-assessment activities such as one-minute papers are given an average of 0 percent of time in principles classes (Watts and Becker 2008).

Methodology

This study was conducted in Spring 2009 at a small, private university in the southeastern U.S. Three sections of Principles of Macroeconomics were taught by same instructor on the same days (MWF). No other sections were offered at the university. Two sections were the control group; students did no writing except on quizzes and exams. The third section comprised the experimental group; students took the same quizzes and exams plus they wrote a one-minute essay at end of each class. Two questions were asked:

1. What did you learn in class today?
2. What was the most confusing thing in class today?

Each one-minute paper was read by the instructor. If a student wrote a question, it was answered in writing. Otherwise, the instructor did not comment. Papers were returned to all students one to three days later.

The research question is whether writing influenced students' final grades. Unlike prior studies, the minute papers were not graded. A second difference is that student comments were not discussed in a subsequent class. Third, the study differs from prior research because of the data on student background. Other studies of business students relied on self-reported data. Here, the university's Registrar provided data which prior literature has found to have an impact on student grades: cumulative GPA, cumulative credit hours earned, grade in prior course, SAT math and SAT verbal scores. Other variables include gender, status as a student-athlete, and absences.

Table 1 provides descriptive statistics. All of the students in the course fell into the traditional age range of 18 to 22 years old. 53 percent of the students were males and 47 percent females. 52 percent of the students were NCAA Division II athletes and 48 percent were not

athletes. There were no statistically significant differences in the descriptive statistics among the sections except for cumulative credit hours. Students in the control group had completed an average of 60 hours; students in the writing section an average of 46.

Table 1: Descriptive Statistics

Variable	Standard		Minimum	Maximum
	Mean	Deviation		
Final Average	78.1	12.2	33.3	94.5
SAT Verbal	498.8	78.1	360	700
SAT Math	523.7	77.7	370	710
Cumulative credit hours earned	56.2	27.6	13	133
Cumulative GPA	2.9	0.7	1.5	4
GPA for Principles of Microeconomics	2.7	0.9	1	4
Number of absences	4.3	4.8	0	23

Regression Analysis

OLS regression was used to determine the predictive power of the variables. The most significant factor in predicting a student's final average in Principles of Macroeconomics was, not surprisingly, the student's prior academic performance. As Table 2 shows, absences detract from a student's grade.³ Females had a higher average than males. Consistent with Elzinga and Melaugh (2009), the SAT Math score was more significant than Verbal.

A student's cumulative GPA and grade in Principles of Microeconomics were not included in the same regressions because of the connection between the two. SAT Verbal and cumulative hours earned were included in the first two regressions because of their standing in prior studies, but dropped from the third and fourth regressions when they were not significant with this data set. Regressions including the student's status as an athlete, not reported here, showed the variable to be insignificant. All students in the control classes are grouped into one section for purposes of the analysis; students in the class which did the one-minute papers comprise the second section.

A key finding is that students in the section that wrote the one-minute papers scored higher than students who did not write. In the fourth regression, the 'section' variable was significant at the 11 percent level. Responding to written questions at the end of each class added approximately 4 to 5 points to a student's final average.

³ The attendance policy for the course was that students who missed more than 50 percent of the classes would automatically fail. Other than that, attendance did not directly factor into grade calculations.

Table 2: Regression Analysis

Dependent Variable = Final Average in Principles of Macroeconomics

Variables	OLS <u>1</u>	OLS <u>2</u>	OLS <u>3</u>	OLS <u>4</u>
(Constant)	40.556*** (8.10)	50.275*** (9.18)	43.731*** (7.63)	54.726*** (7.85)
Section of course	4.554** (2.13)	5.934* (1.90)	4.103* (2.07)	3.711 (2.26)
SAT Verbal	0.008 (0.02)	0.012 (0.02)		
SAT Math	0.023 (0.02)	0.011 (0.02)	0.024* (0.01)	0.014 (0.02)
Cumulative credit hours earned	0.041 (0.04)	0.037 (0.05)		
Cumulative GPA	7.278*** (2.01)		7.945*** (1.96)	
GPA for Principles of Microeconomics		5.934*** (1.90)		6.52*** (1.79)
Number of absences	-1.153*** (0.24)	-1.074*** (0.28)	-1.098*** (0.24)	-1.007*** (0.27)
Gender	3.551 (2.23)	2.712 (2.59)	3.905* (2.19)	2.535 (2.54)
Adjusted R ²	0.775	0.751	0.777	0.757

N=54. Standard errors in parenthesis. *** Significant at 1 percent.
** Significant at 5 percent. * Significant at 10 percent.

Correlation

The regressions highlight four factors as key in predicting a student's grade in Principles of Macroeconomics: section (with or without one-minute papers), number of absences, gender and prior academic record. While the regression analysis helps explain the differences in students' macroeconomics grades, there may be underlying relationships among the variables. For example, the section effect may be due not to writing, but to another relationship, perhaps a concentration of absenteeism in one class.

Students were grouped by gender and section: males in regular section (Group 0), males in writing sections (Group 1), females in regular section (Group 2), females in writing section (Group 3). SPSS was used to calculate the correlation between Final Average in Macroeconomics and Group, controlling for Number of Absences and Cumulative GPA. As reported in Table 3, the relationship between Group and Final Average is significant at a level of 3 percent. The positive correlation indicates that students' final average rises from Group 0 (males in control section) to Group 3 (females in writing section).

Table 3: Correlation between Final Average and Group

Control Variables			Final Average	Group (Gender/Section)
Number of absences & Cumulative GPA	Final Average	Correlation	1.0	0.307
		Significance (2 tailed)		0.030
	Group	Correlation	0.307	1.0
		Significance (2 tailed)	0.030	

Note: df = 48

Conclusions

Active learning exercises may make courses more interesting for students and improve learning outcomes. Writing is one type of active learning. Unfortunately, many writing assignments come with a high time cost for the professor. One minute writing can increase students' learning with a relatively low cost to the professor. This study provides evidence that small amounts of writing do make a difference, even one-minute papers without a grade and without a subsequent in-class review of topics by the professor. The writing activity asks students to stop, focus their thoughts and pinpoint their questions before leaving class. Female students may benefit more than males, adjusting for other factors.

Further research on one-minute papers could be done with larger numbers of students, with variations on the grading of papers and with differences in the amount of review the instructor conducts in class. In general, one-minute papers could be used by faculty who want a low-cost way to make classes more interactive. Interactive classes could be one way to address the decline in the economics major outlined in Siegfried (2009).

References

- Almer, Elizabeth Drieke, Kumen Jones and Cindy L. Moeckel. 1998. "The Impact of One-Minute Papers on Learning in an Introductory Accounting Course" *Issues in Accounting Education*, 13 (3): 485-497.
- Anderson, G., D. Benjamin, and M. Fuss. 1994. "The Determinants of Success in University Introductory Economics Courses." *Journal of Economic Education*, 25: 99-119.
- Anderson, Wylie. 1974. "A Comparison of Pre- Versus Post- Organizers upon Retention of Economic Concepts." *Journal of Economic Literature*, 6: 61-64.
- Becker, William E. and Michael Watts. 2005. Teaching Economics to Undergraduates: Alternatives to Chalk and Talk. Edward Elgar.
- _____. 2001. "Teaching Economics to Undergraduates." *Journal of Economic Literature*, 35: 1347-73.
- Borg, Mary O'Malley and Harriet Stranahan. 2002. "The Effect of Gender and Race on Student Performance in Principles of Economics: The Importance of Personality Type." *Applied Economics*. 34: 589-598.

- Borg, Mary O., Mason, Paul M. and Shapiro, Stephen L. 1989. The Case of Effort Variables in Student Performance. *Journal of Economic Education*, 20 (3): 308-313.
- Brewer, Stephanie M. and James J. Jozefowicz. 2006. "Making Economics Principles Personal: Student Journals and Reflection Papers." *Journal of Economic Education*, 37: 202-216.
- Chizmar, John F. and Anthony L. Ostrosky. 1998. "The One-Minute Paper: Some Empirical Findings," *Journal of Economic Education*, (Winter) 3-10.
- College Board, the National Commission on Writing for America's Families, Schools, and Colleges. (2004, September). "Writing: A ticket to work ... or a ticket out: A survey of business leaders." New York: Author.
- Dynan, Linda and Tom Cate. 2009. "The Impact of Writing Assignments on Student Learning: Should Writing Assignments be Structured or Unstructured?" *International Review of Economics Education*, 8: 64-86.
- _____. 2005. "Does writing matter? An empirical test in a college of business course meeting AACSB's new international standard." *Proceedings of the Association for Global Business*.
- Elzinga, Kenneth G. and Daniel O. Melaugh. 2009. "35,000 Principles of Economics Students: Some Lessons Learned." *Southern Economic Journal*, 76 (1): 32-46.
- Greenlaw, Steven A. 2003. "Using Writing to Enhance Student Learning in Undergraduate Economics." *International Review of Economics Education*, 1: 61-70.
- Harwood, W.S. 1996. "The One-Minute Paper." *Journal of Chemical Education*. 73 (3): 229-230.
- Ludwig, Jeanette. 1995. "The One-Minute Paper." *Liberal Education*. 81 (4).
- Miller, Ellen and Geraldine Westmoreland. 1998. "Student Response to Selective Grading in College Economics Courses." *Journal of Economic Education*, 29: 195-201.
- Sewell, Ellen. 2004. "Grade Dropping: An Empirical Analysis." *Journal of Economic Education*, 35: 24-34.
- Siegfried, John J. 2009. "Trends in Undergraduate Economics Degrees, 1991-2008." *Journal of Economic Education*, (Summer) 331-336.
- Siegfried, John J. and S.H. Strand. 1977. "Sex and the Economics Student." *Review of Economics and Statistics*, 59 (2): 247-249.
- Steele, Brian. 1995. "The One-Minute Paper." *Art Journal*, 54 (3): 88-90.
- Watts, Michael and William E. Becker. 2008. "A Little More than Chalk and Talk: Results from a Third National Survey of Teaching Methods in Undergraduate Economics Courses." *Journal of Economic Education*, 39: 273-286.