Does Using Assignments in Teaching Introductory University Economics Promote Learning or Distort the Grades?

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Abstract

This study explores two issues related to teaching university level introductory microeconomics. The first issue is whether completing assignments in the course is effective in helping students learn the salient concepts. The second issue relates to whether inclusion of the assignments has any significant impact on the overall class average and distribution of course grades (relative to those grades that would exist in absence of the assignments).

Issue one was investigated by comparing the results of an assignment question and a surprise quiz (with the same question - completed in class immediately after the assignments were submitted). Based on a statistical analysis of four separate trials over two different semesters, it is concluded that the quiz grades are significantly lower (based on paired T tests at 99% confidence level) and not highly correlated (based on the Pearson correlation coefficients) with the corresponding quiz grades. It was concluded that completing the assignments does not appear to be effective in helping students learn the relevant concepts.

Issue two was examined by comparing the mean and distribution of student final grades with/without the assignments (assignments are worth 15 percent of the final grade). It was found that the assignments do have a statistically significant inflationary impact on the overall grades. Furthermore, the assignments distort the distribution of marks. Students with the highest overall grades are helped very little (and often hindered) by the inclusion of assignment marks. Conversely, students at the bottom end of the distribution see their grades raised by the greatest amount.

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I. Introduction

Assignments have been part of most introductory microeconomics courses taught at Acadia University over the last 15 years. The assignments consist of exercises on theoretical and applied exercises related to the principles taught in the course. The goal of the assignments is essentially to provide students with increased exposure (over and above class lectures) to the salient concepts, as well as practice in applying them. Students are free (in fact encouraged) to get assistance from the instructor if difficulties arise in completing the exercises. Students are told that it is acceptable to discuss the questions with one another but their submitted assignment must contain their own work.

In order to aid the learning process from completing the assignments, students are urged to start working on the assignment when it is distributed and to avoid waiting until the due date is close which necessitates rushing through the exercises.

The assignments are emailed to students 10-14 days prior to the date of submission. All assignments must be typed, with graphical analysis completed on any one of a variety of software applications) and submitted in printed (hardcopy) form. Assignments are submitted directly to the instructor at the beginning of class on the submission date. There are usually three assignments per semester, currently constituting 15 percent of the final grade.

II. The Current Conundrum

In past years assignments were usually worth in the range of 20-25 percent of the final grade. However, this percentage has been reduced to the current 15 percent over concerns of plagiarism on the assignments and resulting grade distortions. Over the last two years such concerns have heightened and elimination of assignments has been considered. Such concerns are based on casual empiricism of the following:

1. Increased numbers of non-original assignments (some obviously copied, some less obviously).
2. Declines in the number of students seeking assistance from the instructor.
3. Virtually all assistance being sought occurs in the final days/hours before submission is required.
4. Rising number of cases where students ignore (do not attempt all or numerous parts of given questions).
5. Decline in the proportion of the class that indicates they have made progress on the assignment when polled in the classes leading up to the submission date.

III. Research Questions

The previously noted observations led to the following research questions:

1) Do the assignments help students learn the relevant concepts associated with the course?
2) Do assignments distort the final grade distribution relative to what would occur in absence of assignments?

IV. Data

As previously noted the goal of the assignments is to help students learn the relevant concepts. Ultimately, the degree to which students actually benefit from completing the assignments is directly dependent on the degree that students actually complete (attempt to complete) the assignments themselves. Such completions (attempted completions) may/may not include assistance from the instructor. Acquiring such help (if necessary) is encouraged by the instructor but left to the discretion of each individual student.

In an attempt to ascertain the degree to which students learn the relevant economic concepts by completing the assignments (indirectly measuring to some extent, the propensity to which students actually complete the assignments themselves) the following experiment was undertaken during the fall semester of 2003 and the fall semester of 2004. Sixty students were enrolled in 2003 and 99 in 2004. The sample sizes are smaller than the total enrollment as not all students complete the assignments, the quizzes or the course.

As part of the course, students are asked to complete "surprise quizzes" throughout the term. There are usually six quizzes each worth two marks. In each of the last two semesters (Fall 2003 and Fall 2004), on two separate occasions, immediately after the assignments were collected (at the start of class) a surprise quiz was given. The quiz consisted of a single question. The quiz question was identical to one contained in the assignment. The marks from the quizzes and the corresponding question from the assignment were compared. The goal was to investigate the degree to which students had mastered the relevant concept by completing the assignment question with quiz grade providing a measure of that mastery. For the purposes of the experiments, students are defined as having learned the relevant concepts if they can make a quiz grade that is equal to or better than the assignment question grade. The results are discussed below.

V. Results

The initial results discussed relate to Research Question 1. Do assignments help students learn the relevant concepts associated with the course?

Table 1 presents descriptive statistics related to the assignment question grades and the corresponding quiz grades. The assignment grades and the quiz question grades are not highly correlated. The Pearson Correlation Coefficient ranges from a high of 0.33 to a low of 0.21 with consistently declining values for the four cases presented in chronologic order.

Table 1

Descriptive Statistics for Assignment Question and Corresponding Quiz Results

	Example 1 (Fall 2003)		Example 2 (Fall 2003)		Example 3 (Fall 2004)		Example 4 (Fall 2004)	
	Assign	***Quiz***	***Assign***	***Quiz***	***Assign***	***Quiz***	***Assign***	***Quiz***
Mean %	76.16	54.37	63	42.78	95.68	64.32	73.75	41.4
Standard Deviation	26.82	37.74	20.63	24.81	8.74	16.48	16.92	33.86
Observations	56	56	45	45	95	95	86	86
Pearson Correlation		0.3303		0.3164		0.2525		0.2143
Hypothesized Mean Difference		0		0		0		0
Actual Difference (Assign-Quiz)		21.79		20.22		31.36		32.35
Degrees of Freedom		55		44		94		85
t Stat		4.2425		-5.0661		18.4290		-8.7100
P(T<=t) two-tail		4.24E-05		3.87E-06		5.73E-33		1.04E-13
t Critical two-tail		1.67303		1.68023		1.98552		1.66297

The assignment question means range from 96 percent to 63 percent with an overall average of 77 percent. The associated quiz means range from 64 percent to 41 percent and averaged 51percent. The assignment question grades exceeded the quiz grades in all four cases, by an average of 26 percent. The differences in the assignment and quiz means ranged from 21 percent to 32 percent and showed a rising trend. Based on paired T tests, the assignment means and the quiz means are statistically different at the one percent level of confidence in all four cases.

Table 2 outlines the differences in the assignment grades (marked out of 100) and the corresponding quiz grades (marked out of 100). In example 1, the assignment grade exceeded the quiz grade in 58 percent of the cases. In 13 percent of cases the difference

(assignment grade less quiz grade) was +80 marks or more, 26 percent were by +60 marks or more and approximately half were by 30 marks or greater) The grades were equivalent in 22 percent of the cases. The quiz grades exceeded the assignment grades in 20 percent of the cases. For Example 2, there were no cases where the assignment grade exceeded the quiz grade by +70 marks or more. In approximately one quarter of the cases the difference was +60 or more and about half had a difference of more than +30 marks. The assignment grade exceeded the quiz grade in 68 percent of the cases, 13 percent of the grades were the same and 20 percent of the cases had a higher grade on the quiz than on the assignment.

Table 2

Differences in Assignment Question and Corresponding Quiz Results

	Example 1		Example 2		Example 3		Example 4	
Assignment /100 minus Quiz /100	**Percent of Class**	**Cumulative Percent**	**Percent of Class**	**Cumulative Percent**	**Percent of Class**	**Cumulative Percent**	**Percent of Class**	**Cumulative Percent**
+ 90-100	6	6	0	0	1	1	3	3
+ 80-89	7	13	0	0	1	2	5	8
+ 70-79	4	17	0	0	3	5	12	20
+ 60-69	5	22	4	4	4	9	7	27
+ 50-59	4	26	20	24	6	15	10	37
+ 40-49	5	31	11	35	17	32	7	44
+30-39	13	44	13	48	24	56	3	47
+20-29	5	49	7	55	34	90	19	66
+10-19	4	53	0	55	8	98	3	69
+1-10	5	58	13	68	1	99	11	81
0	22	80	13	81	1	100	1	82
-1-10	7	87	9	90	0		8	90
-11-20	2	89	4	94	0		6	96
-21-30	4	93	2	96	0		2	98
-31-40	0	93	2	98	0		1	99
-41-50	0	93	0		0		1	100
-51-60	4	97	0		0			
-61-70	2	99	0		0			
-71-80	0		0		0			
-81-90	0		0		0			
-90-100	0		0		0			

Note – the totals may not equal 100% due to rounding the percents to the nearest whole number.

The magnitude to which the assignment grades surpass the quiz grades is more pronounced for Example 3 and 4 conducted in 2004 relative to Example 1 and 2 conducted in 2003. In Example 3, 99 percent of the assignment grades exceeded the corresponding quiz grades. Fifteen percent were by +50 marks or more, more than half were by +30 marks or more and 98 percent were by +10 percent or more. In Example 4, 20 percent of the assignment cases topped the associated quiz by 70 marks or more, approximately half were by 30% or greater, and 80 percent were 10 percent or more. One percent of the class had equivalent grades. Fourteen percent of the cases produced an assignment grade that exceeded the quiz grade by 1 to 20 percent. An additional 4 percent of the quiz grades exceeded the assignment grades between 40 and 50 percent.

Totaling all four experiments, the assignment grades topped the quiz grades in 227 of the 282 cases (80%) and they were equivalent 18 times (6%) and in 38(13%) of the cases the quiz grade exceeded the assignment grade.

If successful learning from the assignment is defined as the ability to make at least an equivalent grade on the corresponding quiz, only one in five succeeded (56/282=20%). Furthermore, the rate of success fell from approximately one in three students (37/101= 37%) in 2003 to about one in ten (18/181 =10%) in 2004.

The following discussion relates to Research Question 2: Do assignments distort the grade distribution relative to what would occur in absence of assignments?

Assignments have constituted 15 percent of the final grade in the last two semesters. To investigate grade distortion, the actual final grade for the fall 2003 and fall 2004 classes were compared to those that would occur in absence of the assignments. To calculate what each student's grade would have been in absence of assignments, the assignment mark (out of 15) is subtracted from the current grade (out of 100) and the total is divided by 85 (which, in absence of the assignments, is the maximum number of marks a student could accumulate). The result is the grade (in percent) that students would have made if there had been no assignments.

Table 3 and Table 4 present the descriptive statistics for the 2003 and 2004 terms respectively. The average course mark including the assignments is 71.1 in 2003 and 70.5 in 2004. The average grade that would occur without the assignments was 68.6 in 2003 and 67.5 in 2004. Based on the paired t tests at the 99 percent confidence level, the average course mark with the assignments is statistically different from the average course grade that would occur in absence of the assignments for both years.

Table 3

Descriptive Statistics for Course Marks With and Without Assignments 2003 and 2004

	2003		2004	
	Course Mark with Assignments	***Course Mark without Assignments***	***Course Mark with Assignments***	***Course Mark without Assignments***
Mean	71.1	68.6	70.5	67.5
Variance	299.18	356.07	229.18	292.74
Observations	67	67	99	99
Pearson Correlation	0.9896		0.9904	
Hypothesized Mean Difference	0		0	
Df	66		98	
Actual Difference (With Assign - Without Assign)	2.50		3.0	
T Stat	6.747208		10.2214	
P(T<=t) one-tail	2.27E-09		2E-17	
T Critical one-tail	1.668271		1.660551	
P(T<=t) two-tail	4.55E-09		4.E-17	
T Critical two-tail	1.996564		1.984467	

Table 4 and 5 contain a breakdown of the differences in the course grades with and without the assignments. The cases are grouped by the actual (with assignment) course grades.

Table 4
A Comparison of Overall Class Grades With and Without Assignments: 2003

1 Actual Final Grade (Percent)	2 Number of Cases	3 Number of Cases Where Including Assignments Pushes Grade Up (percents in brackets)	4 Number of Cases Where Including Assignments Pushes Grade Down (percents in brackets)	5 Actual Final Grade (Includes Assignments Worth 15 Percent of Final Mark) Average	6 Final Grade If Assignments Were Excluded From Marking Scheme Average	7 Difference (Column 2 less Column 3) Average
90-100	10	5 (50%)	5 (50%)	92.1	91.6	+0.5
80-89	17	11 (65%)	6 (35%)	83.7	82.6	+1.1
70-79	13	11 (85%)	2 (15%)	73.0	70.8	+2.2
60-69	14	13(93%)	1 (7%)	63.9	59.4	+4.5
50-59	6	5 (83%)	1 (17%)	55.0	51.4	+3.6
<50	7	6 (86%)	1 (14%)	35.3	31.1	+4.2
Totals	67	51 (76%)	16 (24%)			
Average				71.1	68.6	2.5

Both Tables show similar patterns. First of all, students in the top grade range (90-100%) are impacted very little or negatively by the assignments. In 2003 there were an equal number of students who were affected positively and negatively with the overall impact an increase in the average grade of +0.5 percent. In 2004, eight of the nine students in the top range were impacted in a negative manner, with the overall effect being - 1.5 percent in the average A grade.

For those students in the 80-90 percent mark category, the assignments have a small positive effect (in the range of one percent) in both semesters. In both years, the proportion of the students who saw their mark rise (as a result of the assignments) and the average increase in the mark, rise as the grade range falls. In 2003 between 80 and 90 percent of the students with grades of less than 70 benefited from the assignments with the average grade being pushed up by approximately 4 percent. In 2004, the inverse relationship between the falling grade range and the rising proportion of the students who see the grade increase (along with the magnitude of the increase) is more pronounced. For students in the 70-79 mark range, 80 percent saw their grade rise and by average of 2.8%. Ninety three percent of students with marks in the 60-69 range saw their marks rise by an average of 4.1%. All students in the 50-59 mark range and failing grade range (less than 50 percent) saw the assignments boost their mark, by an average of 5.1 percent and 5.7 percent respectively.

Table 5

A Comparison of Overall Class Grades With and Without Assignments: 2004

1 Actual Final Grade (Percent)	2 Number of Cases	3 Number of Cases Where Including Assignments Pushes Grade Up	4 Number of Cases Where Including Assignments Pushes Grade Down	5 Actual Final Grade (Includes Assignments Worth 15 Percent of Final Mark) Average	6 Final Grade If Assignments Were Excluded From Marking Scheme Average	7 Difference (Column 2 less Column 3) Average
90-100	9	1 (11%)	8 (89%)	95.9	96.4	-0.5
80-89	20	12 (60%)	8 (40%)	83.7	82.2	+1.5
70-79	22	18 (82%)	4 (18%)	74.6	71.8	+2.8
60-69	28	27 (96%)	1 (4%)	64.5	60.4	+4.1
50-59	9	9(100%)	0	54.7	49.7	+5.1
< 50	10	10(100%)	0	45.3	39.6	+5.7
Totals	99	82 (83%)	17 (17%)			
Average				70.5	67.5	+3.0
Note- There was one case where the assignments had no impact on the actual grade.						

VI. Conclusions

The conclusions relate directly to the research questions and are discussed in turn in what follows. A word of caution is order before the research questions are discussed. It is important to note that the experiments take place over just a two year period and include less than 170 cases. A longer time frame and a larger sample size are clearly warranted before definitive conclusions can be drawn regarding the research questions.

Research Question 1 was: Do the assignments help students learn the relevant concepts associated with the course?

The assignment question grades and corresponding quiz grades are not highly correlated and becoming less so. The Pearson Correlation Coefficient fell from approximately 0.30 in the first experiment to 0.20 in the fourth. The assignment question means (averages) exceed the corresponding quiz means in all semesters and the differences are all statistically significant at the 99% confidence level. The average difference in the assignment/quiz means increases from about 20 percent in 2003 to about 30 percent in 2004. The proportion of students able to achieve a quiz grade that was equal or better

than the corresponding assignment question fell from approximately four in ten students in 2003 to one in ten in 2004.

The evidence suggests that the process of completing the assignments is not (in the vast majority of cases) effective in helping students learn the relevant concepts. The inability of the assignments to solidify understanding of the concepts (and achieve quiz results similar to assignment marks) may be a result of the increased numbers of plagiarized assignments combined with increasing proportions of students who wait until the deadline for submission in imminent before beginning the exercise. Other explanations are obviously possibilities, more research is clearly necessary on this issue.

Research Question 2 was: Do assignments distort the final grade distribution relative to what would occur in absence of assignments?

The actual final class average (the mean grade encompassing student assignments, tests, quizzes and exam) exceeded the class mean that would have occurred in absence of the assignments by 2.5 percent in 2003 and 3.0 percent in 2004. These means are statistically different (at the 99 percent confidence level). Furthermore, the students with the lowest grades tend to benefit the most from assignment grade inclusion and students with the highest overall grades benefit the least (if at all). Students in the top grade ranges (80-100%) saw little positive impact on their grades and over half the students in the top mark range (90-100%) saw their grade fall as a result of the assignments. Conversely, a growing percentage of students benefited and by a rising amount as the actual grade range declined. Over 90 percent of students who made a mark of less than 60 percent saw their grade boosted by the assignments and by an average of approximately 5 percent.

Inclusion of the assignment grades does distort the grade distribution and in a perverse way. The students with the higher overall grades are helped the least (and often hindered) by the assignment marks, while the students at the bottom end of the grade distribution see their term grades raised the most.

In summary, the use of assignments in introductory microeconomics must be questioned. Based on the comparison assignment and associated quiz grades, there is little evidence to indicate that completing the assignments is effective in helping students master the relevant concepts. Furthermore, the assignments do inflate the overall grade average and, at the same time, affect the distribution by pushing up grades at the bottom of end of the spectrum but not those at the top.

References

Bussing-Burks, M. (1997, 'Learning Techniques at the Principles Level', *American Economist* 41, 123-127.

Crowley, R. and Wilton D. (1974), 'Learning in Introductory Economics', *Canadian Journal of Economics 7 (4)*, 665-773.

Guest, R. and Duhs C. (2002), 'Economics Teaching in Australian Universities: Rewards and Outcomes', *The Economic Record* 78 (241), 147-160.

Lee, J. Burgess J. and Kneist J. (1996), 'Teaching Australian First-Year Economic Courses: In Search of a Better Way', *Journal of Economic Education* 27 (1), 85-90.

Miller, E. and Westmoreland G. (1998), 'Student Response to Selective Grading in College Economics Courses', *Journal of Economic Education* 29 (3), 195-201.

Walstad, W.B. (2001), 'Improving Assessment in University Economics', *Journal of Economic Education* 32 (3), 281-294.