

USING AN ACTIVE LEARNING APPROACH TO CLOSE THE LOOP

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ABSTRACT

The AACSB International requires schools accredited by that body to assess student learning outcomes and to meet the standard set by the school as well as to create a method to improve student performance. We use the active learning approach to improve the Managerial Accounting class performance which was below par. In support of other studies in the science fields, the active learning approach is the driving force to improve student performance in Managerial Accounting. However, it appears that active learning does not help improve learning at the higher levels of Bloom's Taxonomy.

JEL: M40

KEYWORDS: Active Learning Approach, Accounting, Education

INTRODUCTION

One of the major requirements in the AACSB International, an accrediting body for business schools, is the Assurance of Learning (AOL) in Standard 8. It describes how to determine student outcomes of learning and to conduct assessment of learning as well as to “close the loop”. “Closing the loop” requires that colleges and universities determine a systematic method that will improve student learning outcomes measured by the metrics previously defined and set by the faculty. Therefore, schools must not just assess, but follow up in ways to improve the learning outcome of students. The rationale is that if we provide a systematic method that improves the assessment metrics, it will lead to improved student learning.

In the field of accounting at Menlo College we assess the students learning outcomes in the two principles of Financial and Managerial accounting classes which are required of all business students. In particular, this study focuses on the second principle course, Managerial Accounting ACC 202, because students experience greater difficulty in learning the concepts in Managerial Accounting.

In 2013, the accounting faculty members established an assessment tool comprised of general questions related to concepts that we believe all business students should know. Two tests, one for Financial and another for Managerial, consist of ten general multiple choice questions. Moreover, we set a 70% average score as the acceptable level of performance. The average score for Financial Accounting was 77% in Fall 2013 and 63% in Spring 2014. However, average scores were disappointing for Managerial Accounting with an average of 47% in Fall 2013 and 53% in Spring 2014. The Financial Accounting average scores improved in Fall 2014 to 75% and remained at that level. However, Managerial Accounting test averages remained subpar to the standard set (70%), ranging between 54% and 67% from 2014 to 2016. It confirmed that students experience more difficulty learning concepts in Managerial Accounting.

Aside from the difficulty of the concepts, there are two possibilities that led to the lower than expected results. One, the students were not motivated. They were told the results of the exam will count only as

extra credits for the class. Two, students may have not learned or have forgotten the topics covered earlier in the semester. However, test scores on Exam 1 covering earlier topics refutes both possibilities as the average score was 83%. The average score shows that students were motivated and did learn the concepts covered earlier in the semester.

To improve the student learning and assessment test performance, as well as to “close the loop”, we handed out worksheets with topics to review from the beginning of the semester to all sections of ACC 202. In Fall 2014 and Spring 2015 we administered the exam again, and the results improved slightly, but still below 70%.

It was evident that providing students with review worksheets was not sufficient, but the students needed to actively participate in the learning process. As McLaughlin et. al. (2014) found, “active learning exercises such as teamwork, that prompts students’ engagement and reflection encourage them to explore attitudes and values, while fostering their motivation to acquire knowledge and enhance skills” in the health professions school. [2014, p. 236]. In this case, the students’ attitude towards accounting which is typically viewed as a ‘boring subject’ can be overcome by the learning process of active learning and engaging students in the subject matter.

Our study examines the students learning outcome using test scores by focusing on the active learning approach. If we find that active learning results in higher test scores, we can imply that the active learning results in higher student learning.

Our findings are similar to those of Jensen, Kummer, and Godoy (2015) who examined a flipped classroom approach in a life science class. They found that the “active-learning style of instruction” of the flipped classroom resulted in higher learning compared to a traditional classroom approach. Our results also support the fact that active-learning results in higher student learning in Managerial Accounting, measured by the assessment test scores. The same results are corroborated by Riley and Ward (2017) who found individual active learning in an Accounting Information Systems class produced higher student learning than in collaborative active learning and passive learning. Adler and Milne (1997) also found that action-oriented learning tasks results in improved learning by accounting students.

The remainder of the paper is organized as follows. Relevant literature review is discussed in the next section followed by data and methodology. The results are presented in the next section. Finally, concluding comments are provided in the last section.

LITERATURE REVIEW

While many studies examine the flipped classroom approach, they found that the value of the flipped approach lies in the “active learning style of instruction” conducted in the classrooms. Prince (2004) defines the key element of “active learning” is that students are engaged in the activity and in the learning process, typically in the classroom. While he examines differences between active learning, collaborative learning, cooperative learning, and problem based learning, we focus on the general definition of active learning.

Other researchers have compared active learning to the traditional lecture format. For example, Tune, Sturek, and Basile (2013) studied two groups, one where students were required to watch prerecorded lectures before class, and were given quizzes and homework followed by a question-answer/problem solving period in a physiology class. The control group attended optional lectures and were not given quizzes or homework. The findings provided strong evidence that the flipped classroom (experimental) group outperformed the traditional (control) group by 12 percentage points. They concluded that the homework and in-class quizzes are “critical motivating factors that likely contributed to the increase in student exam performance” [Tune, Sturek, and Basile, p. 316].

However, Jensen, Kummer, and Godoy (2015) examines a flipped classroom approach and a non-flipped classroom method for a life science class, and found that the flipped classroom does not result in higher learning gains or better attitudes compared with the non-flipped classroom when both utilized an active-learning, constructivist approach. They conclude that it is not the order in which the instructor participates in the learning process, but the active learning style. The notion that outcomes from active learning as compared to the traditional lecture pedagogical style appear to be favorable was corroborated by Wilson (2012) in a legal environment class.

McLaughlin, J.E, Roth, M. T., Glatt, D. M., Gharkholonarehe, N., Davidson, C.A., Griffin, L. M., Esserman, D. A., and Mumper, R. J. (2014) also found that learning that resulted from the flipped classroom was a result of the active learning exercises, such as team work, debates, self-reflection, and case studies, that prompts students' engagement and reflection encourage them to explore attitudes and values, while fostering their motivation to acquire knowledge and enhance skills" [McLaughlin, et. al., p. 236].

Finally, Findlay-Thompson and Mombourquette's (2014) study indicated that students liked the interactive method, where one student interviewed stated, "In our class, we could ask questions all the time. I did better because of this" [Findlay-Thompson and Mombourquette, p. 67]. However, other students did not believe it materially affected their grades. Based on the literature review related to the flipped classroom, regardless of the field of study, evidence is strongly in support that active learning and in-class activities are key to the success of student learning rather than the flipping process of lecture outside of the classroom followed by the in-class learning activities.

Our study adds to the literature by examining whether the active learning style improves the student learning outcomes as compared to another class that did not engage in active learning. Four sections of ACC 202 used a traditional method of lectures, homework assignments, and exams. However, to test the effect of the active style, two sections used the active method while the other two were only given the same worksheets without any additional follow-up. We define active learning as an active engagement in the classrooms including student working on problems in teams of 2-3, every student participated in responding to questions on the review sheets in class, students are randomly asked to work on problems, and students volunteered to respond to questions. Students are given participations points for their efforts.

Based on the two groups, Active (experimental group) and non-Active (control group) we test the following hypotheses.

*H1: Active learning increases assessment test scores in Managerial Accounting classes.
Our second hypothesis states that assessment test scores will improve for higher learning levels as defined by Bloom's taxonomy when active learning is utilized.*

H2: Active learning will improve assessment test scores on higher learning levels as defined by Bloom's taxonomy.

DATA AND METHODOLOGY

During Spring 2016, two sections utilized an active review session while two other sections did not. Two sections of the managerial accounting course (or the experimental group) were given review sheets that included all the topics covered during the semester. They were required to review it prior to class, and to complete the worksheets. The professor instructed them that the class will work on the worksheets and all students must participate in class. To engage the active learning approach, students were informed that they will be called on to respond to the worksheet questions, and to work on matching problems together in class in a positive environment. The instructor started from the back of the class, and each student were asked to answer to one of the numerous questions from the worksheet. Students were awarded participation

points for their work. The students of the other two sections (control group) were told that they will be tested on the concepts covered throughout the semester and they should review the material themselves. However, no additional worksheets were handed out nor did the students review in class.

The group that use the active method are labelled as “Active” while the other group is defined as “Non-Active”. Table 1 presents a summary of the two samples described above. The student profiles are divided by their majors, which appears to be somewhat similar. It shows that the percentage of students majoring in quantitative fields (accounting and finance) are 29% and 25%, respectively for the Sections with Active review and the ones without. The relatively non-quantitative fields of management and marketing are 71% and 75% for the Active ones with review and the non-Active group, respectively. The distribution of the different majors in both sections appear to be relatively similar. The average GPA is 3.201 versus 3.102 for the two samples. Testing the null hypothesis that the sample average GPA are equal gives a 31.42% probability. These results provide evidence that the two samples are similar in students’ major and GPA.

Table 1: Summary Statistics of Two Samples: Active Group and Non-Active Group

Sections:	Active Group (Two Sections)	Non-Active Group (Two Sections)	Probability the Samples Come from a Different Population
Major:	Frequency of Students in the Major (Percentage)		Ho: Samples Are Equal
Accounting	9 (20.0%)	5 (15.6%)	
Finance	4 (8.9%)	3 (9.4%)	
Management	24 (53.3%)	9 (28.1%)	
Marketing	8 (17.8%)	12 (37.5%)	
Undeclared	0 (0.0%)	3 (9.4%)	
GPA:	3.201	3.102	0.3142
Average GPA	3.201	3.102	0.314
Sample Size	45	32	

This table shows the frequency of the students’ declared major as well as the average GPA for each group, “Active” and “Non-Active”. We test the null hypothesis that the GPA for Active and non-Active are equal. The test shows that there is 31.42% chance they are equal.

To test the hypothesis that the class using the active approach is expected to show a higher assessment test scores, we use a t-test to examine the difference between the two samples. Finally, to control for other factors such as major and GPA, we run a multiple regression as follows:

$$Score_i = \alpha + \beta_1 DUM_i + \beta_2 GPA_i + \beta_3 A\&F_i + \beta_4 Mang_i + \beta_5 Mktg_i + \epsilon_i \tag{1}$$

where:

Score is the assessment test score for student i.

DUM_i is the dummy variable = 1.0 if Active review was used
= 0 Otherwise

GPA_i is the student i’s overall GPA

A&F_i is a dummy variable to = 1 if accounting or finance major
= 0 Otherwise

Mang_i is a dummy variable to = 1 if management major
= 0 Otherwise

Mktg_i is a dummy variable to = 1 if marketing major
= 0 Otherwise

Evidence supporting our hypothesis would exhibit a positive and statistically significant β_1 coefficient. GPA is used as a proxy for motivation as we postulate that students who have higher GPAs will be more motivated to perform better.

Finally, we utilize Bloom’s Taxonomy to test our second hypothesis which examines whether the active learning approach helps students succeed throughout the hierarchy of learning. That is, will students learn to apply only the lowest level of learning, “knowledge of terminology” or will the active learning approach help them to use the higher levels of learning such as to apply or to analyze?

We identify the level of cognitive process needed for each of the ten multiple choice questions. The ranking from the basic learning hierarchy (labelled 1) to the highest (labelled 4) were used, where Level 1 learning to remember, Level 2 to understand, Level 3 to apply, and Level 4 to analyze. While Bloom’s taxonomy gives six levels, the two highest form of thinking, evaluate and create were not applicable in the assessment test. We assigned the level of learning for each test question and are displayed in Table 4, Panel A.

The final analysis examines the correlation between the Bloom’s hierarchical levels of difficulty in cognitive processing and the Managerial Accounting assessment questions.

RESULTS

Table 2 summarizes the average score for the two groups, Active and non-Active as well as the probability statistics testing the null hypothesis that the two groups are equal. The results show that the probability that the Active group has a higher score than the non-Active group is .01282, implying that the average test score of the Active group is statistically significantly higher than the non-Active group, providing evidence in support of our first hypothesis. However, the scores are 56.67% versus 41.25%, far below the expected 70% standard set by the accounting faculty.

Table 2: The Average Score for the Difference between the Active versus Non-Active Groups

Classes	Sample Size	Average Score Out of 10 Possible	Probability That a=b
Active Approach (A)	45	5.667	
Non-Active Approach (B)	33	4.125	
Difference		1.542	0.01282***

*Ho: T-test determines whether the two samples are likely to have come from the same two underlying populations that have the same mean. We test if the average score for the Active group and average score of the non-Active group are equal. The result shows that we reject the null hypothesis at the 1% significance level. *** indicates 1% significance level.*

Next, we run a regression analysis that includes students’ overall grade point average as well as their major as control variables for performance. The results reported in Table 3 indicates that the variable, Dum, representing Active versus non-Active is statistically significant and positive with a t-statistic of 3.484, implying that students using the active approach performed better than the group without active review. The findings also show that GPA is positively associated with the assessment test scores with a t statistic of 3.048. We deduce from this relationship that students with higher GPAs were motivated to perform better on the test.

We also find that the students’ majors did not influence the outcome of their test scores. Students majoring in accounting or finance did not score significantly better than others; and similar results exist for management and marketing majors.

Taken together, students perform better when active learning occurs, and higher GPA students achieve higher scores. While good students (higher GPA) will do better, these results show that the active learning approach is independent and statistically significant, indicating that all students benefit from active learning, regardless of GPA or major.

Table 3: Regression Analysis Results for Equation 1

Variables:	Coefficient Estimates	T-statistics
Intercept	-0.5222	-0.336
DUM	1.4788	3.484***
GPA	1.4835	3.048***
A&F	0.4792	0.780
Mang	0.8907	1.187
Mktg	-0.4001	-0.807
R ²	32.07%	
Observations	77	

Equation 1: $Score_i = \alpha + \beta_1 DUM_i + \beta_2 GPA_i + \beta_3 A\&F_i + \beta_4 Mang_i + \beta_5 Mktg_i + \epsilon_i$. This table shows the regression estimates for the relationship between test score (SCORE) and whether active learning was used (DUM) or not, GPA, dummy variable for students' major in Accounting or Finance, Management or Marketing. Coefficient estimates and t statistics are shown in columns 2 and 3. ***, **, * denote statistical significance at the 1%, 5%, or 10% level.

Finally, Table 4 presents the cognitive processing levels of each question using Bloom's Taxonomy, and compare the results of student test scores to its hierarchy of learning. Using the Active group only, we attempt to determine whether this group show any difference in their cognitive skills for easier (level 1, remembering) questions versus the more difficult ones such as questions requiring students to analyze (level 4, analyzing). Table 4 presents the results.

Table 4: Impact of Active Approach on Learning Hierarchy of Bloom's Taxonomy

Panel A. Assessment Test Questions and Bloom's Taxonomy										
Row 1: Assessment Test question	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
Row 2: Bloom's Taxonomy of Learning Level	2	3	1	3	4	2	2	1	4	4
Row 3: Number students who responded correctly to question	23	21	30	32	24	23	28	33	20	20
Row 4: Percentage answered correctly	0.511	0.467	0.667	0.711	0.533	0.511	0.622	0.733	0.444	0.444
Panel B. Correlation between "Number of students in Active Group Who Answered Correctly" and "Bloom's Taxonomy Level of Hierarchy"										
Correlation between:										
Number students who answered correctly and Bloom's Taxonomy	-0.66**									

Panel A assigns the hierarchical level from Bloom's Taxonomy to each of the ten multiple choice questions (Q1 to Q10) used in the Assurance of Learning exam. The exam questions were based on general managerial accounting concept. The exam questions are available upon request. Row 2 presents the Bloom's Taxonomy level of hierarchy (1-4) assigned to each question by the authors. Row 3 provides the number of students who responded correctly to each question, Q1 to Q10. Row 4 shows the percentage of correct responses.

Panel B presents the correlation coefficient between the data from Row 2 (Bloom's Taxonomy of Learning Level) and Row 3 (Number students who responded correctly to the question) of Panel A. The correlation is statistically significant at the 5% level. ***, **, and * indicate significance at the 1%, 5%, and 10%, respectively.

The results show that the correlation between the number of correct responses for each question and the level of cognitive processing is negatively correlated at -66%, indicating that the higher the cognitive levels the lower the test scores for the Active group. These results indicate that even if the active approach is used, learning to apply (level 3) and to analyze (level 4) are more difficult as compared to remember and apply terminologies and definitions (levels 1 and 2). Therefore, our results do not support the second hypothesis, H2.

CONCLUDING COMMENTS

This study examines the effect of a flipped classroom by comparing two samples, one that uses active learning review sessions for the AACSB International assurance of learning (AOL) tests and another group that do not. The findings indicate that scores for the group using the active learning method statistically outperformed the group that did not use active learning. This implies that the student performance increases in Managerial Accounting when they actively participate in an instructor led review sessions.

Further statistical tests using a regression analysis show that the Active group outperforms the non-Active ones with statistical significance at the 1% level. Also, overall GPA is also statistically significantly related to the results of the test scores. However, the students' majors did not have any effect. The results show that all students, regardless of GPA or major, benefit from the active learning method.

Examining the variation of test questions relative to Bloom's Taxonomy of cognitive process we find a strong negative correlation where a higher level of cognitive process is related to lower scores even when active learning is utilized. The student performance does not improve when learning more difficult Managerial Accounting concepts even when using the active approach. It would be helpful to further study the use of active learning in the higher levels of the hierarchy of learning in future studies.

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BIOGRAPHY

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