USING ACTUAL PRODUCTS TO ENHANCE STUDENTS' UNDERSTANDING IN INTRODUCTORY ACCOUNTING CLASSES

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ABSTRACT

Active learning techniques and hands-on learning can be used to explain and reinforce cost concepts in an introductory managerial accounting course. The purpose of this paper is to explain a basic activity used in a lecture and explain how the activity impacts the learning of the students. The activity involves allowing students to take apart and examine products before discussing concepts in class. Instructors using the activity found a considerably significant difference in learning between students using the activity versus students who did not use the activity in class.

INTRODUCTION

One can observe how preschool or kindergarten children learn concepts dealing with math or science. They learn not by sitting idly while listening to the teacher defining terms and demonstrating, but by playing and working hands-on with items to reinforce the concepts. This idea of active-learning with hands-on engagement can be brought into the introductory managerial accounting classroom as a way of teaching and reinforcing basic terms presented in the textbook. Instructors using this activity in the classroom found students performed better on assessments of the concepts than students who did not experience the same activity in their classes. The remainder of this paper presents a brief summary of literature on active learning and hands-on learning, a description of the activity, and a short analysis of impact of the activity on the students.

LITERATURE REVIEW

Importance of Active-Learning and Engagement

Active learning has been encouraged for decades, yet still is not part of many college classrooms. Bonwell and Eison (1991) discuss the definition of active learning and the barriers to using it. While they note it can be defined many ways, they propose active learning encompasses "instructional activities involving students in doing things and thinking about what they are doing (p. iii)." In their discussion of strategies, they state how demonstrations, in some disciplines, can further the educational experience of the students. A lecture is not always appropriate for certain concepts and principles. One barrier discussed is the risk of involving a long-term or semester long activity. They suggest short activities to reduce risk and simplify implementation. The Accounting Education Change Commission's position statement (1990) also promotes active learning for accounting students. "Students must be active participants in the learning process, not passive recipients of information…Learning by doing should be emphasized (p. 309)."

Benefits of hands-on learning

Managerial accounting is often a course required of all business majors. While many accounting majors have difficulty with the content, non-accounting majors often struggle more. Some authors argue that the topics are difficult due to a lack of exposure to a manufacturing environment (Lightbody, 1997; Vinciguerra and Lafond, 2011; King and McConnell, 2010).

Hands-on learning has been documented in many disciplines as being beneficial to students. For example, at the University of Colorado at Boulder, the College of Engineering and Applied Sciences developed the Integrated Teaching and Learning program which involves students from freshman year through graduation in projects and active learning activities throughout the curriculum (Carlson and Sullivan, 1999). These types of programs are designed to not only help students to understand concepts in class, but to also give them real-world experience and help with the development of problem-solving skills.

Kern (2002) discusses the lack of hands-on learning in accounting courses. She notes that extensive use of these types of activities are seen in elementary and secondary education, particularly for science and math. Her study shows students' problem-solving skills benefit from not just hands-on learning, but from using these activities in an active environment. In managerial and cost accounting, classroom activities range from puzzles to factory simulations to field trips to simple tasks. Krause (1988) uses a puzzle activity to instruct students on budgeting. Lightbody (1997) simulates a production line using different departments where students "manufacture" paper rabbits. The experience is used throughout the semester to support lectures within class. Vinciguerra and Lafond (2011) present an exercise asking students to produce paper hats to reinforce the concepts of cost terms and the manufacturing process. King and McConnell (2010) provide a short exercise on the first day of class, before course content is discussed, where students must follow directions to produce a name tent. The exercise is then referenced throughout the semester as an example when cost concepts are covered. These exercises all help develop the students' understanding of terms such as direct materials, direct labor, and how to apply overhead costs to a product. Groff (1989) uses a hands-on learning activity to help teach internal controls in an accounting information systems course. Groff argues, similar to managerial accounting, that Accounting Information Systems (AIS) presents concepts that students are not familiar with, and having an activity to demonstrate can enhance their learning.

HANDS-ON ACTIVITY FOR MANAGERIAL COST CONCEPTS

Given a lack of experience with actual products, this simple activity gives students the opportunity to think about managerial accounting terms in the context of a basic product. The main terms involved in this activity are product costs and period costs. The importance of this distinction is important not only for product costing in managerial accounting, but also for complying with the matching principle in financial accounting.

Students are given a physical product to examine and take apart. Good examples of products are packages of candy, (such as ones you'd find at a holiday in some sort of dispenser: plastic eggs, plastic candy cane containers, PEZ, etc.), board games, small decorative lamps, and other items that have pieces easily assembled. Students are asked to examine the products by taking them apart, eating them (if edible), putting them together, and thinking about the components. While examining, students make a list of the components. After about five minutes, instructors lead a class discussion listing on the board the components and costs of the products. Instructors find students typically list the direct materials and can be encouraged to come up with other costs such as sales costs, overhead, advertising, copyrights (logos), etc. Students are then asked to categorize the costs into period and product costs. The introduction of

these terms can be done in a few ways. Students could be required to read about the terms prior to class, be given brief descriptions of the terms before handing out the products, be given definitions of the terms before discussion, or a combination of these methods. While the discussion should focus on the difference between product and period costs, further discussion can be made to describe categories of direct labor, direct materials, and overhead.

This activity can also be referred to throughout the semester as other concepts are introduced. Students recall the physical products and can discuss how the products relate to other topics within the course.

ANALYSIS AND IMPACT

This analysis examines the impact of using actual products in the classroom using a hands-on learning approach on students' learning of product and period cost concepts.

Participants and Process

We tested 173 students in five introductory managerial accounting classes at two universities over three semesters. The tests were conducted as part of normal classroom activities, with students given the option to not participate in the pre- and post-lecture assessments. The pre- and post-lecture assessments were not included in the students' grades for the course. All students present on the day of the lecture participated in the pre- and post-lecture assessments. To ensure anonymity no personal data was collected from students during this study.

The process consisted of the following steps: (1) students completed a pre-lecture assessment at the beginning of the class, (2) a lecture was presented explaining product and period costs, (3) students completed a post-lecture assessment at the end of the class, and (4) students answered items on the final exam related to the topic. In four of the five sections an actual product was used during the lecture, while no product was used during the fifth section.

Pre-lecture assessment. The pre-lecture assessment was given to the students prior to the initial lecture covering product and period costs. Students were assigned pre-class reading assignments covering the topic. In one class the instructor provided a two-paragraph summary of the reading material to the students prior to the pre-lecture assessment instead of giving a pre-class reading assignment, while in the other four classes no additional material was given to students before the pre-lecture assessment. The assessment consisted of eleven (11) cost items. Students were to identify whether they believed the costs were product or period costs.

Lecture. After collecting the pre-lecture assessments all classes received the normal lecture on the topic. In four of the five classes, the instructors used physical products (PEZ candy, lamps, board game) to highlight the difference between product and period costs. In the fifth class, no products were used.

Post-lecture assessment. At the end of the classes students completed the post-lecture assessment. This assessment was identical to the pre-lecture assessment.

Final examination. The final examinations in all five classes included identical materials to assess students' long-term retention of the material. These items consisted of one multiple choice item and 10 matching items requiring students to identify costs as product or period costs. The final examinations were conducted 6 – 10 weeks after the post-lecture assessments. (The pre- and post-lecture assessments and final examination items are available from the corresponding author upon request.)

Results

The study incorporated an experimental design to determine the effect, if any, using actual products during the lecture covering product and period costs had on students' understanding of the topic. Students' understanding was measured using three assessments (pre-lecture, post-lecture, and final examination), and the level of understanding was determined by the percent of items correctly identified on the assessments.

Our hypothesis was confirmed: students who received the lecture using an actual product scored higher on the final examination assessment (M = 72.59; SD = 17.190) than students who did not receive the lecture using an actual product (M = 56.47; SD = 18.495), $F(1,168) = 28.542$, $p < .001$ (see Tables 1 and 3). Thus, using actual products during the lecture increased students' understanding and retention of the material.

We controlled for other factors, including preexisting knowledge, the number of times per week the classes met, and their level of knowledge immediately after the lectures as measured by their post-lecture assessment scores. Based on their pre-lecture assessment scores, there was no significant difference in students' preexisting knowledge of the topic (see Tables 2 and 6). Classes met once, twice, or three times weekly; however, there was no significant difference in the students' results (see Table 4). There also was no significant relationship between their post-lecture assessments scores and their final examination scores (see Table 5). The results for these additional factors indicates there was no sample selection bias.

CONCLUSION AND DISCUSSION

The use of a hands-on activity in a managerial accounting classroom is suggested to help students' understanding of cost concepts. This paper presents a simple activity where students are able to handle products and examine the components. We hypothesized that students who attended lectures where actual products were used to illustrate lecture concepts would gain a deeper understanding and longer retention of the material. Our research findings supported this hypothesis. We found that students who attended the lectures where actual products were used in the classroom lecture averaged significantly higher scores on examinations six to ten weeks after the lectures than students who did not attend those lectures. The increase in the mean final examination scores on the topics included in the study were not only statistically significant, but maybe more importantly, the increase was the equivalent of close to two full letter grades (18 percentage points).

TABLES

Table 1

Means and Standard Deviations for Two Conditions, One Covariate, and One Dependent Variable

	No Product Used			Product Used		
Variable	M	SD	n	M	SD	n
Prelecture score	50.44	13.883	34	54.20	14.678	125
Final exam score	56.71	16.840	45	72.59	17.190	125

Table 2

One-way Analysis of Variance Summary for Pre-Lecture Assessment Scores

Variable and source	df	SS	MS	F
Between groups	1	377.655	377.655	1.793*
Within group	157	33074.382	210.665	

* p = .183

Table 3

One-way Analysis of Variance Summary for Final Examination Assessment Scores

Variable and source	df	SS	MS	F
Between groups	1	8344.940	8344.940	28.542*
Within group	168	49119.436	292.378	

* p < .001

Table 4

One-way Analysis of Variance Summary for Number of Class Meetings per Week

Variable and source	df	SS	MS	F
Between groups	2	569.779	284.890	.836*
Within group	167	56894.376	340.686	

* p = .435

Table 5

One-way Analysis of Variance Summary for Post-Lecture Assessment Scores

Variable and source	df	SS	MS	F
Between groups	8	3552.599	444.075	1.298*
Within group	150	51325.074	342.167	

* p = .249

Table 6

Analysis of Covariance for Condition and Pre-Lecture Assessment Scores

Source	df	MS	F	ω^2
Condition	2	21978.229	72.663*	.482
Pre-lecture	1	745.970	2.466**	.016
Error	156	302.466		

* p < .001; ** p = .118

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