

**BUILDING AIRPLANES IN AN ACCOUNTING CLASS: AN
INTERACTIVE EXERCISE IN MANAGERIAL OR COST ACCOUNTING**

Tim Creel

Harding University

tcreel@harding.edu

Veronica Paz

Indiana University of Pennsylvania

veronica@veronicapazcpa.com

Building Airplanes in an Accounting Class: An Interactive Exercise in Managerial or Cost Accounting

ABSTRACT

The process of building paper airplanes in an accounting classroom allows students to experience an interactive, engaging, problem-solving, and fun learning environment. Building paper airplanes occurs in a managerial accounting class at the undergraduate level, an MBA accounting class or cost accounting class. Students volunteer to build paper airplanes in front of their fellow classmates to illustrate the manufacturing process. The class answers questions related to the manufacturing process after completion of the simulation.

In a cost accounting class, building airplanes simulates aspects of manufacturing such as process re-engineering, value-added and non-value-added activities, Just-in-time inventory systems, the Theory of Constraints, lean manufacturing, and sustainability. Many of these aspects of cost accounting involve real-world problems for the students to solve. Students learn about these aspects of cost accounting along with problem-solving techniques after being broken into teams. Regardless of the accounting course, building airplanes promotes an interactive, engaging, and fun learning environment for accounting students.

INTRODUCTION

Involving students in an accounting classroom is one of the best ways to teach accounting concepts. Students learn by performing functions or becoming an active participant in the course material. Involving the students creates a fun learning environment. One way to foster active learning in a managerial or cost accounting course is having the students build paper airplanes in the classroom. This activity illustrates the manufacturing process and concepts such as process re-engineering, value-added and non-value-added activities, Just-in-time inventory systems, the Theory of Constraints, lean manufacturing, and sustainability in the manufacturing process. The examples discussed in the research is effective in both a campus classroom or shown via videos in an online learning environment.

LITERATURE REVIEW

Building airplanes in an accounting classroom allows students to witness accounting concepts by visual example, interact with classmates, practice problem-solving techniques, and experience a fun learning environment. It acts as a collaborative and active learning environment where students illustrate concepts through role-playing and work together to find solutions. Collaborative working environments help students learn life skills and appeal to a variety of learning styles (Arons, 2016).

Building airplanes in an accounting classroom incorporates interactive learning with the students. Interactive learning involves the students in the learning processes, and students show more interest and enthusiasm in this type of classroom experience (Greeson, 1988). Student evaluations rated this style of learning higher than just a lecture alone (Greeson, 1988).

Robinson and Kakela (2006) found interaction supported a more personalized approach to learning, encouraged original thinking, and expanded the boundaries of the classroom. It promotes student engagement as Stupans, Scutter, and Pearce (2010) observed peer interaction and feedback in an entertaining manner enhances student learning. College students noted the best learning environment as one which is engaging with active instructional methods and illustrates applicable to the real world (Strage, 2008).

This classroom exercise helps students learn to solve real-world problems found in the workplace. Students in cost accounting classes will be broken into teams and asked to solve production problems based on witnessing current processes. Cox and King (2006) found problem-solving in the classroom encourages reflective thinking and improves problem-solving skills. Problem-based learning leads to improvement in problem-solving skills (Roca & Pilar, 2014). A study by Marcketti and Karpova (2014) found working on real-world challenges as part of education increases student knowledge and future employability. It promotes creative thinking and builds more meaningful learning experiences (Marcketti & Karpova, 2014).

Not only does building airplanes in an accounting class promote interaction and improve problem-solving skills, it creates a fun learning environment. Tews (2014) described hands-on exercises encouraging social involvement among the students along with a fun delivery of the material as promoting a fun learning experience. An entertaining delivery was positively related to student engagement, and building airplanes involves interaction between the students to create a fun method of delivery of class material. Jarrett (2010) found fun and play in the college classroom environment promoted student engagement and created positive student reactions.

MANAGERIAL ACCOUNTING COURSES

Students in undergraduate or graduate managerial accounting courses build paper airplanes to illustrate the manufacturing process. By building paper airplanes, students actively participate in the manufacturing process. Since many students have never visited a manufacturing plant, this is a great way to illustrate the process.

The illustration starts by setting up a table with some flat sheets of copy paper on the side. Once class starts, the manufacturing process should be discussed and include topics such as raw materials, work-in-process, finished goods inventory, cost of goods sold, direct and indirect costs, and manufacturing overhead. Next, ask five students to volunteer to take part in an exercise. Three students are seated at the table, and they will be the production workers while one stands behind them acting as a supervisor. One student stands at the far end and serves as a buyer (See Illustration 1). The first production worker will take a piece of paper from a stack of sheets to the right of them and fold it in half before passing the next student. The following student folds down the ends of the plane before passing to the last student. The last student folds the wings or sides down before passing on to the finished goods area (See Illustration 2). The student buyer purchases five airplanes once they after production is complete. Two more planes are completed before the simulation ends. The students laugh and joke during this process which adds to the experience.

Illustration 1

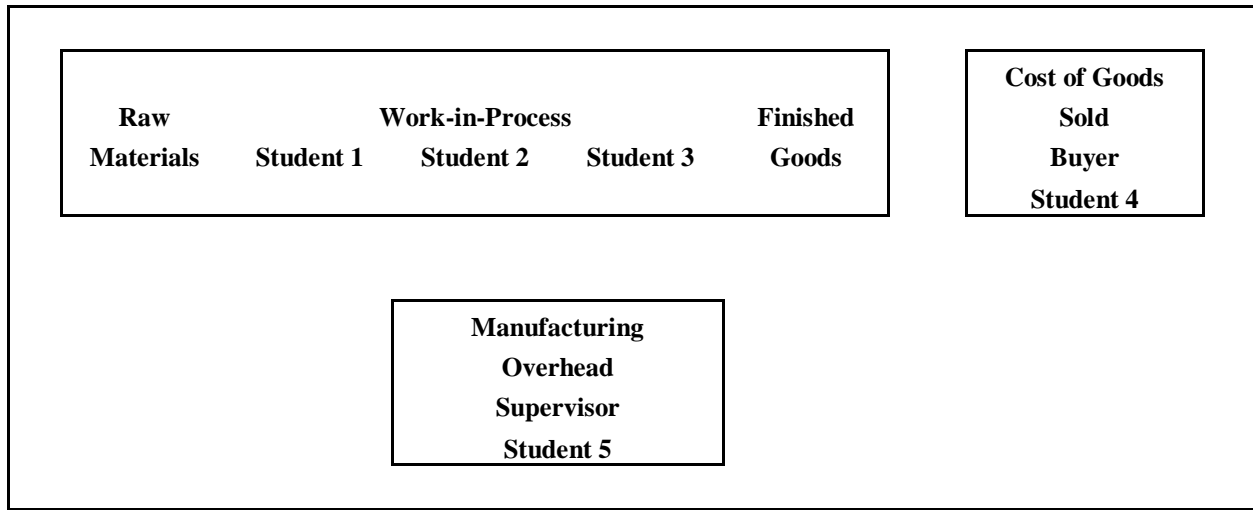
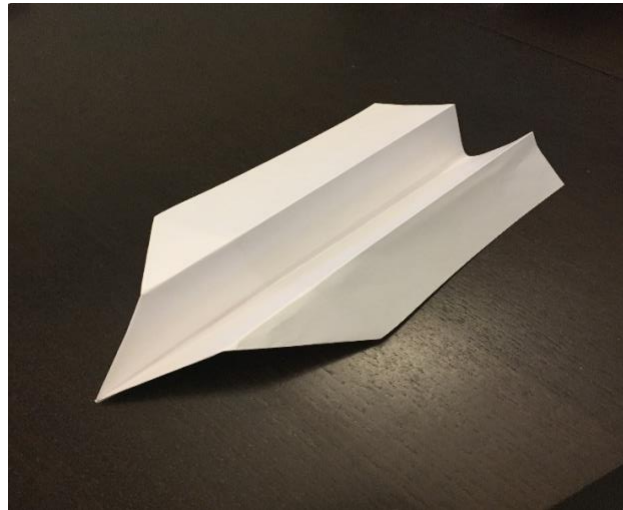


Illustration 2



After completion of the exercise, ask the class questions about different aspects of the activity starting with what you call the stack of paper at the beginning. The correct answer should be raw materials inventory. The next question would be what you call the planes currently in the process of being produced with the answer being work-in-process inventory. The next question would be what you call the stack of completed planes with the answer being finished goods inventory. A question states what the aircraft sold to the buyer are, and the answer would be the cost of goods sold. The professor asks the following questions about the production workers including how you classify their labor with the answer being direct labor and the supervisor being indirect labor. The last question would relate to the classification of the

costs of the room itself along with the heat or air conditioning, and the answer would be manufacturing overhead.

This activity can be filmed for online courses to illustrate the manufacturing process. Building airplanes is not only useful in undergraduate or graduate managerial accounting courses but can be used effectively in cost accounting classes. The activities will be completed in one class period for any accounting class.

COST ACCOUNTING COURSES

The same exercise of building paper airplanes can be used in a cost accounting class in the same manner as discussed in the preceding section. Since cost accounting is an upper-level course for accounting majors, it is used to illustrate other aspects of the course such as process re-engineering, non-value-added activities, just-in-time inventory systems, lean manufacturing, the theory of constraints, and sustainability in the manufacturing process.

Process Re-engineering

Process re-engineering is best defined as a change in operational processes to improve performance within the manufacturing environment (Lanen, Anderson, & Maher, 2017). When building paper airplanes, input into the production process issues where unnecessary storage of inventory exists, there are wait times or where unnecessary movement of items exists. For example, the paper airplanes can be manufactured with unnecessary distances between the processes or cross back and forth in an inefficient manner, the finished planes moved across the room after completion, there is a back-up in the manufacturing process or unnecessary wait times between parts of the process. The students are broken into teams and given time to come up with solutions to improve the production process. This illustrates ineffective production methods and allows the students to arrive at solutions to improve the efficiency of the production process and submit them to the class.

Value-Added and Non-Value-Added Activities

Value-added aspects of a product are items that increase the value of a product to the consumer. Non-value-added activities are parts of the production process that do not add value to manufactured goods. They are issues that increase manufacturing costs but do not increase value to the products produced (Lanen, Anderson, & Maher, 2017). An example would include reworking a quality issue with some of the manufactured units such as not folding one part of the front of one of the paper airplanes. Other examples could include the unnecessary movement of items in work-in-process or storage of excess raw materials or transportation of finished goods. It is best to break the students into teams and allow them time to come up with solutions to the problem and present them to the class. The goal is to make the students identify the value-added and non-value-added items and propose ways to eliminate the non-value-added ones from the production process.

Just-in-time Inventory System

A Just-in-time inventory (JIT) system is used to improve the efficiency of production and decrease the amount of inventory a company keeps on hand (Lanen, Anderson, & Maher, 2017).

During the manufacturing process of the planes, the raw materials inventory comes right into production being brought over by a student acting as an outside supplier. No stock will be on location as it will all be delivered directly into the production process. Point out to students the financial advantage of not investing resources in inventory.

This illustration can be changed to show the biggest weakness of the JIT system which is inventory items arriving damaged or not arriving on-time. An example can illustrate where there is a strike at the shipping ports, weather issues such as snow, or a defective shipment arrives to show what happens to production when there is no available inventory and no backstock to use in its place. This example allows students to witness both the advantages and disadvantages of a JIT system.

Theory of Constraints

The theory of constraints states you find the most inefficient or slowest part of the production process and improve it where it is no longer the least efficient part of production. This activity increases the efficiency of the entire production process (Lanen, Anderson, & Maher, 2017). The design of the manufacturing process causes one area to backup which creates an inefficient element of production. After a few planes are made, have the process stop, break the students into teams and have them solve the backup. An example of a backup is having too many aspects of production completed by one student causing a backup in the production process. This example allows students to both gain a greater understanding of the theory of constraints and practice problem-solving techniques that are a regular part of the workplace environment.

Lean Manufacturing and Sustainability

Lean manufacturing is a system where an attempt is made to eliminate waste and improve efficiency in the manufacturing process (Lanen, Anderson, & Maher, 2017). An illustration of lean manufacturing includes students building paper airplanes in the usual manner but incorporating some inefficiency in the process such as unnecessary movement of inventory or having them cut the paper for production which produces waste as part of the process. The students should be broken into teams and allowed to come up with solutions both improve the efficiency of the operations and decrease or eliminate waste. Lean manufacturing can be illustrated at the same time along with other production processes including process re-engineering, the theory of constraints, and non-value-added activities as they are all similar in nature.

Sustainability is an essential part of manufacturing and a growing aspect of managerial and cost accounting. Examples include the Subaru plant in Indiana which operates with zero waste (Bowman, 2018) and the production of sustainability reports by many major companies such as Walmart for example (<https://corporate.walmart.com/global-responsibility/sustainability/>). Mentioning the elimination or reduction of waste and the use of natural lighting or solar power in the manufacturing environment incorporates sustainability into the manufacturing process. Sustainability is an important topic for many students and allows them to see how it can be an essential element of both accounting and manufacturing.

CONCLUSION

The exercise of building paper airplanes in an accounting classroom works effectively with an undergraduate accounting class, an upper-level cost accounting class or even an MBA managerial accounting class. It is an interactive exercise that allows the students to role play and witness different aspects of the manufacturing process. Not only is it great for illustrating the manufacturing process, but it is also a great way to show cost accounting concepts such as a Just-in-time inventory system, value and non-value-added activities, process re-engineering, lean manufacturing and sustainability. All of these activities promote an interactive, engaging, problem-solving and fun learning environment for the student in an accounting classroom.

References

- Arons, M. (2016). Knowing When to Shut up: Suggestions for Creating a Collaborative Learning Environment. *English Journal*, 103(5), 55-62.
- Bowman, S. (2018, July 27). This Indiana Subaru Plant hasn't taken out the Trash in 14 Years, Saves more than \$12 Million. IndyStar. Retrieved from <https://www.indystar.com/story/news/2018/07/27/indiana-subaru-plant-hasnt-taken-out-trash-14-years-saves-12-million-Lafayette-landfill/825735002/>
- Cox, S. & King, D. (2006). Skills Sets: An Approach to Embed Employability in Course Design. *Education+ Training*, 48(4), 262-274.
- Greenson, L. (1988). College Classroom Interaction as a Function of Teacher and Student-Centered Instruction. *Teaching and Teacher Education*, 4(4), 305-315.
- Jarrett, O., & Burnley, P. (2010). Lessons on the Role of Fun/Playfulness from a Geology Undergraduate Summer Research Program. *Journal of Geoscience Education*, 58(2), 110-120.
- Lanen, W., Anderson, S., & Maher, M. (2017). *Fundamentals of Cost Accounting*, 5th Ed. McGraw-Hill. New York.
- Marcketti, S. & Karpova, E. (2014). Getting Ready for the Real World: Student Perspectives on Bringing Industry Collaboration into the Real World. *Journal of Family and Consumer Sciences*, 106(1), 27-33.
- Robinson, C. & Kakela, P. (2006). Creating a Space to Learn: A Classroom of Fun Interaction and Trust. *College Teaching*, 54(1), 202-208.
- Roca, J., & Pilar, P. (2014). Teaching Methodologies for the Development of "Problem Solving" Competence Among Nursing Students. *Procedia Social and Behavioral Sciences*, 139, 358-365.
- Strage, A. (2008). Traditional and Non-traditional College Students Descriptions of the "Ideal" Professor and the "Ideal" Course and Perceived Strengths and Limitations. *College Student Journal*, 25(1), 225-232.
- Stupans, I., Scutter, S., & Pearce, K. (2010). Facilitating Student Learning: Engagement in Novel Learning Opportunities. *Innovative Higher Education*, 35, 359-366.
- Tews, M., Jackson, K., Ramsay, C., & Michel, J. (2014). Fun in the College Classroom: Examining Its Nature and Relationship with Student Engagement. *College Teaching*, 63, 16-26.
- Walmart Global Sustainability Report. Retrieved from <https://corporate.walmart.com/global-responsibility/sustainability/>.