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Using The Time Machine To Gain Historical Perspective In Management Courses

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ABSTRACT

The time machine is a learning activity that provides students with an active and interesting way to critically think about management history and theory. Students are transported through history to different times, places, and people, providing them with a chance to learn about theories of management within the context they were developed. Understanding the context in which theories were developed provides students with historical perspective that they can use to better understand the present. Time machine activities can be used in courses specifically devoted to management history and theory as well as more mainstream management courses.

Keywords: management history, management education, management theory, active learning, teaching

INTRODUCTION

As an assistant professor I was given a challenge. I was asked to design and teach the management history and theory course that was being added to our curriculum. The theory part sounded okay; I did in fact have a Ph.D. in management so I had studied many organizational theories. Chester Barnard, Max Weber, Abraham Maslow, I could teach that. But management history, now that would be a different story. In fact, I have never liked history. Every history course I have ever taken, in high school or college did not hold my interest. All I remember is names, dates, and events rattled off and lectured at me. Also, as an advisor for management students, anecdotally I knew that history classes were not the elective of choice for most of my advisees. Perhaps they too had previous bad experiences and were now turned off by the subject.

I knew if the class was going to be at all successful, I would have to do two things. First, I would have to get over my own biases about history. Second, I would have to make management history something enjoyable and interesting. But how? I knew nothing about teaching history. So, I went to the library to see if I could get some guidance. I found several textbooks on teaching history, but they were very content specific. Then I found a journal titled, "Journal of Teaching History" and in it found a very interesting and useful article by Susan L. Speaker (1995) entitled "Getting Engaged: Using the Time Machine to Teach History." After reading it I decided to adapt the time machine to my subject area of management history.

MANAGEMENT HISTORY

As noted by Wren (1987), "The study of management history provides examples of theory and practice, illustrates different approaches to management, and identifies great thinkers who have been prominent in refining the practice and theory of management" (p. 339). Just as learning about history in general is an integral part of students' general education, learning about management history is an integral part of management students' business education. Understanding management history can help students to learn the lessons of the past to avoid mistakes in the future (Wren, 1987; Gibson, Hodgetts, & Blackwell, 1999; Thomson, 2001, Smith 2007), and better understand and adapt to change (Wren, 1987; Thomson, 2001; Van Fleet & Wren, 2005, Smith, 2007).

Over the years, many researchers (e.g., Wren, 1987, Gibson et al., 1999; Van Fleet & Wren, 2005; Hartley, 2006; Smith, 2007; Cummings, 2011; Tennent, 2021) have identified the need for the teaching of history in business schools. Despite this research, very few business schools offer courses dedicated specifically to history and most students are only exposed to management history as a very small portion of other mainstream business courses (Gibson et al., 1999; Van Fleet & Wren, 2005). For courses where management history is not the primary focus, textbooks in the field of management have very little coverage of the history of management (Hartley, 2006). With such little coverage, it is difficult for students to understand the context in which management theories were developed.

In addition to limited coverage of history in the management curriculum, there is some belief that it has not been taught as effectively as possible. There has been a call for improved teaching techniques that require students to think more critically (Cummings, 2011). Tennent (2021) suggests a more holistic approach to teaching management history by giving students an "historical context of ideas". In other words, instead of just learning facts about history, students should understand the historical background in which ideas were developed. With so many management theories and ideas, they are often presented hastily without a foundation and understanding of the historical context in which they occurred (Smith, 2007). Students engaged with the history of management are more likely to have positive impacts as future managers, but the quality of teaching materials and the lack of critically looking at history keeps it from being as useful as possible to the future of management (Cummings, 2011).

THE TIME MACHINE

My philosophy and practice of teaching has always been one of active learning. So, in designing and teaching the management history course, I wanted students to do more than just passively memorize history. I wanted them to experience it; to critically think about where the management theories and practices came from and originated and to experience it in the context of history. As future businesspeople, I also wanted them to be able to use that understanding of history to practice management better in the future. Speaker's article about the time machine gave me a jumping off point to develop many different time machine type activities for the course.

Activity prompts

Speaker (1995) provided seven basic templates of the time machine including the simple form, the dialogue, the letter, the memoir, the dinner party or town meeting, the time machine weekend, and Rip van Winkle (see her original article for the actual templates). I have designed time machine activities using many of these templates as well as some of my own design. Some of the prompts that I have used and found to work well in getting students to think critically about history include:

- It is 1832, Charles Babbage and Robert Owen run into each other at an English pub. Over a Bass Ale, the subjects of machines and motivation come up. What are their positions and how to they defend them? Compose their conversation.
- It is 1857 and engineers at the NY and Erie Railroad have gone on strike in protest of the rules, particularly #6, instituted by the Daniel McCallum, the general manager. Version 1: As the engineers on strike, write a letter to the management of the company explaining your position. Version 2: As the management team of the railroad write a letter to the union explaining your position. (Half the students do each version.)
- Frederick Taylor goes to sleep in the United States in 1904 and wakes up in the current year. Curious he observes workers in several different industries, expecting that during the more than 100 years he was asleep his methods have worked to eliminate soldiering. Describe what he would see. Have his methods worked? What has changed? What has not?
- You have traveled back to 1920 Boston to visit Mary Parker Follett. Amazingly she believes you came from the future and is willing to chat with you. She asks you how her ideas on diversity, power, and leadership have been implemented in modern organizations. What do you tell her?
- The year is 1924 and you have recently retired from working on the assembly line at Ford Motor Company, where you worked for sixteen years (from 1908 to 1924). You have been asked by a book publisher to write a brief article about yourself and your experiences at Ford. What do you write?
- You are a manager of a textile factory in the 1930s. Currently you are only using a monetary piece rate system and autocratic leadership to motivate your workers and it doesn't seem to be all that effective. You have recently read about the findings of the Hawthorne Studies and decide that you need to make some changes. Based on the findings of the Hawthorne studies, as specifically as possible, describe the steps you would take in developing a new leadership/motivation system at your factory.
- It is 1935 and you are a business student at Purdue University. Dr. Lillian Gilbreth a mechanical engineering professor at the University and the country's first female engineering professor, is giving an open lecture about the human element in scientific management. You attend the lecture. What does Gilbreth talk about? What are her main points? You get a chance to talk to her after the lecture, what kinds of questions do you ask her?
- You are a sit-down striker at General Motor's Flint Body #1 plant. You have kept a journal for the 44 days the employees have occupied the plant. What would your journal entry say on the first day of the strike (December 30, 1936), on the 23rd day of the strike (January 21, 1937), and on the last day of the strike (February 11, 1937).

- You are currently a CEO of a computer software company that is feeling the effects of a recession. Your company has not shown a profit for the last six quarters. The chairman of the board of your company has sent you a memo indicating his concern. In the memo he tells you about his grandfather who faced a similar situation during the great depression of the 1930s and kept his company afloat by implementing a work sharing program and cutting his own salary. He is suggesting you try this in your company. In a memo to the chairman of the board explain why or why not you think his suggestions would work for your company.

The prompts listed above go along with topics covered in Daniel Wren's, Evolution of Management Thought, textbook, which is currently in its eighth edition (I used the 6th edition). The first edition was published back in 1972 and is considered a primary work in the field, providing important synthesis and direction (Gibson, 1999).

Usage

Although these prompts were originally designed and used in a course specifically devoted to management history and theory, they can be used in many other management courses. In fact, my department no longer offers the management history and theory course for which I originally designed these prompts, but I have continued to use the time machine framework when covering history and theory in other classes I've taught such as human resource management and organizational behavior. Time machine activities could also be used in such classes as principles of management, strategic management, organization theory, and change management, among others.

I have used the time machine in my classes in several different ways. One way that I have used time machine is as team (4-5 students) in-class activities, where students work together to respond to the prompts. Teams will then share their responses with the class in various ways, including reporting out from their seats to the whole class, presenting in front of the class, and sharing with another team. For some time machine prompts, such as the railroad situation above, a debate between two teams works very well. Additionally, I have had students complete the time machine prompts individually as homework assignments and then during class time used their responses to spur discussion as a whole class, in small teams, or in pairs. This method leads to interesting discussion as students can see how their experience of the time machine situation was similar and different than others in the class. Lastly, I have used time machine prompts as essay exam questions as they give students an opportunity to show how they can think critically about a situation and apply theories and ideas from the course.

Student reaction to the using the time machine activities have been positive. Although I still have some students who noted they don't see the value of learning about things that happened in the past, students have had positive things to say about the time machine. Some examples of student comments include:
- "The time machine group activities made the material more interesting and got me to think about the way things were done during different times in history."
- "Time machine questions helped us to get into the minds of those in the past."
- "Discussions based on time machine questions were very engaging and made the history lessons more enjoyable."
- "I feel like the time machine activities let me see history from the viewpoint of those in the past and then connect that to the present and the future."
- "The class activities allowed me to learn a lot about specific individuals and specific situations in depth instead of just getting an overview of management history."

Historical perspective

According to Lawrence (1984), "Historical perspective is the study of a subject in light of its earliest phases and subsequent evolution." It is different from history as its purpose is to better understand the present, not the past (Lawrence, 1984). Time machine activities allow students to experience situations and theories in the context of the person, place, and time that they happened or were developed. Understanding the context in which theories were developed provides students with historical perspective that they can use to better understand the present. This is an important skill to have. Wren (1987) states, "So we may see a manager wrestling with the problem of motivating a modern worker and know that is not the same event as one of 200 years ago, but that the problem of motivation still exists and has always existed" (p. 342) He continues on to say, "Managing today is different from that of last year, the last decade, or whatever date we choose. But how different? How do we know the difference if we have no prior knowledge?" (Wren, 1987, p. 342). Although things change throughout history, being able to truly understand those

changes requires an understanding of the context in which they began. Time machine activities provide students with context that allows them to see and understand the present with historical perspective.

CONCLUSION

The time machine is an activity that gives context to students as they learn about the history and theory of management. It provides them with historical perspective to better understand the present. Students have enjoyed the time machine activities and found them useful. They are not the only ones who have benefitted from the time machine. As someone who never liked history before I taught the management history and theory course, I am now a history enthusiast. I actively seek out opportunities to learn more about all types of history through reading historical fiction, biographies, watching movies and tv series, and visiting museums and other historic sites. I hope in addition to helping them become better managers, the time machine has also spurred students' interest in history.

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Word Puzzles in an Operations Analytics Class

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ABSTRACT

Teaching Operations Analytics in business schools requires a review of basic algebra. We spend the first week of the semester to review algebra (or Linear Algebra fundamentals for the School of Engineering). Our classroom experience has been very positive when we reviewed such basics using simple word puzzles. One such word puzzle is a problem related to *Nickels, Dimes, and Quarters* – available on the internet in a variety of forms. It is a simple puzzle, but we make it interesting by going beyond the algebra. We explore the Data Analytics concepts by showing how each additional piece of information (or data) adds value and improves our analysis of the problem. Furthermore, we encourage the student to make logical deductions of possible solutions when we have only partial information available. The students perceive this as fun activity and enjoy the solution process. The student involvement and motivation continue to be high when we discuss topics such as Linear Programming.

Keywords: Word puzzles, Analytics, Algebra, Linear Algebra, Logical Deduction.

INTRODUCTION

Courses such as Operations Management or Management Science have traditionally been more challenging for Business School students. More recently, several colleges have started incorporating the Analytics component into their quantitative courses. We at Thomas Jefferson University are revamping and revising the content in our Business Statistics, MIS, and Operations Management classes. Our traditional Operations Management course is now called *Operations and Data Analytics*. Our course revisions include experimenting with software such as R and Tableau while retaining Excel as the primary and predominant software tool in the classroom.

Because of the availability of high-quality data, executives are no longer content with decisions based only on intuition and instinct; they require data (Liberatore & Luo, 2010). Analytical executives like Harrah's CEO Gary Loveman, have coined the mantra, "Do we think this is true? Or do we know?" (Davenport, 2006). Recent studies stressed on the importance of data in their definition of business analytics. One definition is: "*Business analytics* is an evolving phenomenon that reflects the increasing significance of data in terms of its growing volume, variety and velocity" (Mortenson, Doherty & Robinson, 2015). Another definition is: By *analytics* we mean the extensive use of data, statistical and quantitative analysis, explanatory and predictive models, and fact-based management to drive decisions and actions" (Davenport & Harris, 2007). These definitions help us in the classroom as an introduction to Analytics before demonstrating the value of data or information.

Despite current trends related to business analytics and related software tools, Operations Management as a course still requires a reasonably good background in algebra. The business majors do better with a refresher in basic algebra. The Engineering majors benefit by a refresher in Linear Algebra fundamentals – especially if the Professor is teaching the Simplex Algorithm later in this course. We have always devoted the first week of the semester to review basic algebra in our Operations classes. While the students do appreciate the Professor's attempt to review basic Math, they do not seem motivated when we simply review a bunch of Algebra (or Linear Algebra) problems. Our experience has shown that word puzzles have always made the class very interesting and significantly improved class participation. Furthermore, the students maintain a high level of involvement when we eventually discuss topics like Linear Programming and Integer Programming. While we do not teach the Simplex Algorithm to business majors, we do stress on enhancing their ability to convert various word problems into LP or IP models. Our experience has been that students struggle more with Linear Programming and Integer Programming because of the Math and the challenge in interpreting word problems and converting them into algebra. Even students who are good with quantitative material are not too comfortable with word problems. Hence, word puzzles provide an interesting start to the semester and the student gains confidence when we tackle more difficult problems later in the semester.

The purpose of this paper is multifold. We introduce elementary word puzzles in the classroom for multiple reasons. We demonstrate how to convert the information into algebraic equations and then solve those equations. We then address the scenario with only partial information of such puzzles and encourage the students to think logically and arrive at the final solution or a set of possible solutions. Furthermore, we discuss the fundamental ideas of Data Analytics and explain how every piece of information of the puzzle adds value to our analysis and improves the solution process. Lastly, we present the Gaussian Elimination and Gauss-Jordan Elimination methods of Linear Algebra in an Appendix to solve one variant of a word puzzle.

THE NICKELS, DIMES, AND QUARTERS PUZZLES

Formulating word problems into algebra requires can be a challenge for undergraduate students. Word puzzles have helped us in instilling confidence in them. There are several word puzzles that can be solved in very little time. One such puzzle is related to *Nickels, Dimes and Quarters* and there are several variants of it available on the internet: https://www.algebra.com/algebra/homework/word/coins. In this paper, we present three simple variants of this puzzle. We discuss Variant 1 in detail but omit the matrix solutions for the other two variants. Discussing such puzzles keep the students engaged and also help in refreshing their algebra skills. In the case of the Engineering students, we provide a review of Linear Algebra. Both groups of students benefit when word problems are formulated into algebra. The students also appreciate the value of quality data when the focus is on Analytics. Furthermore, we challenge the students by encouraging them to use logical deduction approaches if only partial information is available.

VARIANT 1: The Nickels, Dimes, and Quarters puzzle
In your pocket, you have nickels, dimes, and quarters. There are 12 coins altogether and exactly twice as many dimes as nickels. The total value of the coins is $2.00. Find the number of coins of each type.
Algebraic formulation: Let N, D, and Q represent the number of nickels, dimes, and quarters respectively. It is important to assume that $N \geq 1$, $D \geq 1$, and $Q \geq 1$ and it is implied that they are all integers. The second sentence has two pieces of information and results in equations 1 and 2. Finally, the third sentence of the Problem statement results in the third equation. The equations are:

$N + D + Q = 12$ ➔ Equation 1
$2N – D = 0$ ➔ Equation 2
$N + 2D + 5Q = 40$ ➔ Equation 3 (*Note*: This is the simplified form of the original equation: $5N+10D+25Q = 200$).

Solution: From Equation 2, we have $D = 2N$. Substituting this in equations 1 and 3, we obtain

$3N + Q = 12$ ➔ Equation 4
$N + Q = 8$ ➔ Equation 5

Solving equations 4 and 5, we obtain $N = 2$; $Q = 6$. From equation 1, we obtain $D = 4$. *Hence, there are 2 Nickels, 4 Dimes and 6 Quarters in your pocket.*

A Logical Deduction exercise of Variant 1 with partial information
Suppose Variant 1 of the puzzle is now modified as: *In your pocket, you have nickels, dimes, and quarters. There are 12 coins altogether. The total value of the coins is $2.00. Find the number of coins of each type.*
Note that we no longer have the earlier information of <u>twice as many dimes as nickels</u>. This means, we only have Equations 1 and 3 to work with. From equation 1, we obtain $N = 12 – D – Q$. Substituting this into equation 3 and simplifying, we obtain $D + 4Q = 28$. Now, it is a case of logical deduction. We consider all feasible values of Q (i.e., Q = 1, 2, 3, 4, 5, and 6). This results in only one feasible solution (see Table 1 below). This analysis demonstrates that logical deduction approaches are valuable, and we may be able to find solutions without having complete information.

TABLE 1

Q	D	N	Feasible/Not Feasible
1	24	-13	Not Feasible
2	20	-10	Not Feasible
3	16	-7	Not Feasible
4	12	-4	Not Feasible
5	8	-1	Not Feasible
6	**4**	**2**	**Feasible**

<u>Note</u>: We obtain D by using the equation $D + 4Q = 28$. We obtain N by using the equation $N + D + Q = 12$. And for all $N \leq 0$, the solutions are <u>not</u> feasible.

<u>**A discussion of Data Analytics with Variant 1**</u>

Data Analytics has several definitions as given by researchers in an earlier section of this paper. And *data* is the very core of analytics. There can be no analytics without data or information. While real-world examples are important, the Nickels, Dimes, and Quarters puzzle illustrates the value of data in an Introductory Analytics class. The students appreciate how additional data improves the analysis of a problem and results in more accurate conclusions.

Consider the first sentence of Variant 1: *In your pocket, you have nickels, dimes, and quarters.* If the question is to figure out the number of coins of each type from this sentence, it is not possible as there can be an *infinite or a large number of solutions*. The first sentence is still an example of "data" since it provides the basic information that you have nickels, dimes, and quarters in your pocket and that $N \geq 1$, $D \geq 1$, $Q \geq 1$ and integers. Now consider the first part of the second sentence: *there are 12 coins altogether*. This is an example of quality data since the number of possible solutions is now reduced drastically to *55 solutions* as shown below in **Table 2** – a set of 10 sub-tables.

TABLE 2

N	D	Q
1	1	10
1	2	9
1	3	8
1	4	7
1	5	6
1	6	5
1	7	4
1	8	3
1	9	2
1	10	1

N	D	Q
2	1	9
2	2	8
2	3	7
2	4	6
2	5	5
2	6	4
2	7	3
2	8	2
2	9	1

. . . .

N	D	Q
9	1	2
9	2	1

N	D	Q
10	1	1

Thus, the number of solutions = $10 + 9 + 8 + 7 + 6 + 5 + 4 + 3 + 2 + 1 = 55$ i.e., the sum of the first 10 positive integers. The second piece of the second sentence of the puzzle i.e., *there are twice as many dimes as nickels* is also an example of quality data. Incorporating both parts of this sentence results in only *three solutions* as given in Table 3 below.

TABLE 3

N	D	Q
1	2	9
2	**4**	**6**
3	6	3

Finally, the third sentence of the Problem Statement i.e., *The total value of the coins is $2.00* results in only *one possible solution* i.e., N = 2; D = 4; Q = 6. The other two solutions do not add up to $2.00. This example illustrates the fundamental idea of data analytics since our understanding of the problem increased with each additional piece of information or data. In the real world too, quality data results in better understanding of the problem, better predictions and the ability to provide unique solutions. However, we inform the student that real-world problems may not have simple solutions and that our puzzle was to only illustrate the concept of improved information with additional data.

VARIANTS 2 AND 3 OF THE NICKLES, DIMES AND QUARTERS PUZZLE

In this section, we present Variant 2 and Variant 3 of the Nickels, Dimes, and Quarters puzzle as Student Exercises. We provide the algebraic solutions, the logical deduction methods, and the data analytics related discussion. The instructor may choose to also discuss Variant 2 in the classroom and assign Variant 3 as homework.

VARIANT 2: The Nickels, Dimes, and Quarters puzzle
In your pocket, you have nickels, dimes, and quarters. There are 14 coins altogether and one more nickel than dime. The total value of the coins is $1.55. Find the number of coins of each type.
Algebraic formulation: Based on Variant 2, the equations are:
N + D + Q = 14 ➔ Equation 1
N – D   =   1 ➔ Equation 2
N + 2D + 5Q = 31 ➔ Equation 3 (*Note*: It is the simplified form of the original equation 5N + 10D + 25Q = 155).
Solution: From Equation 2, we have N = D + 1. Substituting this in equations 1 and 3, we obtain
2D + Q = 13 ➔ Equation 4
3D + 5Q = 30 ➔ Equation 5
Solving equations 4 and 5 results in D = 5; Q = 3. From equation 1, we obtain N = 6. *Hence, there are 6 Nickels, 5 Dimes and 3 Quarters in your pocket.*

A Logical Deduction exercise of Variant 2 with partial information
Suppose Variant 2 of the puzzle is now modified as: *In your pocket, you have nickels, dimes, and quarters. There are 14 coins altogether. The total value of the coins is $1.55. Find the number of coins of each type.*
Note that we no longer have the earlier information of <u>one more nickel than dime</u>. This means, we have only Equations 1 and 3 to work with. From equation 1, we obtain N = 14 – D – Q. Substituting this into equation 3 and simplifying, we obtain D + 4Q = 17. Now, it is a case of logical deduction. We consider all possible values of Q (i.e., Q = 1, 2, 3, and 4). This results in a total of three feasible solutions (see Table 4 below). Interestingly, all three solutions are possible since they add up to $1.55. Thus, this is an example where the lack of the additional data/information of "one more nickel than dime" prevents us from arriving at a single unique solution.

TABLE 4

Q	D	N	Feasible/Not Feasible
1	13	0	Not Feasible
2	**9**	**3**	Feasible
3	**5**	**6**	Feasible
4	**1**	**9**	Feasible

Note: We obtain D by using the equation D + 4Q = 17. We obtain N using the equation N + D + Q = 14. And for all N ≤ 0, the solutions are <u>not</u> feasible.

Data Analytics with Variant 2
As in the case of Variant 1, the first sentence of Variant 2 also results in an infinite number of solutions. Now, consider the first part of the second sentence: *there are 14 coins altogether*. This is an example of quality data since the number of possible solutions is reduced drastically to only <u>78 solutions</u>. The rationale is same as the set of sub-tables in Table 2 except that in this case, the set of Tables would start with 12 combinations. Hence, the sum of the first 12 positive integers = 78. The second part of the second sentence i.e., *one more nickel than dime* is another example of quality data. Incorporating both pieces of the second sentence results in only <u>six possible solutions</u> as given in Table 5 below.

TABLE 5

N	D	Q
2	1	11
3	2	9
4	3	7
5	4	5
6	**5**	**3**
7	6	1

Finally, the third sentence of the Problem Statement i.e., *the total value of the coins is $1.55* results in only <u>one possible solution</u> i.e., N = 6; D = 5; Q = 3. The other five solutions do not add up to $1.55.

VARIANT 3: The Nickels, Dimes, and Quarters puzzle

In your pocket, you have nickels, dimes, and quarters. There are 20 coins altogether and exactly twice as many dimes as nickels. The total value of the coins is $3.00. Find the number of coins of each type.

Algebraic formulation: Based on Variant 3, the equations are:

N + D + Q = 20 ➔ Equation 1

2N – D   =   0 ➔ Equation 2

N + 2D + 5Q = 60 ➔ Equation 3 (*Note*: This is the simplified version of the original equation 5N+10D+25Q = 300).

Solution: From Equation 2, we have D = 2N. Substituting this in equations 1 and 3, we obtain

3N + Q = 20 ➔ Equation 4

 N + Q = 12 ➔ Equation 5

Solving equations 4 and 5 results in N = 4; Q = 8. From equation 1, we obtain D = 8. *Hence, there are 4 Nickels, 8 Dimes and 8 Quarters in your pocket.*

A Logical Deduction exercise of Variant 3 with partial information

Suppose Variant 3 of the puzzle is now modified as: *In your pocket, you have nickels, dimes, and quarters. There are 20 coins altogether. The total value of the coins is $3.00. Find the number of coins of each type.*

Note that we do not have the earlier information of <u>twice as many dimes as nickels</u> and have only Equations 1 and 3 to work with. From equation 1, we obtain N = 20 – D – Q. Substituting this into equation 3 and simplifying, we obtain D + 4Q = 40. Now, it is a case of logical deduction. We consider all possible values of Q (i.e., Q = 1, 2, 3, 4, 5, 6, 7, 8, and 9). This results in a total of three feasible solutions (see Table 6 below). Interestingly, all three solutions are possible since they add up to $3.00. Thus, this is also an example where the lack of the additional data/information of "twice as many dimes as nickels" prevents us from arriving at a single unique solution.

TABLE 6

Q	D	N	Feasible/Not Feasible
1	36	-17	Not Feasible
2	32	-14	Not Feasible
3	28	-11	Not Feasible
4	24	-8	Not Feasible
5	20	-5	Not Feasible
6	16	-2	Not Feasible
7	**12**	**1**	**Feasible**
8	**8**	**4**	**Feasible**
9	**4**	**7**	**Feasible**

Note: We obtain D by using the equation D + 4Q = 40. We obtain N by using the equation N + D + Q = 20. And the solutions are <u>not</u> feasible for all N ≤ 0.

Data Analytics with Variant 3

As in the case of Variant 1, the first sentence of Variant 3 also results in an infinite number of solutions. Now, consider the first part of the second sentence: *there are 20 coins altogether*. This is an example of quality data since the number of possible solutions is now reduced drastically from an infinite number of solutions to only *171 solutions*. The rationale is same as the set of sub-tables in Table 2 except that in this case, the set of Tables would start with 18 combinations. Hence, the sum of the first 18 positive integers = 171. The second part of the second sentence of the Problem statement i.e., *there are twice as many dimes as nickels* is another example of quality data. Incorporating both pieces of the second sentence results in only *six possible solutions* as given in Table 7 below.

TABLE 7

N	D	Q
1	2	17
2	4	14
3	6	11
4	**8**	**8**
5	10	5
6	12	2

Finally, the third sentence of the Problem Statement i.e., *the total value of the coins is $3.00* results in only <u>one possible solution</u> i.e., N = 4; D = 8; Q = 8. The other five solutions do not add up to $3.00.

CONCLUDING REMARKS

Our experience has been that the typical business school student starts an Operations Analytics class with a certain amount of anxiety and concern. We spend the first week of this class by reviewing basics of algebra to instill confidence in our students. While our past attempts of solving some high school algebra problems were certainly appreciated, we realized that the class participation is higher when we use simple word puzzles instead. The students enjoy solving such puzzles and the objective of an algebra refresher is also achieved. The students gain confidence and stay motivated, and it helps when we tackle word problems in topics such as Linear Programming and Integer Programming. The students also enjoy the logical deduction exercises in arriving at solutions when only partial information is available. Furthermore, we also introduce the Analytics component during this first week itself using these word puzzles. Our students appreciate the value of quality data and how it improves our analysis and understanding of the problem which then results in more informed decisions and better predictions.

Finally, we present the Gaussian Elimination and Gauss-Jordan Elimination methods of Variant 1 of the Nickels, Dimes and Quarters puzzle in an <u>Appendix</u>. This exercise benefits the Engineering students if the Simplex Algorithm of Linear Programming is discussed in the classroom.

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APPENDIX

We solve Variant 1 using the Gaussian Elimination and Gauss-Jordan Elimination methods. We solve the linear system of equations simultaneously (Larson, 2017) so that the student can see the algebra during this process.

Linear System	Associated Augmented Matrix
$N + D + Q = 12$ $N + 2D + 5Q = 40$ $2N - D \quad = 0$	$\begin{bmatrix} 1 & 1 & 1 & 12 \\ 1 & 2 & 5 & 40 \\ 2 & -1 & 0 & 0 \end{bmatrix}$
Add the 1st equation to the 3rd equation. $N + D + Q = 12$ $N + 2D + 5Q = 40$ $3N \quad + Q = 12$	Add row 1 to row 3 to produce a new row 3. $\begin{bmatrix} 1 & 1 & 1 & 12 \\ 1 & 2 & 5 & 40 \\ 3 & 0 & 1 & 12 \end{bmatrix}$ R3 + R1 ➔ R3
Add –1 times the 1st equation to the 2nd equation. $N + D + Q = 12$ $\quad D + 4Q = 28$ $3N \quad + Q = 12$	Add –1 times row 1 to row 2 to produce a new row 2. $\begin{bmatrix} 1 & 1 & 1 & 12 \\ 0 & 1 & 4 & 28 \\ 3 & 0 & 1 & 12 \end{bmatrix}$ R2 + (–1) R1 ➔ R2
Add –1 times the 2nd equation to the 1st equation. $N \quad - 3Q = -16$ $\quad D + 4Q = 28$ $3N \quad + Q = 12$	Add –1 times row 2 to row 1 to produce a new row 1. $\begin{bmatrix} 1 & 0 & -3 & -16 \\ 0 & 1 & 4 & 28 \\ 3 & 0 & 1 & 12 \end{bmatrix}$ R1 + (–1) R2 ➔ R1
Add –3 times the 1st equation to the 3rd equation. $N \quad - 3Q = -16$ $\quad D + 4Q = 28$ $\quad 10Q = 60$	Add –3 times row 1 to row 3 to produce a new row 3. $\begin{bmatrix} 1 & 0 & -3 & -16 \\ 0 & 1 & 4 & 28 \\ 0 & 0 & 10 & 60 \end{bmatrix}$ R3 + (–3) R1 ➔ R3
Multiply the 3rd equation by 1/10. $N \quad - 3Q = -16$ $\quad D + 4Q = 28$ $\quad Q = 6$	Multiply row 3 by 1/10 to produce a new row 3. $\begin{bmatrix} 1 & 0 & -3 & -16 \\ \mathbf{0} & 1 & 4 & 28 \\ \mathbf{0} & \mathbf{0} & 1 & 6 \end{bmatrix}$ (1/10)R3 ➔ R3

Note: The matrix is now in row-echelon form. Using back-substitution, substituting $Q = 6$ from the 3rd equation into equations 1 and 2 results in $N = 2$ and $D = 4$. We continue to reduce the matrix into a reduced row-echelon form.

Add –4 times the 3rd equation to the 2nd equation $N \quad - 3Q = -16$ $\quad D \quad = 4$ $\quad Q = 6$	Add –4 times row 3 to row 2 to produce a new row 2. $\begin{bmatrix} 1 & 0 & -3 & -16 \\ 0 & 1 & 0 & 4 \\ 0 & 0 & 1 & 6 \end{bmatrix}$ R2 + (–4) R3 ➔ R2
Add 3 times the 3rd equation to the 1st equation $N \quad = 2$ $\quad D \quad = 4$ $\quad Q = 6$	Add 3 times row 3 to row 1 to produce a new row 1. $\begin{bmatrix} \mathbf{1} & 0 & 0 & 2 \\ 0 & \mathbf{1} & 0 & 4 \\ 0 & 0 & \mathbf{1} & 6 \end{bmatrix}$ R1 + 3R3 ➔ R1

Graduate Business Student Performance in a Hybrid Class

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ABSTRACT

Prior research on student performance with different content delivery formats shows mixed results and often occur across semesters, students, and instructors. This study compares graduate business student performance in an operations management course for content delivered in a hybrid course where content delivery is both face-to-face and online to the same students by the same instructor in the same semester. Results demonstrate a significant difference in student performance and favor face-to-face content delivery.

Keywords: Hybrid, Graduate business students, Performance

INTRODUCTION

Administrators argue that online learning is the same or superior to those in the traditional face-to-face (FTF) classroom (Allen & Seaman, 2013); however, critics argue that due to intrinsic differences online education does not replicate the learning that occurs in the FTF classroom (Bejerano, 2008). Correctly or incorrectly, instructors assume that whenever they implement information technology in a classroom, it contributes to student learning (Peng, 2009). However, instructors should evaluate the various assessment activities used to evaluate student performance and enhance the learning environment to verify the relevance to students learning (e.g. Braunscheidel, Fish & Shambu, 2013; Fish, 2015, 2017; Santos, Hu & Jordan, 2014; Weldy, 2018). In general, when instructors enthusiastically embrace online education and carefully integrate assignments and course materials, the students embrace it as well (Arasasingham et al., 2011). Researchers have explored student performance in courses which are offered online, FTF and web-enhanced (which includes hybrid). With this in mind, the question before us is: Do graduate students perform the same for content delivered in the online environment as in the FTF environment?

Review of the Literature. Specific definitions for online, hybrid and FTF vary as technology continues to change and classes change to include different, up-to-date technological elements. FTF content delivery refers to the traditional instructor lecture style where the students and instructors are in the same physical location at the same time. In FTF instruction, the instructor lectures and interacts with the students, answering questions and encouraging participation in real-time. Online delivery refers to all instructional materials being located online and delivered asynchronously, such as instructor pre-recorded lectures that are passive and do not allow for real-time questioning. In 'pure online' course delivery, the instructor does not meet synchronously to answer a student's questions in real-time. Hybrid or web-enhanced courses occur in a variety of forms. In this study, hybrid refers to content delivery through an 'every other week' format whereby the students participate one week in FTF content delivery and the next week in 100% online delivery.

Many studies researched student performance in various educational formats: FTF, online and hybrid. Several studies found that traditional FTF education yields better student performance than web-based performance (Coates, Humphreys, Kane & Vachris, 2004; Crawford, 2008; Evans, 2015; Flanigan, 2014; Grotton-Lavoie& Stanley, 2009; Mahmood, MahMood & Malik, 2012; Metzgar, 2014; Trawick, Lile & Howsen, 2010; Verhoeven & Rudchenko, 2013). Contrastingly, other studies found that student performance in web-based classes is better than traditional FTF (Gratton-Lavoie & Stanley, 2009; Harmon, Alpert, & Lambrinos, 2014; Means, Toyama, Murphy, Bakia, & Jones, 2010). Additionally, other studies showed no difference in student performance between traditional FTF and web-based instruction (Cavanaugh, & Jacquemin, 2015; Larson & Sung, 2009; Ni, 2013; Olitsky & Cosgrove, 2014; Stack, 2015; Terry, 2007; Zacharis, 2010). In yet another study, researchers found that student performance was higher for instruction that combined FTF lecture and online components than purely FTF instruction or purely online instruction (Angiello, 2010). In a 2010 meta-analysis study, the U.S. Department of Education indicated that hybrid teaching is the most effective instruction approach to achieve better student learning outcomes than courses that are entirely online or entirely FTF (Means, Toyama, Murphy, Bakia, & Jones, 2010; Molnar, 2017). In a study of graduate business student performance over a decade ago, student performance on class assignments delivered through FTF, online, and hybrid formats were the same (Terry, 2007). Additionally, while not statistically significant, the study found that graduate online students performed over 4% lower on the final exam than graduate students who learned material in FTF or hybrid delivery (Terry, 2007). These studies have occurred in various business and non-business courses, for graduate and undergraduate students, with large and small sample sizes and at various sized Universities. Results are

obviously mixed; however, most studies evaluate student performance across different instructors or semesters or students. A hybrid course, taught by the *same instructor* to the *same students* in the *same semester*, offered a unique opportunity to analyze student performance on content delivered FTF versus online.

Statement of the Problem. This study evaluates the impact of different educational formats in a hybrid class - specifically online and FTF content instruction on graduate business student performance where the content is delivered by the same instructor for the same course in the same semester to the same cohort. The specific research question is: *Did graduate students perform the same on content delivered in FTF and online?* Specifically, this study seeks to explore the following hypothesis:

Student Performance on FTF versus Online Content:
Ho1:   There is no difference between student performance for content delivered in the FTF and online environment.
H11:   There is a difference between student performance for content delivered in the FTF and online environment.

METHOD

With increasing graduate business student demands to offer more online components in programs, an AACSB-accredited University in the northeast began the transition to a hybrid program in 2019. In the spring of 2020, prior to the pandemic, an instructor taught an operations management course as a hybrid course. By hybrid, the format for delivery entailed an 'every-other' week FTF session – online session transition. The course began with the students attending class the first night to review material in a FTF environment. Then the following week, the students completed the material online. In the third week, the students returned to the FTF environment to take a quiz on the prior 2 weeks of material and cover content in the FTF environment. This pattern of content delivery whereby material was reviewed FTF, then online, then a quiz on the two weeks of material in a FTF setting repeated itself over the semester. The University prides itself on being a teaching University with small class sizes (average 17) and significant instructor-to-student interaction. Students typically regard the operations management course as 'difficult' as it includes qualitative and quantitative content that they do not have prior experience on. Topics covered (outlined here in the sequence they were covered) include introduction to operations management, process analysis, quality management and statistical process control, supply chain design and integration, layout design, forecasting, sustainability, capacity management, inventory management, operations planning, resource planning, Material Requirements Planning, scheduling, and lean systems. The same instructor taught two sections of the hybrid course (where one week the class was FTF and the next week they were online) in the same semester. Prior to the pandemic shut down, topics covered included introduction to operations through sustainability. Given the nature of the material, the instructor purposely chose the most qualitative topics with the simplest quantitative tools for online education – process analysis, supply chain design and integration, and sustainability. Over the first eight weeks of the course, the only quantitative techniques that the instructor reviewed online included break-even analysis and preference matrices. Both of these techniques are very simple and not complicated to learn. However, in the FTF class, the instructor reviewed the more challenging and intricate techniques associated with statistical process control charting, assembly line balancing and process layout. Whether it was an online or FTF week, student expectations included reading the corresponding textbook material. The instructor conducted FTF classes in a traditional lecture format with student participation. For both online and FTF sessions, instructor handouts with an outline of the class were given to the students as the basis for their notetaking. It is important to understand that the University does not utilize instructional designers and the instructor is responsible for the design and content in the course for any online and FTF materials. For online weeks, the instructor posted videotapes online of the traditional lecture to the course learning management system (LMS). During online sessions, students listened to the videotapes and completed the course handouts – similar to their FTF class sessions, but without the immediate ability to ask questions and receive answers. Students could contact the instructor with questions on the online content at any time. Additionally, the instructor provided suggested problems with solutions to the LMS for each topic.

The graded requirements for the course included quizzes, homework assignments, individual assignments, a midterm and a final exam. The instructor administered 5 quizzes over the semester, with the 4 best scores counting toward a student's overall grade, and quizzes accounted for 25% of a student's overall grade. The student completed 10 online homework assignments that were administered through a notable textbook publisher with a focus on mastery through 3 attempts on each problem, and the homework grade counted toward 10% of a student's overall grade. Students were required to complete 3 individual written assignments, worth 15% of the student's overall grade. A non-cumulative

midterm and final exam were each worth 25% of a student's overall grade. Prior to the pandemic, the instructor administered three quizzes in class. Quizzes included multiple choice questions, short answer questions and quantitative problems. The testing was 'closed book and notes', students were limited to a basic calculator, and the instructor provided all formulas for testing. Quiz content include two weeks of material (one FTF session reviewed two weeks prior to the quiz and one online session reviewed online a week prior to the quiz). Each quiz took roughly 25 minutes to administer in-class. The midterm was administered in the FTF class, covered the material that was taught FTF and online, and consisted of 30 multiple choice questions, 5 short answer questions and 6 quantitative questions.

An example of a multiple-choice question from the midterm is:

The ease with which equipment and employees can handle a wide variety of products, output levels, duties and functions, is known as:
a. customer involvement
b. resource flexibility
c. capital intensity
d. line process

Similarly, an example of a short answer question is:

Describe a job shop [2 points], and its customer involvement, capital intensity and resource flexibility. [3 points]

An example of a quantitative question from the midterm is:

Joseph's Tailoring makes custom designed shirts for men. The shirts could be flawed in various ways, including flaws for weave or color, loose buttons or holes in the fabric. The manager examined shirts each day over a week; however, the number of shirts made each day could vary. Given the information in the table below:

Day	1	2	3	4	5
# Defects	18	13	17	12	22

a. Determine 3-sigma control limits to help the manager monitor quality. [3 points]
b. If on the 6th day, the manager found 25 defects, is the process in control?
   Yes   No   Undecided   Why or why not? [2 points]

For this study, for content delivered through FTF instruction, there were 29 multiple choice questions, 6 short answer questions (18 points total) and 7 quantitative questions (39 points total). For content delivered online, there were 15 multiple choice questions, 4 short answer questions (16 points total) and 2 quantitative questions (8 points total). The instructor graded all quiz and exam short-answer and quantitative problems, and awarded partial credit using a rubric for consistency between students. For purposes of this study, the instructor recorded the FTF and online question results for multiple choice, short answer and quantitative questions for each student. Due to COVID, the course transitioned to 100% online and the last quizzes and final exam were administered online, and therefore could not be used in this study. In keeping with University requirements, student permission to use their performance was noted and obtained through the course syllabus. Homework results were not included as the focus of the homework assignments was on mastery of the technique with multiple tries, 'hints' were given, and the event was recorded online versus in a classroom setting. In completing the homework, students also had access to the other students, the instructor, textbook and notes.

ANALYSIS

In the spring of 2020, COVID19 interrupted many lives – and the University switched to fully online following the eight-weeks of classes. For purposes of this study, only the first eight weeks of the course resulted in a FTF-to-online session comparison whereby the testing was the same for all students (that is, in-class FTF testing proctored by the instructor). All 54 students participated in this study and received both online and FTF instruction in the 'hybrid' class. There were 25 students in one section and 29 in the other section taught by the same instructor. The instructor gathered all question results and coded them as material reviewed FTF or online, and whether the question was a multiple choice, short answer or quantitative question. Since the number of points for FTF and online were not equal, for

comparison purposes, student scores were calculated as a percentage. As shown in Table 1, paired t-test analysis (two-tails) showed a significant difference (p=.000) for student performance on FTF and online content. Students performed significantly better on average for content administered FTF than online. In particular, they performed significantly better on short answer questions (p=.0210) covered FTF than online. The results show a slight significance for multiple choice questions (p=.0776). There was no statistical difference (p=.1666) on quantitative questions between content covered in-class versus online.

Table 1: Comparison of Student Performance on FTF and Online Administered Content.

Question Type	FTF Average	Online Average	T-Test
Multiple Choice	75.48	72.1	.0776 **
Short Answer	69.01	63.80	.0210 *
Quantitative	86.75	83.22	.1666
Total	79.24	70.98	.0000 *

*p ≤ .05, ** p ≤ .10

DISCUSSION

Research regarding the effectiveness of different educational formats is mixed. These studies typically compared different students in different treatments. This study analyzed the *same graduate student* in both FTF and online treatments and their performance on content delivered in each method was tested simultaneously. The *same instructor delivered the material* in the *same semester to the same students*. Regardless of the question type, students performed better on average for content delivered in the FTF environment than online. Analysis revealed a significant difference in student performance between FTF and online delivered content and favored the traditional FTF method. These results support the research that favored FTF content delivery over online or web-enhanced content delivery (Coates, Humphreys, Kane & Vachris, 2004; Crawford, 2008; Evans, 2015; Flanigan, 2014; Grotton-Lavoie& Stanley, 2009; Mahmood, MahMood & Malik, 2012; Metzgar, 2014; Trawick, Lile & Howsen, 2010; Verhoeven & Rudchenko, 2013). Specific to graduate students, these results contrast the older study that showed no significant differences between FTF, online and hybrid in graduate business student performance (Terry, 2007). This is particularly interesting as the FTF material was administered two weeks prior to the online material for quiz testing, and typically covered more difficult material that also required quantitative understanding of the topic.

With respect to the different testing formats, graduate students showed a significant difference in their performance on short answer questions and a slight significance on multiple choice, but not on quantitative questions. As for the lack of a significant difference in the quantitative performance, perhaps this result can be attributed to the fact that the easier quantitative techniques were reviewed online, and the analysis only included a few questions on online quantitative content. Also, the online homework encouraged mastery of the methods through the three attempts. If the complexity of the quantitative problems taught online had been more, perhaps the results on quantitative questions may have been different.

CONCLUSIONS

Clearly, the results support significant difference in graduate student performance between FTF and online instructor administered content, and favor the traditional FTF administered format. As most graduate students have been taught through traditional FTF educational systems, it may also indicate that graduate students at this teaching institution may not be as acclimated to online education at this time. Perhaps, following the pandemic and graduate students' participation in 100% online education, results may be different.

Limitations. Due to the pandemic, student performance included results for only 3 quiz results and 1 midterm. Completion of the entire semester would have allowed a more thorough review of quantitative problems reviewed online versus FTF content.

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Undergraduate Student Performance in Multi-Modal Educational Format

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ABSTRACT

In a multi-modal environment where students could self-select their education method, differences in student performance exist. While average student performance for students who attended at least one class was better on graded assignments than online students; online students were not significantly different than other students on overall performance, homework and exams. Students who attended more than 75% of in-class opportunities performed significantly better on graded assignments than other students. The number of times that a student attended the face-to-face sessions appears to have an impact upon performance. Results have implications for education following the pandemic.

Keywords: Undergraduate students, performance, multi-modal

INTRODUCTION

During the pandemic, education dramatically changed as online education became the foundation for teaching at the collegiate level. While administrators argue that online learning performance is the same or superior to those in the traditional face-to-face (FTF) classroom (Allen & Seaman, 2013), others argue that online education does not replicate the traditional FTF classroom due to intrinsic differences (Bejerano, 2008). Several studies highlight the need for instructors to evaluate online activities to verify their relevance to student learning (e.g., Braunscheidel, Fish & Shambu, 2013; Fish, 2015, 2017; Santos, Hu & Jordan, 2014). During the pandemic, since some college students did not wish to have a completely online experience, institutions and instructors modified their courses to include in-class components. This study analyzes the impact of different educational formats - specifically online and online with FTF components on undergraduate business student performance. Specific questions include: (1) Did online students perform the same as FTF students on graded assignments? and (2) Did the number of times that a student attended a FTF session impact upon their performance?

In recent years, researchers have studied student performance in different educational formats – for example, online, hybrid, and 'web-facilitated' in comparison to traditional FTF courses. As technology changes, the definitions for these formats are 'blurred'. In this study, we refer to online learning as courses whereby everything is 100% online including all instructional and testing materials. Hybrid or blended courses offer a combination of FTF and online *instructional* time. 'Web-facilitated' courses include FTF classroom instruction supplemented by online materials such as the syllabus, PowerPoint presentations, taped lectures and handouts. Traditional FTF courses refer to courses taught in a FTF environment whereby all instructional and testing elements occur in the same physical environment.

Research regarding the effectiveness of different formats is mixed (e.g., Angiello, 2010, Cathoral et al., 2018, Ginns & Ellis, 2007; Love, Hodge, Grandgenett, & Swift, 2014; Metzgar, 2014; Olitsky & Cosgrove, 2014; Terry, 2007; Verhoeven & Rudchenko, 2013; Weldy, 2018). The frame of reference with these comparisons is in contrast to FTF courses. In a public institution's personal health course, student performance in web-facilitated (with FTF components) and hybrid course delivery formats were similar in spite of student preferences for web-facilitated courses with more FTF interactions (Cathoral et al., 2018). Contrastingly, in undergraduate managerial economics courses, student performance was lower in hybrid classes as compared to traditional FTF classes and results indicated that complex courses may not lend themselves to hybrid formats (Metzgar, 2014). Contrastingly, in an introductory economics course, there was no change in student performance (Olitsky & Cosgrove, 2014), but in an undergraduate microeconomics course, student performance in a hybrid section was weaker than in a FTF section (Verhoeven & Rudchenko, 2013). Yet another study over a decade ago, researchers found that student performance was higher for instruction that combined FTF lecture and online components than purely FTF instruction or purely online instruction (Angiello, 2010). In a study of graduate business student performance also performed over a decade ago, student performance on class assignments in FTF, online and hybrid formats were equivalent; however, students in online courses performed over 4% lower than FTF or hybrid students on the final exam (Terry, 2007).

Many of these studies involve different instructor comparisons or different student populations (typically across semesters or courses). The pandemic - and institutional requirements to offer a course as a 'multi-modal educational

experience' - offered a unique research opportunity as student performance in the *same class* with the *same instructor* but different educational formats can be compared. The institutions reference to a 'multi-modal educational experience' required all materials to be available online (due to potential quarantining requirements and COVID contraction) but encouraged FTF components for students who desired it. This multi-modal requirement changed the frame of reference from prior to studies being FTF to the online experience as the frame of reference. Specifically, this study seeks to explore the following hypotheses:

Online vs FTF Component Inclusion
Ho1:   There is no difference between student performance for students taking the course solely online versus students who attend FTF sessions in addition to online.
H11:   There is a difference between student performance for students taking the course solely online than students who attended FTF sessions in addition to online.

Number of Times FTF:
Ho2:   There is no difference in student performance for students who attend more FTF sessions than students who attend fewer FTF sessions.
H12:   There is a difference in student performance for students who attend all FTF sessions than students who attend fewer FTF sessions.

METHOD

At an AACSB-accredited University in the northeast due to the pandemic in the fall of 2020, the University required all classes to be offered as 'Multi-Modal'. By 'Multi-Modal', the University allowed students to self-select to attend classes in-person or online or both throughout the course, attendance could not be mandatory, and all materials were required to be available through online means. In other words, the courses were mainly online, but FTF elements were included. (Note this is a different form of hybrid than past studies as instructional elements were mainly online and supplemental elements were in the FTF classroom.) The University prides itself on being a 'teaching' University where class sizes are small (average 17), and the majority of classes prior to the pandemic were FTF - not online. In the fall of 2020 the *same instructor* taught two sections of a junior-level operations management course. Since the course involves both qualitative and quantitative material that students do not typically have experience with, students regard it as a complex and difficult course. The topics that the course taught included an introduction to operations management, process analysis, forecasting, project management, linear programming, inventory management, quality management, statistical process control, facility layout, Material Requirements Planning, aggregate planning, capacity planning, supply chain management, sustainability, and lean production. Twenty-two students enrolled in each of the two sections. For the first section, the in-class attendance ranged from 2 to 8 students at a session, while for the second section the in-class attendance ranged from 6 to 13 students at a session. (Five students withdrew from the course in the first section, but no one withdrew in the second section.) While the class 'normally' would meet twice a week for 75 minutes, to avoid quarantining requirements for everyone in the class per state Department of Health requirements, each in-class session was limited to less than 60 minutes. In keeping with state Department of Health requirements for contact tracing, while not a component of the class, the instructor recorded student attendance for in-class sessions. The instructor offered 18 in-class sessions to each section over the semester.

In keeping with the 'Multi-Modal' requirements, the instructor pre-recorded all lecture Power Point materials and posted them to the course Learning Management System (LMS). In keeping with University recommendations, the majority of videos averaged 7-15 minutes in length. (The instructor subdivided lectures by content to meet the time requirements. Some mathematical problems took longer than 15 minutes, and the instructor completed an entire math problem – regardless of how long it took – in a single videotape session.) The instructor provided a corresponding instructor developed handout for each lecture to students through the LMS. The handout required students to 'fill in' various sections as if they were sitting in class. Whether they attend the FTF class sessions or online, the instructor strongly recommended to a student that they listen to the lectures and fill in the notes. The instructor also provided suggested problems that corresponded to the textbook homework through the LMS. In order to keep the FTF classes 'value-added', the instructor did not repeat the lecture but gave a brief topic overview, and with the students, completed the suggested problems. All students – whether they attended a FTF class or not - were expected to listen to the videotapes, take notes and read the textbook. The in-class overviews were brief, lasting 5-10 minutes and in-class students could ask questions in real-time about the material. Since advanced technology was not available in the classrooms, online students did not attend the in-class session through any means and in-class sessions could not be

recorded.   For online students, solutions to the suggested problems went 'live' following the FTF sessions, and they were encouraged to contact the instructor with any questions that they had.

In keeping with University requirements, student permission to use their performance was noted and obtained through the course syllabus. The graded course requirements included 9 online homework assignments (through a notable textbook publisher, 5% of overall grade), 9 quizzes that corresponded to the homework (23% of overall grade), and 3 non-cumulative exams (24% of overall grade each). The homework assignments were due the evening prior to the in-class quizzes and were graded by the textbook management system. A student had 3 attempts on each problem as well as '*hints*' and access to instructor assistance. In keeping with University requirements for testing during the pandemic, the quizzes and exams were only offered during the class time. Students who came to class could take the quiz in-class, while those online took it at the same time but online. Students had access to all materials during the quizzes and exams. FTF students did not have access to their cellphones or computers. The quizzes, each worth 10 points, consisted of multiple-choice questions, a short answer question and a math question on the relevant material. Quizzes were timed in the classroom and online with 20-minutes allowed before a 5-minute grace period began. Online quizzes did not allow students to go back to a question and were randomized by section. The instructor wrote all quiz and exam multiple choice, interpretation and short answer questions and did not use the pre-provided textbook materials (as solutions are available to students via alternative means). For math problems, online students were required to enter the mathematical answer into the textbox during the quiz, and once the quiz was over, submit their corresponding handwritten work to a Dropbox for credit. Credit for mathematical problems was only given if the Dropbox work corresponded to the answer in the textbox as the quiz was 'not an exercise in data entry into Excel'. With respect to the exams and given the state Department of Health 60-minute quarantining potential, *all* students were required to take the exams online. Each of the three exams were timed, consisted of 25 multiple choice, 4-5 short answer questions, an interpretation question, and 4-5 mathematical problems (where the numbers for each problem were randomized so the problems varied by student). The instructor pre-set all testing so a student could not go back to a question and randomized questions within each section (multiple choice, short answer, interpretation and math questions) between students occurred. The exam math question requirements were the same as for quizzes as students were required to insert the answer into the textbox and submit their handwritten work to a Dropbox for credit within 15 minutes of test completion. With respect to grading, the LMS graded the multiple-choice questions based upon the pre-selected correct response. The instructor graded all exam and quiz short-answer, interpretation and math problems, and awarded partial credit using a rubric for consistency between students.

ANALYSIS

Following completion of the course, the instructor analyzed student attendance at FTF sessions. As shown in Table 1, student attendance varied. A total of 16 students (out of 44) attended 11 or more FTF sessions, only 3 students attended 5 to 7 FTF sessions, and the rest of the students attended online only.

Table 1: Number of FTF Sessions Attended

Number of FTF Sessions Attended	Number of Students who Attended	Number of Sessions Attended	Number of Students who Attended
18	0	9	0
17	3	8	0
16	4	7	1
15	2	6	1
14	2	5	1
13	1	4	0
12	2	3	0
11	2	2	0
10	0	1	0

To address the basic question whether there was a difference in student performance given attending any FTF sessions or not, student performance on the graded material for students who took the class solely online versus those who attended at least one session FTF was analyzed using a two-tailed t-test. Twenty students completed the course completely through online means, while 19 students attended at least 1 session. As shown in Table 2, analysis revealed that student overall performance was slightly significant (p=.06) and quiz performance (p=.01) was significantly

different between FTF and online students as FTF students performed better than online students on quizzes. While the average student performance for those who attended at least one in-class session was better than online students on homework and exams, a statistically significant difference in their performance did not exist.

Table 2: Face-to-Face vs Online Student Performance

Student Performance	FTF Average	Online Average	T-test
Overall	81.34	76.08	.06 **
Homework	93.41	90.31	.31
Quizzes	89.17	77.96	.01 *
Exam I	74.72	69.82	.19
Exam II	81.07	77.52	.25
Exam III	78.21	75.70	.51
Exams All	78.00	74.49	.21

*p ≤ .05, ** p ≤ .10

As shown in Table 1, there is a definite gap in attendance between the number of students who attended in-class sessions 7 times (which corresponds to 38.9 % attendance) and 11 times (which corresponds to 61.1% attendance). Given the course structure, one may surmise that students who attended less than 8 times completed the majority of their learning online. As shown in Table 3, comparing student performance for students who attended FTF class 7 or fewer times (note that this includes online students) with those that attended FTF class more than 10 times reveals statistically significant differences in overall performance (p=.02), quizzes (p=.00), and exam II (p=.05). (Note no students attended 8 to 10 sessions of the course in person.) The overall average on all exams (p=.06) and exams I (p=.07) were slightly significantly different between the groups. Homework and exam III was not significantly different between the two groups. Regardless of the graded item – and although it's not always statistically significant, FTF students who attended more than 10 times performed better than students who attended 7 or fewer FTF sessions on all graded items. The number of times that a student attended the FTF sessions appears to have an impact upon their performance.

Table 3. FTF More than 8 Times vs Online & FTF Less than 8 Times Student Performance

Student Performance	Average FTF > 11 times	Average FTF<8 & OL	T-test
Overall	82.32	76.09	.02 *
Homework	92.64	91.25	.64
Quizzes	89.93	78.90	.00 *
Exam I	76.03	69.55	.07 **
Exam II	82.59	76.93	.05 *
Exam III	78.88	75.95	.35
Exams All	79.17	74.14	.06 **

*p ≤ .05, ** p ≤ .10

To explore the impact of student attendance further, students were grouped into three groups: attendance at more than 75% of in-class sessions (14 or more FTF sessions; Group #1), less than 75% attendance at in-class sessions (1 to 13 FTF sessions; Group #2), and online only (Group #3). There were 11 students who attended 14 or more sessions, 8 students who attended 1 to 13 sessions, and 20 students who did not attend any FTF classes. Various statistical testing results are in Table 4. Comparing students who attended FTF 14 times or more with solely online students (Group #1 v Group #3) showed significant differences in overall (p=.01), quiz (p=.00), and all exams (p=.03) – and particularly exam II (p=.03), as well as slightly significant for homework (p=.07). Comparing students who attended FTF 14 times or more with students who attended 13 FTF sessions or less (Group #1 v Group #2) was statistically significant for overall (p=.02), quizzes (p=.05), and all exams (p=.03) – particularly exam II (p=.02) and exam III (p=.04). Interestingly, comparing students who attended 13 or fewer session with online students (Group #2 v Group #3) did not reveal any significant differences between the groups; however, quizzes were slightly significant (p=.07). Since the differences between students coming to class 13 times or less and online students was insignificant, comparison between the students who came to class 14 times or more and the other two groups was performed. Results demonstrate a significant difference on every performance measure except exam I.

Table 4: Student Performance FTF 14 Times or More vs FTF 13 Times or Less vs Online

Student Performance	Average Group Performance			T-Test			
	#1 (14+ FTF)	#2 (1 – 13 FTF)	#3 (OL)	#1 v #3	#1 v #2	#2 v #3	#1 v #23
Overall	84.23	77.36	76.08	.01 *	.02 *	.68	.00 *
Homework	95.64	90.34	90.31	.07 **	.20	.99	.04 *
Quizzes	91.62	85.8	77.96	.00 *	.05 *	.07 **	.00 *
Exam I	76.69	72.01	69.82	.10	.30	.63	.10
Exam II	84.84	75.89	77.52	.03 *	.02 *	.67	.01 *
Exam III	81.72	73.39	76.14	.11	.04 *	.46	.05 *
Exams All	81.08	73.76	74.49	.03 *	.03 *	.82	.01 *

*p ≤ .05, ** p ≤ .10

DISCUSSION

As noted in the literature review, research regarding the effectiveness of different formats is mixed and still accumulating. For most prior studies, the FTF environment was the frame of reference for comparison (e.g. Angiello, 2010, Cathoral et al., 2018, Ginns & Ellis, 2007; Love, Hodge, Grandgenett, & Swift, 2014; Metzgar, 2014; Olitsky & Cosgrove, 2014; Terry, 2007; Verhoeven & Rudchenko, 2013). The pandemic and radical change in course delivery methods offered the opportunity to analyze delivery formats from another perspective. This study adds to this research stream as online and online with FTF components are studied for a complex and difficult undergraduate business course. Only a slight significant difference on overall student performance between students taking the course solely online versus students with some additional FTF components exists. This result is different than the study over a decade ago that showed students performed better when online components were added to a FTF lecture than in pure FTF or pure online (Angiello, 2010). Notice that the point of reference is adding online to FTF instead of FTF to online as in this study. The general results are similar to another older study that showed no significant differences between FTF, online and hybrid in graduate business student performance, and students in FTF or hybrids performed better than online students on a final exam (Terry, 2007).

Hypothesis #1 was - and was not - held. While students who attended some sessions performed better on all graded material, the difference was not statistically significant. Quizzes were statistically significant. While the questions were the same, the method of taking the quiz was different. In-class quizzes were static – and what most students were accustomed to. FTF students could move between questions where those online were limited in their ability to move back to a question (to reduce cheating). However, as noted before, due to time constraints and Department of Health requirements (discussed previously), all students took the exams online – and experienced the same testing medium. While a statistical significant difference in their performance between the two groups did not exist, those students who experienced some FTF elements performed better on average than their online counterparts on exams. Therefore, the difference cannot be solely attributed to the different test taking method.

Our analysis explored the impact of a student attending more FTF sessions, and hypothesis #2 was not held for most performance metrics as students who attended more than 10 sessions FTF performed significantly better on overall performance and in particular, quizzes (and a slight significance on exams). Merely attending just a few FTF sessions did not significantly impact upon student performance.

Further analysis that divided the students into the three groups highlighted the significant impact attending more FTF sessions had on student performance. Results showed that the online group and lower attendance groups were very similar in their performance. *In other words, if a student did not come to class 'enough', there was not a positive benefit of coming to class over staying online completely.* This result implies that there is a 'threshold' of attendance that needs to be overcome for students to benefit from FTF sessions, and students adjust to teaching methods over time. For FTF students, those who attended class 14 times or more (Group #1) performed significantly better than students who attended less than 14 times (Group #2) on everything but homework and Exam I. With respect to Exam I, for many mainly FTF students Exam I was their first online testing experience and they struggled with the experience. By Exam II and III, students who attended more appear to 'reap' the benefits of the FTF experience as they performed significantly better than those that attended FTF less. Students who attended 14 or more times (Group #1) performed significantly better than other students (Groups #2 and #3) on graded assignments - except Exam I. Again, this result supports the difficulties that the students who attended 14 or more times may have experienced in

the initial online testing format. Interestingly, homework was only significantly different between the groups when comparing the results for students who attended 14 or more FTF sessions versus the other students. Homework was essentially the same for all students as it was online, encouraged mastery, allowed for hints, and other sources to solve the problems. A potential conclusion is that through reviewing the suggested problems in the FTF sessions, students who came to the majority of classes *learned from the experience*. In this study, we divided and analyzed the results at two different FTF attendance points: (1) less than 8 and more than 11, and (2) less than 14 versus 14 or more. Student performance changed between these two studies as more graded assignments became significantly different between the two groups. Therefore, there appears to be a difference by attending more sessions but there is a question as to what *specific number* of FTF classes a student should attend that will make a difference in performance. Given the dataset size, there simply isn't enough data to firmly establish a specific attendance number. However, clearly there is an aspect of attending FTF that has a positive overall effect – particularly for students who come to more than 75% of available sessions.

CONCLUSIONS

While the general results do not support a significant difference between adding FTF components to online classes to improve student performance, deeper analysis shows significant differences as discussed in this study. This study demonstrates the strong impact that 'attendance' requirements for FTF components into mainly online classes can have on student performance. It is important to understand that the student body selected the School originally for its strong in-class traditional teachings, and additionally students self-selected their educational method for this course during the pandemic. For this student body, students performed better when they attended a significant portion of in-class sessions. This type of education is what the majority of the students have been educated throughout their academic career. These results speak to the idea that for this student body has not experienced and learned to be educated through online education yet. This result may change in the future as they experience more online education. As the pandemic subsides, education will need to change to meet the current student body's perceptions and requirements regarding educational components. Going forward, instructors and institutions need to address what methods education will use in the 21st century.

Limitations.
Due to the small class sizes, while meeting the general threshold of having at least 30 data points in order to draw relevant conclusions, when subdividing the dataset further, it becomes difficult to interpret the results due to the small subset sizes. Replicating this study requires much larger classes to draw deeper conclusions.

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The Efficacy of a Business Simulation in an Orientation Course on Student Engagement and Learning

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ABSTRACT

For more than five decades simulations have been used in business courses. More recently, simulations have been developed to provide an overview of the business disciplines for students starting the program. These simulations are team based, requiring students to collaborate on decisions. With the objective of enhancing student engagement and providing a foundation for understanding how businesses function, a comprehensive but basic simulation was introduced into a freshman orientation course. Focusing on student perceptions of engagement and learning, the findings of a survey support the value of introducing the simulation at the freshman level.

Keywords: Student engagement, business simulation, orientation course

INTRODUCTION

Business schools are placing more emphasis on helping students succeed academically, especially in the first year. One method to achieve this goal of helping students to succeed is to increase their engagement. A literature search during the last 10 years yields thousands of scholarly articles on the topic of student engagement in schools of business, highlighting the importance of the issue.

There are several definitions of student engagement. Basic definitions of engagement generally refer to the degree to which students are actively involved in their assignments and the associated learning activities. More complex definitions of engagement encompass intellectual, emotional, physical, social, and cultural elements (Glossary of Education Reform, 2016).

This study focuses on the implementation of a basic but comprehensive business simulation into a freshman orientation course offered by the Ancell School of Business. The primary reason for introducing the simulation into the course was to increase student engagement and specifically to help students develop connections with cohorts, therefore enhancing social and emotional engagement. A secondary goal was to give students a multidisciplinary perspective on business, providing an opportunity for intellectual engagement. This intellectual engagement with the core elements of their academic major might also increase their confidence in the ability to perform in the business program.

LITERATURE REVIEW

Overview of the Simulation Research

It is not the intent of this paper to review the use of simulations in the business curriculum, so only a cursory discussion of the literature will be presented here. Simulation games have been used in schools of business since 1957 (Faria, 1998, Goi, 2019), and their use has been increasing since that time (Faria, et al, 2009). The efficacy of simulations versus other teaching methods (e.g., case method) has been examined experimentally in numerous studies over the years. For example, in an early empirical study using a pre-post experimental design, Wolfe and Guth (1975) found that simulations can produce significantly better performance compared with more traditional case methods on course concept exams in a business capstone course.

As the number of articles on the use of simulations in education have increased, so have the meta-analyses. Vlachopoulos and Makri (2017) reviewed previous meta-analyses on simulations in education and performed their own using specific criteria for inclusion of studies into their analysis (e.g., peer reviewed, empirical, more recent, college level, etc.). After these criteria were applied, 8,859 studies were included in their meta-analysis. Overall, the authors confirmed previous meta-analyses of simulations in education concluding that they have positive impact on learning goals.

Within the business disciplines there are options developed for students at various stages in the undergraduate curriculum and for specific learning objectives. For example, in addition to content areas within the business disciplines such as supply chain, product development and entrepreneurship, simulations have been used to teach responsible decision making (e.g., Gibbons, Fernando and Spedding, 2021). There is also some evidence that business simulations increase student engagement (Rogmans & Abaza, 2019), which relates to a major objective of the present study.

Engagement and Student Success
The literature includes several studies that support the hypothesis that engagement increases student success (Svanum & Bigatti, 2009, Levant, Coulmont, & Sand, 2016, Hosaka & Mat, 2017). For example, utilizing data from the National Survey of Student Engagement, Webber, Krylow & Zhang (2013) found that class preparation, working on team projects outside of class and engaging faculty and peers in discussions were positively related to cumulative GPA and college experience satisfaction.

Bowden, Tickle and Naumann (2021) used a survey method to develop a structural model of student engagement. The model includes four dimensions: affective, social, cognitive, and behavioral engagement plus two antecedents, involvement, and expectations. Structural equation modeling was used to determine the relationships among the antecedents and dimensions and outputs (institutional reputation, student well-being, transformative learning, self-efficacy, and self-esteem). The authors summarized the findings as follows:

> *The results show that student expectations and involvement have an important seeding role in student engagement. Affective engagement was the most important determinant of institutional reputation, wellbeing, and transformative learning. Behavioral engagement determined self-efficacy and self-esteem. Cognitive and social engagement were necessary but not sufficient conditions for student success.*

Student self-confidence has also been considered a factor in student success. (Pritchard and Wilson, 2003).

Academic Self-efficacy
Bandura (1995) defined perceived self-efficacy as "the belief in one's capabilities to organize and execute the courses of action required to manage prospective situations." Paraphrased, self-efficacy refers to the belief in one's ability to succeed in a specific situation. Studies demonstrating the predictive power of self-efficacy on behavior go back to Bandura (1977). More recently, Robbins et al., (2004) performed a meta-analysis of 109 studies examining the relationship between psychosocial and study skills and college outcomes. Of these variables, academic self-efficacy and achievement motivation were found to be the best predictors of GPA.

In addition to being an important correlate of achievement, Chemers et al., (2001) found in college students, that self-efficacy relates to effort and perseverance in learning, self-regulation, less stress in demanding situations and better adjustment to new learning situation. While the factors related to self-efficacy do not account for all the variance in academic success, (e.g., Szulecka, Springett, and de Pauw, 1987) methods that increase self-efficacy might be reasonably easy to integrate in the curriculum and have personal value for students.

RESEARCH OBJECTIVES AND RELATED SURVEY ITEMS

As stated previously, the major objective of this study was to determine the effects of introducing a business simulation in an orientation course on student-perceived engagement. The survey data also included general measures of learning and enjoyment along with specific measures related to learning in business discipline areas and collaboration skill areas. Pre/Post measures were collected on the specific learning measures in the Fall 2020 semester. Below is a summary of these measures and the data analysis.

General perceptual measures collected from students after the simulation was completed. Data for these analyses were collected in the Fall 2019 and Fall 2020 semesters., and included:
- Distribution of the student ratings for engagement, learning and enjoyment.
- Relationships among the student ratings for engagement, learning and enjoyment.

Specific perceptual measures collected in the Fall 2020 semester before and after the Marketplace Simulation was implemented. Parametric statistics were used to compare the discipline and skills areas, including:

- Knowledge of business discipline areas - Marketing, Finance, Accounting, Information Systems, General Business Management, Supply Chains/Distribution, Production, Sales
- Business skills areas - leadership, collaborating, time management, problem solving in teams, team planning processes, evaluating personal performance in teams, evaluating a team's performance.

The Simulation

The Business Primer - Bikes simulation (Marketplace Simulations https://www.marketplace-simulation.com/business-primer-bikes) a team-based simulation, was selected for this orientation course. While the simulation covers important business fundamentals, it allows students to experience key aspects of each business discipline without the difficulty of delving into too many details. The characteristics of this simulation are consistent with the goals of increasing intellectual and social engagement without potentially increasing the stress sometimes experienced with more demanding simulations.

METHODS AND RESULTS

Methods - General Measures

An anonymous online survey was distributed to students in the Ancell School of Business freshman orientation course in the Fall 2019 and Fall 2020 semesters. The sample was 183 students, representing about 78% of the students who completed the course with the simulation. The survey completion rate for these students was more than 90%. For the measurements of engagement, learning and enjoyment, students used a rating scale from 0-100.

Findings

Figure 1. represents the number of students in each of the four rating bins on the question; *"Overall, how much did the Marketplace Simulation help you to become more engaged with WCSU students at the Business School?"* Three points were labeled on the scale as follows: 0 = No additional engagement at all, 50 = A moderate amount, 100 = Very much engagement. Assuming that no effect of the simulation would produce an equal distribution of students in the 4 bins, the observed values yield a Chi squared of 23.2 with 3 degrees of freedom. The two-tailed P value is less than 0.0001. More than 65% of the students rated engagement within the "moderate to very much" range.

Figure 1. Engage
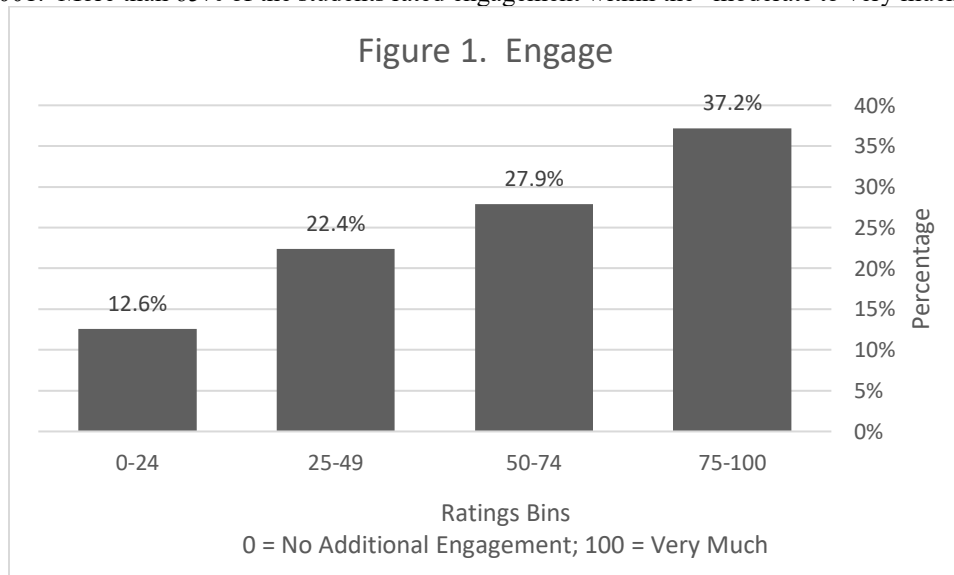
Figure 2. represents the number of students in each of the four rating bins on the question, *"Overall, how much did you learn from the Marketplace Simulation?"* Three points were labeled on the scale: 0 = No additional learning at all, 50 = A moderate amount, 100 = Very much learning. Assuming no effect of the simulation would produce an equal distribution of students in the 4 bins, the observed values yield a Chi squared of 39.0 with 3 degrees of freedom. The two-tailed P value is less than 0.0001. More than 70% of the students rated learning within the "moderate to very much" range.

Figure 2. Learn
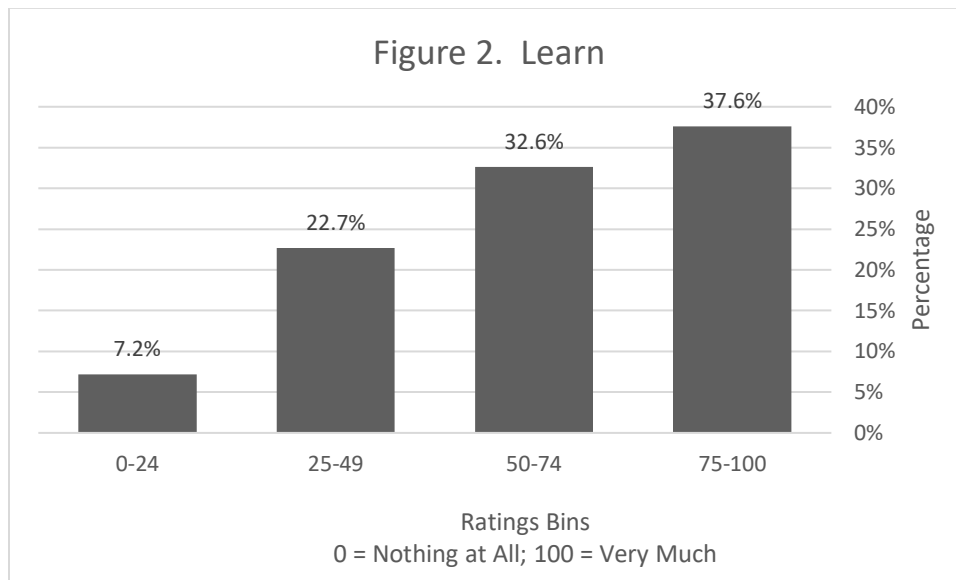
Figure 3. represents the number of students in each of the four rating bins on the question, "*Overall, how much did you enjoy participating in the Marketplace Simulation?*" Three points were labeled on the scale: 0 = Did not enjoy at all, 50 = A moderate amount, 100 = Very much enjoyment. Assuming no effect of the simulation would produce an equal distribution of students in the 4 bins, the observed values yield a Chi squared of 33.8 with 3 degrees of freedom. The two-tailed P value is less than 0.0001. More than 69% of the students rated enjoyment within the "moderate to very much" range.

Figure 3. Enjoy
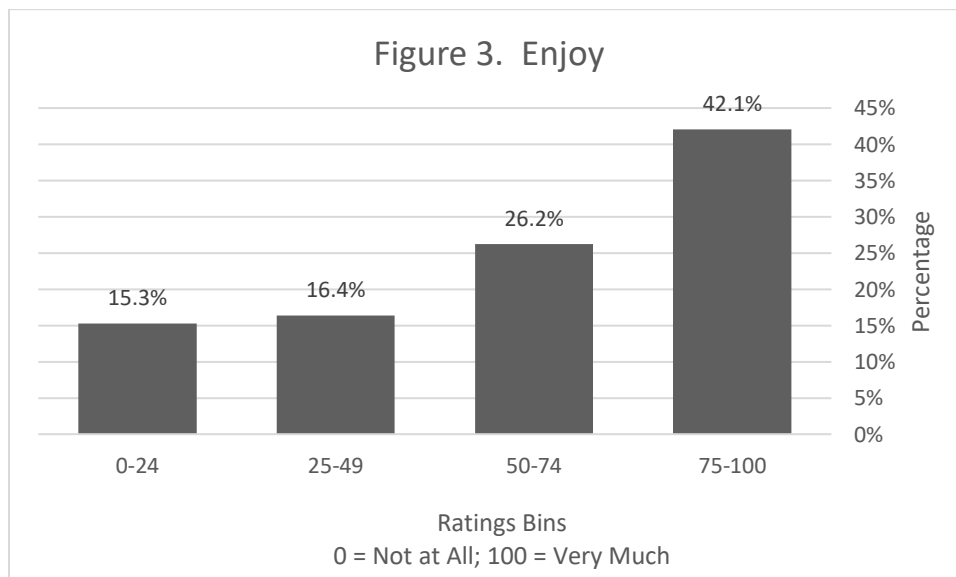
Relationship Among Simulation Perceptions

The results of Pearson Correlation analyses are displayed in Table 1. indicating significant positive correlations among the learning, engagement, and enjoyment measures.

Table 1. Pearson Correlations

Survey Items	Overall, how much did the Marketplace Simulation help you to become more **engaged** with WCSU students at the Ancell School?	Overall, how much did you **enjoy participating** in the Marketplace Simulation?
Overall, how much did you **learn** from the Marketplace Simulation?	.760	.780
Sig. (2-tailed)	<.01	<.01
N	181	181

Comments on General Measures Results

The analyses of the general measures indicated that the simulation produced positive perceptions of engagement, learning and enjoyment. Note that conservative expected values were used for the Chi square analyses assuming an equal distribution of counts across the four ratings bins. (A less conservative analysis would have higher expected values in the bins that represented lower levels of engagement, learning and enjoyment, which would have yielded greater Chi squared values for all three measures tested).

As an additional analysis of the effect of the simulation, one-sample t-tests were performed for the three measures with the midpoint of the scale (50) as the test value. All three t-tests (two-tailed) were statistically significant at less than the .0001 probability level.

The analysis of the correlations among the measures indicated a relatively strong relationship among the measures. That is, as perceived learning increases so does engagement and enjoyment in the simulation.

Methods – Specific Learning Measures Pre/Post

An anonymous online survey was distributed to students in the Ancell School of Business freshman orientation course in the Fall 2020 semesters before and after they participated in the business simulation. The pre-sample was 114 and the post sample was 177. The design was non-paired sample. The survey completion rate for these students was more than 90%. For the discipline and skills survey items, students used a rating scale from 0-10 where 0 was no knowledge or skill at all and 10 was very much. Analyses were performed with SPSS v26.

Figure 3. displays the means of the pre- and post-simulation ratings of students' knowledge of business discipline areas. A multivariate analysis (Pillai's Trace) of the data yielded a value of 0.281; $F=13.18$; $df=8,269$; $P<.001$. Subsequent pre-post tests of each dependent variable (i.e., discipline areas) yielded statistically significant differences at $P<.001$. See Table 2.

Figure 3. Business Discipline Knowledge Pre-Post Simulation

Discipline	Pre	Post
Sales	5.5	7.4
Production	4.4	7.1
SupplyChains/Distribution	4.0	7.0
General BusinessManagement	5.8	7.3
InformationSystems	4.8	6.3
Accounting	4.5	6.6
Finance	5.3	7.1
Marketing	5.9	7.5
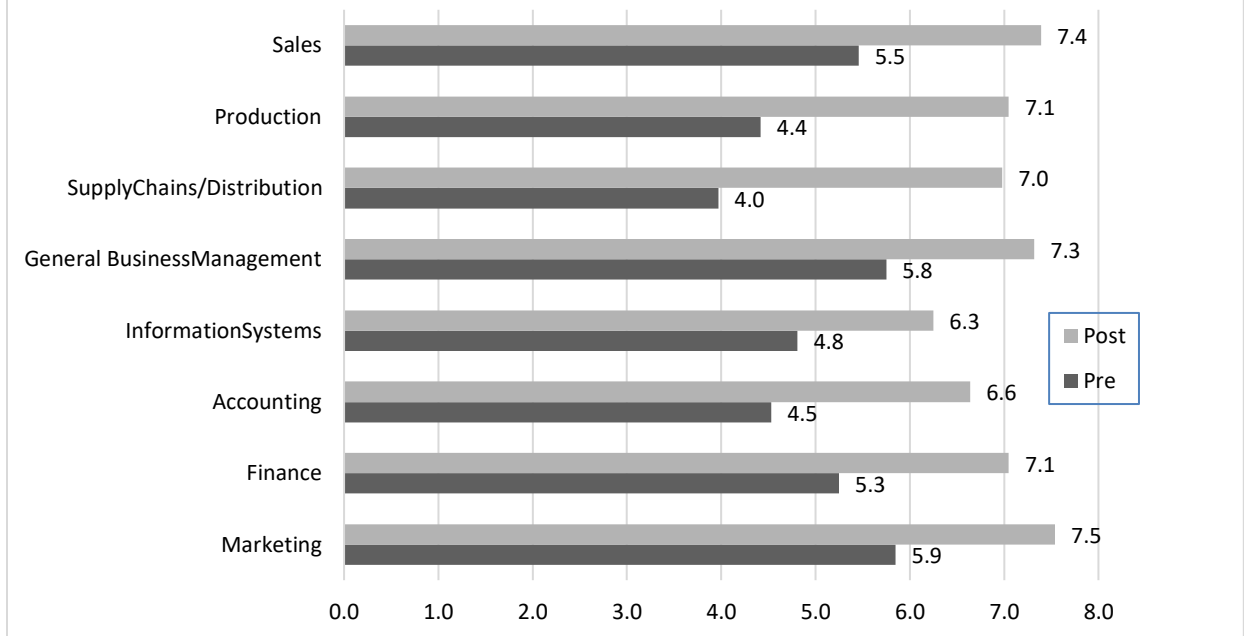
Table 2. Tests of Between-Conditions Effects					
Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.
Marketing	187.89	1	187.88	27.10	<.001
Finance	213.72	1	213.72	33.51	<.001
Accounting	295.85	1	295.85	41.40	<.001
Information Systems	138.02	1	138.02	20.45	<.001
General Business Management	163.86	1	163.86	24.25	<.001
Supply Chain / Distribution	599.66	1	599.66	91.40	<.001
Production	461.69	1	461.69	72.35	<.001
Sales	245.89	1	245.89	38.98	<.001

Figure 4. displays the means of the pre- and post-simulation ratings of students' business skills areas. A multivariate analysis (Pillai's Trace) of the data yielded a value of 0.079; $F=3.45$; df=7,283; $P<.001$. However, only one of the subsequent pre-post tests of each dependent variable (i.e., skills areas) yielded statistically significant differences at $P<.05$. That was the Team evaluation rating; Type III Sum of Squares=54.30; df=1; Mean Square=54.3; $F=7.43$; $P<.01$.

Figure 4. Skills Self Evaluation Pre-Post Simulation

Figure 4. Skills Self Evaluation Pre-Post Simulation

Skill	Pre	Post
Team Problem Solving	7.3	7.4
Team Planning Process	6.9	7.1
Team Evaluation	6.6	7.5
Self Evaluation	7.2	7.4
Time Management	6.7	7.2
Collaboration	7.7	7.6
Leadership	7.4	7.7
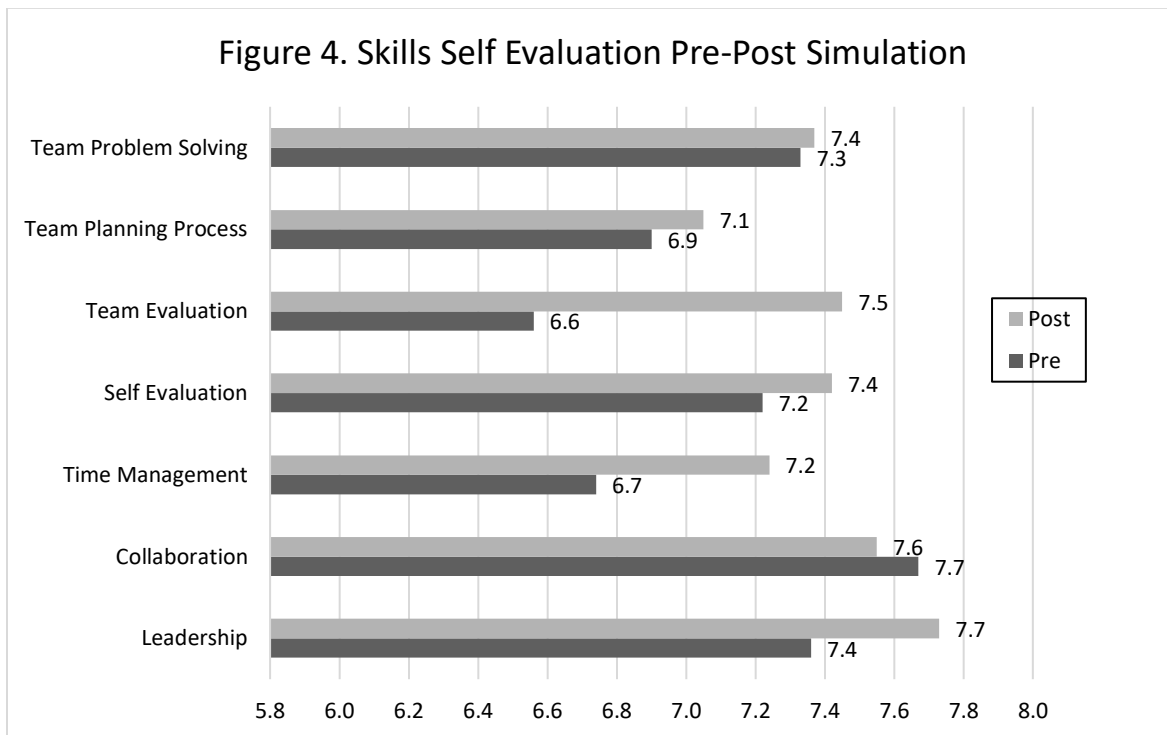
Discussion of Findings and Study Limitations

This study contributes to the literature by demonstrating the potential benefits on engagement and learning of introducing a basic discipline-specific, team-based simulation into an orientation course. This study focuses on student perceptions of engagement and learning which may not reflect more objective measures of these factors. However, with the goal of increasing student retention, perceptual measures are important.

The addition of the enjoyment item into the survey was a valuable metric considering the sample of students at our institution, a regional, AACSB accredited public university. Our students are culturally diverse, generally first-generation college students who have acceptable (but not ideal) college preparation. Therefore, it was important to know if this engagement/learning activity was enjoyable. If it was not generally enjoyable, it might add stress at a time when students are most susceptible to attrition. The finding of a strong relationship between learning and enjoyment was encouraging.

Overall, students reported at least a moderate amount of engagement, learning and enjoyment participating in the basic business simulation integrated into the one-credit freshman orientation course. These positive perceptions were reported even though many student groups did not perform well on the simulation.

In a pre-/post analysis, perceived learning was found in all the business disciplines that were measured. However, only one skill area, team evaluation, showed a statistically significant increase in ratings pre to post simulation. It is important to note that because of the pandemic, all students in the pre-/post sample were taking the orientation course online (synchronously) which might have affected the collaborative skills ratings.

Future Research
The obvious focus of future research should be on the retention rates and academic success of students who participated in the simulation in their freshmen year. Did the cohort of students who reported engagement and learning resulting from the simulation have higher retention and GPA levels? While paired sample methods would be more difficult to implement, they would provide more specific information on these factors.

Additions to future surveys should include more direct measures of student perceived self-efficacy. Based on the positive predictive finding on perceived self-efficacy and performance, it might be valuable to determine if that relationship also holds for the introduction of an introductory simulation.

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Teaching Business Analysts How To Construct
Predictive Multi-Variate Regression Equations
Or
The Art And Science of Creating Multiple Regression Equations for Prediction

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ABSTRACT

This article presents a methodology that could be used by professors teaching model building and by practitioners in the business world for creating a regression equation to predict a future event given the pattern of the past occurrences continues. The procedure is a heuristic that creates an estimated regression equation with the smallest number of independent variables. The estimated regression equation is created from data observations void of outliers and high influence data observations. The estimated regression equation also does not contain any independent variables whose observed p-values exceed the chosen level of significance and independent variables that have a high variance inflation factor. The statistical analysis in this six step procedure was performed using Python but any software package capable of performing statistical analysis can be used for this heuristic. The procedures in steps 2 through 5 of this tutorial can be performed in any sequence.

Keywords: regression, outliers, high influence data values, multi-variate regression analysis, predictive analytics, observed p-value, data observations, dataset, stepwise regression, backward elimination regression

INTRODUCTION

Business activities often include situations where numerical outcomes of certain events need to be predicted. What would be the estimated revenue of a new store? How many customers can we expect on a weekday? Linear Regression is a very frequently used method to try to build a model that can predict such values, due to its wide availability and ease of use. But these can also lead to misuse of the method, and searching for clarification on different issues in the procedure inevitably can lead to statistical textbooks where the level of mathematics would require time investment not available for a practitioner looking to get fast results.

The goal of this article is to try to build a tutorial which addresses the main points of building a Linear Regression model, that is highly rigorous but stays at the level where one does not have to get lost in the mathematical details. For ease of understanding, the procedure is broken down into 7 different steps using an artificial dataset, each having a technical description, a technical analysis, and a practical explanation, using a real-life example.

MODEL BUILDING

For a particular business activity where there is a need to predict the value of a dependent variable and several candidates for the independent variables have been identified, perform the following steps:

1. Select a representative sample of data observations of size n from the population defined for the business experiment. The data observations are of the form **(Y, x1, x2, …, xk)** where k represents the number of independent variables that are candidates for the multivariate regression equation. Select a level of significance for performing the tests of hypotheses. For this procedure, an alpha level of .05 is selected. The realistic range on the level of significance level or alpha level is usually .005 to .10.

Table 1: Dataset Used in Analysis

```
        x1   x2   x3     x4   x5       x6   x7        Y
0       -4   -6   -9   0.13   -1    -7.20   12   -88.70
1       -4   -5    5   1.45   -2     1.06    2    23.77
2       -6    3    8   1.50   -3    12.03   -2   210.27
3       -4   -7    8   0.07   -2    10.83    5   164.16
4      -12   -3  -13   1.23   -3   -15.32   -2  -279.87
..      ..   ..   ..    ...   ..      ...   ..       ...
95       3   -2   -2   0.11    1     2.09  -14   -32.37
96      12    0    9   0.70    3     9.77  -10   103.95
97     -12   -7    4   1.60   -4     5.70    6    60.96
98      -3    4  -17   1.59   -1    -6.32   18   -55.78
99       3   -2  -16   1.20    3   -13.08   19   -83.13


  -------------------------------------------------
  The number of observations in the dataset is: 100
  The number of predictors in the dataset is: 7
```

Analysis: In this specific case, the data has seven independent variables (predictors), meaning seven candidates that could explain the changes in the dependent variable. The ultimate goal is to find a function of our predictors that will yield us a close approximation of our dependent variable. There are 100 observations available, from which this function will be estimated. Eighty observations were chosen randomly and are used to create the estimated regression equation and the remaining twenty observations are used as test data.

Practical explanation: A specific example is when a business would like to know more about what influences sales figures at their different locations. They could collect a number of variables that they think has an effect on it, such as number of associates, advertising budget, size of the store, etc. These will be the independent variables, and the sales figure would be the dependent variable. The observations (rows in the dataset) would be the individual stores from which data was collected.

2. Using an appropriate statistical software package, create an estimated regression equation using all the possible independent variables. Examine the estimated regression equation with the intent of eliminating all independent variables whose observed p-values are greater than .05. These independent variables can be eliminated from the estimated regression equation all at once or eliminated one at a time where the independent variable with the largest observed p-value is eliminated first. The two processes of elimination will not necessarily create the same estimated regression equation. The result of this step is an estimated regression equation where all independent variables have observed p-values less than or equal to .05. This step is the backward elimination regression model building procedure.

3. The output of our regression analysis lists several metrics. These will be discussed in the order they become of importance.

4. **Analysis**: This step aims to eliminate independent variables that do not have an effect on our dependent variable. Each independent variable has a coefficient listed under 'coef' in the output. These values indicate the effect size on the dependent variable. However, since we are working with sample data, it is possible that we only see the effect because of the randomness in our sampling process, and the actual effect is in fact zero. The metric that quantifies this possibility is the p-value of the coefficient of each independent variable, listed on this output as P>|t|. Loosely speaking the p-value tells us: Given that the independent variable has no effect (0 coefficient, meaning zero effect) on the dependent variable, what is the probability of us getting the coefficient we are getting? This argument naturally leads us to eliminate high p-value independent variables, since it tells us that it is very plausible that they have no effect on our dependent variable, hence are not needed in our analysis. In this analysis, we are going to eliminate high p-value variables sequentially. The largest p-value here is associated with x4: 0.743, so the variable is deleted from the dataset, and the analysis is re-run.

5. Please note that the 0.05 threshold for elimination is more of a best practice than a hard limit. It is perfectly OK to slightly adjust that value, usually up to 0.1.

Table 2: Result of Regression Analysis, Initial Run

```
Original       OLS Regression Results
==============================================================================
Dep. Variable:                   Y   R-squared:                        0.911
Standard Error:              38.63   Adj. R-squared:                   0.903
Method:             Least Squares   F-statistic:                      105.8
Prob (F-statistic):       2.68e-35   Df Residuals:                        72
No. Observations:               80   Df Model:                             7


==============================================================================
              coef    std err          t      P>|t|      [0.025      0.975]
------------------------------------------------------------------------------
const      -0.3208     12.383     -0.026      0.979     -25.005      24.364
x7          2.3452      0.412      5.687      0.000       1.523       3.167
x6          9.2929      1.694      5.485      0.000       5.915      12.670
x5         -7.5474      3.873     -1.949      0.055     -15.268       0.174
x4          2.6362      8.001      0.329      0.743     -13.314      18.587
x3          3.0442      1.738      1.751      0.084      -0.421       6.510
x2          1.9528      1.897      1.030      0.307      -1.829       5.734
x1          4.4256      1.360      3.254      0.002       1.715       7.136
==============================================================================
```

Practical explanation: Let`s say that we originally included an independent variable such as number of associates because we thought that it could influence our sales figures. The analysis will most likely give us a coefficient (size of an effect) that is nonzero. However, if the p-value for that variable is high, it tells us that the effect (coefficient) we are seeing is likely to be just because of the random nature of our sample, and in reality, the number of associates has no effect on our sales figures.

Table 3: Result of Regression Analysis, Iteration 2.

```
ITERATION 2    OLS Regression Results
==============================================================================
Dep. Variable:                   Y   R-squared:                        0.911
Standard Error:              38.39   Adj. R-squared:                   0.904
Method:             Least Squares   F-statistic:                        125
Prob (F-statistic):       2.42e-36   Df Residuals:                        72
No. Observations:               80   Df Model:                             7


==============================================================================
              coef    std err          t      P>|t|      [0.025      0.975]
------------------------------------------------------------------------------
const       2.7455      8.118      0.338      0.736     -13.433      18.924
x7          2.3666      0.405      5.847      0.000       1.560       3.173
x6          9.1845      1.652      5.560      0.000       5.892      12.477
x5         -7.4901      3.846     -1.948      0.055     -15.154       0.174
x3          3.1301      1.708      1.832      0.071      -0.274       6.535
x2          2.0430      1.866      1.095      0.277      -1.675       5.761
x1          4.3986      1.349      3.260      0.002       1.710       7.087
==============================================================================
```

The second iteration now has x4 excluded (please see left-hand side of output). It still has independent variables with p-values over the predetermined 0.05 level, the largest one belonging to x2: 0.277. This variable is eliminated from the analysis, and the analysis is re-run.

Table 4: Result of Regression Analysis, Iteration 3.

```
ITERATION 3     OLS Regression Results
================================================================================
Dep. Variable:                       Y   R-squared:                       0.910
Standard Error:                  38.44   Adj. R-squared:                  0.904
Method:                  Least Squares   F-statistic:                     149.3
Prob (F-statistic):           3.39e-37   Df Residuals:                       72
No. Observations:                   80   Df Model:                            7

================================================================================
                 coef     std err         t       P>|t|      [0.025      0.975]
--------------------------------------------------------------------------------
const         -4.1618       5.117    -0.813       0.419     -14.359       6.035
x7             2.3342       0.404     5.775       0.000       1.529       3.140
x6            10.7107       0.888    12.058       0.000       8.941      12.481
x5            -7.8810       3.834    -2.055       0.043     -15.521      -0.241
x3             1.5895       0.970     1.638       0.106      -0.344       3.523
x1             4.5695       1.342     3.405       0.001       1.896       7.243
================================================================================
```

The third iteration now has x4 and x2 excluded (please see left-hand side of output). It still has independent variables with p-values over the predetermined 0.05 level, the largest one belonging to x3: 0.106. This variable is eliminated from the analysis, and the analysis is re-run.

Table 5: Result of Regression Analysis, Iteration 4.

```
ITERATION 4     OLS Regression Results
================================================================================
Dep. Variable:                       Y   R-squared:                       0.907
AIC:                             38.88   Adj. R-squared:                  0.902
Method:                  Least Squares   F-statistic:                     181.9
Prob (F-statistic):           8.73e-38   Df Residuals:                       72
No. Observations:                   80   Df Model:                            7

================================================================================
                 coef     std err         t       P>|t|      [0.025      0.975]
--------------------------------------------------------------------------------
const         -8.1131       4.564    -1.778       0.079     -17.204       0.978
x7             2.2334       0.404     5.529       0.000       1.429       3.038
x6            11.9360       0.484    24.643       0.000      10.971      12.901
x5            -9.3168       3.774    -2.468       0.016     -16.836      -1.798
x1             5.0494       1.324     3.814       0.000       2.412       7.687
================================================================================
```

The fourth iteration does not have independent variables with p-values over the 0.05 threshold, meaning that step 2 is finalized, and all independent variables which likely did not have an effect on our dependent variable are eliminated.

6. From the final estimated regression equation in step 2, identify the data observations that have high influence on the estimated regression equation. These data observations are to be removed from the dataset used to create the estimated regression equation and a new estimated regression equations is to be created. The purpose of this step is to eliminate the data observations that have a large influence on the numerical values of the regression coefficients.

Analysis: The regression model fits its parameters taking all available observations into account. However, in most datasets there could be observations which are considered to be outliers. These are observations that diverge from the main underlying pattern of the data. Since the goal of the analysis is to find a function that generalizes

well to other, unseen observations, and the inclusion of these outliers could greatly reduce the generalizability of our model, these observations need to be removed from the dataset. A common measurement for this purpose is Cook`s distance, which shows the influence of each observation on the model. The following output plots individual influence of each observations using Cook`s distance and determines a threshold over which an observation can be called influential. The threshold is calculated is 4/N, where N is the number of observations in the dataset. We can see in Figure 1 that there are 8 observations that need to be eliminated and the model needs to be re-run. The threshold of 4/n is an acceptable standard in the literature.

Practical explanation: It is possible that a few of our stores for which the analysis is run on have unique characteristics that do not generalize well to other stores. As an example, it is possible that one of our stores is located at the middle of a business district where it is the only store, and as a result, sees higher sales figures than comparable stores at other locations where competition is present. Since that unique characteristic is not applicable to other stores, the data from it would not generalize well, and has to be excluded.

Figure 1: Visualization of Cook`s Distance for Each Observation.
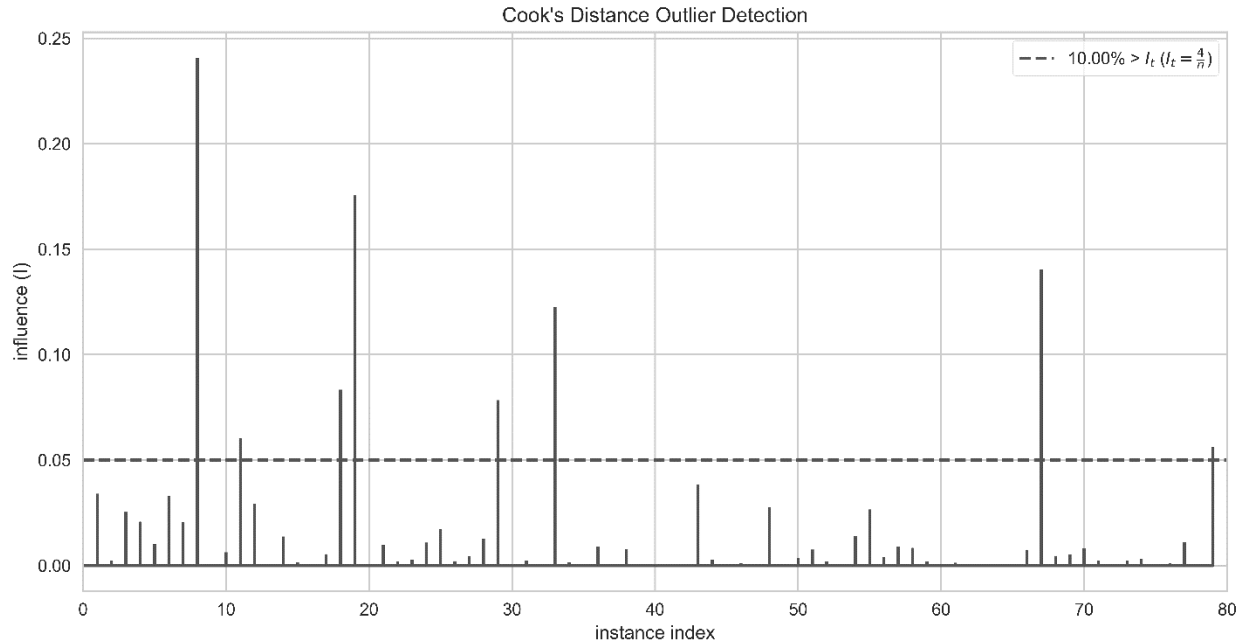

```
Cooks distance values, threshold is: 0.05
The percentage of observations that are outliers is 10.0 %
High influence observations: [55 88 21 25 11 67 15 99]
```

Please see model after eliminating high influence observations in Table 6:

Table 6: Result of Regression Analysis, Iteration 5.

```
ITERATION 5    OLS Regression Results
======================================================================
Dep. Variable:                    Y   R-squared:                  0.947
Standard Error:               28.31   Adj. R-squared:             0.944
Method:               Least Squares   F-statistic:                299.1
Prob (F-statistic):        6.13e-42   Df Residuals:                  67
No. Observations:                72   Df Model:                       4

======================================================================
              coef    std err        t      P>|t|     [0.025     0.975]
----------------------------------------------------------------------
const      -5.8557      3.467   -1.689      0.096    -12.775      1.064
x7          2.4240      0.320    7.584      0.000      1.786      3.062
x6         12.6109      0.393   32.071      0.000     11.826     13.396
x5        -13.6359      3.154   -4.323      0.000    -19.931     -7.341
x1          6.5675      1.078    6.091      0.000      4.415      8.720
======================================================================
```

7. From the final estimated equation in step 3, identify the data observations whose residuals are more than two standard deviations from zero. These data observations are to be removed from the data set used to create the estimated regression equation. These data observations can be eliminated all at once or one at a time where the data value with the largest residual is eliminated first. The two processes of elimination will not necessarily create the same estimated regression equation. For small data sets, the data values with large residuals should be eliminated one at a time. The purpose of this step is to eliminate the data observations that can influence the numerical values of the regression coefficients.

Figure 2: Visualization of Residuals for Iteration 5 of the Regression Analysis
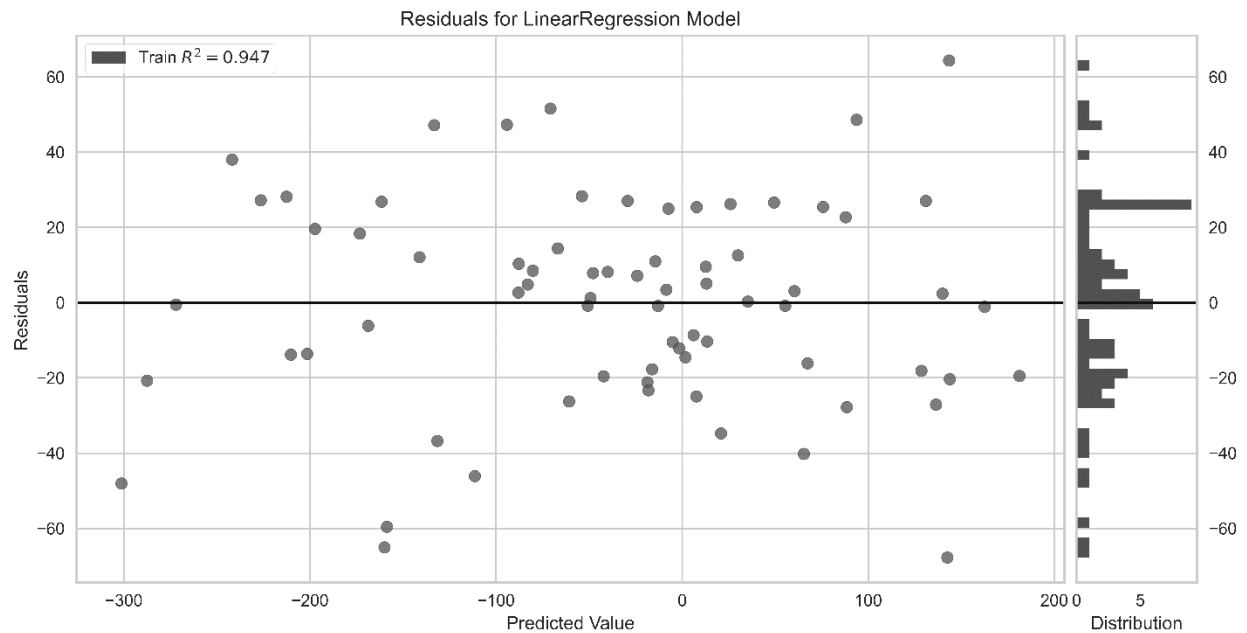

```
Data observation(s) whose residuals are more than two standard deviations:
[64 79 43  2]
```

Analysis: This step serves similar purposes as step 3: eliminating observations that do not represent the underlying pattern in the data (outliers). However, this metric addresses the problem from a different angle: For which

observations is the prediction off by more than 2 standard deviations? This signals that the observations characteristics do not fit the pattern in the data, and have to be removed for the model to generalize well. Calculating the residuals (differences between predicated and actual values), gives us four data points that should be eliminated and the analysis re-run.

Practical explanation: Using the same example as before, for a few of our stores, our predictions could be highly inaccurate, meaning that the general rules we worked out with the help of the model does not seem to apply to them. This signals that the store has characteristics that are significantly different from the vast majority of our stores, and should not be included in the model building that aims to find generally applicable rules.

Table 7: Result of Regression Analysis, Iteration 6.

```
ITERATION 6    OLS Regression Results
==============================================================================
Dep. Variable:                      Y   R-squared:                      0.961
Standard Error:                 24.05   Adj. R-squared:                 0.958
Method:                 Least Squares   F-statistic:                    386.9
Prob (F-statistic):          1.43e-43   Df Residuals:                      63
No. Observations:                  68   Df Model:                           4


==============================================================================
                coef    std err          t      P>|t|      [0.025      0.975]
------------------------------------------------------------------------------
const        -7.2158      3.050     -2.366      0.021     -13.311      -1.121
x7            2.5790      0.275      9.366      0.000       2.029       3.129
x6           12.8637      0.354     36.363      0.000      12.157      13.571
x5          -12.4138      2.693     -4.610      0.000     -17.795      -7.032
x1            6.1692      0.920      6.704      0.000       4.330       8.008
==============================================================================
```

8. From the final estimated equation in step 4, identify the independent variables whose Variance Inflation Factor (VIF) is greater than 5. These independent variables need to be eliminated from the estimated regression one at a time until there are no more independent variables with VIF value greater than 5. The independent variable with the largest VIF is eliminated first. This step minimizes the opportunity for multicollinearity.

Table 8: Variance Inflation Factors for Independent Variables before and after elimination

```
                ================================
                    Independent
                    Variable          VIF
                          x7         1.032
                          x6         1.020
                          x5         8.602
                          x1         8.556
                ================================
                Final table, with no VIF > 5
                    Independent
                    Variable          VIF
                          x7         1.007
                          x6         1.007
                          x1         1.008
                ================================
```

Analysis: Variance Inflation Factor quantifies the severity of multicollinearity, which is loosely speaking is how related are our independent variables in the model. If they are highly correlated, the effect (coefficient) of variables can become highly variable, and this unstable. VIF ranges from 1 upwards, 1 meaning the variance of a coefficient is not influenced by other variables in the model. In our data, x1 and x5 have high VIF values, meaning that their coefficients are less dependable, which could cause a problem when using the model on unseen data. The independent variable x1 has the highest values, and as a result removed from the model and the analysis is re-run.

Practical explanation: When two independent variables are highly correlated, they tend to try to explain the same effect on our dependent variable. In our store example, let's say that the area of the store and the number of aisles are both used in the model as independent variables. Since they are closely related (bigger stores can fit more aisles), their effect (coefficients) on sales are trying to explain the same phenomenon (i.e.: effect of store size on sales). Separating the two effects is very difficult, since they explain the same thing, and as a result their coefficients cannot be counted on being accurate.

9. The result is an estimated regression equation where the data set used to create the estimated regression equation is void of data values with high influence and data values that are outliers. The estimated regression equation is also void of independent variables whose observed p-values are greater than .05 and independent variables whose VIF values are greater than 5. The upper bound on the variance inflation factor could be as large as 10.

Table 9: Result of Regression Analysis, Iteration 7.

```
ITERATION 7    OLS Regression Results
=============================================================================
Dep. Variable:                     Y   R-squared:                       0.948
Standard Error:                27.59   Adj. R-squared:                  0.945
Method:               Least Squares   F-statistic:                     386.5
Prob (F-statistic):         1.43e-43   Df Residuals:                       63
No. Observations:                 68   Df Model:                            4

=============================================================================
                coef    std err          t      P>|t|      [0.025      0.975]
-----------------------------------------------------------------------------
const        -6.4142      3.494     -1.836      0.071     -13.394       0.565
x7            2.7725      0.312      8.879      0.000       2.149       3.396
x6           13.0679      0.403     32.452      0.000      12.263      13.872
x1            2.1873      0.364      6.013      0.000       1.461       2.914
=============================================================================
```

This is the final model that addressed all the potential issues listed in the previous steps. It is expected that this model performs better on unseen data, since the factors that could prohibit it from doing so were eliminated. Once one obtains such an output, the result can be analyzed more thoroughly. The most important metrics for practitioners are listed and explained below:

R-squared:

Analysis: This term (ranging from 0 to 1, inclusive) gives us the proportion of variance in our dependent variable that is explained by the variance in our independent variable. A value of 1 would mean that our independent variables explain all the changes in the dependent variable perfectly, while 0 means that the independent variables collectively have no explaining power. There is no hard threshold of when a model is good or not based on this metric, practitioners have to decide whether the value they have is good enough for their purposes.

Practical explanation: Using our store example: Let's say that our final model for our stores has 3 independent variables in it: area of the store, advertising budget and number of hours open. If our model has an 0.9 R-squared value, it tells us the following: Our sales figures vary store to store, but we can explain 90% of that variation by looking at area of the store, advertising budget and number of hours open.

Prob (F-statistic):

Analysis: This metric is a p-value for the process that tests whether our predictors in the model are independent as a whole from the dependent variable. A low value here would mean that the probability of our model as a whole having no effect on the dependent variable is very low.

Practical explanation: Let's say that our final model for our stores has 3 independent variables in it: area of the store, advertising budget and number of hours open. Loosely speaking: If we obtain a Prob (F-statistic) of 0.01 that means that given that our 3 independent variables as a whole have no effect on sales, the probability of seeing

the effects we are seeing in the output, has a 0.01 probability of coming up. The natural consequence of this is that lower values indicate a stronger relationship between our independent variables and dependent variable.

Standard Error:

Analysis: This metric provides an estimate of the "average" distance of our predictions using the model from the actual values. The average here is not meant to be an actual arithmetic average, but more of an intuitive understanding of the metric. (The actual calculation is the square root of the sum of squared differences between predictions and actual values divided by the residual degrees of freedom.) This tells us how off we were with our predictions using the model we built. The lower this value, the more accurate our predictions are. There is no hard threshold for this metric, whether a model has sufficiently low standard error depends on the purpose it serves and is evaluated on a one-by-one basis.

Practical explanation: If we were to use a model that has a standard error of $4000, we could think of it as: If I were to use this model for prediction of sales figures for other stores, I would on average be off by approximately $4000.

Please observe that during our model building, the R-squared value almost consistently increased and the Prob (F-statistic) and Standard Error decreased, meaning that the improvements we made on our data have resulted in a better fitting model using linear regression. Please see table below for metrics:

Table 10: Comparison of Performance Metrics

Model	R-squared	Prob. (F-statistic)	Standard Error
Original model	0.911	2.68e-35	38.63
Finalized model	0.948	1.43e-43	27.59

10. The purpose of creating a model that is capable of predicting a given dependent variable is to use it on unseen data. For this reason, the model needs to generalize well. In this step, the model is run on unseen data from the same distribution. The performance is quantified with the help of Root Mean Squared Error of the estimates. There are two different models used for assessment:

Table 10: Comparison of Performance on Seen and Unseen Data

RMSE	known data	unseen data
Original model	36.65	63.74
Finalized model	26.76	59.74

Analysis: Root Means Squared Error is a metric that quantifies how off we are with our predictions using the model on a given dataset. The lower the value, the better predictions the model makes. It can be observed in the table that the final model does better for both known data (i.e.: data that the model was developed on) and unseen data (data that was not involved in the development of the model, but comes from the same distribution.

Practical explanation: A model performing well on data it has not seen yet (new data) is essential in business use. In the store example: Having a model that can reliably and relatively closely predict sales figures of stores that are just being developed can heavily influence investment decisions.

CONCLUSION

There is no one best estimated regression equation. This heuristic or procedure gives students and practitioners a methodology to create an estimated regression equation using a set of rules that satisfy statistical principles and the freedom of making choices about high influence data observations and data observations that generate residuals that are outliers. It is not necessary to perform steps 2 through 5 in any particular order. The order in which the steps are performed can be controlled by the business analyst or business professor.

The authors would like to encourage other professors teaching regression analysis model building and practitioners using model building techniques to contribute their ideas about how best to create an estimated multi-variate regression equation for prediction.

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Do It Yourself: Adding Value and Relevance in a Graduate Business Program

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ABSTRACT

The relevance of graduate business education has generated considerable controversy over the past decades. In this paper, I demonstrate an approach used to add relevance to graduate education through solving real world work problems tailored to individual students and methods used to generate discussion among students leading to peer-to-peer collaboration on their work situations. I begin by describing the class and then discuss the learning theories that were applied and how they were used in this course. Finally, I conclude with several suggestions for creating a similar class.

Keywords: Graduate education, Problem-based learning, Self-determination theory, Scaffolding, AACSB

INTRODUCTION

The discussion of the relevance of graduate level business education has generated much heat but not much light over past decades (Usdiken, Kipping, & Engwall, 2021). A common complaint is that business education should be treated as a profession rather than as a science (Bennis & O'Toole, 2005). This debate has moved beyond academia and is impacting business colleges in a very real way. MBA programs have been declining in the U.S. since 2013 (Byrne, 2019). While cost and MBA proliferation are important issues, the value being added in MBA education should also be considered a factor.

Questions about relevance in business education are also being addressed through the standards of the Association to Advance Collegiate Schools of Business (AACSB). Many business schools go through the certification process with AACSB, and this is seen as a stamp of approval by an external body and a signal of quality to the academic and business community. In 2013, AACSB introduced the three pillars of engagement, innovation, and impact. Business colleges were required to demonstrate their progress in these three areas when the AACSB came to review them (AACSB, 2013).

In the context of these changes, our business college sought to create a more innovative curriculum. The goal was to develop graduate concentrations which currently employed individuals could use to advance their careers as professionals. Each concentration was composed of five or six eight-week courses depending on the discipline. They were designed to provide a professional certificate in a specific business discipline. While these concentrations were separate from the MBA program, they provided a soft start into the MBA for those who wanted to continue their education. Students who maintained a "B" average throughout the concentration could be admitted into the MBA program without taking the Graduate Management Admissions Test (GMAT).

The leadership concentration was among the first of these graduate programs to be developed. My task was to create a class that would teach students how to fit in with the business strategy as part of the leadership concentration. The goal was to create a novel course that would lead students through the strategic process without replicating strategy content from other classes.

In the forthcoming sections, I will show how the class fulfilled the three pillars of the AACSB, how it used learning theory to enhance student outcomes, and suggestions for instituting a similar course in other institutions.

CLASS DESIGN

The original name of this course was Support the Business Strategy. All classes in the leadership concentration were eight weeks long and were co-taught with an experienced business professional. Taking this title as a starting point, students would not only understand how they fit into the strategic process in their organizations but would actively take part in it through the class project. The course would lead each student to create a plan for their business unit or department which would benefit their employer. Students would develop the business plan in weeks 3-7 and would have a short presentation in week 8.

The plan developed in the following sequence:

1. Write a vision and mission statement for your department or business unit and establish goals.
2. Write a plan for achieving those goals and show how it aligns with your company's strategy.
3. Write your approach to gaining stakeholder approval for your plan.
4. Prepare a short proposal based on your previous papers.
5. Write a full proposal for a strategic plan for your department or unit.
6. Present your proposal in three minutes.

In every week except the first, students were assigned to read specific articles from Harvard Business Review, McKinsey Quarterly, Sloan Management Review, or other business journals. Classes were three hours long and were built around discussion of the week's readings. These readings and discussions would prepare students to write that week's part of the business plan. Participation was 30% of the grade which led to energetic debates in the class. In some cases, the instructors stayed so long after class with students that the security guard asked us to leave.

Table 1

Preparatory Assignments	Tuesday (F2F) Meeting (7:00 - 9:50 pm)	Hybrid Meeting
Week 1 – August 25th **Introduction and Frameworks**		
Read: (Slides) for week 1	Introductions Introduce some major strategic frameworks Discuss the format for the class. Begin peer to peer and class discussions.	Look at slides for the introductory class.
Week 2 – September 1st **Overview of strategic leadership**		
Read: (See Reading Assignments) for week 2	Discuss the overall strategic process. Discuss the format for the class. Peer to peer and class discussions.	Read overview materials.
Week 3 – September 8th **Develop a vision, mission, and goals that align with organizational vision and mission for your unit**		
Read: (See Reading Assignments) for week 3	Engage in class discussion among peers to brainstorm an effective vision and mission. Discuss the weekly readings	**Assignment One:** Write up the vision and mission with a discussion of your reasons. Establish goals for your department. Discuss how you are supporting the larger goals. **Due September 10th at midnight**
Week 4 – September 15th **Develop a business plan for your unit that aligns with organizational plans and goals.**		
Read: (See Reading Assignments) for week 4	Engage in class discussion on how best to align your unit and organizational goals. Discuss the weekly readings.	**Assignment Two:** Write a paper discussing your plan for achieving unit goals, and how that aligns with higher level strategic plans. **Due September 17th at midnight**

Week 5– September 22nd		
Gaining support from team, including aligning incentives and goals for unit business plans		
Read: (See Reading Assignments) for week 5	Engage in class discussion on using incentives and goals to promote your unit business plan. Discuss the weekly readings.	**Assignment Three:** Write a paper discussing your plan for gaining support for your unit plan. **Due September 24th at midnight**
Week 6 – September 29th		
Developing effective internal and external stakeholder relationships		
Read: (See Reading Assignments) for week 6	Discuss internal and external perspectives (coworkers, customers, partners, competitors, international) and strategies for effectively managing internal and external relationships. Include importance of and tactics for professional networking. Discuss the weekly readings.	**Proposal:** Write a 3-page proposal for the final paper with a rationale for your plan and a brief explanation of the parts of your paper. **Due October 1st at midnight**
Week 7– October 6th		
Leading implementation of unit business plan.		
Read: (See Reading Assignments) for week 7	Discuss how to develop implementation plans. Discuss the weekly readings.	**October 8th – Final paper due by midnight through Blackboard**
Week 8 – October 13th		
Putting it all together		
	Presentation of plans	

FULFILLING AACSB REQUIREMENTS

In 2013 AACSB standards were being updated to include the three pillars. The new standards required that colleges of business demonstrate engagement, innovation, and impact throughout the college. This could take place through infrastructure, research, community engagement, and teaching.

Engagement was defined by AACSB as academic involvement in learning experiences (AACSB, 2013). This course produced engagement in several ways. First, students were highly involved in the classroom through discussion of thought-provoking articles, through interaction with the instructors, and through interactions with each other. Students often discussed their work experiences which benefitted other students who were facing similar situations in their own work environments. Student's also generated novel solutions to address different work conditions in class. Secondly, students interacted with colleagues. Many students spoke with their supervisors as well. This created a buzz for the new programs. Third, students developed strategic plans at their jobs demonstrating initiative to their supervisors.

Innovation was defined as enhancing creativity, entrepreneurship, and experimentation (AACSB, 2013). The course itself was a significant departure from lecture or case studies which have been traditionally used in strategy courses. Rather than simply discussing material, students were implementing concepts into their workplace. This additionally addressed the belief by Bennis and O'Toole (2005) that management should be a practice more than a science. Further, students developed novel plans and implementations for their workplaces showing creativity and intrapreneurship.

Impact was defined by AACSB as making a difference in business, the community, and globally (AACSB, 2013). Assessing our impact globally is difficult but the impact on student's lives created by producing a directed product for their workplace is clear. Students interacted with individuals and demonstrated initiative. Further, the community became aware of our program as student's began to talk about a different kind of program.

LEARNING THEORY

Three areas of learning theory were used to enhance student outcomes: problem-based learning, self-determination theory, and scaffolding. Problem based learning (PBL) involves learning concepts by solving real world problems, self-determination theory is a theory of motivation based on autonomy, competence, and relatedness and scaffolding is a technique much like apprenticing where the student is gradually introduced to a complex task with the assistance of the instructor. Initially the instructor provides considerable support but as the student learns, that support is withdrawn.

Problem-based learning (PBL) is typically self-directed with the goal of lifelong learning (Walker, 2009). Early work in PBL focused on the medical profession but has since been extended to a wide range of disciplines (Hallinger, 2021). PBL uses ill-structured problems to provide a context for students to construct knowledge (Hmelo-silver & Barrows, 2009). Typically, students are expected to solve real world problems through discussion and interaction with each other (Walker & Leary, 2009). The corporate fellow and I accomplished this in several ways. Each week students were presented with articles which made novel suggestions that students could evaluate and attempt to apply. For example, Hamel (2009) discussed a company without managers. In that company, workers created groups as needed to solve problems. Different people could become leaders of these groups, but the company had no formal hierarchy. Instructors would provide basic questions, but students would often take the questions to other areas. Starting with a question such as, "Is this a workable idea for companies?" discussion might then develop into "how would you apply this in your workplace" and "what are the roadblocks to such a solution?" We made student participation 30% of the grade and this resulted in discussions and interactions among students where students went beyond the articles and often provided useful insights to each other about how to improve their workplace.

Problem-based learning was also applied through the assignments. Students had to determine the unique workplace problem and to develop a solution using the structure provided in the assignment. The problem had to be constructed before it could be addressed which impelled students to think creatively and search for solutions that could then be applied to their specific jobs and departments. For example, one student wanted to address low productivity in his department caused by employees calling in sick. He described the problem and his potential solution. When I reviewed the paper, it was clear that the goal was good, but the solution needed improvement. This type of interaction occurred weekly with each student on their projects along each step of the process.

Student motivation was also developed using self-determination theory (SDT). SDT is a macrotheory that posits when specific human needs are met, the quality of motivation will improve. Specifically, intrinsic motivation where individuals desire to engage in an activity for its own sake is the preferred result (Gagne & Deci, 2005). However, intrinsic motivation is difficult in a classroom environment where students are trying to achieve a grade, an external reward. In fact, early research on intrinsic motivation showed that intrinsic motivation decreased in the presence of external rewards (Deci & Ryan, 2000). Another outcome of SDT is a higher quality of extrinsic motivation, motivation through an external outcome (Deci & Ryan, 2008). As the basic human needs of autonomy, competence, and relatedness are met, individuals' quality of motivation becomes more intrinsic. In the theory, autonomy refers to individual's control over their activity, competence is represented by the perceptions of ability with respect to the task or job, and relatedness is the need to interact with other people.

Students had a great amount of latitude in choosing their work issue. The assignment was structured which might have reduced autonomy, but the problem and solution belonged to each student. One benefit of providing structure was to enhance competence. Students would learn by doing and then reflecting on how their attempts were working. Additionally, those who were working on this class project were expected to have a fair level of competence in their jobs. Thus, they would be aware of problems and possible solutions. This would also improve the quality of their work as belief in competence is related to performance (Bandura, 1977). Finally, relatedness was achieved in two places: the class and the workplace. In class, students presented workplace issues and received feedback from other students. This was often the outgrowth of class discussions on the week's readings. Students also found relatedness at work. Part of the assignment was to gain support from coworkers and supervisors. This required the student to interact with coworkers and supervisors to achieve the goal of their strategic plan.

The final learning approach used was instructional scaffolding. Typically, novel and sometimes complex tasks are broken into parts and the learner improves by doing. As the student gains competence support is gradually reduced (Ninio & Bruner, 1978). Effective instructional scaffolding requires the selection of the task, evaluation of the learner's ability, and anticipation of mistakes (Beed, Hawkins, & Roller, 1991). In this course, the outcome was to learn how to solve problems strategically. This is like the aphorism "If you give a man a fish, you feed him for a day. If you

teach a man to fish, you feed him for a lifetime." In other words, students learned how to be problem solvers through the strategic process provided in the course. Week by week, students would receive the next step in the process to execute. By the end of the class, they had created a strategic plan which they would be able to replicate for other issues.

SUGGESTIONS

Research has shown that the techniques used for this class were sound. However, not every course or situation is the same. Below are some suggestions and guidelines that might be helpful.

1. Keep papers short. Papers in the course were 1-3 pages long except for the final paper. The final paper incorporated the shorter papers, however. Thus, even with 80 papers to review weekly, the workload was manageable.
2. Know your student's ability and background. We knew that over 90% of students had full time jobs. Thus, we could provide an assignment based on their current job. In rare cases, adjustments had to be made for those who were currently unemployed. Those students could use previous jobs for their model.
3. Make participation a significant part of the grade. For our course, participation was 30% of the grade. This led to much more engagement in class.
4. Use interesting articles. Each of the articles in the class was thought provoking. The goal was to challenge their perceptions about business and to generate wide ranging discussion.
5. Look for ways to draw out shy students. Some students come from cultures where participation is different from our American business schools. In retrospect, I would have used small groups to provide more opportunities for shy students to engage with other classmates.
6. Don't prejudge student experience. We had two classes, one composed of students with business degrees and the other with few students who had business degrees. The most engaged and interesting discussions often came from people outside the business professions.
7. Provide some structure but not too much. In this course, students were provided with a basic structure and classroom discussion, but they learned by engaging in the project. Students learned largely through doing, discussion, and reflection.
8. Prepare students to make short presentations. The students struggled to explain their plan in three minutes. I would give them practice in making a short presentation prior to their business plan presentations now.

In this paper, I have presented an approach to learning used in a graduate business class. It is my belief that research, and practice support the approach of learning by doing. This was certainly evident in this course as students produced a work product that allowed them to show initiative and thoughtfulness at their jobs. Some students instituted their plans at their workplaces, and some subsequently received promotions as well. It is my hope that readers of this article will try something similar in their courses and will produce student success and engagement in their classes.

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Developing Teamwork Skills in Accounting Education: Integrating Process Controls into Group Projects

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ABSTRACT

This paper presents the successful integration of teamwork process controls into a group project. The project was assigned in an undergraduate auditing course at an AACSB-accredited university. The subject of the assignment was a case study from the Ernst and Young Foundation Academic Resource Center. An online teamwork assessment tool from Capsim Management Simulations, Inc., was used for team performance feedback and confidential peer evaluations. Both the case-study work and the assessments were completed in two stages. This approach afforded teams and team members an opportunity to improve their case-study work and team performance before final grading. The quality of the case-study work increased significantly. The team and peer assessment scores were positive throughout and improved during the assignment, despite an increase in team conflict. A post-assignment survey indicated that students were satisfied with the group project.

Keywords: accounting education, group project, peer assessments, team assessments, teamwork skills

INTRODUCTION

Team competencies have been recognized as essential for students entering the accounting profession. In 2010, The Pathways Commission on Higher Education, a joint initiative of the American Accounting Association and the American Institute of Certified Public Accountants, established a Task Force to develop an educational framework to address the competencies required of accountants (Pathways Commission, 2012). The Task Force (Lawson et al., 2014) advanced an integrated framework consisting of three competency areas: accounting, broad management and foundational. The framework maintains that foundational competencies should be developed during undergraduate accounting education to prepare students for entry-level jobs. Human relations skills are among five foundational competencies identified. The Task Force advised that human relations skills are needed in teamwork activities, noting that they require relationship-building skills, team-management skills, negotiation abilities, and conflict resolution abilities. Further, the Task Force observed that human relations skills are not adequately emphasized in accounting education.

The Association of International Certified Professional Accountants reinforced the importance of team skills to entry-level accountants in its Pre-certification Core Competency Framework (AICPA, 2018). The framework points to collaboration as a critical professional competency which is described as "work productively with diverse individuals in a variety of roles, with multiple interests in outcome to achieve acceptable and optimal results" (AICPA, 2018). Similarly, The Association to Advance Collegiate Schools of Business (AACSB, 2018) emphasized the importance of team competencies in Standard 9. This accreditation standard requires that undergraduate business curriculums include learning experiences that address interpersonal relations and develop the ability of students to work productively in team settings.

This paper presents a group project that employs teamwork process controls to support the development of team competencies. The project was assigned in an undergraduate auditing course at an AACSB-accredited university. Data was collected from three sections in two academic years. The average enrollment was 20 students per section. The assignment included case-study work, along with team effectiveness assessments. Confidential peer assessments were used to measure individual team member contributions and to counter free riding. Both the case-study work and the assessments were completed in two stages. This approach afforded teams and team members an opportunity to improve their case-study work and team performance before final grading.

TEAMWORK SKILLS GAP

Studies have determined that undergraduate accounting curriculums do not adequately address the teamwork proficiencies desired by employers. Kavanagh and Drennan (2008) found that both students and employers believed that soft skills, such as oral and written communication, ethics, and teamwork were insufficiently emphasized in accounting education. Similarly, Jackling and De Lange (2009) compared graduate and employer perceptions of the

emphasis placed on technical and non-technical skills in undergraduate accounting curriculums. Graduates indicated that their course work prioritized technical skills, while employers were most focused on team skills, leadership abilities, and verbal communication skills.

A gap has been identified between the skills required by employers and student competencies. The American Productivity and Quality Center and Institute of Management Accountants conducted a survey of 173 accounting and finance recruiters about the skills possessed by entry-level accounting and finance talent (APQC/IMA, 2015). The survey determined that 64% percent of the recruiters believed that team skills were necessary for success in their organization, but only 8% of entry-level accounting and finance professionals possessed teamwork competencies. Similarly, Alshare and Sewailem (2018) identified a skills gap between employer requirements and the competencies taught by business educators. The study determined that employers prioritize soft skills such as interpersonal skills, adaptability, and teamwork while educators emphasize technical skills. The authors pointed to the increased importance of teamwork in the workplace and maintained that students should have opportunities to work in teams to prepare for the work environment. Among their recommendations was to de-emphasize conventional exams in favor of hands-on, teamwork-based assignments.

TEAMWORK PROCESS CONTROLS

According to Oosthuizen et al. (2021), teamwork process controls are necessary in group assignments to create a setting in which students can develop effective team member skills. They maintained that in the absence of instructor guidance, teams avoid time consuming but necessary activities, causing team conflict to increase. They pointed to free riders (a.k.a. social loafers) as a common source of team conflict. To decrease free riding, they recommended formal process controls that add transparency to team member participation levels, such as peer assessments and team meetings with agendas and minutes. Correspondingly, Opdecam and Everaert (2012) identified free riders as a weakness in the team-learning format, because they are not prepared for team interactions. They found that free riders disturbed team processes and caused students to view group assignments as time-wasting.

Bryant and Albring (2006) advanced guidelines to help accounting educators develop teamwork competencies in group projects. The guidelines recommend small teams to reinforce member accountability and suggest that teams select a coordinator to interact with the instructor. They also advise that instructors meet with teams to review their progress and provide coaching. Further, the framework supports the use of assessment tools that both enable teams to self-evaluate their performance and provide instructors with insight into team effectiveness. To ensure grading consistency, the guidelines advocate the use of rubrics and recommend providing them to students at the start of the project. Mixed-incentive grading structures in which a team member's project grade is impacted by their individual contribution are encouraged. The framework suggests that instructors use peer evaluations for this purpose. Chiang et al. (2021) used peer evaluations to provide feedback to individuals about their performance in a team-based auditing assignment. In their approach, the project work was submitted in stages, together with confidential peer assessments, to afford underperforming students an opportunity to correct their performance in later portions of the project.

THE GROUP PROJECT

Case-study materials: The group project utilized Parts I and II of TechWear, a case study developed by the Ernst and Young Foundation Academic Resource Center (Ernst and Young Foundation, 2016). The case used Microsoft Excel to audit the order-to-cash cycle and accounts receivable balance for TechWear. The case materials included an Excel data set with transactions, written audit procedures, and videos demonstrating the Excel requirements. Additional procedures added by the instructor included sampling, Pivot Table work, and required questions. At the start of the project, students received instructions which included a project description, due dates, and a grading rubric.

Team assignments: Twenty teams of three students each were created randomly via the Excel RAND function. One student from each team was designated (randomly) as the liaison to the professor. Team assignments were made during class to ensure transparency. A prerequisite course required Microsoft Office Specialist Excel Certification (Rotondo, 2020). This ensured that all students had sufficient Excel skills for the assignment.

Case-study deliverables: The case-study work was completed in two parts. In Part I, students used Excel to analyze the data file for completeness and accuracy. In Part II, students used Excel to perform a risk assessment of the order-to-cash cycle and evaluate accounts receivable collectability. In both parts, the deliverables were a written report documenting the audit procedures performed along with a summary of the audit findings, and an Excel worksheet

evidencing the work. Part I included seven (37%) of the nineteen total audit procedures and Part II had the remaining twelve (63%). The Part I audit procedures were straightforward in comparison to the Part II procedures which were more challenging. Parts I and II were submitted at weeks six and fourteen, respectively, of a fifteen-week semester.

Part I review: The Part I case-material submissions were reviewed, but not graded, by the instructor. This step simulated an audit work review performed by an audit supervisor. This written review provided the teams with early feedback to help them determine if they were on track to successfully complete the project. The feedback included the identification of completed and incomplete procedures, suggestions for addressing deficiencies, and recognition of procedures done well. The teams were required to correct Part I work and resubmit it along with Part II for final grading. Following the Part I feedback, the instructor made a presentation to the class to review the overall performance of the teams, highlight common mistakes, and answer questions.

Final grades: Final group project grades combined Parts I and II. Part I corrections were eligible for full credit. Each audit procedure was scored as completed (full credit) or not completed (no credit). All nineteen audit procedures were equally weighted. After the final grades were posted, a class presentation was again made to review the overall performance of the teams and answer questions.

Table 1 contrasts the mean percentage of audit procedures completed correctly in the Part I review with the mean final project grade. The results show significantly improved case-study work performance. The mean percentage of audit procedures completed correctly in Part I was 61% (S.D. = 20%) for the seven required items. In comparison, the mean final grade was 93% (S.D. = 16%) for the nineteen total items. This represented a 52.5% improvement amid decreased variability. The result suggests that the early feedback provided in Part I was an effective teamwork process control. Teams benefitted from the feedback that they received in Part I of the project and used it to improve their case-study work performance in Part II of the project.

Table 1: Audit procedures completed correctly

Part I (Review)		Final Grade		Mean	
Mean	S.D.	Mean	S.D.	Change	% Change
61%	20%	93%	16%	32%	52.5%

N = 20 Teams

TEAM AND PEER ASSESSMENTS

TeamMATE, an online survey-based assessment tool from Capsim Management Simulations, Inc.(www.capsim.com) was used to monitor, measure, and provide feedback on team and team member effectiveness. TeamMATE includes both team and peer assessments. According to Capsim (n.d.), each assessment has the following objectives and factors:

Team assessments: Team assessments provide feedback to team members about their team's operating effectiveness and their teamwork behaviors. The team assessment has two components, a team-level assessment, and an individual-level assessment. Team-level factors include confidence (belief in the team's ability to successfully complete the project), cohesion (shared responsibility for the team), conflict (team member disagreement), coordination (integration of individual efforts in team tasks), and cooperation (information exchange quality). The individual-level factors are preparation (planning activities), execution (completing tasks), monitoring (assessing performance), and adjustment (adapting).

Peer assessments: Peer assessments evaluate individual team member contributions to the project by measuring their accountability, work quality, and work quantity. Accountability includes meeting attendance, meeting preparedness, and communication. Work quality includes contribution to team performance, attention to detail, engagement degree, and effort level. Work quantity addresses the portion of the project work done by a team member.

Team assessments and peer assessments were completed twice in conjunction with the Part I and Part II due dates. The team assessment results were viewable by all the team members as well as the instructor. The Part I team assessments provided teams and team members with an early measure of their teamwork effectiveness, affording both an opportunity to adjust their performance in Part II of the project. The peer assessment results were confidential and viewable only by the instructor. The peer assessments discouraged free riding and provided the instructor with information to evaluate team member contributions. Moreover, the assignment instructions informed students that

their project grade could be negatively affected by a deficient peer assessment. Importantly, the team and peer assessment criteria (factors) served as a road map for productive team functioning. To build awareness of the assessment criteria, students were provided with examples of each as well as the questions underlying the assessments.

TEAM AND PEER ASSESSMENT RESULTS

Table 2 compares the Part I and Part II team-level mean assessment scores for each factor. On balance, the scores were high in both parts. Team operating effectiveness improved in all areas, except for conflict. Confidence increased 3.3%, cohesion increased 6.0%, coordination increased 5.2%, and cooperation increased 6.0%. The increased scores for cohesion, coordination and cooperation were particularly encouraging. Notwithstanding these improved scores, conflict increased 46.9%. Considering the results altogether, the increase in team conflict likely reflects the incremental pressures of completing the project and does not suggest a breakdown in team functioning.

Table 2: Team Assessments - Team Level

Factor	Part I		Part II		Mean Score	
	Mean Score	S.D.	Mean Score	S.D.	Change	% Change
Confidence	91.15	9.51	94.20	6.57	3.05	3.3%
Cohesion	89.00	11.92	94.35	6.98	5.35	6.0%
Conflict	7.35	9.43	10.80	11.59	3.45	46.9%
Coordination	88.55	11.23	93.15	6.43	4.60	5.2%
Cooperation	84.05	9.68	89.10	10.92	5.05	6.0%

N = 20 Teams

Table 3 compares the Part I and Part II individual-level mean assessment scores for each factor. Overall, the scores were high and showed improved team member behaviors during the project. Preparation increased 1.2%, execution increased 2.1%, monitoring increased 4.1%, and adjustment increased 2.7%. The results suggest that individual team members assimilated the assessment criteria and effectively employed them in their team interactions. This inference is further supported by the improved team-level performance presented in Table 2.

Table 3: Team Assessments - Individual Level

Factor	Part I		Part II		Mean Score	
	Mean Score	S.D.	Mean Score	S.D.	Change	% Change
Preparation	91.60	10.26	92.70	8.80	1.10	1.2%
Execution	92.80	9.70	94.75	7.80	1.95	2.1%
Monitoring	85.75	9.96	89.25	9.61	3.50	4.1%
Adjustment	89.80	9.90	92.25	8.97	2.45	2.7%

N = 20 Teams

Table 4 compares the Part I and Part II mean confidential peer assessment scores for the three factors. An overall (average) score is also provided. The scores were favorable in both parts and improved in all areas. Accountability increased 5.2%, work quality increased 5.6%, work quantity increased 1.6%, and the overall score improved 4.1%. The results are broadly consistent with the individual-level assessment data presented in Table 3 and similarly suggest that team members incorporated the evaluation criteria into their team behaviors. The results also indicate that the peer assessments were effective in countering free riding. It is encouraging that team member views of their peers' contributions to the group project increased in Part II, despite the increase in team conflict presented in Table 2.

Table 4: Confidential Peer Assessments

Factor	Part I		Part II		Mean Score	
	Mean Score	S.D.	Mean Score	S.D.	Change	% Change
Accountability	90.66	13.86	95.33	8.19	4.67	5.2%
Work Quality	90.48	12.16	95.52	6.05	5.04	5.6%
Work Quantity	96.66	10.66	98.24	3.69	1.58	1.6%
Overall Score	92.57	11.21	96.33	5.27	3.76	4.1%

N = 58 Team Members

STUDENT PERCEPTIONS OF THE ASSIGNMENT

The survey model developed by Pirog et al. (2019) was used to gather and evaluate data about student perceptions of the group project. The survey measures student views across six variables. Three variables address the assignment's merits: "helpful", "learned", and "realistic". Two are affective variables: "involved" and "enjoyable". One is an overall variable: "worthwhile". Worthwhile combines the merit and affective variables to measure student satisfaction with the assignment. Students recorded responses via a nine-point Likert-scale where 1 = "strongly disagree" and 9 = "strongly agree". The surveys were completed anonymously and after the final grades were posted. Table 5 summarizes the survey results.

Table 5: Student Assessments of Group Project

Scale Item	Variable	Mean	S.D.	r
1) The assignment was helpful to me in my understanding of working in teams (merit)	helpful	7.78	1.63	0.61
2) I learned a lot about working in teams from this assignment (merit)	learned	7.34	1.92	0.67
3) Working on this assignment will allow me to apply my knowledge to realistic business problems (merit)	realistic	7.88	1.53	0.69
4) I was highly involved in this assignment (affect)	involved	8.26	1.29	0.69
5) This assignment was enjoyable (affect)	enjoyed	7.26	1.91	0.71
6) This assignment was worth the effort (merit and affect)	worthwhile	7.81	1.82	1.00
	Total ÷ 6	*7.72*	*1.45*	
Notes: N = 58; Scale items: Strongly Disagree (1) to Strongly Agree (9).				
r = correlation with "worthwhile"				

The average mean score of all six scale items was 7.72 (S.D. = 1.45). Student responses to questions addressing the assignment's merit (helpful, learned, realistic) were encouraging with mean scores of 7.78 (S.D. = 1.63), 7.34 (S.D. = 1.92), and 7.88 (S.D. = 1.53), respectively. On balance, the merit scores indicate that students both furthered their understanding of teamwork and acquired knowledge that will be useful in the workplace. The 8.26 (S.D. = 1.29) mean score for the affective variable "involved" was the highest of the six scale items and likely reflects both the significant time required and team coordination needed to complete the group project. In contrast, the 7.26 (S.D. = 1.91) mean score for the affective variable "enjoyed", while favorable, was the lowest of the six scale items. This result might be due to the high degree of involvement required in the project and/or the team conflict increase indicated in Table 2. The response to the "worthwhile" variable was very positive; its 7.81 (S.D. = 1.82) mean score reflects student views that the assignment was a valuable use of their time.

Following Pirog et al. (2019), Pearson correlation coefficients were also calculated to determine the relationship of the "worthwhile" variable to the other five variables (See Table 5). This measure indicated that student views about whether the assignment was worthwhile was most closely related to the affective variable "enjoyed" (r=.71) and least associated with the merit variable "helpful" (r=.61). This was surprising as it was anticipated that student views regarding whether the assignment was "worth the effort" would have been most strongly correlated with a merit variable. In this regard, the merit variable "realistic" (r=.69) was consistent with this expectation. Overall, the result indicates that students were satisfied with the assignment.

CONCLUSION

This paper presented the successful integration of teamwork process controls into a group project. The assignment included case-study work, team effectiveness assessments, and confidential peer evaluations. The project was completed in two stages to enable early feedback. As a result, teams and team members had an opportunity to improve their case-study work and team performance before final grading. The quality of the case-study work increased significantly. The team and peer assessments scores were positive throughout and improved over the course of the project, despite an increase in team conflict. Confidential peer assessments discouraged free riding and measured team member contributions to the project. A post-assignment survey indicated that students were satisfied with the assignment and considered it worth the effort.

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A Mathematical Model of Loyd's Archery Puzzle

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ABSTRACT

Recreational mathematics is the term frequently used to refer to applications of mathematics for fun. It is used to refer to games and puzzles and thus has a much broader appeal to students and the general public than would mathematics. The purpose of this paper is to illustrate how a classic mathematical puzzle, written by Sam Loyd, which appeared in *Sam Loyd's Cyclopedia of 5000 Puzzles Tricks and Conundrums with Answers* can be utilized in the pedagogy of engagement with and understanding of critical thinking and development of mathematical skills.

Keywords: problem-solving, puzzle-based learning, recreational mathematics, Excel Solver, LINGO

INTRODUCTION

Recreational mathematics is the term frequently used to refer to applications of mathematics for fun. It is used to refer to games and puzzles and thus has a much broader appeal to students and the general public than would mathematics. Well-known recreational mathematicians include Charles Dodgson, better known as Lewis Carroll, Sam Loyd, H. E. Dudeney and Marilyn vos Savant. Perhaps the best-known recreational mathematician was Martin Gardner, whose popular column *Mathematical Games,* appeared for twenty-five years in *Scientific American.*

While undergraduate university education typically focuses on practical and professional education, the methodology. The purpose of this paper is to illustrate how a classic mathematical puzzle, written by Sam Loyd, which appeared in *Sam Loyd's Cyclopedia of 5000 Puzzles Tricks and Conundrums with Answers* can be formulated and solved with mathematical modeling.

PREVIOUS RESEARCH

The chief economist for Google explains that while data is abundant and available, "what is scarce is the ability to extract wisdom from them" (Cukier, 2010). The recent rise in large datasets that need to be analyzed has provided opportunities for training and jobs for graduating college students that have skills in this area of data analytics (Henry & Venkatraman, 2015; Parks, Ceccucci, & McCarthy, (2018). Optimization modeling is a translation of the key characteristics of the business problem that needs to be solved (Chirinko, 1993, Tiwari, Vergidis & Majeed, 2006). The three primary elements are the objective function, decision variables and the constraints. Chirinko uses prices, quantities and shocks in a demand example for an investment in his benchmark model. Although the basic models are relatively straightforward and simple, they are the building blocks for learning much more in being able to apply it in one of the fastest growing professions in the job market. Analytic skills, IT knowledge and skills and business skills are the main skills being taught at universities to satisfy the growing demand (Parks, Ceccucci,& McCarthy, 2018).

Real life learning in colleges and universities can be made more interesting and powerful through the use of puzzles in business analytic classes. The hurdle of finding challenging examples while keeping the material interesting has previously been the conundrum. Many students see the job-world as years away while the classroom is now and boring. Although it is not important for the professor to be a stand-up comdedian, it is important that we remember that teaching can be fun and students learn something at the same time (Hong, 2020; Presthus, & Bygstad, 2012). Hing (2020) found that introducing puzzles from Sudoku, Kakurasu, Nundrix and others, students had the satisfiability of the challenging yet solvable problems that allowed them to obtain essential knowledge in marketable skills.

Mathematical optimization is the science of determining the best solution and are often are often associated with nonlinear programming, and in models associated with real world management and industry issues. Mathematical optimization allows us to formulate a problem subject to constraints. These types of optimizations are useful in many industries, such as operations management, engineering, science, finance and economics (Snyman & Wilke, 2005).
LINGO can greatly reduce the complexity of the problem-solving process. In fact, in simple cases, the program code is no different from the mathematical model and is beneficial in helping students' critical thinking, and innovative

consciousness (Men & Yin, 2018). Men & Yin (2018) also found that teaching master advanced and quick methods and techniques could improve their ability to solve problems that are more complex.

Solving complex problems has also been made easier by examining spreadsheet models with a free Excel add-in tool called Solver. Since most managers have knowledge and experience using spreadsheets, this Excel tool has gained widespread acceptance. The practical aspects of modeling and optimization require expertise and knowledge of the processes. However, executives, business analysts, managers and even lower level employees are often expected to have these skills (Bartolacci, LeBlanc, Kayikci & Grossman, (2012).

This paper examines Sam Loyd's archery puzzle as an example of enhancing the fun in a classroom while contrasting mathematical optimization models with LINGO and Excel Solver optimization software. These techniques have been applied in engineering, technology, and business schools with much success (Patterson & Friesen, 2018; Talib, Aliyu, Malik & Siang, 2019). Although this puzzle has been around for many years, utilization of the puzzle to teach modern optimization software techniques has not been done.

SAM LOYD'S ARCHERY PUZZLE

Sam Loyd (1841-1911) is the author of a huge collection of puzzles and riddles. He was also recognized as master chess player and many of his puzzles dealt with the board game. The puzzle selected for this paper is the Archery Puzzle. It appears in both *Cyclopedia of Puzzles* (Loyd, 1914), as well as *Mathematical Puzzles of Sam Loyd* (Gardner, 1959). The puzzle is re-printed below:
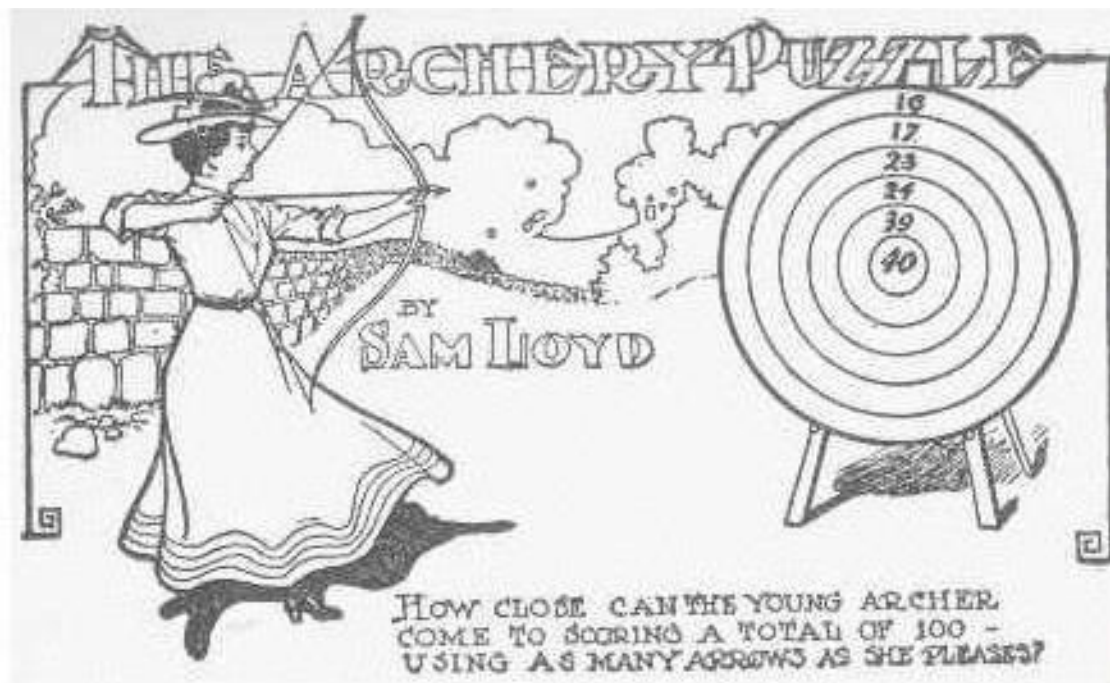
Gardner (1959) re-states the problem as follows:
"How many arrows does it take to score exactly 100 on this target?

THE ARCHERY PUZZLES AS A MATHEMATICAL OPTIMIZATION MODEL

The Archery Puzzle can be formulated as a mathematical optimization model. The formulation is presented below:

Minimize: number
Subject to:
n16*16+n17*17+n23*23+n24*24+n39*39+n40*40 = 100
n16, n17, n23, n24, n39, n40 = integer
n16, n17, n23, n24, n39, n40 >= 0
number = n16+n17+n23+n24+n39+n40

THE ARCHERY PUZZLE AS A LINGO MODEL

LINGO is a popular software modeling tool developed and marketed by LINDO Systems, (LINDO SYSTEMS, 2021). LINGO software is commonly used in planning problems and solving optimization models; however, it is also a fast and efficient tool for solving nonlinear problems as well (Schrage, 1999, 2006). Other optimization tools developed by the organization include LINDO and What's Best! The LINGO formulation of the model for solving the puzzles is displayed below:

```
Model
Min =number;
nu16=16;
nu17=17;
nu23=23;
nu24=24;
nu39=39;
nu40=40;
(nu16*n16)+(nu17*n17)+(nu23*n23)+(nu24*n24)+(nu39*n39)+(nu40*n40) = 100;
n16>=0;
n17>=0;
n23>=0;
n24>=0;
n39>=0;
n40>=0;
number=n16+n17+n23+n24+n39+n40;
@gin (n16);
@gin (n17);
@gin (n23);
@gin (n24);
@gin (n39);
@gin (n40);
END
```

The LINGO output from the model is displayed in Figure 1. The correct answer is six (6) arrows. Four of the arrows lands in the area valued at seventeen points and the other two score sixteen points each, for one-hundred.

Figure 1: LINGO Model Output of Loyd's Archery Puzzle

Global optimal solution found.

Objective Value:	6.000000
Objective bound:	6.000000
Infeasibilities:	0.000000
Extended solver steps:	0
Total solver interactions:	0

Variable	Value	Reduced Cost
NUMBER	6.000000	0.000000
NU16	16.00000	0.000000
NU17	17.00000	0.000000
NU23	23.00000	0.000000
NU24	24.00000	0.000000
NU39	39.00000	0.000000
NU40	40.00000	0.000000
N16	2.00000	1.000000
N17	4.00000	1.000000
N23	6.00000	1.000000
N24	6.00000	1.000000
N39	6.00000	1.000000
N40	6.00000	1.000000

Row	Stack or Surplus	Dual Price
1	6.00000	-1.000000
2	0.00000	0.000000
3	0.00000	0.000000
4	0.00000	0.000000
5	0.00000	0.000000
6	0.00000	0.000000
7	0.00000	0.000000
8	0.00000	0.000000
9	2.00000	0.000000
10	4.00000	0.000000
11	0.00000	0.000000
12	0.00000	0.000000
13	0.00000	0.000000
14	0.00000	0.000000
15	0.00000	-1.000000

THE ARCHERY PUZZLE AS AN EXCEL SOLVER SPREADSHEET MODEL

The Archery Puzzle can also be formulated and solved using the Solver add-in tool which is a part of the standard Excel spreadsheet. The Solver add-in was developed for Microsoft by Frontline Systems, a well-known developer of advanced optimization software (Solver.com, 2010).

The initial spreadsheet formulation is presented in Table 1. The Solver parameters are displayed in Figure 2. The Solver solution is presented in Table 2. As discussed earlier, the solution includes four arrows worth seventeen each and two worth sixteen each.

Table 1: Excel Solver Spreadsheet Model Formulation of the Archery Puzzle

1\A	B	C	D	E	F	G
2	16	17	23	24	39	40
3	0	0	0	0	0	0
4			Sum	0		
5			Goal	100		

Figure 2: Solver Parameters for Archery Puzzle
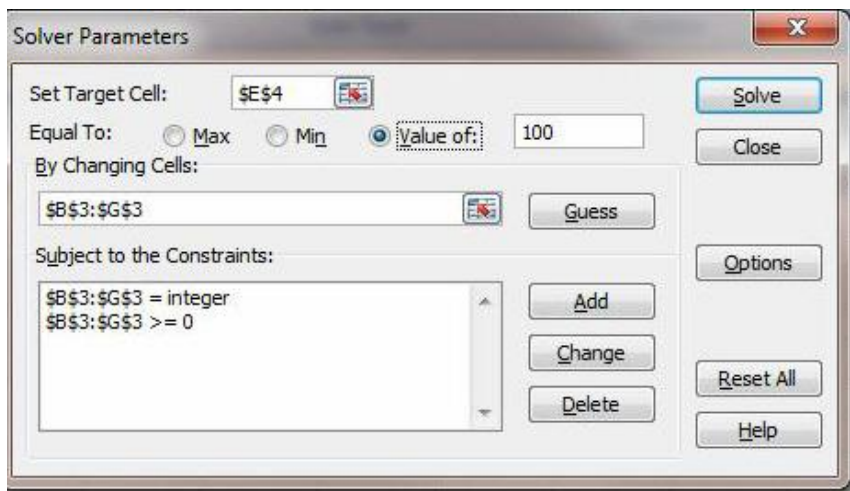
Table 2: Excel Solver Solution to the Archery Puzzle

1\A	B	C	D	E	F	G
2	16	17	23	24	39	40
3	2	4	0	0	0	0
4			Sum	100		
5			Goal	100		

DISCUSSION

Traditional learning from lectures and homework is shifting to more active-learning approaches as teachers and professors search to find methods that contain both education and entertainment to enhance students' skills while making the classroom more fun. The use of puzzle-based learning concepts has brought this type of instruction to classrooms for all types of business classes from marketing, operations management and finance. The challenge to find new examples and new problems to use in the classroom, along with the solutions and multiple software tools will be a continuing problem. The use of older models adapted to new technology provides one convenient source for this issue. By adapting the challenging older problems with new technology, students can gain the fundamental skills needed to learn and generalize to the complex problems in the business world.

CONCLUSIONS

Puzzles and games have long appealed to individuals seeking a challenge to their thinking, logic and math skills. Riddles, such as the Archery Riddle by Sam Loyd, written over 100 years ago provide interesting and challenging logic exercises for mathematical modeling, utilizing software tools, such as LINDO and Excel Solver.

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The Reflective Leader As Cultural Diversity Advocate

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ABSTRACT

Today's leaders are navigating new territory and are at a critical crossroad. COVID-19 has caused significant changes to the workforce. With new pressing matters cultural diversity may take a back seat. Further, outdated and ineffective leadership styles might not be tolerated in the post-pandemic era where employees have more employment choices and power. Reflective leadership offers a fresh and innovative approach for promoting today's multicultural organizations. Respecting diverse cultures and challenging beliefs and assumptions are central to reflective leadership. This paper focuses on the leader's role in advocating cultural diversity as a top business initiative. Leadership barriers that hinder diversity, a survey for assessing reflective behaviors vital for multicultural success, and best practices for leading culturally diverse teams are presented.

Keywords: reflective leadership, cultural diversity, diversity, equity, inclusion

INTRODUCTION

A recent Willis Towers Watson Workplace Dignity Survey (2020) conducted in collaboration with Robert F. Kennedy Human Rights found a lack of diversity in one in three employers. Although some strides have been made toward cultural diversity in organizations over the years, there is much work to be done. According to McKinsey (2020), the lingering effects of COVID-19 and lessons from previous crises indicate a very real risk that inclusion and diversity may now recede as a strategic priority for organizations. The pandemic has caused enormous changes to the workforce with new urgent matters such as adapting to remote work, as well as consolidating and downsizing of the workforce, and finding new ways to communicate, connect and engage employees while assuring productivity. And while some leaders and employers may not be paying attention to diversity, today's employees are demanding *more* diversity. Diversity, Equity, and Inclusion (DE&I) are hot topics in today's workforce. Diversity recognizes individual differences and covers a wide spectrum of dimensions such as, but not limited to, race, ethnicity, religion, gender, sexual orientation, and age. Equity ensures equal and impartial treatment of all employees. An inclusive workplace provides a sense of belonging and support for all employees. Cultural diversity generally deals with different societies whereas diversity is more concerned with individuals. Although this paper focuses on cultural diversity, the terms diversity and cultural diversity are often used interchangeably since both exist together in society. In a recent study by Glassdoor (2020), more than 3 out of 4 job seekers and employees (76%) report that a diverse workforce is an important factor when evaluating companies and job offers. According to new research, the true challenge for leaders is that work flexibility is the natural extension of embracing diversity in all its facets (*Geneva: International Labour Office. Teleworking during the COVID-19 Pandemic and beyond: A Practical Guide. 2020*). As organizations redefine and reimagine their future, the leader's role in navigating new territory can make all the difference between a company's success and failure. Therefore, a fresh and innovative business model is needed to ensure today's leaders are embracing and promoting a culturally diverse workforce. Further, leveraging best practices for leading global organizations effectively can be maximized through reflective leadership.

REFLECTIVE LEADERSHIP (RL)

Reflective leadership (RL) can be defined as the consistent practice of reflection, which involves conscious awareness of behaviors, situations and consequences with the goal of improving organizational performance (Castelli, 2016). Similar to other relationship-oriented leadership styles such as servant leadership, transformational leadership, authentic leadership, and values based leadership, reflective leadership focuses on treating employees with respect where the leader's actions and behaviors demonstrate their genuine caring for the well-being of employees. These people-oriented leadership styles in global teams that are viewed as stimulating, encouraging and supporting types of leadership were found to have positive effects in both global virtual teams and in multicultural collocated teams (Zander et al., 2012). Task-oriented leadership is also an important part of reflective leadership since the leader is responsible for helping employees understand how their tasks relate to and impact the organization's mission, explaining how tasks contribute to goals, and relating work to company objectives (Castelli, 2016).

Reflective leadership is centered on self-awareness and self-reflection since without critical self-examination, it is nearly impossible to be authentic with others. According to Odegard-Koester (2020), "To be a leader who is responsive

to the needs of the team served, it is imperative that the leader is *reflective*" (p. 178). The practice of mindfulness is an integral part of reflective leadership. Mindfulness is the ability to focus in the present moment (both self-awareness and information from the environment or from others) and to integrate resulting information into action (Baron et al., 2018). Additionally, emotional intelligence is closely related to mindfulness in that the leader must be able to monitor her/his reactions as well as respond attentively to the reactions of others. Therefore self-awareness, mindfulness, and emotional intelligence combined provide the foundation for reflective leadership. This thoughtful leadership approach is especially important when dealing with today's multinational and multicultural organizations.

REFLECTIVE LEADERSHIP AND DIVERSE CULTURES

Respecting diverse cultures and challenging beliefs and assumptions are central to reflective leadership (Carmeli et al., 2013; Castelli, 2016; Egleston et al., 2017). Cultural diversity has grown significantly in the past four decades due to a changing global workforce and the growth of multinational corporations. Cultural diversity can be defined as coexistence in one area of different cultures or societies (Mazurkiewicz, 2020) and takes into account language, religion, race, sexual orientation, gender, age and ethnicity. In the early 2000s companies started to formally recognize diversity and create training programs to better manage the new changing demographics of the workforce. Over the years many cross-cultural models have emerged and include cultural awareness, cultural competence, cultural safety, cultural humility and cultural intelligence (Shepherd et al., 2019). In addition, there is a sound business case to promote cultural diversity. McKinsey's (2020) research findings regarding ethnic and cultural diversity were compelling; in 2019, top-quartile companies outperformed their less diverse peers by 36 percent in profitability, slightly up from 33 percent in 2017 and 35 percent in 2014. Beyond profitability, the management of cultural diversity must be viewed as an essential aspect of an organization's role in society. Taking into account cultural differences and harmonizing them is a human rights issue and an important dimension of corporate social responsibility (Lozano & Escrich, 2017).

THE REFLECTIVE LEADERSHIP INSTRUMENT

The theory of reflective leadership is relatively new and has gained momentum in the past 20 years as a result of globalization. Reflective leadership is necessary in multinational and multicultural organizations since RL promotes cultural awareness that enables organizations to adapt their strategies, policies, and business practices to the diverse markets in which they compete (Castelli et al., 2013). Although a number of studies have broadly suggested that RL improves organizational performance (Detert & Burris, 2007; Joshi, 2010; Matsuo, 2012), impacts of a clearly defined, validated model of leadership on specific measures of performance had not been empirically tested until recently. In 2012, Castelli's (2012, 2011) theory of reflective leadership was tested by creating a unique quantitative survey using a diverse global population consisting of 714 respondents in 81 nations. The results demonstrated that three components of RL (openness, purpose, and challenging beliefs) significantly improve organizational performance (sales, profits, and meeting organizational goals) and that performance improvements are mediated by cultural adaptation (Castelli, et al., 2014; Egleston, et al., 2017).

The Reflective Leadership Survey (see Appendix A) asks respondents to rate the extent to which they demonstrate particular reflective behaviors in their job as a leader. The results focus on three areas critical for the reflective leader's multinational and multicultural success: challenging beliefs and assumptions, providing an open and safe environment, and providing work purpose. Reflective leadership offers practical applications for most every organizational setting whose workforce consists of multinational and/or multicultural employees. In practice, the RL instrument is used as a tool for development planning in diverse work groups and, based on results, respondents are asked to provide tangible ways to make meaningful change to improve their reflective leadership skills. Below are some examples of respondents' verbatim action plans for improvements.

1. Have an open forum with the team to understand their experiences, assumptions, and beliefs and how this may impact work assignments. This will help me understand how as their leader I can help them to overcome some of these challenges.
2. Talk to team members about their views on the project, how we can do things differently, and create a safe environment where they can express their views without being worried about the outcome(s). I would like the team to feel safe expressing their views and what is on their mind.
3. During the start of a project or assignment, make sure every team member is aware of their responsibilities and also relay to them how their contributions help us to meet the overall goal of the organization and also help them grow in the company.

4. Increase my trust with my team and their trust of me. I need to improve by making every person feel comfortable, safe and valued for the benefit of the whole.
5. Be more communicative in discussing beliefs and values of the team initially in individual tasks and assignments.
6. Be more informative about how individual goals or tasks are aligned with overall organizational goals to provide more purpose to each task.
7. Be more open to review how assumptions, values, or beliefs have affected previous experiences and show willingness to work through those to meet future tasks in a more aligned manner.
8. Providing purpose - I could take further time to explain the importance that our roles and work play in the 'big picture' that we are working towards as a company. This can provide both clarity and orientation for not only my co-workers but also for myself.
9. I intend to do a better job of communicating to team members not only the organizational goals and vision, but also how the current projects and work tasks they are performing align with the organization's goals and vision.
10. Making sure everyone feels safe sharing their thoughts with the team. If a team member feels that they would be judged for making a comment or bringing up an issue, ideas may not be generated to help move the organization forward.

LEADERSHIP BARRIERS THAT HINDER CULTURAL DIVERSITY

Cultural factors play a significant role in all organizations. Understanding that differences in cultures can present stress, mistrust and conflicts is an important first step in addressing barriers. If ignored, cultural challenges can affect both the performance of individuals and the performance of the organization (Castelli, 2016). Although there are many barriers that hinder cultural diversity, the root cause that is preventing organizations from making progress is ineffective leadership (Lockwood Primus 2021). Research from Wingfield & Caruso (2021) state that nearly 4 in 10 (39%) leaders at the Vice President level and above believe that diversity initiatives are a waste of organizational time, effort, and money. According to research from Perry (2020), 57% of employees think their company should be doing more to increase diversity and/or inclusion initiatives and 41% of managers state they are "too busy" to implement any kind of diversity and inclusion initiatives. The Center for Diversity & Inclusion (2020), identified three barriers to Diversity, Equity and Inclusion (DE&I) success, all of which can be attributed to leaders. They are: 1) leaders who are undermining DE&I initiatives, 2) detrimental attitudes from the leadership majority, and 3) not elevating DE&I to a top business initiative. Lockwood Primus (2021) states that "succeeding with DE&I initiatives is a worthwhile goal for companies" (para. 15). She references studies by Deloitte who found that organizations can see an 80% improvement in business performance when levels of diversity and inclusion are high, and a McKinsey & Company study where companies in the top quartile for ethnic and cultural diversity are 36% more profitable than those in the fourth quartile.

Another leadership barrier is the lack of cross-cultural competence. Cross-cultural competence is the ability to work effectively with other cultures by understanding and respecting cultural values, norms and beliefs. Cross-cultural competence is essential for team leadership, which is critical for the functioning of multicultural teams (Zander et al., 2012). Further, leaders "inability to simultaneously work with people from different backgrounds as well as possessing a lack of insight into, sensitivity toward, and accommodation of different cultures are among the major reasons for failure in multicultural teams" (Hajro & Pudelko, 2010 as cited in Zander et al., 2012, p.595). A leader's lack of self-awareness impedes positive efforts for promoting cultural diversity (Jenifer & Raman, 2015). Other leadership barriers that impact cultural diversity include stereotyping, ethnocentrism and bias. Additionally, inflexible leadership or the inability to adjust one's leadership style based on the culture and values of various groups is another obstacle. Inclusion starts with changing the mindsets of leaders and addressing the barriers they often create; without this first step, multicultural organizations won't be successful in making positive change (Lockwood Primus 2021).

BEST PRACTICES FOR LEADING MULTICULTURAL TEAMS

A universal framework for practicing reflective leadership was developed by Castelli in 2016. This framework is unique since it specifically relates reflective leadership to better understanding the cultures and values of others in multinational and multicultural organizations. Castelli's research included a critical examination of over 100 studies across several disciplines. Common components of reflective leadership emerged in the research and are discussed below including examples of reinforcing leader behaviors and practices.

1. Creates a Safe Environment that Promotes Trust
Common practices include: displays consistent behavior, serves as a role model, is considered a relationship builder, values opposing views, and demonstrates integrity.

2. Values Open Communications
Common practices include: provides an open door policy, displays transparency, is an active listener and is empathetic, welcomes constructive criticism, and is a credible communicator.

3. Connects Work to Organization Mission
Common practices include: describes task impact on mission, explains how tasks contribute to goals, relates work to company objectives, acknowledges contributions, and views work as purposeful.

4. Builds Self-Esteem and Confidence
Common practices include: builds supportive relationships, is viewed as trustworthy, provides direction and feedback, serves as coach and mentor, and provides positive reinforcement.

5. Respects Diverse Cultures and Customs
Common practices include: values diversity, is respectful of varying customs/values, promotes inclusiveness, adapts to local policies and practices, and displays sensitive, and self-monitoring, and objective behaviors.

6. Challenges Beliefs and Assumptions
Common practices include: questions assumptions, recognizes blind spots, is open to alternatives, displays a willingness to change, and shares lessons learned.

Leaders create a safe environment that reduces or eliminates the threat associated with acknowledging failure by promoting open communications (Castelli et al., 2014). Open and candid communications, central to any effective leader's mission, is accomplished by encouraging followers to discuss the impacts of their values and beliefs on their individual performance and the company's performance (Fisher-Yoshida & Geller, 2009). It is the leader's job to help employees understand the purpose of their work by connecting it to the organization's mission. Moreover, leaders who continually seek direction, advice and input from their employees make their employees feel trusted, and that trust is likely to be reciprocated (Evans & Castelli, 2018).

Respecting diverse cultures is not limited to any specific industry. Rather, it encompasses all fields and organizations from government, non-profit organizations, to K-12 and higher education. Recently the Association to Advance Collegiate Schools of Business (AACSB), an educational accrediting body with international membership of approximately 900 institutions, released a positioning paper specifically geared to diversity, equity, inclusion, and belonging. The paper is "intended to reinforce AACSB's global perspective, principles-based approach, and commitment to action, and to underscore the importance of AACSB and our members embracing diversity within our organizations and the communities we serve" (*AACSB: Our commitment to diversity, equity, inclusion, and belonging,* 2021, December, para. 5). According to the Center for Creative Leadership, "inclusion requires active, intentional, and ongoing efforts to promote the full participation and sense of belonging of every employee, customer, and strategic partner. It involves policies and practices, and also includes the ability to envision and enact new ways of leading" (*5 Powerful Ways to Take REAL Action on DEI (Diversity, Equity & Inclusion)*, 2022, para.14).

According to Egleston et al., (2017), reflective leaders challenge underlying employee assumptions and work-related values and beliefs that affect attitudes, behavior, and the objectivity of decision-making. This practice is essential for all organizations, especially those participating in the global economy where values, beliefs, expectations, and goals of consumers, investors, employees, and local communities can vary dramatically with profound impacts on organizational performance. They also found that challenging underlying assumptions is essential to the ability of leaders and followers to "think globally and act locally" (p. 893). When followers challenge their own assumptions and feel safe discussing their past failures with one another and with their leader, the result is identification of adaptive models of behavior that improve individual and organizational performance (Mollick, 2012). Organizational training, coaching, and mentoring can improve cultural awareness, and can also help avoid pitfalls that could damage the reputation of the firm when working in culturally-diverse settings (Castelli, Marx, & Egleston, 2014).

LEADING CULTURAL DIVERSITY IN PRACTICE

Many top leaders are consciously promoting cultural diversity within their organizations. Below are some examples that illustrate the ways in which leadership informs, advocates and celebrates diversity.

Higher Education – Lawrence Technological University, Southfield, Michigan
Each year during the first week in April, Lawrence Technological University, a private university located in Southfield, Michigan, hosts an International Festival to recognize its many students from around the world. The University proudly celebrates its diverse mix of international students and scholars from over 45 countries. Lawrence Tech hosts a variety of daily events from different cultures around the globe that showcase the benefits of international education and exchange worldwide. International students, faculty, and staff come together to share their culture and talents with the entire University community. Sample events include: Holi – Festival of Colors, international cuisine with recipes submitted by students and prepared daily in the cafeteria, an international game night, and a cultural center informational fair. *(Lawrence Technological University, Events, 2022 International Festival)*

Business and Industry – Gap, Inc.
Over the last 46 years, the Gap, Inc. has grown from a single store to a global fashion business with five brands—Gap, Banana Republic, Old Navy, Athleta, and Intermix. Gap's clothes are available in 90 countries worldwide through 3,300 company-operated stores, almost 400 franchise stores, 10,000 employees worldwide, and e-commerce sites that are still growing. Gap's products are diverse, and so is the company's team. But, these differences are the very thing that brings employees closer together. "The diversity and backgrounds of the people here lend itself to ensuring you have a full experience at work," shares Angela Rapadas, Director of Customer Success. "A simple idea—that we all deserve to belong, and on our own terms—is core to who we are as a company," Rapadas added. For over 50 years, Gap brands have championed inclusivity not only for its teams and customers, but also through the product. Gap is a member of Open to All (*https://www.opentoall.com/*) which is a growing coalition of more than 200 non-profits, from the Leadership Conference on Civil and Human Rights and the Anti-Defamation League to disability groups, LGBTQ groups, faith organizations and more. Open to All also unites thousands of large and small businesses across the country committed to being Open to All. (*Gap, Inc. We Are Inclusive, by Design*, 2022)

Health Care - Health Care Service Corporation
Health Care Service Corporation (HCSC) is the largest member-owned, and fourth largest overall, health insurer in the U.S., serving Illinois, Montana, New Mexico, Oklahoma, and Texas as a licensee of Blue Cross Blue Shield. A purpose-driven community of 22,000 employees serving over 15 million members, HCSC is devoted to a mission of improving lives, health, and care. HCSC leverages diversity to create an inclusive culture that thrives. Diverse employee groups, unite talent from all lines of difference to benefit all lines of business, boast high membership engagement and host meaningful events. Employees participate in many volunteer opportunities, including unique interactive programs that support local communities. HCSC's strong network of employee groups is a meaningful way for our employees to remain engaged in D&I strategy. Business Resource Groups and Employee Networks offer a way for employees to feel connected, respected, and valued while cultivating inclusion at HCSC. (*Health Care Service Corporation. Our Impact: Diversity, Equity, and Inclusion, 2022)*

Online Career Platform - The Muse
The Muse is a New York City-based online career platform founded in 2011. The Muse helps people navigate their entire career journey. They offer expert advice alongside a job search experience that's engaging and helps companies recruit top talent from a diverse pool of qualified candidates by showing millions of readers what it's like to work at an organization before they even apply. The company features a variety of articles on their website that focus on diversity and ways to educate current employees as well as prospective candidates who may use The Muse to apply for open positions. On their diversity and inclusion link, The Muse states, "Learn about how to find an employer that values you for your whole self; how you can be a better ally, whether as a leader or a coworker; what other companies are doing to make a difference; and more." (The Muse. Diversity and Inclusion, 2022)

CONCLUSION

Reflective leadership promotes cultural awareness that allows organizations to ensure their goals align with the diverse markets they serve. Reflective leaders create a safe environment, value open communications, connect work to the organization's mission, build the confidence of others, respect diverse cultures, and challenge beliefs and assumptions.

These leadership practices are necessary for companies to thrive in today's diverse workforce. According to Perry (2020) diversity's successes continue to produce positive results:

- 85% of CEOs with diverse and inclusive cultures notice increased profits.
- Companies with equal numbers of men and women earn 41% more revenue.
- Racially and ethnically diverse companies are 35% more likely to perform better financially.
- Diverse companies are 70% more likely to capture new markets.
- Diverse teams are 87% better at making decisions.
- Inclusive companies are 1.7 times more innovative.
- Companies that have a highly inclusive culture have 2.3 times more cash flow per employee.
- Inclusive companies are 120% more likely to hit financial goals.

While recent advancements in diversity can be applauded, there is still much work ahead. As leaders fully realize the importance and benefits of cultural diversity, hopefully they will strive to lead this worthy cause and become reflective diversity champions for the organizations they serve.

Appendix A: The Reflective Leadership Survey

Reflective Leadership Survey

Directions: Using the scale below, rate the extent to which you demonstrate the following behaviors on your job as a leader.

5 = always, 4 = most of the time, 3 = sometimes, 2 = rarely, 1 = not at all

1. I ask my team to discuss how their experiences with their assignments affected their assumptions, values and/or beliefs.

2. I help my team feel safe expressing their views.

3. I describe how my team's responsibilities are tied to organizational objectives.

4. I encourage my team to ask how their beliefs could affect their performance.

5. I help my team feel safe discussing their work experiences.

6. I relate my team's responsibilities to the organization's goals and objectives.

7. I ask my team to discuss how their assumptions, values and/or beliefs affect their work.

8. I provide an environment where open communications are valued.

9. I explain how my team's tasks contribute to the goals of the organization.

10. I ask my team to discuss how their assumptions, values and beliefs were affected by their experiences.

11. I provide a safe environment where open communication is encouraged.

12. I explain the purpose of team's tasks and responsibilities.

13. I ask team members to discuss their assumptions, values and/or beliefs at the beginning of their assignments.

14. I help team members feel safe sharing what they learn from their experiences.

15. I connect my team's work to the organization's mission.

Castelli, P.A., Marx, T.G, and Egleston, D.O. (2014). *CME Reflective Leadership Instrument.*

Appendix A: The Reflective Leadership Survey Continued

SCORING:

Total Scores	Total Scores	Total Scores
A	**B**	**C**

Add the scores for numbers 1, 4, 7, 10, 13 in box A. Put the total score in box A Total Scores.

Add the scores for numbers 2, 5, 8, 11, 14 in box B. Put the total score in box B Total Scores.

Add the scores for numbers 3, 6, 9, 12, 15 in box C. Put the total score in box C Total Scores.

Look up your total scores in the table below.

Total Score for A _____   Total Score for B _____   Total Score for C ____

A = Challenges Assumptions	B= Provides Open and Safe Environment	C= Provides Purpose
5 to 14 below average	5 to 14 below average	5 to 14 below average
15 to 19 average	15 to 19 average	15 to 19 average
20 to 25 above average	20 to 25 above average	20 to 25 above average

Based on your results, provide three tangible action plans to improve your reflective leadership skills.

1.

2.

3.

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Teaching Data Mining Online to Business Undergraduate Students Using Python

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ABSTRACT

This article describes the design and delivery of an online Python-based undergraduate data mining course by applying the Quality Matters[TM] standards. Student evaluations show significant improvement after the implementation of these standards. The challenges of and solutions to delivering such a course online during the COVID-19 pandemic are illustrated through a six-part assignment in the course *Quality Matters[TM] Improving Your Online Course*. The practice of teaching undergraduate business students data mining using Python discussed in this article complements Wu et al. (2015) who shared the practice of teaching such a course using R.

Keywords: Business analytics, online course, open-source software, project, Quality Matters[TM]

INTRODUCTION

In "Competing on Analytics: The New Science of Winning", Davenport and Harris (2007) explain how businesses gain a competitive edge over their rivals using analytics. Since its publication, many business analytics degree programs have been started by business schools. Most of these programs include data mining and machine learning courses at the graduate level. In some business analytics programs, undergraduate students take such courses as electives and R appears to be the choice of software (Wu et al., 2015). A business analytics major for undergraduate students was launched in Fall 2020 in the business school where the author has been teaching. Data mining using Python is a required course for this major. Offering such a course to undergraduate students in Fall 2020 for the first time presented additional challenges in that all classes at the University were forced to be delivered online due to the COVID-19 pandemic. Students and instructors confronted a number of problems teaching in the zoom environment for the first time. For example, students cannot be required to have their cameras turned on in zoom. Students experienced zoom fatigue and found it hard to concentrate during the online class. Interaction between students and the author was more limited in zoom than in a computer lab where the author could walk to the student's computer station to answer a question. There was not as much effective interaction in zoom as in a classroom. These challenges led the author to take a course *Quality Matters[TM] Improving Your Online Course* (IYOC, www.qualitymatters.org) offered by the University's Center for Teaching and Learning to learn how to teach more effectively online. This article shares a design and delivery of an online course based on the Quality Matters[TM] standards to teach undergraduate students data mining using Python. The author also hopes sharing this experience will start a conversation among educators in business schools to deliver a modern business analytics curriculum successfully to both undergraduate and graduate students using Python, complementing R.

Students are admitted to our business school as juniors and are required to take several core 101 business courses first, including Introduction to Business Analytics. This course focuses on Regression and Analysis of Variance demonstrating how these methods can be applied to link data to business decision making. Having grasped these traditional statistical methods, business analytics majors are required to take three courses: Business Intelligence, Data Mining for Business Analytics, and Advanced Business Analytics. Students learn data visualization using Tableau as well as SQL in the Business Intelligence course. How the author teaches "Data Mining for Business Analytics" using Python is the focus of this article. Data mining, a popular course in Computer Science or Engineering, is perceived by many to be different from statistics. Grover and Mehra (2008) compare and contrast how statisticians and data miners perceive data mining. Computer science or engineering students have better programming skills and their approaches to data mining are somewhat different from what business students learn in applied data analysis courses that focus on traditional statistical methods. Both the technical foundation of the students and different applications in the course require the data mining course for undergraduate business students to be structured differently from a data mining course in Computer Science or Engineering. Li (2011) presents a practice-oriented data mining course for undergraduate engineering students. Wu et al. (2015) present a course design of a data mining course for undergraduate business students using R and also describe the delivery and assessment of their data mining course. This article shares

the design and delivery of an online Python-based data mining course for undergraduate business students by applying the Quality Matters™ standards.

QUALITY MATTERS™ IYOC

The course *Quality Matters™ Improving Your Online Course (IYOC)* focuses on online course design by following eight Quality Matters™ General Standards (Quality Matters, 2018):
1. Course Overview and Introduction
2. Learning Objectives (Competencies)
3. Assessment and Measurement
4. Instructional Materials
5. Learning Activities and Learner Interaction
6. Course Technology
7. Learner Support
8. Accessibility and Usability

Under these eight General Standards, there are 42 Specific Review Standards used to evaluate the design of online and blended courses for QM certification. For example, there are nine Specific Review Standards for General Standard 1 (Quality Matters 2018):
General Standard 1: Course Overview and Introduction
The overall design of the course is made clear to the learner at the beginning of the course.
Specific Review Standards:
1.1 Instructions make clear how to get started and where to find various course components.
1.2 Learners are introduced to the purpose and structure of the course.
1.3 Communication expectations for online discussions, email, and other forms of interaction are clearly stated.
1.4 Course and institutional policies with which the learner is expected to comply are clearly stated within the course, or a link to current policies is provided.
1.5 Minimum technology requirements for the course are clearly stated, and information on how to obtain the technologies is provided.
1.6 Computer skills and digital information literacy skills expected of the learner are clearly stated.
1.7 Expectations for prerequisite knowledge in the discipline and/or any required competencies are clearly stated.
1.8 The self-introduction by the instructor is professional and is available online.
1.9 Learners are asked to introduce themselves to the class.

Self-Review
The course starts with a self-review assignment having the participants explain how each course meets at least 5 of the 42 Specific Review Standards and for the areas of the course that do not meet these standards, how each participant plans to meet them. These 42 Specific Review Standards were reviewed for the author's data mining course and evidence from the course was presented in this self-review assignment to show why these standards have been met. Some of the 42 Specific Review Standards appear to have been met since the author participated in a Quality Matters workshop offered by the University several years ago and based all his courses in the Canvas Learning Management System (canvas.csus.edu) on a sample Canvas course shell provided at this workshop. Below is the evidence the author provided for this self-review assignment to support meeting Specific Review Standard 1.1:
I include "how to get started" instructions on the first page students see when clicking my Canvas course:
This is a required course for the Business Analytics concentration. Students will learn concepts and techniques in data mining using the programming language Python and its libraries such as Pandas and Scikit-Learn. We will meet in zoom regularly for class lecture and discussion. Students must complete reading and other assignments prior to each meeting to be prepared for class discussion. All information related to this course will be provided in this Canvas course shell and course updates will be provided using Canvas "Announcements" delivered to your email. This course is designed to provide students with methods and tools for discovering or "mining" patterns from complex data. Data mining can be more accurately called pattern analysis, knowledge discovery, or knowledge extraction. It is a process of extracting and identifying useful information, patterns, and knowledge from "Big Data" using statistics, mathematics, machine learning, and artificial intelligence techniques. An important goal is to generate good predictions. Please follow the syllabus and modules throughout the semester. We will meet in zoom during class periods and office hours.

This evidence was presented by the author to the course instructor from the University, not the reviewers from Quality Matters[TM], to show the Specific Review Standards have been met. To have the course QM certified, a review team from Quality Matters[TM] will review and score all 3-point Specific Review Standards of a course. An overall score of at least 85% is required for a course to attain QM certification. The author highly recommends any instructors teaching online courses complete *Quality Matters[TM] Improving Your Online Course* and also consider to have their online courses QM-Certified (see www.qualitymatters.org).

Alignment

Even though many of the 42 Specific Review Standards were met after minor modification during the course, six of them address "alignment" and require additional work. "Alignment" means "critical course components work together to ensure that learners achieve the desired learning outcomes" (Quality Matters 2018). The six Specific Review Standards involving alignment are listed below:

2.1 The course learning objectives, or course/program competencies, describe outcomes that are measurable.
2.2 The module/unit-level learning objectives or competencies describe outcomes that are measurable and consistent with the course-level objectives or competencies.
3.1 The assessments measure the achievement of the stated learning objectives or competencies.
4.1 The instructional materials contribute to the achievement of the stated learning objectives or competencies.
5.1 The learning activities promote the achievement of the stated learning objectives or competencies.
6.1 The tools used in the course support the learning objectives or competencies.

These six standards require coordination among course learning objectives, module learning objectives, assessments, instructional materials, learning activities, and learning tools. In the second assignment, the participants are asked to have at least two course modules meet these six Specific Review Standards. This assignment is divided into six parts as explained below.

Topics

The topics from the textbook (Shmueli et al., 2020) covered in the two courses "Data Mining for Business Analytics" and "Advanced Business Analytics" are organized into five modules:
I. Overview of the data mining process
II. Data exploration and dimension reduction: data visualization and dimension reduction
III. Evaluating predictive performance
IV. Prediction and classification methods: multiple linear regression (including ridge regression and lasso), k-Nearest Neighbors (kNN), Naïve Bayes classifier, classification and regression trees, logistic regression, neural nets, discriminant analysis, combining methods - ensembles and uplift modeling.
V. Mining relationships among records: association rules and collaborative filtering, cluster analysis.

The first part of the assignment is to list the topics for at least two modules. Modules (I) and (III), corresponding to Chapters 2 and 5 of Shmueli et al. (2020) respectively, were selected for this assignment as these two critical chapters lay the foundation for other chapters of the textbook by explaining key concepts and methods in data mining.

Chapter 2 *Overview of the Data Mining Process* provides an overview of data mining steps and discusses data collection, cleaning, preprocessing, partitioning, and overfitting. The following topics, given a high-level overview in the textbook, were submitted for the assignment:
(1) Classification vs. Prediction
(2) Association Rules and Recommendation Systems
(3) Data Reduction and Dimension Reduction
(4) Data Exploration and Visualization
(5) Supervised and Unsupervised Learning
(6) Sampling from a Database and Oversampling Rare Events in Classification Tasks
(7) Preprocessing and Cleaning Data: categorical variables, outliers, missing values, normalizing and rescaling data
(8) Predictive Power: overfitting, data partition into training and validation sets, cross-validation
(9) Data Ethics

Chapter 5 *Evaluating Predictive Performance* is another critical chapter for all methods in the textbook and describes ways to evaluate predictive performance of various methods. Detailed discussion of prediction and classification performance metrics including confusion matrix, ROC curve, sensitivity, specificity, asymmetric misclassification

costs, and gains and lift charts to judge ranking performance, is provided. The following topics summarized from this chapter were submitted for the assignment:

(1) To prevent overfitting to the training data, test model performance on data that were not used in training based on performance metrics:

Prediction - Average Error, MAPE, RMSE based on the validation data.

Classification - confusion matrix (overall accuracy, specificity and sensitivity, metrics that account for misclassification costs), ROC curve.

(2) Judge ranking performance using gains and lift charts.

(3) Oversample rare cases and adjust performance metrics for the oversampling.

(4) Compare metrics based on the validation data to those based on the training data for the purpose of detecting overfitting.

Learning Objectives

The second part of the assignment is to improve the course-level and module-level learning objectives to ensure that action verbs are in the learning objectives and the learning objectives are measurable, meeting Specific Review Standards 2.1 and 2.2. The author followed Bloom's Taxonomy, as developed by Bloom et al. (1956) and revised by others (see Anderson and Krathwohl eds. 2001), to revise the module-level and course-level learning objectives. Bloom's Taxonomy (Ben-Jacob 2017) below lists the verbs that are measurable for course learning objectives.

Bloom's Taxonomy

create — Produce new or original work
Design, assemble, construct, conjecture, develop, formulate, author, investigate

evaluate — Justify a stand or decision
appraise, argue, defend, judge, select, support, value, critique, weigh

analyze — Draw connections among ideas
differentiate, organize, relate, compare, contrast, distinguish, examine, experiment, question, test

apply — Use information in new situations
execute, implement, solve, use, demonstrate, interpret, operate, schedule, sketch

understand — Explain ideas or concepts
classify, describe, discuss, explain, identify, licate, recognize, report, select, translate

remember — Recall facts and basic concepts
define, duplicate, list, memorize, repeat, state

Several action verbs were chosen from Bloom's Taxonomy during the course to revise the Course Learning Objectives (CLO) to be:

Students will be able to

1. Explain the role of data mining in business decision making.
2. Perform data processing and analysis.
3. Apply appropriate data mining methods for a given business problem using various data mining tools.
4. Evaluate and compare model performance using various data mining tools.
5. Evaluate the output of data mining for business decision making.
6. Apply ethical principles to data mining models.

The Module Learning Objectives (MLO) were also revised to include action verbs and were checked for alignment with CLOs by listing them in parentheses to align with MLOs:

Module 1: Overview of the Data Mining Process
1. Describe the core tasks in data mining (2, 3, 4).
2. Identify the core steps in data mining (2, 3, 4, 5).
3. Apply the appropriate methods to avoid overfitting (4).
4. Implement ethical practice in data mining (1, 6).

Module 2: Evaluating Predictive Performance
1. Assess the predictive performance of data mining methods using appropriate performance metrics (4).
2. Classify the most interesting or important records using gains and lift charts (5).
3. Oversample rare cases and adjust performance metrics for the oversampling (3).
4. Detect overfitting by comparing metrics based on the validation data to those based on the training data (4).

Assessments
The third part of the assignment is to align assessments with learning objectives by answering two questions to meet Specific Review Standard 3.1:
1. Do your assessments align with your MLOs and CLOs? Make sure that your assessments permit your students to demonstrate the "actions" in your MLOs.
2. Do you provide a variety of ways for your students to achieve the learning objectives? For example, do you only have multiple-choice exams or do you have other types of assessments?

The following assessments are used to determine the extent to which students have achieved the Module Learning Objectives (MLOs in parentheses):

Module 1: Overview of the Data Mining Process
1. Homework: explain concepts and methods, write Python code to apply the methods (1, 2, 3).
2. Quiz: True/False, multiple choice, calculation (2, 4).
3. Exam: explain concepts and methods, write Python code to apply the methods, calculation (1, 2, 3).

Module 2: Evaluating Predictive Performance
1. Homework: explain concepts and methods, write Python code to apply the methods (1, 2, 3, 4).
2. Quiz: True/False, multiple choice, calculation (1).
3. Exam: explain concepts and methods, write Python code to apply the methods, calculation (1, 2, 3, 4).

In addition to quizzes, problems at the end of each chapter are assigned every week as homework. Most of these problems require students to apply data mining methods to real business data using Python. In addition, a project involving a large real data set and adapted from an earlier publication (Li et al., 2018) was assigned to have students process the large data set using Python and apply various data mining methods. This data set was obtained by one of the co-authors from Small Business Administration (www.sba.gov). Since its publication (Li et al., 2018), the authors have received inquiries from researchers around the world to use the data for their research or thesis and this data set has also been used by many others on Kaggle (Toktogaraev 2020) for data mining projects. The first part of this project is to have students use Python to summarize the data by reproducing tables and figures in Li et al. (2018) and extract a subset of the original data, loans pertaining to the Real Estate and Rental and Leasing industry in California in (see Li et al., 2018):
(a) Write Python code to reproduce Tables 3, 4, and 5 and Figures 2 and 3 using the national SBA data (download under the "Supplemental" link).
(b) Write Python code to extract the SBA case data following Section 4.2.
This part of the project is assigned after students learn Python and Pandas. The second part of this project (see Appendix) is assigned after students have learned most classification methods to classify loans into two categories: loans that will likely default and loans that will likely be paid in full.

Learning Activities and Materials
The fourth part of the assignment is to ensure that learning activities and materials support assessments and learning objectives by answering the following questions to meet Specific Review Standards 4.1 and 5.1:
1. Do your learning activities support your assessments? Consider eliminating learning activities from your current semester that do not help students be successful for the assessments you have developed.
2. Do you provide a variety of learning activities besides reading?
3. Do your learning activities permit students to interact with each other?
4. How will you interact with your students as part of the learning activities?
5. Do your students have access to course materials and technology that support the learning activities?
6. Do your learning materials meet accessibility standards?
7. Have you considered equity-related issues?

The learning activities were revised during the course to include:
(a) Reading assignments with quiz at the beginning of the class to assess whether students have completed the reading assignment.
(b) Class discussion of important topics from reading in zoom and its Breakout rooms.
(c) Homework assignments.
(d) Quizzes.
(e) Exams.
(f) Students share their homework and Python code in zoom.
(g) Discord (discord.com) group for students to discuss the course outside class.

All interactions between the instructor and students take place in zoom (csus.zoom.us) during class periods and office hours. Students access all course materials in Canvas. The "Accessibility Checker" and ALLY tool within the course in Canvas were used to fix all accessibility problems, e.g., the HTML's heading structure in the syllabus was adjusted to the right level.

Equity-related issues were examined through an assignment in the course and most were already addressed in the syllabus. A welcome page, the first page students see in the Canvas course, explains what the course is about, what tools students need, the expectations, where to find course related information in this Canvas course, how students will receive course updates, and when to meet in zoom. The syllabus includes policies, course time commitment, required technical skills, links to Canvas Student Tour and technical assistance, important tips for success, links to various student support services, Statement of "Inclusivity", expectations of the students and the instructor. The instructor asked us to consider the type of images and media content to reflect principles of equity and adjustments were made. For example, audio captions are automatically added to lecture videos hosted on the University's Mediasite system through AutomaticSync, a captioning provider that the University contracts with. Some students need audio captions for the instructor's lecture videos and captioning is legally required. All instructors were instructed by the University not to require students to have their video cameras on in zoom as some students may feel uncomfortable showing their surroundings in their homes.

The adopted textbook (Shmueli et al., 2020) is accessible to undergraduate business students as it does not require an understanding of calculus or matrix algebra. It focuses on data mining concepts and applications, with the related algorithms implemented in Python. Even though Python is adopted in these courses, the author is more familiar with R and is also open to teach such courses using R, especially at the graduate level for which excellent textbooks are available, e.g., James et al. (2021), Taddy et al. (2023).

Tools and Technologies
The fifth part of the assignment is to consider the tools and technologies that the instructor will need for the online course to support active learning and student engagement to meet Specific Review Standard 6.1. Tools are software or applications that will permit the instructor to deliver the course content and assessments. These tools are part of Canvas (canvas.csus.edu) or can also be external to Canvas such as Flipgrid. Examples of tools are discussion boards, gradebooks, StudyMate, quiz tools, Turnitin, online proctoring tools, etc. The tools needed for learning activities in Modules 1 and 2 are discussion boards, gradebooks, announcements, assignment and quiz tools. All instructional materials are hosted in Canvas. Students also access the Canvas courses via the Canvas app installed on their iOS or Android devices. Students complete homework using JupyterLab in Anaconda (www.anaconda.com) and submit their Jupyter Notebook files using Canvas' "Assignments" tool. The instructor assigns grades and provides comments in Canvas for each assignment. The "Discussions" tool in Canvas is used for Q&A after class and for graded discussion assignments. Students join the zoom class meetings scheduled in Canvas. Students use the "chat" tool in zoom for Q&A or sharing information during class. The "Polls" feature in zoom is used often by the instructor during class to poll students to see if they understand the lecture. All lectures are automatically recorded in zoom cloud. Lecture recordings and audio transcripts are available in zoom cloud soon after class so students can review the lectures. Both the instructor and students share Python code on their computers with the class using the "Share Screen" feature of zoom. Students are asked to explain the code they share on screen in class. Then the author provides more clarification of the code and helps correct any mistakes in students' code. The author also obtained a Microsoft Surface Pro computer to write over the lecture slides (highlighting, drawing, deriving a formula, etc.) using a Microsoft Surface Pen.

Python and its scikit-learn library are widely used in data mining and machine learning. Most of our students are career orientated and eager to learn Python and R after seeing both programming languages in job descriptions related to analytics and data science. Both the author and his students have found the efforts using Python in the business

analytics curriculum interesting and rewarding. The biggest challenge to teaching undergraduate business analytics students data mining using Python is how to teach them enough Python needed for data mining. Many of the enrolled students have taken a Python programming course but did not learn Pandas, NumPy, or Scikit-Learn libraries needed for data mining. The author spends the first six weeks of the 16-week data mining course on Python data structures, Pandas, NumPy, and Scikit-Learn. The classification, prediction, and clustering methods have Python implementation in the Scikit-Learn library with the exceptions of market basket analysis and collaborative filtering, for which the libraries "mlxtend" and "surprise" are needed. The Pandas library is perfect for data manipulation and analysis. Pandas' simple syntax allows data prepared easily and quickly for analysis without much coding in Python. However, it is critical for students to first understand the data structures of Python: *lists*, *tuples*, *dictionaries*, *ndarray* (NumPy array). The Pandas library introduces two new data types: array-like one-dimensional *series* and two-dimensional *DataFrames*. Many Python libraries including the popular Scikit-Learn library for machine learning depend on NumPy. NumPy and Pandas are closely related. Pandas *series* and *DataFrames* use Numpy arrays. They can be passed to many NumPy operations while Numpy arrays can be passed to many *Series* and *DataFrame* operations. Once the students understand these data types, they are ready to use the Scikit-Learn machine learning library for most data mining methods. The author finds Deitel and Deitel (2020) to be an excellent textbook for the first six weeks of the course to learn Python, focusing on Chapter 5 Sequences: Lists and Tuples, Chapter 6 Dictionaries and Sets, and Chapter 7 Array-Oriented Programming with NumPy. Chapter 7 ends with Pandas *Series* and *DataFrames* and students then watch the tutorial video on Pandas by Chen (2017). Deitel and Deitel (2020) is a comprehensive textbook covering all aspects of the Python programming language as well as data mining and machine learning using Python. It also serves as a reference text for the second course "Advanced Business Analytics" required of all business analytics students. The JupyterLab application of Anaconda (www.anaconda.com) is used as the coding environment. Deitel and Deitel (2020) provide excellent videos explaining all Python programing topics, including how to install Anaconda. Students also learn several Python libraries for data visualization: Matplotlib (matplotlib.org), pandas, seaborn, gmaps and cartopy, which support various data mining methods in Shmueli et al. (2020). The Python lessons during the first six weeks are reenforced by the Python example code in the data mining textbook by Shmueli et al. (2020). At the beginning of each chapter, an overview is provided for the relevant Python libraries. Detailed discussions then follow to explain the functions and methods (methods here mean some calculation or operation performed in the Python environment) from the Python libraries such as Pandas and Scikit-Learn. These discussions are supported by example code.

Course Map
The sixth part of this assignment is to check alignment of all parts explained above in a course map: Course Learning Objectives, Module Learning Objectives, Assessments, Learning Activities, Learning Materials, Tools for Assessments, and Tools for Learning Activities.

STUDENT FEEDBACK

Before the implementation of these Quality Matters™ standards, the average score of Course Evaluations (1-Very Poor, 5-Very Good) was 3.67 but only 2 students completed this course evaluation during the COVID-19 pandemic in December 2020. After the implementation of all Quality Matters™ standards described above, the course evaluation scores from a sample of 8 (out of 14) students in December 2021 improved significantly:

Area Course Evaluation	Average Rating
1. Knowledge of the subject.	4.75
2. Preparation for the course.	4.38
3. Ability to make subject matter understandable.	4.00
4. Mutual respect (Instructor's respect for students and visa-versa).	4.75
5. Effective use of class time and/or course resources.	4.75
6. Ability to enhance learning through intellectual stimulation.	4.63
7. Relevance of assignments to the course.	4.63
8. Fairness and impartiality in grading.	4.88
9. Which rating best describes this instructor?	4.75

SUMMARY

This article discusses how Quality Matters™ (2018) standards can be applied to design an online data mining course delivered during the COVID-19 pandemic. The author shares his experience teaching undergraduate business students data mining using Python. The author's experience and student evaluation show data mining using Python can be effective and accessible to undergraduate business students majoring in business analytics. Many business analytics programs have been launched during recent years for graduate students but undergraduate business analytics students should also have access to such curriculum using a modern programming language Python. The author hopes sharing this experience using Python complements other educators (Wu et al., 2015) who have successfully demonstrated teaching undergraduate business students data mining using R.

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APPENDIX: PROJECT

Include your name and answers in a Jupyter notebook (.ipynb file) and submit it in Canvas by the due date.

The U.S. Small Business Administration (SBA) was founded in 1953 on the principle of promoting and assisting small enterprises in the U.S. credit market. Small businesses have been a primary source of job creation in the United States; therefore, fostering small business formation and growth has social benefits by creating job opportunities and reducing unemployment. One way SBA assists these small business enterprises is through a loan guarantee program which is designed to encourage banks to grant loans to small businesses. SBA acts much like an insurance provider to reduce the risk for a bank by taking on some of the risk through guaranteeing a portion of the loan. In the case that a loan goes into default, SBA then covers the amount they guaranteed. There have been many success stories of start-ups receiving SBA loan guarantees such as FedEx and Apple Computer. However, there have also been stories of small businesses and/or start-ups that have defaulted on their SBA-guaranteed loans. The rate of default on these loans has been a source of controversy for decades. Conservative economists believe that credit markets perform efficiently without government participation. Supporters of SBA-guaranteed loans argue that the social benefits of job creation by those small businesses receiving government-guaranteed loans far outweigh the costs incurred from defaulted loans. Since SBA loans only guarantee a portion of the entire loan balance, banks will incur some losses if a small business defaults on its SBA-guaranteed loan. Therefore, banks are still faced with a difficult choice as to whether they should grant such a loan because of the high risk of default. One way to inform their decision making is through analyzing relevant historical data such as the datasets provided here. The case study focuses on loans pertaining to the *Real Estate and Rental and Leasing* industry in California. The relevant data are extracted from the National SBA file to create this file which has 2,102 observations and 35 variables.

VARIABLE DESCRIPTIONS: The data reside in a comma-separated values (csv) file. A header line contains the name of the variables.

Variable Name	Data Type	Description of variable
LoanNr_ChkDgt	Text	Identifier – Primary Key
Name	Text	Borrower Name
City	Text	Borrower City
State	Text	Borrower State
Zip	Text	Borrower Zip Code
Bank	Text	Bank Name
BankState	Text	Bank State
NAICS	Text	North American Industry Classification System code
ApprovalDate	Date/Time	Date SBA Commitment Issued
ApprovalFY	Text	Fiscal Year of Commitment
Term	Number	Loan term in months
NoEmp	Number	Number of Business Employees
NewExist	Text	1 = Existing Business, 2 = New Business
CreateJob	Number	Number of jobs created
RetainedJob	Number	Number of jobs retained
FranchiseCode	Text	Franchise Code 00000 or 00001 = No Franchise
UrbanRural	Text	1= Urban, 2= Rural, 0 = Undefined
RevLineCr	Text	Revolving Line of Credit : Y = Yes
LowDoc	Text	LowDoc Loan Program: Y = Yes, N = No
ChgOffDate	Date/Time	The date when a loan is declared to be in default
DisbursementDate	Date/Time	Disbursement Date
DisbursementGross	Currency	Amount Disbursed
BalanceGross	Currency	Gross amount outstanding
MIS_Status	Text	Loan Status
ChgOffPrinGr	Currency	Charged-off Amount
GrAppv	Currency	Gross Amount of Loan Approved by Bank
SBA_Appv	Currency	SBA's Guaranteed Amount of Approved Loan
New	Number	=1 if NewExist=2 (New Business), =0 if NewExist=1 (Existing Business)
Portion	Number	Proportion of Gross Amount Guaranteed by SBA
RealEstate	Number	=1 if loan is backed by real estate, =0 otherwise
Recession	Number	=1 if loan is active during Great Recession, =0 otherwise
Selected	Number	"Ignore this variable"
Default	Number	=1 if MIS_Status=CHGOFF, =0 if MIS_Status=P I F
daysterm	Number	Extra variables generated when creating "Recession"
xx	Number	Extra variables generated when creating "Recession"

Source: the background information and description of the dataset above for this project are extracted from Li et al. (2018).

Apply *k*-NN, Naïve Bayes, Logistic Regression, Neural Networks, Bagging, Random Forests, Boosting, and Classification Trees (apply GridsearchCV to training data coupled with cross-validation) to classify a loan application as a "lower risk" (approve) or "higher risk" (deny), based on appropriate predictors. Partition the data into training (50%), validation (30%), and test (20%) sets. Normalize data where it's appropriate. Find the best *k* for *k*-NN. Report classification accuracy rate for training, validation, and test data. Produce the lift and gains charts for all classifiers.

Jujutsu Persuasion: Learning How to Coopt with Another's Values

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ABSTRACT

The purpose of this pedagogical paper is to present three innovative exercises that foster learning of oral-persuasion skills at the undergraduate and graduate levels. Namely, business students are instructed to frame their arguments on delicate issues with the other person's values. The technique is called jujutsu persuasion because it uses an adversary's force (i.e., their key values) against them, instead of attempting to persuade with one's own values. Prior research has shown that jujutsu persuasion can moderate the other person's more extreme attitudes and reduce their defensiveness. Using Bloom's Taxonomy as a framework, the first exercise develops knowledge and understanding by having students experience and reflect on the jujutsu-persuasion technique. In the second exercise, students apply and analyze the persuasion technique by developing and experimenting with framing arguments using another person's values. In the third exercise, students engage in a role play to further apply and analyze the jujutsu-persuasion technique.

Keywords: oral persuasion, communication framing, values, cooptation, civility, undergraduate, MBA

INTRODUCTION

Oral communication is unquestionably one of the most important competencies for success in the workplace (Brink & Costigan, 2015; Hynes, 2012; Kane, 1993). One type of oral communication – persuasion – is particularly crucial to possess in a variety of managerial and non-managerial roles. As evidence, Costigan and Brink (2021) noted that persuasion skills are critical to have in 37% of the 967 jobs appearing in the U.S. Department of Labor's O*NET database. Furthermore, "Persuading and Influencing" is one of the key competency dimensions in Bartram's (2005) Great Eight competency model of workplace performance. Similarly, Tett, Guterman, Bleier, and Murphy (2000) included "Motivating by Persuasion" as one of the essential competencies in their hyperdimensional taxonomy of the managerial role, even describing it as the essence of leadership. Moreover, persuasion is among the 10 characteristics of servant leadership (Northouse, 2016).

Persuasion seems especially important today, given the increasing incivility in all sectors of society, including the workplace. Incivility in terms of putting people down and making shameful comments is a big problem in today's workplace (Schilpzand, De Pater, & Erez, 2016). The encroachment of divisive national politics into coworker relationships seems to be a new norm (Pedrow & Cognato, 2017). One survey (see D'Costa, 2018) reported that 80% of the workforce had discussed politics with professional contacts or colleagues, and nearly 50% had witnessed political conversations turn into arguments. A recent Randstad Inc. survey (see Smith, 2018) showed 55% of the sampled workforce had observed an overly heated political conversation. Seventy-two percent of these employees indicated that they experienced significant anxiety during the argument. Another 44% responded that these impassioned discussions had negatively impacted their productivity. In another survey, 25% of workers felt that their strong political convictions could negatively impact their chances of promotion (see Wolfe, 2018). Notably, these disturbing statistics are all from before the COVID pandemic and the 2020 presidential election, both of which evolved into highly divisive events. Indeed, political quarrels and business disputes are happening more often in organizations. Discovering ways to diffuse such strong emotions and weaken extreme stances seem needed now more than ever.

Given the import of persuasion skills, it is surprising that the development of business students' persuasion skills has received so little attention in the academic literature. We expanded upon and updated Costigan and Brink's (2021) search of the persuasion literature over the past two decades and found only four published articles (i.e., Brownell & Jameson, 2004; Kinnick & Parton, 2005; Rawlins, 2014; and now Costigan and Brink's 2021 publication) in the leading management-education and business-communication journals (i.e., *Business and Professional Communication Quarterly*, *Business Education Innovation Journal*, *Journal of Education for Business*, *Journal of Management Education*, *Management Learning*, and *Management Teaching Review*). There seems to be a mismatch in the importance of persuasion skills in the workplace and the unimportance that pedagogical journals and perhaps business-education scholars have given to this topic. Instructing management educators on ways to upgrade their students' persuasion skills in interpersonal relationships has presumably not been a priority.

Although needed, persuasion has proven to be a challenge for young business professionals – doing it well has not been easy for this population (Reinsch & Shelby, 1997). Apparently, it is a skill that takes time, practice, and experience to develop. To close the literature gap, Costigan and Brink (2021) offered online pedagogical exercises designed to help MBA students enhance their persuasion skills and their ability to diffuse polarizing stands on heated issues. Their findings suggest that the MBA's use of the role-play partner's values in framing counterarguments moderated the partner's viewpoint and lessened his/her defensiveness. Both parties in the role play noted that they could have a cordial conversation without becoming overly irritated. Although preliminary evidence supports the use of this persuasion technique, it is challenging and complex; more than 20% of MBA students failed to correctly use the technique, suggesting that MBA students may benefit from more remedial exercises. Remedial exercises will also make the technique more amenable to undergraduate business students.

The main objective of this paper is to expand upon the pedagogical recommendations provided by Costigan and Brink (2021) and propose innovative instructional possibilities for elevating the persuasion skills of all business students, but especially undergraduates. We give primary attention to the strategic use of values in persuading others in dyadic conversations. Past research linking values and persuasion will be discussed first. Then, we describe the literature and related pedagogy that can be used for persuading individuals even when their deep-rooted values may differ.

REVIEW OF LITERATURE

Scholars have opined long ago that effective persuasion requires knowing your opposition. Aristotle noted that an element of persuasion is ethos, which is the speaker's credibility (Faber, 1998). This credibility increases when the speaker's expressed values are in alignment with the values of the listening audience (Baldwin, Bommer, & Rubin, 2008). Karlins and Abelson (1970) reported that personal qualities will affect one's capacity to be persuaded. The target's personal qualities should be considered first and then a persuasive message that is consistent with these unique needs, aspirations, goals, and values can then be developed.

Management-development books (Baldwin et al., 2008; Robbins & Hunsaker, 2003; Whetten & Cameron, 2002) emphasize that overlooking the persuasion target's personal attributes may act as a barrier to a successful persuasion bid. Tailoring the argument to the target's characteristics and appealing to their interests are ways of becoming more persuasive (Robbins & Hunsaker, 2003). Baldwin et al. (2008) recommended that finding answers to questions such as "what is important to the target" is critical to achieving successful persuasion.

Wickert and DeBakker (2018) offered a similar strategy that change agents can use to promote corporate social responsibility (CSR) inside organizations; they advised CSR proponents to take into consideration the personal values of the target of change when forming persuasive CSR arguments. Breaking impasses in negotiations also calls for an understanding of a counterpart's interests, often rooted in their underlying values, and then acting on these interests to move the negotiations forward (Lax & Sebenius, 1986). Likewise, effective leadership requires knowing follower values. Transformational leaders, for example, appeal to the values of their followers (Bass, 1985; Burns, 1978). Clarifying values and affirming shared values is the first behavioral competency in Kouzes and Posner's (2007) leadership model.

Persuading with Another Person's Values Using the Jujutsu-Persuasion Technique

Persuading with communication framing is a tactic aimed at grabbing the attention and then gaining the support of listeners by pointing them towards the more conspicuous parts of a message (Druckman, 2001). Druckman (2001, p. 490) documented the strong effects of communication framing on attitudes saying that "values … are powerful and reliable weapons in the persuader's arsenal." Not surprisingly, prior political-psychology research has demonstrated that a political candidate is generally more acceptable to an audience when the candidate's value-based language matches the audience's values (Nelson & Garst, 2005).

Deep-rooted values are often the foundation of polarizing attitudes expressed by individuals (Hornsey & Fielding, 2017). Feinberg and Willer's (2015) research gives support to the values foundation of attitude roots. Their studies showed that both liberals and conservatives futilely compose "persuasive" messaging that reflects their own values, not the values held by the other individual. Virtually, everyone persuades this way – discussing and quarreling in ways that we are most comfortable. With this persuasion tact, a gulf remains between the opposing sides. "Individuals on both ends of the (liberal-conservative) continuum tend to speak past one another, advocating for a given position with value-laden language they find most convincing" (Costigan & Brink, 2021, p. 87). Our adversary's attitudes continue unmoved when arguments are framed in language consistent with one's own values (Feinberg & Willer, 2015).

Feinberg and Willer's (2015) results demonstrated support for a different persuasion tact. When arguments are framed in words that appeal to the values of the other person, it is more likely that we will be successful in persuading them (i.e., moderating their more extreme attitudes). More simply, our adversary becomes more favorable to our stance when we use their values to frame our arguments. Hornsey and Fielding (2017) advocated for the use of a comparable approach, which they termed jiu jitsu persuasion. (In this paper, we opt for the more conventional spelling of jiu jitsu, which is jujutsu.) In Hornsey and Fielding's reckoning, there is a parallel between the jujutsu martial-art and jujutsu persuasion. They say that both use the opponents' force against them, instead of attempting to beat them head-on.

After applying Hornsey and Fielding's (2017) jujutsu thinking and Feinberg and Willer's (2015) results to an MBA learning experience, Costigan and Brink (2021) reported that most MBAs were able to use this persuasion technique successfully in a role play. As such, the role-play partner chose a controversial business topic (e.g., whether CEO pay in today's organizations is fair, whether affirmative action is still necessary in organizations), and then after some reflection, presented their arguments in favor of their chosen side of the issue. The MBA's counterarguments were framed with the role-play partner's liberal or conservative values. Costigan and Brink reported that when the MBA made counterarguments framed with the role-play partner's values, the partner's attitude on the topic seemed to become less extreme. One role-play partner said that they were surprised at how much they agreed with the MBA's counterarguments. In sum, a shift in the other person's attitude seemingly occurred in these role plays when the MBA used the collocutor's values to frame his or her arguments.

Costigan and Brink (2021) applied jujutsu persuasion at the MBA level. In their research, MBAs identified ways that this persuasion strategy could be utilized in their workplace relationships and role-played this technique with a trusted coworker, relative, or friend. Minimal instruction and feedback on their performance in the role play were given to these MBAs. Considering Reinsch and Shelby's (1997) caution that oral persuasion gives the younger employee their biggest communication challenge, it makes sense to extend persuasion instruction to undergraduate business students to better prepare them for workplace situations calling for this skill early on. In addition, although most MBAs in the Costigan and Brink study successfully used the technique, more than 20% did not, suggesting that MBAs may also benefit from more remedial exercises before conducting the role play. Consequently, we are proposing primer exercises for introducing jujutsu persuasion with a series of more basic hands-on pedagogies.

PEDAGOGIES FOR DEVELOPING JUJUTSU-PERSUASION KNOWLEDGE AND SKILLS

Exercise 1: Expose Students to the Jujutsu-Persuasion Technique
To gain an understanding of jujutsu persuasion, we have students experience Feinberg and Willer's (2015) stimulus materials on an individual basis. This activity can be completed in class or as an assignment. We slightly modified the stimulus materials employed in their experiments. To begin, we ask each student the following question: "When it comes to political and social issues concerning one's moral convictions, do you consider yourself more liberal or more conservative?" Students are advised to choose one or the other orientation, meaning that they do not need to be extremely liberal or conservative, just tending more liberal or conservative. A response of neither or both would be unacceptable for this exercise.

The specific purpose of this first exercise is to expose students to the jujutsu-persuasion technique. Liberal students read the stimulus materials designed to persuade them to adopt a more conservative attitude by presenting them with conservative arguments framed in language reflecting liberal values. Conservative students, on the other hand, read other materials designed to persuade them to adopt a more liberal attitude by presenting them with liberal arguments framed in language reflecting conservative values.

Specifically, those students indicating that they tend to be liberal are asked to read "Leveling the Playing Field with English" (Reading 1 in the Appendix). This conservatively written narrative argues in favor of installing English as the official U.S. language which, according to Feinberg and Willer's research, liberals would normally not agree with. In line with Feinberg and Willer's (2015) procedures, these conservative arguments are framed with values typically preferred by liberals (e.g., caring for others, protecting others from harm, giving to others, social justice, and fairness). After reading this narrative, the liberal students are asked: "Do you tend to favor installing English as the official language in the U.S.?" A five-point scale anchored with 1 = "strongly disagree" and 5 = "strongly agree" is used for this rating. The liberal students are then asked to read a second narrative ("The Military Provides a Fair Chance for Minorities and the Poor") which favors an increase in military spending. According to Feinberg and Willer (2015), most liberals would be against such an increase. This second narrative (Reading 2 in the Appendix) includes

conservatively written arguments framed with some of the same liberal values listed above. After reading this narrative, the liberal students are asked whether: "Cutting funding to the military would be a mistake?" The same five-point scale anchored with 1 = "strongly disagree" and 5 = "strongly agree" is used for the rating of this second reading. After finishing their two ratings, the liberal students are debriefed on the exercise. They are asked to read the short liberal debriefing which appears after the rating of the second reading. They are also asked to peruse Readings 3 and 4 and the related Conservative Debrief that follows as well as the Overall Debrief appearing at the end of the Appendix.

The purpose of Readings 3 and 4 in the Appendix is to persuade conservative-leaning students to adopt a more liberal attitude by presenting them with liberal arguments framed in language reflecting conservative values (e.g., patriotism, loyalty, respect for authority, respect for tradition, self-discipline, self-sufficiency, sanctity, purity for maintaining good health). These conservative values are noted in Feinberg and Willer's (2015) research. More specifically, the conservative students read the narrative titled "Universal Health Care for Everyone" (Reading 3 in the Appendix). Feinberg and Willer (2015) present a liberal narrative arguing in favor of universal health care for all citizens; as said, these liberal arguments are framed with conservative values. After reading this liberal narrative, the conservative students are asked: "Do you tend to favor universal health care for all U.S. citizens?" The same five-point rating scale is used for this rating. The conservative students are asked to read a second narrative: "Gay Americans are Proud and Patriotic Americans" (Reading 4 in the Appendix). Reading 4 includes liberally written arguments framed with some of the same conservative values given above. After reading this narrative, the conservative students are asked: "Regardless of what the courts have decided, I think that same-sex couples should be allowed to marry." The same five-point scale is used for this rating. After finishing the two ratings, the conservative students are debriefed on the exercise. They are asked to read the short conservative debriefing which appears after Reading 4. Next, they are instructed to peruse Readings 1 and 2 and the related Liberal Debrief and finally the Overall Debrief shown at the end of the Appendix.

The Liberal and Conservative Debriefs and the Overall Debrief explain Feinberg and Willer's (2015) experimental procedures and results. Instead of having the students decipher the details in the debriefings completely on their own, we suggest a follow-up session during class time in which the course instructor explains the debriefings, especially the Figure in the Overall Debrief. Each student is asked to compare their ratings to the ratings made by the liberal (or conservative) participants in Feinberg and Willer's (2015) experiments. The Overall Debrief addresses whether the "reframed messages" presented in the different readings persuaded each student (or not) towards a more supportive viewpoint on the issue that s/he assessed. Feinberg and Willer's results are shown on the four continuums in the Figure. If the student's two ratings are close to or higher than the "reframed message" mean ratings in the Figure, then jujutsu persuasion worked as planned. As a point of contrast, the "typical, non-framed" mean ratings in the Figure reflect the typical results of either liberals or conservatives in Feinberg and Willer's studies who were not shown the reframed message but were shown instead arguments framed in values that run contrary to one's own beliefs. In this first exercise, if a student's ratings are closer to the "typical non-framed" results, it suggests that the "reframed message" framed with his/her own values (i.e., jujutsu persuasion) had no effect in persuading this student.

The purpose of this exercise is to expose students to the persuasion technique of framing arguments according to another person's values and to have students reflect on the extent to which this framing technique may have swayed their opinions on the topics discussed in the readings. Of course, liberalism versus conservatism is a continuum rather than a dichotomy. Students will vary widely on this spectrum, and even those who are strongly liberal (or conservative) may not agree with all liberals (or conservatives) on all issues. When implementing this exercise, it is important to prevent the conversation from stalling on these limitations; rather, the course instructor should acknowledge these limitations and redirect students to the general purpose of the exercise.

Exercise 2: Jujutsu Persuasion Quasi-Experiment

In exercise 2, students work in small groups to (1) identify a "hot-button" business topic, (2) use the jujutsu-persuasion technique to develop arguments and identify appropriate values in favor or against the chosen topic, and (3) gather data to investigate whether the designed persuasion arguments and connected values produced the expected results. For the exercise, we recommend four students in each group. Because of the complexity of this activity, we suggest having the groups work on this task during class time so that they can ask clarifying questions of the instructor. If the group does not complete the assigned work, then finishing the assigned work outside of class time is an option. Costigan and Brink (2021; see Table 2) provide several business topics that could be used for this exercise. Additional topics might include:

- In favor of employment laws prohibiting discrimination against transgender people (typically preferred by liberals) vs. against employment laws prohibiting discrimination against transgender people (typically preferred by conservatives).
- Requiring employees to receive COVID vaccinations to remain employed by the organization (preferred by liberals) vs. not requiring employees to get COVID vaccinations (preferred by conservatives).
- In favor of companies requiring employees to attend diversity training that focuses on implicit bias and critical race theory (preferred by liberals) vs. against companies requiring or offering diversity training that focuses on implicit bias and critical race theory (preferred by conservatives).

After choosing a business topic, each group then develops four sets of arguments on the chosen topic, representing four quasi-experimental conditions. The two treatment conditions attempt to frame arguments using a collocutor's values whereas the two control conditions attempt to frame the same arguments using the persuader's own values. We suggest that the four sets of arguments and values be pilot-tested with a few persons not in the course to ensure that they are clearly written and understandable. The argument/value sets are as follows:

1) Conservative-to-liberal treatment: Arguments in favor of a liberal issue, but framed with conservative values (i.e., patriotism, loyalty, respect for authority, respect for tradition, self-discipline, self-sufficiency, sanctity, purity for maintaining good health). These are intended to persuade the more conservative individuals to favor liberal arguments.
2) Liberal-to-conservative treatment: Arguments in favor of a conservative issue, but framed with liberal values (i.e., caring of others, protecting others from harm, giving to others, social justice, and fairness). These are intended to persuade the more liberal individuals to favor conservative arguments.
3) Conservative-to-liberal control: Same arguments as above in favor of a liberal issue, but framed with liberal values. These are intended to persuade the more conservative individuals to favor these liberal arguments. Although this approach is more typically used in persuasion, it is expected to be less effective compared to the conservative-to-liberal treatment arguments.
4) Liberal-to-conservative control: Same arguments as above in favor of a conservative issue, but framed with conservative values. These are intended to persuade the more liberal individuals to favor these conservative arguments. Although this approach is more typically used in persuasion, it is expected to be less effective compared to the liberal-to-conservative treatment arguments.

Once the arguments and respective value sets are developed, each member of the four-person team asks 10 or more students (participants) in their other classes to complete this experiment. Note that this may require the approval of the university's institutional review board. The team member asks whether the participant tends to be more liberal or conservative when it comes to political and social issues. Each conservative participant is given either the conservative-to-liberal treatment arguments or the conservative-to-liberal control arguments. Each liberal participant is given either the liberal-to-conservative treatment arguments or the liberal-to-conservative control arguments. After reading their assigned narrative, all participants then complete a rating such as: I am in favor of _____. The anchors for this five-point scale are 1 = "strongly disagree" and 5 = "strongly agree".

Once all data are gathered, the four-person team sorts the survey responses into their respective experimental cells (i.e., the four experimental conditions) and computes a favorability mean rating for each condition. If the students have had a statistics class, have them run a t-test comparing the two liberal-to-conservative conditions (i.e., treatment versus control) and then a second t-test comparing the two conservative-to-liberal conditions (i.e., treatment versus control). If the students have not had a statistic course, they can simply examine the mean rating for the treatment condition relative to the mean rating for the respective control condition. It would be expected that the treatment conditions should yield more favorable ratings (i.e., higher means) compared to the respective control conditions. Students should examine the data and results and consider whether the conditions appear to differ in the way that jujutsu persuasion would predict. More generally, did the experiment work as planned? If not, what changes should the team make to the four sets of arguments and values framing these arguments? Even if the experiment worked as planned, the team is encouraged to make changes to improve their arguments and respective values for the upcoming role-play activity.

Exercise 3: Jujutsu-Persuasion Role Play
In the third exercise, students engage in a role play using the jujutsu-persuasion technique. Each student in the 4-person team chooses a student in another course, a coworker, or an acquaintance to role play with using the arguments and respective values developed in the second exercise. The selected role player should not be familiar with jujutsu persuasion. We recommend that these dyadic role plays be assignments taking place outside of class

time. To begin, the team member asks the role-play partner whether s/he tends to be liberal or conservative on political and social issues. Next, the team member shows the role-play partner the side of the argument that matches his/her liberal (or conservative) orientation. If the partner does not agree with the side of the argument, the team member should find another role player. Once a suitable match is found, the team member should take the opposite side of the argument whether they agree with it or not. The team member is to use the final version of the arguments and respective values in the relevant condition (i.e., liberal-to-conservative treatment or conservative-to-liberal treatment) constructed in the second exercise. (The arguments and values constructed for the two control conditions are not to be used in these role plays.) The role-play partner should be given adequate time to prepare his/her arguments for the role play. At the scheduled time, the team member and role-play partner commence the role play. A cell phone is used to record the role-play interactions. Note that this exercise may require the approval of the university's institutional review board.

Next, each team member's recording of their role play is shown to the other three team members during class time. The three team members give feedback on the extent to which: the team member's arguments and values were used persuasively, the role play remained civil (absent of defensiveness), the non-verbal behaviors were appropriate in the conversation, listening in the role play was good, oral expression was effective, and agreement on the topic was reached. We recommend the use of behaviorally anchored rating scales (BARS) to enhance the feedback given by team members. The development of BARS rubrics is discussed elsewhere (e.g., Campbell, Dunnette, Arvey, & Hellervik, 1973; Ohland, Loughry, & Woehr, 2012; Thornton & Mueller-Hanson, 2004). Sample BARS rubrics for listening and oral expression are provided by Costigan and Brink (2020, pp. 157-158). Scales such as these will enrich the feedback process for each team member participating in the role play. To broaden the feedback further, the course instructor could also review and assess each student's performance in the recorded role play.

CONCLUSION

The maxim "know your audience" is at the crux of jujutsu persuasion. More precisely, knowing your adversary's values and then basing arguments and counterarguments framed with these values is the key to using this persuasion tactic properly. Note that the target of jujutsu persuasion is an individual. Public speakers use a similar strategy often; typically, they consider all sorts of audience characteristics, such as demographic qualities, occupational, and non-work interests, whereas jujutsu persuasion focuses solely on the values of the other person to form arguments. Across multiple disciplines (e.g., political psychology, psychology, business), the use of a collocutor's values to frame arguments is proving to be reliable and effective in the persuasion activity. In this paper, we have relied on Feinberg and Willer's (2015) liberal/conservative value scheme to frame arguments. Broadening this framing approach beyond liberalism and conservatism to personal values held dear by another person might be explored and developed in future pedagogical research. A boss, for example, who prizes customer satisfaction might respond better to any employee proposal when it is framed with maximizing customer satisfaction.

We suggested a series of pedagogies for developing jujutsu-persuasion skills. The first pedagogy provides an understanding of jujutsu persuasion via participation in Feinberg and Willer's (2015) studies. This pedagogy gives a clear blueprint on how to successfully construct persuasive messaging with values framing. The second pedagogy has small student groups replicating Feinberg and Willer's studies with their own construction of a jujutsu-persuasion experiment. The third pedagogy has students practicing jujutsu persuasion in a role play. Peer and instructor feedback critiquing each student's persuasion skills and supporting communication behaviors are planned after observing the video recording. Even with this guidance, jujutsu persuasion can be complex and challenging to use. It is counter-intuitive and requires a lot of preplanning around a collocutor's values instead of simply fighting back with arguments framed in one's own values. Practice in jujutsu persuasion is critically important – learning to utilize this technique on an impromptu basis is the goal. We recommend that jujutsu persuasion be used strategically, reserved for more crucial conversations when moderating an opponent's attitude and diffusing their defensiveness are important.

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APPENDIX: READINGS FROM FEINBERG AND WILLER (2015)[1]

[Instructions for the readings assigned to liberal students:]
Read "Leveling the Playing Field with English" and then complete the survey item that follows. Next, read "The Military Provides a Fair Chance for Minorities and the Poor" and complete the survey item.

Reading 1: "Leveling the Playing Field with English"
When immigrants come to America they have a choice – learn English or not. Many choose to not learn it. Who can blame them? It is not easy learning another language. But the choice to not learn English puts these new immigrants at an extreme disadvantage in society. Immigrants who do not speak English earn substantially less money, are **rarely treated as equal** members of society, and are often **discriminated against**. For these reasons, we should make English the official language of the US. Doing so will not force immigrants to stop speaking their native language, it will simply push them to learn English so they have a greater chance of succeeding and being **treated more equally** by other members of society. No wonder such a large majority of Americans (approximately 90%), including recent immigrants, advocate for making English the official language of the US.

According to the 2000 census, approximately 21.3 million Americans speak English 'less than well' with approximately 6.7 million not speaking English at all. Really, these non-English speakers have much less of a **fair shot** at success and happiness. They are forced to settle for backbreaking work that pays so poorly that many are poverty stricken. Specifically, immigrants who speak English earn $40,741 per year compared to $16,345 that the non-English speaking immigrants earn. Worse, they are often treated **unfairly** in their day-to-day lives – even discriminated against. They face a phenomenon called 'language discrimination', where they are **treated unfairly** and as **second-class citizens** because they do not speak English. People often ignore them or deny them service (for example, they won't be seated at restaurants), they will be treated worse by authorities (for example, police officers will treat them more like criminals when being interviewed), and they even receive harsher sentencing in court. Making English the official language of the United States will help level the playing field for these immigrants. It will compel them to learn English and will authorize the government to provide learning support for them. Instead of paying millions of tax dollars (an estimated $260 million each year) on translating documents, we should invest in helping them to learn English. Making English the official language is key to giving all immigrants an **equal opportunity** at succeeding in America.

Complete the following survey item:
I am in favor of making English the official language of the United States.

1	2	3	4	5
Strongly disagree				Strongly agree

Reading 2: "The Military Provides a Fair Chance for Minorities and the Poor"
In a society where not everyone is born into **equal socioeconomic** conditions, the military helps to level the playing field. Disadvantaged Americans who the country has traditionally discriminated against the most – the poor and minorities – can achieve **equal standing** in the military. Recently, however, people have suggested cutting military funding. Such cuts will limit the military's ability to offer **equal opportunity to minorities and the poor**, by cutting away at their chances to find employment and career advancement through the military. Many of those who join the military do not have access to other opportunities. The military recruits Americans, without concern for their race, religion, or socio-economic background. Indeed, a majority of soldiers come from economically depressed rural or urban areas where they face very limited means for pulling themselves up out of poverty. Enlisting in the military enables the rural and urban poor to break free of the **bonds of inequality**.

The military is a largely **meritocratic** institution where people compete for advancement on a level playing field not always found in America; servicemen and women are evaluated by their ability, performance, and demonstrated potential. Promotions and salary increases are awarded based on achievements and time served. Veterans' benefits such as the GI Bill, College Loan Repayment, VA housing loans, and job placement programs are available to absolutely every soldier. Being in the military means having a reliable salary and a future apart from the challenges of poverty and **inequality**. We must not cut funding to an institution that provides **equality of opportunity** and standing for all Americans.

Complete the following survey item:
Cutting funding to the military would be a mistake.

1	2	3	4	5
Strongly disagree				Strongly agree

Liberal Debrief: Readings 1 and 2 were written to change the opinion of liberals on two conservative messages (i.e., making English as the official U.S. language and not cutting the U.S. military spending). The words in **bold font** reflect key liberal values. *[Note: The two conservative readings should first be given to the liberal students with all words appearing in regular font (i.e. not bolded font) and without this boxed debrief. After completing the two ratings in this exercise, students are then provided with all four readings with the **bolded** values (i.e., conservative and liberal narratives) along with the boxed debriefings and the overall debriefing.]*

[Instructions for the readings assigned to conservative students:] *Read "Universal Health Care for Everyone" and then complete the survey item that follows. Next, read "Gay Americans are Proud and Patriotic Americans" and complete the survey item.*

Reading 3: "Universal Health Care for Everyone"

The absence of universal healthcare, often referred to as ObamaCare in the United States, practically ensures that we will have **unclean**, **infected**, and **diseased** Americans walking among us. The uninsured often develop "**diseases of poverty**", such as tuberculosis, hepatitis, toxocariasis, and other viruses or parasites that can easily spread throughout the population. **Diseases are disgusting infestations** that invade the human body and leech out needed nutrients to survive. Many of these diseases have grotesque symptoms like yellowing of the skin and eyes, coughing up bloody mucus, itchy rashes, and lesions. These **diseases are contagious** and spread through the population **infecting** many, including those who are not poor. The spread of these **diseases**, however, would be easily preventable if all Americans had healthcare. Individuals **infected with these contagious diseases** would become much less likely to **spread their sickness to others**, because doctors could provide them with medicine to cure or control the disease, and doctors could **educate these sick patients on how to avoid infecting** others.

According to a 2009 Kaiser Commission on Medicaid, there were 50 million Americans who lacked any type of healthcare insurance. At that time, the large number of uninsured was especially susceptible to **contracting infectious diseases** because they are often the poorest among us, suffering from malnutrition and stress, both of which lead to weakened immune systems. So, this means that the uninsured tend to serve as repositories that harbor and cultivate **contagions** which can then, after incubating, more easily spread to others in the population. Healthcare reform represents a major step towards the **extermination of infectious diseases**. With universal healthcare, those who are currently uninsured would be able to see doctors and become educated in how to **avoid contracting diseases,** and those who have contracted disease could get the medicine they need to cure them or at least making them **less contagious**. Overall, universal healthcare is a way of **purifying** America from some of its **most infectious diseases**, making it less and less likely that healthy individuals will ever encounter these diseases. Universal health care provides an economic benefit to companies. **Absenteeism costs due to employee health problems** would decrease with proper health care – **prevention, early diagnosis and intervention** would improve the attendance of workers in large and small businesses. To conclude, everyone should have healthcare.

Complete the following survey item:
I am in favor of universal health care.

1	2	3	4	5
Strongly disagree				Strongly agree

Reading 4: "Gay Americans are Proud and **Patriotic** Americans"
Although gay couples in America have different sexual preferences, they are still **proud Americans** like you and me. They share the same basic hopes and desires in life. They share in the American dream: to have a family, a home, a safe neighborhood and community to live in, a well-paying job, financial stability, and someone to love and share their lives with. Like other **proud Americans**, gay couples peacefully build lives together, buy homes, and contribute to the American economy and society. Like all other Americans, they deserve the right to marry the one they love.

Gay couples contribute much to the United States economy. According to U.S. Census data, gay couples contribute just as much – if not more – to the economy as heterosexual couples. Gay couples are **stable members of the American economy** – 65% of them own their own home. Homeownership is foundational to the **stability** of the American economy, and an excellent predictor of being a **law-abiding** citizen and involved in the community. As upstanding American citizens, they should be able to enjoy the complete American dream – which includes marrying the person they love. Also of note, gay men and women make up a large portion of our nation's military. There are approximately 66,000 gay members of the armed forces. Many are **bravely** serving our country in Iraq and Afghanistan, standing shoulder to shoulder with their fellow soldiers, **fighting for freedom** and **defending what America holds most dear**. Overall, gay couples are just like other American couples. They are **proud and patriotic Americans**. They **contribute greatly to our economy and communities**, and they **patriotically** serve our country. Like other **proud, patriotic Americans**, they should be allowed to marry.

Complete the following survey item:
Regardless of what the courts have decided, I think that same-sex couples should be allowed to marry.

1	2	3	4	5
Strongly disagree				Strongly agree

Conservative Debrief: Readings 3 and 4 were written to change the opinion of conservatives on two liberal messages (i.e., supportive of universal health care for all Americans and favoring same-sex couples right to marry). The words in **bold font** reflect key conservative values. *[Note: The two liberal readings should first be given to conservative students with all words appearing in regular font (i.e. not bolded font) and without this boxed debrief. After completing the two ratings in this exercise, students are then provided with all four readings with the **bolded** values (i.e., liberal and conservative narratives) along with the boxed debriefings and the overall debriefing.]*

Overall Debrief:

The more **liberal** students would normally be against making English as the official language in the U.S and against keeping the military spending strong. The <u>reframed</u> messages (i.e., reframed in the values of liberals) in Readings 1 and 2 should have caused the liberal students to become more favorable (pro) towards making English the official U.S. language and supporting military spending. If you are in the "liberal camp," did this happen? Compare your ratings to the liberal participants in Feinberg and Willer's experiments. (Their results are shown in the second and fourth continuums in the Figure below.) Are your ratings similar to the results of the liberals in Feinberg and Willer's studies who experienced conservative arguments framed with liberal values (above the mid-point)? If 'yes', then jujutsu persuasion worked as planned. As a point of contrast, the <u>typical</u> liberal position is a control group (see the second and fourth continuums in the Figure below) – the control group did <u>not</u> have liberal values framing the conservative arguments that they read. If your rating is closer to the <u>typical</u> liberal results (below the mid-points), this suggests that your reading of the conservative arguments framed with liberal values had no effect in persuading you.

The more **conservative** students would normally be against universal health care and around the midpoint on the same-sex marriage issue. The <u>reframed</u> messages (i.e., reframed in the values of conservatives) above should have persuaded the conservative students to become more favorable towards universal health care and same-sex marriage. If you are in the "conservative camp," did this happen? Compare your ratings to the conservative participants in Feinberg and Willer's experiments. (Their results are shown in the first and third continuums in the Figure below.) Were your ratings similar to the ratings of the "reframed" conservatives in their studies? As a point of contrast, the <u>typical conservative</u> position on the first and third continuums reflects the typical ratings of conservatives in the control group. The control group did <u>not</u> have conservative values framing the liberal arguments that they read. If your ratings are closer to the <u>typical conservative</u> ratings, this suggests that the reframed message had no effect in persuading you.
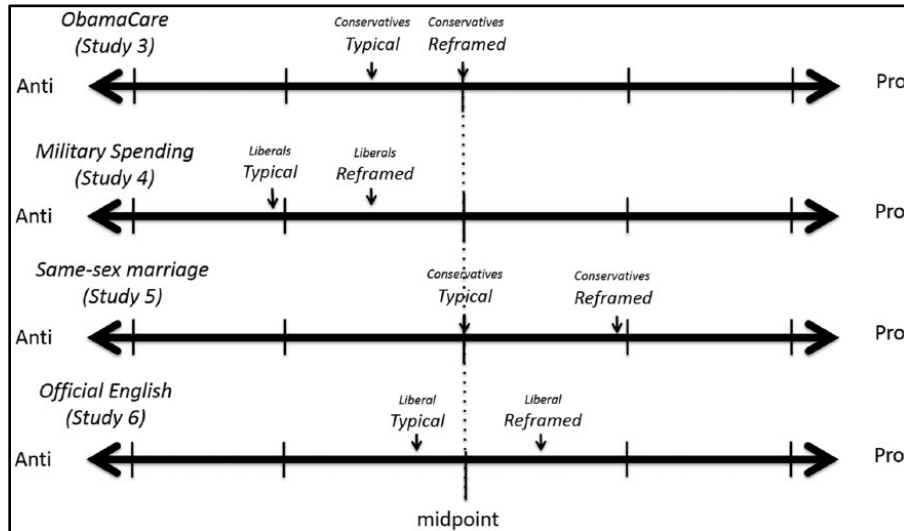
Figure. Key results from Feinberg and Willer's (2015) studies demonstrate how arguments reframed with another's values (versus the more typical arguments) affected the attitudes of their participants. Source: From *Gulf to Bridge: When Do Moral Arguments Facilitate Political Influence?* (p. 1678), by M. Feinberg and R. Willer, 2015, *Personality and Social Psychology Bulletin*, *41*(12), (https://doi.org/10.1177/0146167215607842). Copyright 2015 by Sage. Reprinted with permission.

Endnote:
[1]Source: Online supplemental stimulus materials were available at http://pspb.sagepub.com/supplemental. Adapted from *Gulf to Bridge: When Do Moral Arguments Facilitate Political Influence?* by M. Feinberg and R. Willer, 2015, *Personality and Social Psychology Bulletin*, *41*(12), (https://doi.org/10.1177/0146167215607842). Adapted with permission.

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Data Mining Skills for Marketing Education

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ABSTRACT

Accessible data mining skills have often been excluded from traditional marketing education programs, although this is beginning to change as more business programs begin to include analytics as an elective or even a core part of the curriculum. Given the increasing volume of data that is becoming available, and the need to establish more personalized relationships with customers, it is important that all marketing students be taught how to use a fundamental set of data mining skills. This article briefly describes three categories of data mining skills that should be covered in every marketing program's curriculum. These include skills that allow graduates to discover data, learn from the past, and segment datasets.

Keywords: data mining, marketing

INTRODUCTION

Data mining is a process that can be used by marketers to analyze large data sets and "mine" useful information out of them. It is a practice that allows marketers to learn more about their customers and use new knowledge to establish a more personalized approach to their marketing strategies. Data mining can help marketers achieve the long-sought goals of one-on-one relationships, better customer service and support, and enhanced product development (Arthur, 2013). It can also lead to enhanced sales and reduced costs (Devon, Sihi, & Muzellec, 2021).

Data mining is an important part of a data analytics lifecycle that allows organizations to analyze datasets to gain the insights and knowledge that enable data-informed marketing. It can be used to such ends as database marketing, customer segmentation, credit risk management, fraud detection, predictive analytics, or, with the use of text mining, spam Email filtering, and tracking customer sentiment analysis and product enhancement requests (Shmueli, Bruce, Yahav, Patel, & Lichtendahl, 2018). Companies can utilize data mining strategies to forecast sales, reduce customer attrition, predict the results of marketing campaigns, target customers with specific product offers, and increase customer lifecycle value (Patel, 2019).

The De-mystification of Data Mining

For many companies, the approach to data mining and similar skills has been to focus them largely within technical units. They are seen as skills that reside outside of traditional business disciplines and to make use of data requires the assistance of "data people" who can bring the expertise necessary to turn raw data into something meaningful. It also creates the false impression that foundational data skills are inaccessible and are best left with the technical "data people".

There are, however, several data mining tools, that, in the past, have not traditionally been built into university-level marketing programs. But they could be helpful in addressing common scenarios that future marketers are likely to face. It may be best if these skills are not just an elective part of a marketing program but are tightly infused into several of the core marketing courses that make up those programs.

Data mining instruction, built into marketing programs, should de-mystify these tools and underscore their applicability to common business and marketing problems. When students begin to understand these tools, they can build their own data mining tool kits leading them to higher levels of productivity and efficacy as a marketer.

A Data-mining Tool Kit

To successfully integrate data mining into marketing education requires a re-framing of students' understanding of data mining. Sometimes, students approach data instruction with trepidation because they believe themselves to be "not good at math or statistics" and they are hesitant to try. In other cases, graduates have little experience with data because their programs did not include this type of content into core marketing instruction. Non-data students can be successful in the use of these tools when they are explained in a real-world context and used in authentic instruction

scenarios. Students can learn these skills through simulated, real-world practice as they begin to build their own data mining tool kits.

A marketing student's data mining toolkit can consist of three parts: data discovery, prediction, and segmentation. In data discovery, students learn to visualize their data, clean up any problems such as missing or flawed data, and reduce its dimensionality to narrow their focus. In prediction, students learn to use past data sets to make predictions about the future. These tools include forecasting, simple and multiple regression, and logistic regression. In segmentation, students learn to understand the relationships and associations of different parts of their data, helping them to personalize their marketing efforts toward specific groups. The tools in this section of the kit include clustering, classification, and association rules. In the sections that follow, each of these tools and their applicability to marketing will be discussed in more detail.

DISCOVERING THE DATA

Data can come from several sources. Regardless of how the data are accessed, the first steps in data mining are to discover what is in the dataset and ensure that it is quality data (Morales-Serazzi, Gonzáles-Benito, Martos-Partal, 2021). This can help inform later decisions about the most appropriate direction for analysis. In some cases, part of data discovery can be duplicitous because the contents of the data file are already known, or they match the fields that were asked for when the output was requested. In many cases, however, the data miner must take time to learn what they have. Even when the fields that make up the data file are known, there three important steps to the data discovery process: visualization, data cleansing and data reduction.

Visualization

Visualization can be the first stage of the data mining process. It serves many purposes, but its main use is as an introduction to the scope and nature of the data. Visualization can be conducted using numeric summarizations or graphical tools. The goal is the same which is to explore data and provide an effective way to present results.

Visualization techniques are primarily used in the preprocessing portion of the data mining process (Shmueli et al., 2018). They can help us identify clear errors in the data (e.g. customers whose age is 999), replace missing values, remove duplicate rows, and deal with other formatting or content errors that must be corrected or accounted for. Beyond ensuring a clean dataset, data visualization techniques support freeform exploration for the purpose of understanding the data structure, identifying interesting patterns and generating novel questions (Shmuli et al., 2018).

Cleaning the Data

Closely aligned with data visualization is the process of data cleansing. Two key problems with many datasets are missing data and outliers, although data duplication can be an issue as well. At this stage, the questions to be asked are: How should missing data to be handled? Do the ranges of data points make sense or are there obvious outliers? If outliers exist, what strategy should be employed to handle them? Did all data fields convert correctly (e.g. dates and units of measure)? Are there any sections of the dataset that have been duplicated?

Missing data can be a frequent problem in datasets. Should a dataset have empty fields, different applications will handle them in different ways and some data mining tools will simply fail to run until the missing data problem is resolved. Strategies for handling missing data include row removal or value replacement (with column mean). Future data analysis needs can often drive decisions regarding the handling of missing data.

In general, there are two types of outliers. The first is obvious errors in the data. The second are legitimate but extreme values that fall well outside the expected ranges for variables. How each type is handled is up to the analyst. Removal of outliers that are clearly errors can be accomplished by deleting the impacted rows entirely or by replacing erroneous outliers with the column mean that excludes the outlier values. Extreme but legitimate values require more consideration of both their importance and their impact on the analysis. It may be best to remove extreme values that do not impact later analysis. In other cases, the inclusion of extreme values is necessary, and the analyst will need to anticipate the impact on results.

Two other challenges that may be encountered at the data cleansing stage are field formatting and data duplication. It is not uncommon that numeric fields, such as currency or dates, lose their proper formats when transferred from one platform to another. This is generally easily fixed by specifying the format of the fields in a separate step. Data

duplication can be found using sorting, visualization or other tools that show the number of times that values of a key variable appear in a data set. Erroneously duplicated data rows, once identified, can simply be removed.

Data Reduction

Once the data are visualized and cleaned, and the analyst is familiar with the contents of the dataset, more informed decisions can be made about the how the dataset will be analyzed. This may lead to data reduction or the removal of fields that will not be used in later analysis. Unneeded columns can simply be deleted from the data set (with proper backups made) but this process should be done judiciously so that further reviews, suggested by the initial analysis, are not hampered or rendered impossible because of missing data.

In some cases, analysis of the data is simplified by removing rows of unneeded records. Regardless of method, the goal of data reduction is to simplify the dataset and the analysis. It is largely driven by the questions that the analysis of the dataset is intended to answer. It allows the analyst to focus energy and effort only on those parts of the dataset that will contribute to the analysis without requiring extra time, storage, or effort.

LEARN FROM THE PAST

There is a great deal that marketers can learn from old data. Information about products that customers bought, or did not buy, is often captured in datasets and this useful in determining product design, feature enhancement, and marketing strategies. Past data can tell us how much customers are willing to spend, which customer segments we should be focused on, information about customer retention or attrition, the likelihood that customers will be interested in our products and how many of those products we will need to produce to precisely meet customer demand.

Included in the marketer's data analysis tool kit should be methods of using past data to predict future customer behavior. At a minimum, marketing students should be familiar with forecasting, linear regression, and logistic regression. Each of these are described further in the sections that follow.

Forecasting and Time Series Analysis

Forecasting future customer behavior can be a key part of an organization's success. It can be one of the most important methods of ensuring that the right number of products are available when customers want them. Underproduction can lose customers who go to competitors when products are not available, and overproduction leads to waste. Product forecasts must be as accurate as possible and a key method for forecasting future sales is to include information about past sales.

Time series analysis uses past data to predict future performance by tracking key variables over intervals (months, quarters) to determine how those values have changed over time. When using a time series for forecasting, both the trend and the seasonality of past data must be considered. Line charts and other visualization tools can help the analyst see such patterns. Through this process, it is easy to determine if there an up or downward trend or if the data is flat and consistent with limited variability. It is also possible to detect patterns in the data that suggest seasonality where there are consistent and predictable peaks and valleys in the values. These questions become an important part of the strategy that can be used to determine future forecasts.

Linear Regression

Another tool that can be used for predictions and forecasting is linear regression. With regression, an analyst may be attempting to predict numeric values of an output variable by considering relationships in past data.

Regression uses two sets of variables: predictor and output. The process of building a regression model is to look at how the predictors were related to the output variable in past data. From that analysis, the model provides coefficients that define the relationship between the predictor and output variables. These coefficients can then be applied to scenarios where predictor variables are known but the output values are not. By doing so, predicted output values can be produced. The accuracy of the regression model is highly dependent on the past relationship between the predictor and output variables and on the volume of data that is used to "train" or build the model.

Logistic Regression

While we may be looking for predicted numeric values in linear regression, logistic regression allows the prediction of likelihood or probability. Like linear regression, the relationship between predictor and output variables is determined. Also, like linear regression, there can be single or multiple predictors. But with logistic regression the

output is converted to a probability, ranging from 0 to 1. Logistic regression helps determine the likelihood of customer behavior by looking at the relationship between predictor variables and customer behavior in past data. A common use of logistic regression is in loan approval decisions. Predictors such as credit score and income can be used to determine the likelihood of loan repayment which drives the loan approval decision.

DATA SEGMENTATION

For a variety of marketing purposes, many companies find it useful to segment their customers into groups based on patterns of behavior (Dolnicar & Leisch, 2017; Linhof & Berry, 2011). Customers are separated based on their purchasing patterns, income level, purchase frequency, or a combination of similar fields. Each customer is assigned to a group according to which categories or combinations of categories they match best. Then organizations can mount targeted campaigns leading to improved returns and expanded customer relationships. The expectation is that by focusing on groups of similar customers, these efforts will be more effective than a one-size-fits-all approach.

Applying segmentation to large customer transaction databases helps companies to understand the behavior of their different customer groups including what they are buying and how much they are spending. Each segmented group of transactions becomes its own cluster. Once the transactions are segmented into clusters, association rules can be built on each separate cluster, further personalizing the marketing approach that a company can take.

The following sections will cover three tools that can be used for segmenting or associating data including: clustering, classification and association rules. All three should be part of the marketer's data mining tool kit.

Cluster Analysis

In simple terms, clustering allows a large dataset to be broken into smaller sets based on the values of selected variables (Marudachalam & Ramesh, 2017). In marketing, these variables could be customer demographics, purchase frequency, or product selection. The goal is to identify subsets of customers who can be associated with each other because they have similar patterns across selected variables. Then companies can reach out to those subsets using customized approaches.

There are two common methods for clustering a large dataset. The first divides the data into a pre-determined number of subsets based on a geometric determination of distance. K-means clustering is one common method of dividing data into groups. The newly clustered records can be reviewed in both graphical and tabular formats making it easy to see which cluster each record has been assigned to. One downside of the k-means clustering process is that it forces all records to be in a limited number of k clusters and that can be complicated by outliers.

The second form of clustering is agglomerative or hierarchical clusters. Under the agglomerative clustering process, all records start out as their own cluster. Next, the two records that are most similar to each other are joined. The process of joining similar records continues until every record is part of a single cluster. The value of this strategy is that the entire process of joining records is captured and represented in a graphical tree structure called a dendrogram. Similar records are on the same branches and the lengths of the branches indicate the level of similarity.

Both clustering tools help to separate customers or transaction records into smaller sections, each of which can be treated separately with targeted marketing campaigns. It is important to note that k-means and agglomerative clustering are only two of the many different types of clustering options available to marketers.

Classifiers

Very similar to clustering is the process of classification and, like clustering, there are many methods of classifying. One method that is easy to understand and set up is the k nearest neighbor (kNN) classification process. As was the case with k-means clustering, similarity is most often determined by distance which is usually a geometric measure of distance between the new record and the closest k records. Each existing record has already been assigned to a class. The new records are compared to their closest neighbors and the class represented by highest number of neighbors becomes the class of the new record.

Classification can be used to learn more information about new data. For marketing, it is useful when determining how to approach new customers who do not have established buying patterns. The assumption is that customers who are similar, in many aspects, to already known customers are likely to have similar purchasing patterns and this can help define marketing strategies for unknown customers.

Association Rules

The creation of association rules, also known as market basket analysis, allows marketers to determine item sets or collections of products that have a higher likelihood of being purchased together. Through careful analysis of purchase records, confidence measures can help companies determine product sales as a function of their associations with other products. Counting the number of items of each type that are purchased and then counting associations of items purchased together allows for the determination of the likelihood that items will be bought together.

Culling through a transaction database makes it possible to create meaningful association rules leading to different approaches to product placement and marketing. Products with strong associations can be placed together in a store or on a website encouraging customers to purchase both (or all) products at once.

CONCLUSION

This article contains a brief description of items that could make up a marketer's data mining tool kit. It is one likely version of a tool kit and is only intended to describe common tools that are accessible and that have the potential to be useful when establishing and maintaining more personalized customer relationships.

But tools are just tools. The primary driver in any effort to utilize data and data mining tools should be an analytic mindset, one in which questions are asked or opportunities are identified that drive data exploration. This is similar to the generation of hypotheses that drive research. Directive questions and goals should be identified at the outset of any data project as the selection of data sources and analysis methods are dependent on them. A data project without a purpose is analogous to a journey without a destination.

When planning marketing education, one needs to consider the ongoing digital disruption that is currently impacting so many fields (Arthur, 2013). It is not going away and companies need to adapt to the technological demands that are being placed on them. This includes data and the ability to mine it. No longer can the responsibility for data analysis be relegated to technical departments who are likely overloaded with their own demands. Data mining skills should and must become a standard part of the education that prepares future marketers for the new digital marketplace.

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Reducing and Detecting On-line Exam Cheating: Building a Better Mousetrap Protocols for Canvas and Other Learning Management Systems

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ABSTRACT

The authors provide protocols to reduce item harvesting and item pre-knowledge (Le et al., 2021) in order to protect the integrity of online multiple choice examinations for use in future administrations of an exam. The study also adapts methods used in Golden and Kohlbeck (2020) to help the instructor determine if cheating is occurring with online exams, and provides resources for use with the Canvas and other online learning platforms. A multiple choice exam protected by the protocols was administered to 82 undergraduate business students in a management class taught each semester by one author. Questions for the exam were randomly assigned to students using methods adapted from Golden and Kohlbeck. A statistical analysis of exam results demonstrated that widespread cheating did not occur.

Keywords: academic dishonesty, cheating, online exams, Canvas, learning management systems

INTRODUCTION

Cheating in academic settings has been occurring for decades (McCabe et al., 2001), and recently has significantly increased with the advent of online instruction and evaluation (Costley, 2019), leading to what has been termed *digital academic dishonesty*, offenses in which digital technology of some sort is used to assist students in cheating on exams and engaging in other forms of academic dishonesty (Etgar et al., 2019). As it relates to the current study, a multitude of studies as well as anecdotal evidence appearing in the popular press, illustrate that academic dishonesty, specifically cheating on exams, continues to be problematic in higher education (Juvenal & Anderson, 2018), and is increasing as a result of the wholesale move to on-line education necessitated by the Covid-19 global pandemic (Associated Press, 2021; Bilen & Matros, 2021; Meyer, 2020; Newton, 2020). White (2021) notes that due to their administration logistics, where students participate remotely, online exams are not capable of being completely invigilated as are exams administered face-to-face (FTF). As a result, White (2021) states that online administration creates an environment which fosters opportunity, one of the three legs of the fraud triangle (Cressey,1973). Although audits by accounting professionals are often utilized to detect fraud, O'Dwyer (2022) affirms Golden and Kohlbeck's (2020) notion that allowing cheating to occur in the academic setting leads to similar behavior in the workplace. Thousands of auditors working in U.S., Australian, and Canadian CPA firms were found to have shared questions from professional certification exams over the period from 2016 to 2020, a very interesting finding considering that one of the primary functions of an auditor is to determine if fraud of any kind may be occurring.

Support for online cheating has also turned into a multi-billion dollar for-profit industry (Braithwaite, 2021). Numerous contract cheating web sites are available, offering resources to assist students with engaging in various forms of academic dishonesty. A quick Google search lists a multitude of online vendors that provide services to help students cheat on exams as well as engaging in other academic dishonesty (Kasen, 2021). A cursory search of YouTube also revealed tutorials designed to assist students with cheating during online exams (ThatOneMohamed, 2021). Interestingly, due to the availability of technology which can be used to facilitate academic dishonesty (Costley, 2019; Salhofer, 2017), a student who wishes to cheat on an exam could easily access these tutorials using a split screen, while simultaneously taking the exam.

PREVENTION PROTOCOLS

The focus of the current study, the development of protocols as a method to prevent academic dishonesty, stems from one of the current author's experiences with exam integrity, specifically cheating which occurred with multiple choice exams in a management class required as a core course for all business administration majors. Students would frequently be absent from class, some missing approximately 50% or more of scheduled lectures, yet be among the top performers on examinations. During a module addressing ethical behavior, the author discussed cheating, stating not only was academic dishonesty morally wrong, but also that an increase in exam averages due to dishonesty reduced the value of any curve which might be applied to every student's exam. A student quickly enlightened the author after

class, stating that "Greek" organizations on campus had developed test banks containing copies of exams, with answers, from most of the institution's instructors, a practice which seems to be wide spread across many institutions of higher education (Juvenal & Anderson, 2018). Exams with correct answers would be given to members of the organization, or would be sold to non-members.

Now enlightened, the instructor developed an entirely new set of exam questions as described below. The authors then developed exam administration and review protocols to prevent item harvesting and item pre-knowledge from occurring in an attempt to reduce exam dishonesty. The protocols used by the current authors to counteract these practices are found and discussed in detail in Appendix A.

As part of their literature review addressing online academic dishonesty, Garg and Goel (2022) have developed an Academic Dishonesty Mitigation Program (ADMP) suggesting methods instructors may use to prevent as well as detect academic dishonesty. In general, the authors identify five types of academic dishonesty: impersonation, where someone other than the student of record is responsible for completion of the assessment; forbidden aids, where the test-taker has access to unauthorized resources; plagiarism, when the student copies the work of another; collusion, when students illicitly collaborate on the assessment; and gaming the system, where some property of the system used in completion of the assessment allows the student to cheat.

Garg and Goel then identify four factors instructors can use to prevent dishonesty. Technological intervention such as locking down the browser; a strong authentication method to ensure that the person completing the assignment is the student of record; the use of academic integrity policies such as a code of ethics; and the assessment format Additionally, each factor contains a number of distinct subcomponents, however, the discussion of these subcomponents are beyond the scope of the current study.

In addressing prevention, the current study limits its focus to prevention of one of the ADMP's types of academic dishonesty; the use of forbidden aids, specifically reducing the possibility of the student having access to an unauthorized test bank of exam questions. Through use of the protocols available in Appendix A, the current study targets the reduction of cheating that occurs with multiple choice exams as a result of what is termed item harvesting, where students make an effort to collect exam questions and answers beforehand, as well as item pre-knowledge, when students obtain exam information through methods detailed in Appendix A.

Similar to the ADMP's concerns about forbidden aides, Golden and Kohlbeck (2020) discuss laxity with exam materials on the part of instructors, such as returning exams to students, which serve to promote item harvesting and item pre-knowledge. White (2021) indicates that students who take examinations on an earlier day, or earlier on the same day, may often share contents of the exam with students taking the exam at some later time. Lei, et. al (2021) and Golden and Kohlbeck (2020) discuss the use of forbidden aides such as use of test banks from internet sources. Golden and Kohlbeck (2020) examine practices which combine to erode exam integrity such as instructors' reliance on question sets and test banks; citing several sources (Savage & Simkin, 2010; Madara et al., 2017), which illustrate the ease with which students can access and purchase these materials online, comparable to the Greek organization's practice of item gathering and subsequent sales discussed above.

After learning of course exams being compromised as noted above, the instructor created a completely new set of exam questions to be used in subsequent course exams. Nayak et al. (2018) advise instructors to design their own specific assignments which are not readily accessible online. Each new exam, therefore, consisted of a test bank of 40 conceptual multiple choice questions developed by the instructor. Approximately two-thirds of the questions for each exam were derived from lecture material and the remaining one-third from text material, however, the instructor personally wrote the latter questions using materials from the text rather than using standard test bank questions. The exams were then administered for several semesters using both FTF and online administrations, using the relevant protocol guidelines found in Appendix A.

DETECTION OF DISHONESTY

This study also assesses the effectiveness of the authors' protocols against item gathering and item pre-knowledge by replicating the method of detection used by Golden and Kohlbeck(2020), adapted for use with the Canvas learning management system. Golden and Kohlbeck attempted to determine if during the exam, students were engaged in item harvesting through internet access of the publisher's test bank paired with the course text. They examined whether the

percentage of questions answered correctly differed between original questions from the publisher's test bank, and paraphrased test bank questions written using the publisher's test bank questions as the basis. For each exam question, students were randomly assigned an original or a paraphrased test bank question. Golden and Kohlbeck (2020) found the correct responses on the original test bank questions significantly exceeded those of the paraphrased ones, suggesting the use of item harvesting or item pre-knowledge had occurred.

In the current study, to determine if the protocols were effective, the authors used the set of exam questions developed by the instructor as described in the Prevention Protocols section, rather than the publisher's test bank questions used in Golden and Kohlbeck. As with Golden and Kohlbeck, paraphrased questions were then developed for comparison with the original set of questions that had been administered for several semesters prior to the current study. In both studies, students had never been exposed to the paraphrased questions, therefore item pre-knowledge, gathering or harvesting were not possible with paraphrased questions from either the current study or the Golden and Kohlbeck study.

RESEARCH DESIGN

For the initial iteration of the planned exam manipulations, students in three organizational behavior classes taught by one of the co-authors were administered their first regular semester examination. Per the institution's IRB, all students in the three classes were given the option to participate in the study, however, students were not informed of the true nature of the study, instead they were told the authors wished to enhance the operation of Canvas as the institution's online learning platform. This deception was approved by the institution's IRB.

Eighty-two of the 120 students elected to participate by completing a brief demographic questionnaire. Table 1 shows that the median age was 21 while ages ranged from 20 to 47, 50% of the students were between 21 and 22 years old. Thirty-eight students identified as female, 44 participants identified as male. Other identification options were also made available, but not selected. All students majored in some aspect of business administration. Thirty-four participants were juniors, 48 were seniors and shared their demographic information.

While the 120 students were administered the same format of the exam, randomly selected paraphrased and test bank questions, only the results for the 82 students that participated are reported.

Table 1: Student Demographics

Characteristic	N = 82
Age	
Median(IQR)	21(21, 22)
Range	20, 47
Gender	
Female	38 (46%)
Male	44 (54%)
Track	
Accounting	16 (20%)
Business Minor	5 (6.1%)
Finance	14 (17%)
Management	21 (26%)
Marketing	23 (28%)
Special Concentration	1 (1.2%)
Wine Business	2 (2.4%)
Class	
Junior	34 (41%)
Senior	48 (59%)

To test exam integrity using the procedures from the Golden and Kohlbeck (2020) study required two sets of questions; the first being the original set of questions the instructor had created and used for several semesters. As per Golden

and Kohlbeck (2020), the authors then created a second test bank consisting of paraphrased questions constructed using the original questions from the first set (see Appendix B for sample questions from both the original test bank and the paraphrased test bank).

After the authors created the two versions of each question, the first exam of the semester was administered remotely via Canvas using the R/exams package (Zeileis et al., 2014) to randomly assign either a test bank or paraphrased version of each of the 40 questions to each student. The R/exams package output is in a format that can automatically be read in to Canvas as a quiz. Although the authors used the package to produce output to be read into Canvas as a quiz, R/exams can also generate output for use as the basis for quizzes in other Learning Management Systems (e.g., Moodle, Blackboard, OpenOLAT, and ARSnova) or for use in standalone formats (e.g., PDF, HTML, docx and odt). The R/exams package is free and open source (available here: http://www.r-exams.org). In response to the Covid-19 pandemic, Andrew Zammit-Mangion developed a free online course that takes instructors from installation of the software through automatic exam generation (link to the course is available here: http://www.r-exams.org/general/andrewzm_course/). Specific coding instructions for using the Golden and Kohlbeck (2020) method are available from the authors upon request.

As noted, the exam was administered remotely using the Canvas learning platform. Students were given one hour and fifty minutes to complete the exam. The test taker was able to view only one question at a time. Questions as well as answers were not shuffled. Students were required to be monitored in a Zoom conference to ensure the actual student and not a replacement was taking the exam, and to reduce the possibility that students had materials available that would constitute cheating, however, observation of the students' entire test-taking environment was not possible.

The authors tested the effectiveness of the R/Exams package in allocating paraphrased and test bank questions by gender and class. Table 2 shows the results of testing for differences between the numbers of paraphrased and test bank questions. The total number of questions administered to the 82 students was 3280 (82 students x 40 questions per student). The 82 participants had 1,563 paraphrased and 1,717 original test bank questions on their exams. Table 2 shows that the R/exams package effectively randomized the paraphrased and test bank questions between gender (p-value = .85) and class (p-value = .95).

Table 2: Assignment of Paraphrased and Test Bank Questions

Characteristic	Paraphrased N = 1,563	Test bank N = 1,717	p-value[1]
Gender			0.85
Female	727 (47%)	793 (46%)	
Male	836 (53%)	924 (54%)	
Class			0.95
Junior	649 (42%)	711 (41%)	
Senior	914 (58%)	1,006 (59%)	

[1]Pearson's Chi-squared test

DISCUSSION

Table 3 shows the results of testing for differences in percentages of questions answered correctly based on whether the question is a paraphrased or an original test bank question. Forty-eight percent of the correctly answered questions were paraphrased and 52% were original test bank questions. This difference is statistically insignificant (p-value = .92). For gender and class there are very small but statistically significant differences (p-values <0.01). The finding of no difference between correctly answering paraphrased and test bank questions suggests the author's cheating mitigations methods detailed in Appendix A are effective.

CONCLUSION

The authors had planned on testing exam integrity throughout the semester with all versions of the exam administration formats used in the Golden and Kohlbeck (2020) study. Statistical analysis of the first iteration of the exam, however, unlike the original study, failed to demonstrate any significant differences between scores on items from the original set of questions and items from the paraphrased set of questions, providing strong support to the idea that after several

semesters of administration of the original examination questions, the set of integrity protocols developed by the authors of the current study was a significant bulwark against the possibility of cheating occurring during exams of this type. At this point, the authors felt there would be no need to conduct further iterations of the exam administrations used by Golden and Kohlbeck (2020), and ended the study. The R/Exams package is an effective way to test the effectiveness of different protocols in learning management systems.

Table 3: Correctly and Incorrectly Answers

Characteristic	Incorrect N = 1,455	Correct N = 1,825	p-value[1]
Question			0.92
Paraphrase	692 (48%)	871 (48%)	
Test bank	763 (52%)	954 (52%)	
Gender			<0.01
Female	722 (50%)	798 (44%)	
Male	733 (50%)	1,027 (56%)	
Class			<0.01
Junior	558 (38%)	802 (44%)	
Senior	897 (62%)	1,023 (56%)	

[1]Pearson's Chi-squared test

Table 4 presents the results of ANOVA analysis. The ANOVA suggests that whether a question was a paraphrased or test bank question did not explain the variation between those that answered the question correctly and those that did not (p = 0.92). While the differences in correctly and incorrectly answered questions by gender and class are statistically significant (p-value < 0.01) the effects are very small for both.). These results support the effectiveness of the cheating mitigation methods outlined in Appendix A.

Table 4: ANOVA

Source of variation	df	Sum of squares	F-stat	p-value
Paraphrased	1	0.00	0.01	0.92
Gender	1	2.79	11.38	< 0.01
Class	1	2.15	8.74	< 0.01
Residuals	3276	804.62		

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Appendix A: Protocols for In-person, Canvas and Other Online-administered Examinations

Costley (2019), Etgar, et. al (2019) and Salhofer (2017) address the use of technology as it facilitates cheating. Costley describes several instances where students used camera phones to take screenshots of exam questions in order to share with fellow students who had not yet taken the exam, facilitating cheating in situations where exam administration to different cohorts occurs in staggered intervals (Nayak et al., 2018; Girdhar & Kumar, 2018; White, 2021), or occurs in later semesters.

Writing multiple-choice questions that require the use of higher levels of cognitive reasoning and promote critical thinking, rather than merely recalling factual information (Nguyen et al., 2020; Zaidi et al., 2018), may also attenuate students' ability to cheat on multiple choice exams. Nguyen, et al. (2020) suggest constructing questions requiring application of knowledge where students must combine concepts they have learned in order to address real-world situations. The authors also stress the need to construct novel multiple choice questions rather than use test bank questions which can be readily found online.

The following are the protocols used by the authors to promote integrity of their examinations. All are remedies which come from experiences the authors have had with students found cheating on examinations, and also take into consideration suggestions made in the studies addressed directly above as methods by which cheating can be reduced or eliminated. In general, no matter what the specific recommendation, these remedies attempt to reduce the sharing of exam content with other students (White, 2021) as described above. Nguyen et al. (2020) note that instructors may believe these steps to be somewhat onerous, but as noted in the current study, they have served to significantly reduce or eliminate cheating.

Note: Most on-line learning platforms share similar features with Canvas, and the suggestions found here that reference online learning systems can often be used with other platforms

1. Write original questions from lecture material. The material included in your lecture is obviously the most important. Using questions formed from lecture encourages the students to focus on that material.

2. Avoid use of the textbook's test bank if at all possible. Many test bank questions may not be well-written. Write your own questions from the text. Focus on concepts you believe to be key subject matter. This will attenuate students finding and using examination material from online sources.

3. Never return a copy of an exam to any student. If you do, copies will soon be spread across campus like wildfire. This is how campus test banks are formed.

4. Be willing to allow the students to review their exams, but only under your supervision or that of an assistant.

5. Do not leave students unattended with an examination unless you are sure they are phone-free. In the age of camera phones, it only requires moments for a picture of exam material to be taken.

6. As with 5, should you have an in-class review, ensure that all phones are put away. Students have been observed using phones to photograph exam materials projected on large video screens.

7. For multiple choice exams, never provide less than five possible answers for each question. The greater the number of choices, the more difficult it becomes to memorize answers.

8. Write conceptual-type multiple choice questions (see Appendix Two for an example). They are much more difficult to memorize than definitional-style questions, and they enhance student learning.

9. When using Canvas, or a learning platform with similar features, set the exam to show the student only one question at a time. This reduces the possibility of exams being copied with screen shots while the student is taking the exam.

10. With Canvas, do not allow students to see their quiz responses, and limit access to the exam to only the period in which the exam is being administered. Again, this prevents screen shots being used to copy exams.

11. Be willing to review Canvas exams with students on-line in a Zoom meeting. The student's exam should be available only to the instructor, and screen-shared with the student rather than providing the student direct access to the exam.

Appendix B: A Sample Exam Question

Original Question

Dr. Jendrzewski has won the Powerball! $156 Million! His poor management students see this as their big break: there would have to be a new professor taking over class, wouldn't there? (Things can only get better, how much worse could it get?). After collecting his lump sum payment of $68 million, however, there he is next class, happily lecturing away about motivation. The horror! They re-read his syllabus: he states he plans on working until at least his 100th birthday. Dr. Jendrzewski's decision to keep working can best be attributed to:

a. low self-esteem
b. high Machiavellianism
c. high work ethic
d. high extrinsic motivation
e. low collective orientation

Paraphrased Question

Sonia Schmidt has just inherited $250 million. All the local teens in the neighborhood see this as their chance to earn money doing odd jobs for her. Surely with all this money she would want to spend most of her time relaxing. The next morning, the teens are horrified to see her fire up the lawnmower immediately after coming back from walking her dog to the paint store where she purchased all the equipment she will use to paint her house. Sonia's desire to continue working can best be attributed to:

a. low self-esteem
b. high Machiavellianism
c. high work ethic
d. high extrinsic motivation
e. low collective orientation

Measuring Retailers' Timing of Payments to Suppliers in Good and Bad Economic Times

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ABSTRACT

Days' purchases in accounts payable (DPAP) is introduced as a measure to reveal how long retailers take to pay suppliers for merchandise purchases. Data for the 2004-2019 period confirms conventional wisdom that large retailers increasingly delay payments, not so much out of economic necessity, but because they possess the power to do so. Accounts-payable stretching by apparel retailers in 2020 is compared to their stretching during the previous 15 years. This sector reported greatly diminished sales and cash from operations in 2020 as COVID sharply reduced consumer purchases. In response, apparel retailers delayed payments to a degree never seen before, with the larger firms increasing DPAPs by more in 2020 than during the prior 15 years. DPAP is seen to represent a useful financial measure to gauge the extent to which powerful retailers dictate payment terms to suppliers, in good and bad economic times.

Keywords: Accounts-payable stretching, retailer-supplier relationships, COVID's effect on retailers' payments

INTRODUCTION

When instructors address financial-management strategies in their classes, firms' efforts at minimizing their investment in inventory often receive much attention. It has long been recognized that many firms have succeeded in adopting Just-in-Time Inventory Programs, whereby suppliers take on much of the burden of holding merchandise – not to be delivered until very close to when those goods are needed by their customers. What's not covered so much – but should be – is a second means through which powerful firms achieve supply-chain economies, namely by taking longer to pay their suppliers – a practice known as accounts-payable stretching.

In one research study, it was discovered that an important factor in Wall Street's valuation of retailers was the time they took to pay their accounts payable. Powerful retailers were more highly valued for taking longer to pay their suppliers, with such delays often viewed correctly as a sign of financial strength rather than financial weakness (Gosman, Kelly, Olsson, and Warfield, 2004).

Carrying accounts payable for longer periods of time complements retailers' efforts to hold on to inventory for shorter periods of time, in that both actions reduce working capital and enhance cash flows. As an example, Wal-Mart carried $11.9 billion less working capital in 2019 than it would have had it not increased its DPAP by 11 days over the preceding 12 years (Gosman, 2020). Conversely, worried suppliers required Sears in 2015 to advance payments by nine days, causing the retailer to use up an additional $432 million of the firm's already depleted funds (Kapner, 2015).

Because successful efforts at accounts-payable stretching produce supply-chain economies, trends in retailers' payments to suppliers has relevance for discussions in marketing classes as well as those in finance and accounting.

In this paper, we introduce a ratio useful for measuring retailers' efforts at delaying payments to their suppliers.[1] Initially, we document firms' success at accounts-payable stretching over the 15-year period ending in 2019. Following this, we examine how this practice accelerated during 2020 for apparel retailers, a sector especially affected by COVID. We conclude by suggesting assignments that enable students to follow up on issues raised in this paper.

A RATIO TO MEASURE ACCOUNTS-PAYABLE STRETCHING

Retailers' accounts-payable balances and trends are best measured by their days' purchases in accounts payable (DPAP), calculated as follows: Average accounts payable / average daily purchases. This financial measure captures

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[1]Although the focus in this paper is on retailers' accounts-payable stretching, retailers' actions often reverberate up the supply channel, leading suppliers to take longer to pay their own suppliers. For an action taken by Proctor & Gamble, see (Strom, 2015).

the average time it takes for a firm to pay its suppliers. To calculate the numerator, one accesses accounts-payable data from the comparative balance sheet. For the denominator, the firm's purchases -- equal to cost of goods sold + ending inventory - beginning inventory -- is divided by 365.

Although days' purchases in accounts payable is one of three ratios that measure working-capital efficiency -- the others being days' sales in inventory and days' sales in accounts receivable -- DPAP often receives less attention in textbooks and in the classroom. Perhaps this is because inventories and receivables are prominent on firms' financial statements, while purchases must be calculated as shown above. Or it might not be acknowledged frequently enough that an extra dollar of accounts payable reduces a firm's working capital and enhances its cash flows to the same degree as one fewer dollar invested in inventories and accounts receivable – given that working capital equals current assets minus current liabilities.

ACCOUNTS-PAYABLE STRETCHING BY RETAILERS, 2004-2019

Although one might expect longer payment periods to be concentrated among financially weak firms, very often it is the more successful and powerful retailers that are in position to negotiate the higher DPAPs. As one executive noted about such retailers, "it doesn't matter what the terms are, they're going to pay you whenever they want" (Ostrowski, 1998). The following note in one manufacturer's SEC Form 10-K is especially revealing: "Receivables from Wal Mart are typically paid in full between 45-55 days from purchase, while receivables from the company's remaining domestic customers are generally on 30-day terms." (Big Smith Brands, 1998). By offering credit terms of 45-55 days only to Wal Mart, Big Smith Brands had acquiesced to giving its most powerful retail customer 50-83% longer to pay.

In Table 1, accounts-payable stretching by a group of 10 large, successful retailers is shown for the 2004-2019 period. As illustrated there, these firms increased their DPAPs over the 15-year period by anywhere from 28% – 109%, with a median increase of 56.5% -- equivalent to 17.1 days.

Table 1: Percentage Increases in DPAP for 10 Large Retailers, 2004-2019

Retailer	2004 DPAP	2019 DPAP	Percentage Increase, 2004-2019
Amazon	62.6 days	92.3 days	47%
Best Buy	45.0	57.7	28%
Big Lots	21.4	44.8	109%
Dick's Sporting Goods	34.9	52.5	50%
Dollar General	25.8	48.2	87%
Dollar Tree	18.6	30.3	63%
Lowe's	35.0	58.4	67%
Rite Aid	21.8	32.8	50%
Wal Mart	33.7	43.5	29%
Williams-Sonoma	31.5	51.2	63%
	Median: 32.6 days	Median: 49.7 days	Median: 56.5%

As seen in Table 1, powerful retailers used their clout during the 2004-2019 period to take considerably longer to pay suppliers for their credit purchases of merchandise. And depending on the relationship between a firm's rising DPAP and its days' sales in inventory (average inventory / average daily cost of goods sold), an extremely desirable cash-flow situation can arise -- as it did for Wal-Mart. In 2019, the retailer's 43.5 days' purchases in accounts payable exceeded its 41.0 days' sales in inventory. Accordingly, it's almost as if it were Wal Mart's retail customers that paid its suppliers during 2019.[2]

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[2] As is the case for most retailers, credit cards used by Wal Mart's customers, including its proprietary card, are administered by outside financial institutions. Wal Mart would receive payment on customer's charge purchases within approximately two days via electronic fund transfers within the banking system. Therefore, collections on average customer accounts would have occurred in time for those funds to be used to pay suppliers for merchandise sold to customers.

Over the 2004-2019 period, total U.S. retail sales (excluding motor vehicles) grew by $1.56 trillion, or 60% (U.S. Census Bureau, 2022). It follows that many firms that stretched accounts payable during this period did so not out of

financial necessity but rather because they had the power to do so. Would accounts-payable stretching accelerate during 2020, given COVID's serious disruption of the retail economy in that year? This prospect is examined in the next section for apparel retailers – a sector particularly affected by COVID.

ACCOUNTS-PAYABLE STRETCHING BY APPAREL RETAILERS

Financial Stresses on Apparel Retailers
During April 2020, retail sales for clothing and accessories declined by 78% (Wahba, 2020). And in 2020 as a whole, apparel sales fell by 29.5% (U.S. Census Bureau, 2022). State-wide quarantines lasted months, offices continued remote operations, and many state and local governments discouraged public gatherings. As a result, many consumers had little need to purchase apparel for work or for socializing outside their homes. The predicament apparel retailers faced was acknowledged by the Gap's CEO when she observed that "Banana (Republic) certainly had challenges unique to Covid, between occasion wear and work wear." (Maheshwari, 2021).

Sample Firms
The apparel retailers listed in Table 2 were examined to determine the extent to which financial stresses caused by COVID prompted them to take longer to pay their suppliers for merchandise purchases. The retailers studied represent all publicly held retailers within Standard Industrial Classification Codes 5311 (4 department stores), 5621 (2 women's clothing stores), and 5651 (10 family clothing stores). Department stores (e.g., Macy's) were included because apparel accounts for over 75% of their total sales. Together, these 16 retailers operated over 18,000 stores and recorded $125 billion in sales in 2020.

Table 2: Apparel Firms

Abercrombie & Fitch	Cato	Dillard's	Nordstrom
American Eagle Outfitters	Chico's FAS	Gap	Ross Stores
Buckle (The)	Children's Place	Kohl's	TJX
Burlington	Destination XL	Macy's	Urban Outfitters

Decreases in Sales Revenue and Cash from Operations
As expected, apparel retailers experienced steep declines in sales revenue and cash from operations in 2020 due to COVID. The Table-3 data illustrate the challenging economic conditions these retailers faced. The medians for decreases in sales and cash from operations were 21.5% and 75.5%, respectively. All but one of the 16 retailers experienced a decrease in sales revenue and 13 retailers reported substantial decreases in cash from operations. Five of the latter firms moved from positive to negative cash from operations, including Nordstrom and Gap, where operations used $780 million and $327 million of cash, respectively, in 2020.

Table 3: Firms' Financial Decreases from 2019 to 2020

Retailer	2020 Sales Revenue	% Decrease from 2019		2020 Cash from Operations	% Decrease from 2019
Abercrombie & Fitch	$1,834,000,000	15%		$335,441,000	Increase
American Eagle Outfitters	$3,759,000,000	13%		$233,407,000	37%
Buckle (The)	$901,278,000	Increase		$210,672,000	Increase
Burlington	$5,751,000,000	21%		$114,574,000	88%
Cato	$567,516,000	30%		($36,041,000)	152%
Chico's FAS	$1,324,000,000	35%		($79,935,000)	286%
Children's Place	$1,523,000,000	19%		($74,726,000)	147%
Destination XL	$318,946,000	33%		$3,444,000	81%
Dillard's	$4,301,000,000	31%		$401,908,000	Increase
Gap	$13,800,000,000	16%		($327,000,000)	124%

Kohl's	$15,031,000,000	20%		$379,000,000	77%
Macy's	$17,346,000,000	29%		$412,000,000	74%
Nordstrom	$10,357,000,000	32%		($780,000,000)	169%
Ross Stores	$12,532,000,000	22%		$1,307,096,000	36%
TJX	$32,137,000,000	23%		$2,450,700,000	39%
Urban Outfitters	$3,450,000,000	13%		$216,299,000	14%
		Median: 21.5%			Median: 75.5%

Firms with negative cash from operations or much reduced but still positive cash from operations could find their ability to pay suppliers seriously impacted. The extent to which their financial difficulties led to increased accounts-payable stretching is explored in the following section.

Increases in Apparel Firms' Accounts-Payable Stretching

In Table 4, increases in apparel retailers' DPAP during 2020, the first year of COVID, are noted. For comparison purposes, these numbers are contrasted with the DPAP increases these firms achieved over the 2004-2019 period – a 15-year period where their financial results were not impacted by COVID. Firms that increased their payment periods by the greatest number of days from 2019 to 2020 are listed first.

Table 4: DPAP Changes During 2020 Compared to Those Occurring During 2004-2019

Retailer	Sales Rank	DPAP	DPAP	DPAP	Additional Days Taken to Pay Suppliers	Additional Days Taken to Pay Suppliers
		In 2004	In 2019	In 2020	2004-2019 Period	2019-2020 Period
Nordstrom	6	37.5	56.3	85.6	18.8 days	29.3 days
Ross Stores	5	49.9	38.8	68.1	11.1 fewer	29.3 days
TJX	1	34.6	32.2	57.0	2.4 fewer	24.8 days
Dillard's	8	37.6	63.7	86.6	26.1 days	22.9 days
Abercrombie & Fitch	11	22.5	55.6	77.2	33.1 days	21.6 days
Macy's	2	35.4	40.3	61.4	4.9 days	21.1 days
Kohl's	3	28.5	35.8	52.0	7.3 days	16.2 days
Gap	4	38.4	40.9	56.7	2.5 days	15.8 days
Burlington	7	68.0	72.4	84.1	4.4 days	11.7 days
Cato	15	54.6	55.2	64.6	0.6 days	9.4 days
Destination XL	16	55.2	45.5	54.6	9.7 fewer	9.1 days
Urban Outfitters	10	23.1	20.6	29.0	2.5 fewer	8.4 days
Children's Place	12	26.8	60.1	67.9	33.3 days	7.8 days
Buckle (The)	14	16.0	19.5	26.5	3.5 days	7.0 days
Chico's FAS	13	27.4	37.5	41.8	10.1 days	4.3 days
Amer. Eagle Outfitters	9	26.4	34.3	38.5	7.9 days	4.2 days
					Median: 7.6 days	Median: 13.8 days

It could be expected that apparel retailers, facing substantial declines in sales and cash from operations in 2020, would need to negotiate more favorable credit terms with suppliers. But the extent to which they extended their payment periods was surprising. The median *additional* time apparel retailers took to pay suppliers had been 7.6 days during the 15-year period (2004-2019) preceding 2020. Not influenced by COVID, this increase in DPAP reflected the ever-

present actions by retailers to use their power to delay cash payments -- even in good economic times. But in 2020 alone, the additional days taken almost doubled, with a median increase of 13.8 days.

Of the 16 retailers, 8 took an additional 15-29 days to pay suppliers during 2020. Eleven of the 16 firms increased their DPAP by more in 2020 alone than they had over the previous fifteen years. COVID's effect on these apparel retailers' economic well-being led them to delay payments to suppliers to an extent not seen before.

The sales-rank data in Table 4 reveal that the enhanced accounts-payable stretching observed during 2020 was especially prevalent among the largest apparel retailers. Seven of the eight firms that extended their payment periods by one-half month or more during 2020 were among the eight-largest firms studied. This finding is not surprising given the likelihood that larger retailers are better positioned to exert the most power over suppliers, in challenging as well as not-so-challenging economic times. (Shoulberg, 2020).

ASSIGNMENTS FOR STUDENTS

Instructors who wish to follow up on the issues raised in this paper could assign the following as a course requirement or for extra credit:

1. To what extent, if any, did the 16 apparel retailers listed in Table 4 begin to pay their suppliers more quickly in 2021 as the economic effects of COVID lessened somewhat?

Note to Instructor: There is evidence that retailers became very comfortable with the greater leeway suppliers allowed in 2020, creating continued challenges for suppliers even as the economic effects of COVID lessened somewhat in 2021(Broughton, 2021).

2. Which other retailers listed in Table 1 achieved, as did Wal Mart, a days' purchases in accounts payable that exceeded days' sales in inventory -- creating a situation where it's almost as if their retail customers were paying their suppliers? How did they differ from those retailers whose days' sales in inventory exceeded their days' purchases in accounts payable?

Note to Instructor: You might want to remind students that days' sales in inventory (DSI) is calculated as average inventory / average daily cost of goods sold. The 10 retailers from Table 1 appear again in Table 5 shown below, but now are listed in the order of their 2019 sales revenue. The Table could be distributed to class members, with the three right-most columns left empty for them to fill in.

As shown below, students will discover that two firms, Amazon and Best Buy, (like Wal Mart) achieved DPAPs that exceeded their DSIs. Therefore, it was at three of the four largest sample firms where (on average) merchandise was sold before suppliers had to be paid. Despite its large size, Lowe's did not fit this pattern, perhaps because (1) its contractor customers require in-store availability of most everything needed for their daily work and (2) the consequences of any inventory overstock, such as changing consumer preferences, are less in its line of business.

Table 5: Relationship between DSAP and DSI for 10 Large Retailers in 2019

Retailer	2019 Sales	2019 DPAP	2019 DSI	Excess of DPAP	Excess of DSI
Wal Mart	$519,926,000,000	43.5	41.1	2.4 days	
Amazon	$280,522,000,000	92.3 days	41.5 days	50.8 days	
Lowe's	$72,148,000,000	58.4	95.5		37.1 days
Best Buy	$43,638,000,000	57.7	57.5	0.2 days	
Dollar General	$27,753,973,000	48.2	83.1		34.9 days
Dollar Tree	$23,610,800,000	30.3	77.7		47.4 days
Rite Aid	$21,928,393,000	32.8	40.2		7.4 days
Dick's Sporting Goods	$8,750,743,000	52.5	118.6		66.1 days
Williams-Sonoma	$5,898,008.000	51.2	108.1		56.9 days
Big Lots	$5,323,180,000	44.8	53.8		9.0 days

SUMMARY AND CONCLUSIONS

Retailers' success at stretching their accounts payable was measured by examining trends in their days' purchases in accounts payable. Carrying accounts payable for longer periods of time complements firms' efforts to hold on to inventory for shorter periods of time, in that both actions reduce working capital, enhance cash flows, and achieve supply-chain economies.

Ten retailers in a variety of business lines used their clout with suppliers to successfully negotiate extended payment periods during the healthy economic period of 2004-2019. For these firms, DPAP rose by 17.1 days, or 56.5% over this period.

Accounts-payable stretching was then measured during 2020, a year in which the emergence of COVID presented serious financial challenges for business in general, but even more so for the retail-apparel sector. State-wide quarantines lasted months, offices continued remote operations, and many state and local governments discouraged public gatherings. Many consumers had little need of apparel for work or for socializing outside their homes.

For 16 publicly held apparel retailers, the median decreases for sales revenue and cash from operations were 21.5% and 75.5%, respectively, during 2020. Cash from operations became negative, sometimes substantially so, in five instances. In response, payments to suppliers were delayed to an extent not seen before, with the larger apparel retailers increasing their DPAPs by more in 2020 than the substantial increases they had achieved during the prior 15 years.

DPAP was seen to represent a useful financial measure to gauge the extent to which powerful retailers have dictated payment terms to suppliers, in good and bad economic times. Accordingly, trends in accounts payable belong in classroom discussions of firms' financial strategies to the same extent as consideration of their inventory and accounts-receivable management.

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Comparing Learning Outcomes in Remote vs. In-Class Negotiation Courses

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ABSTRACT

In March 2020 the Covid pandemic generated disruption to academic institutions around the world. While challenging to both students and professors, the forced pivot to on-line and remotely taught courses has prioritized long needed discussions on educational reform in general, and, in particular, the relative effectiveness of remote vs. in person delivery.

This dramatic increase in remote, hybrid, and distance learning has raised obvious questions about the efficacy of these new modes of remote delivery compared to traditional in-class education. Many educators, and much of the public remain highly skeptical about online education. Despite conclusions from past studies which generally conclude that in-class instruction is not significantly superior to distance education in terms of impact on learning outcomes, there are many reasons to question both the validity as well as the usefulness of this generalization. Might conclusions differ when other factors such as course content, kinds of student learners, or nature of technology are taken into account? Research needs to dive deeper and compare outcomes for specific course content, technology, types of learning environments, and types of students.

This study steps modestly into this issue here by comparing outcomes on a number of measures in a "high touch" negotiation class, comparing students who took the highly experiential course online versus those who took the course in-class. While a majority of the measures showed an advantage for the in-class mode, few of the thirty-seven measures approached a level of significance. Contrary to the expectation expressed frequently by faculty, students, and industry, learning outcomes for both in-class and remote classes were similar. Furthermore, the study highlights the need for research to explore under what particular conditions (e.g. subject matter, pedagogy, technology, learning types) in-class or its alternatives may be more effective.

Keywords: Negotiation, online, remote, learning outcomes, distance learning, in-person, face to face instruction

INTRODUCTION

The last decade has seen a huge increase in proportion of students in higher education who take at least part of their courses online. Below are some of the reasons.

- Online education offers opportunities for those who cannot, or choose not to, attend traditional classes or for whom access is not physically available or convenient;
- Through asynchronous classes with continuous access to course materials and lectures, professionals can juggle family, work, and study by accessing courses at any time;
- Online delivery of courses can be more cost-effective and can help address the budgetary challenges higher education faces;
- It may allow those (faculty and students) who are physically challenged opportunities they might not otherwise have;
- New technologies for communication and collaboration are available;
- Student expectations are evolving; "with near universal access to digital devices and the internet, students will seek …the same things they are getting from the music, movie, and newspaper industry." (Levine and Van Pelt, 2021); and
- Employer attitudes are likely evolving, as well. Receptivity to hiring online graduates appears to be trending upwards based on business actions. Large employers including Starbucks, JetBlue and Anthem, Inc [a health care benefits corporation] have partnered with various universities to offer free online degrees to their employees.[Selingo, 2016].

Due to technological advancements in each generation, distance learning has now evolved to the point where accessibility to professors and resources is only a matter of adequate internet connection. This, in turn, has led to an explosion of on-line enrollment growth. Between 2002 and 2012, overall college enrollment grew by 28 percent but the number of students taking at least one on-line course increased by 345 percent. (Protopsaltis and Baum, 2019) Data collected by the National Center for Educational Statistics shows that in 2015-2016, 43 percent of all undergraduate students were taking at least one on-line course and 11 percent were enrolled in fully on-line programs. (NCES, 2020) In two months in spring of 2020, Coursera, one of the early massive open online course [MOOC] platforms, added ten million new users, seven times the rate of sign-ups from 2019. (2) There are now more than 50 MOOC based degrees offered worldwide. (Gallagher and Palmer, 2020)

This increase in on-line registrations is especially dramatic in for-profit universities. The twenty-three largest for-profit institutions enrolled more 1.1 million students in 2012, which accounted for 20 percent of the entire growth in U.S. bachelor's degrees from 2002-2012. (Protopsaltis and Baum, 2019)

The explosion of technology related to education including cloud computing, platforms such as ZOOM and TEAMS, MOOC platforms, artificial intelligence, augmented learning, learning analytics, speech to text options, and large datasets, has laid the foundation for a huge growth in opportunities for innovation in the field. The COVID-19 Pandemic with its sudden forced shift to remote education has understandably focused great attention on this field. It seems clear that when the current crisis is over, some form of remote or hybrid education will be a major and growing component of higher education moving forward. It is critical for research to keep up with these changes by examining how these technologies intersect with content, student learner types and styles to impact outcomes.

HISTORICAL PERSPECTIVE

While the Covid-era has focused the spotlight on virtual methods of course delivery, the idea of distance education has roots that date back over a century.

> *The first correspondence and distance learning educational programs were initiated in the mid-1800s by the University of London. This model of educational learning was dependent on the postal service and therefore wasn't seen in American until the later Nineteenth century. It was in 1873 when what is considered the first official correspondence educational program was established in Boston, Massachusetts known as the "Society to Encourage Home Studies." (Paul and Jefferson, 2019)*

Even before the COVID-19 Pandemic, the pressures for a shift to online higher education were strong. While it is too soon to say what the long-term result of this unplanned 2020-2021 experiment with online education will be, about two thirds of those institutions surveyed by the Chronicle of Higher Education expect to continue distance education post-pandemic (Zimmerman, 2020).

GROWTH VS. ACCEPTANCE

Despite the explosion of interest in distance learning, there has been a reluctance to fully embrace the on-line paradigm. In a comprehensive overview of on-line education, Protosaltis & Baum (2019) argue that "a wide range of audiences and stakeholders—including faculty and academic leaders, employers and the general public—are skeptical about the quality and value of online education, which they view as inferior to face-to-face education."

The lack of buy-in to online learning from higher education faculty is a well-documented phenomenon. (Mirchell, et.al., 2015; Vivolo, 2016) Since faculty reluctance may be tied to simple lack of experience (Shreaves, D.L et.al. 2020) the pandemic had the potential to change existing concerns by giving thousands of instructors first-hand experience in the digital learning environment and, in so-doing, diminish doubts about its effectiveness. (Lederman, 2020) However, the pandemic has not significantly contributed to a change in attitudes as evidenced by a recent survey in which two-thirds of faculty respondents agreed with the statement "Instruction delivered without using technology most effectively serves my students." (Lederman, 2019)

Several possible explanations for faculty hesitancy (intrinsic, extrinsic and institutional) exist.
- Professors may be reluctant to change long-established teaching routines. Thirty-five percent of faculty said they "lose too much control over the course when they use technology" (Lederman, 2019)

- Faculty may feel that online classes are tarnished by association with for-profit colleges that have been widely criticized for providing poor quality education, and for leaving students with large debts and no jobs. (Howarth & Stifler, 2019)
- Highly publicized student-led legal actions against online education may reinforce a bias toward face-to-face education. For example, in 2016, students from George Washington University sued the school on the basis of receiving a lower quality education online than their peers who took on-campus courses. The complaint stated that, "plaintiffs were deceived into spending tens of thousands on tuition alone for a program that functionally required them to teach themselves the material."(Straumsheim, 2016).
- More recently, post-pandemic class action lawsuits to recover tuition money have been filed at more than 70 U.S. colleges and universities arguing that online courses were poor substitutes for classroom instruction. (Cappellino, 2022).
- A final reason for skepticism may be the lack of certain kinds of institutional support for implementing digital technologies. Fifty percent of faculty in a 2019 poll said adequate technical support for digital development was available, but only 22% of the faculty agreed that their institutions offered fair compensation for the creation of on-line courses. Additionally, 78% did not believe their school rewarded 'teaching with technology' in tenure and promotion decisions. (Lederman, 2020)

Perhaps more troubling than the negative perception of on-line learning expressed by academics is the fact that on-line education has historically been devalued by employers. A 2013 study of employers across industries found 40 percent in agreement that on-line education was of lessor quality than a traditional degree. (Fogi and Elliot, 2013) In that same year, a survey of over 400 human resource professionals revealed that on-line degrees were viewed less favorably than traditional degrees by half the respondents and, further, on-line degrees were considered far less acceptable for higher positions in the company. (Allen and Seaman, 2013).

The explosion of online teaching in accredited public and private universities has undoubtedly helped to legitimize digital learning. Nonetheless, comments made by CEOs and top executives, all with hiring experience and representing a range of industries, show that there are still challenges in changing employer views of online education (Blore, 2017). Specifically, the business interviewees expressed concerns such as:

- There's a stigma associated with online education, especially at the undergraduate level;
- The scope of an online degree is more limited than a traditional degree;
- Getting an online degree is easier and less rigorous than attending a physical campus; and
- Online education doesn't offer the best preparation for some fields.

Given the generally supporting evidence that students in on-line courses fare as well in terms of learning as their peers on campus, it is difficult to explain the overwhelming reluctance of various constituencies to fully embrace on-line course delivery. However, as Protopsaltis and Baum (2019) point out, employers are the ultimate arbiters of the value of on-line education, since they are best positioned to compare the skills, knowledge, and overall employability of online graduates and, as such, listening to their objections may be the key to gaining larger receptivity for digitally driven educational offerings. This idea is supported by academic leaders who indicated that lack of endorsement by potential employers was a 'very important' or 'important' barrier for the adoption of on-line classes.

The primary concern cited by employers about online learning "was the lack of interaction, in particular, face-to-face communication between students and faculty." (Protopsaltis & Baum, 2019). This is a recurring theme emerging from the literature: "the lack of sufficient interaction between students and faculty is likely online education's Achilles' heel." (p.1) The response of human resource professionals supports this statement. In a large sample, 82 percent of HR respondents agreed that a hybrid education model, where there is some contact between student and instructor, provides a more optimal educational experience. (Linardopoulos, 2012)

A return to "normalcy," will likely see various forms of online or hybrid education continuing to grow significantly. As Gallagher and Palmer (2020) point out, "…there was already widespread acknowledgement that the traditional higher education business model is seriously challenged…(as many) leaders scrutinize the price and value of higher education through the new lens of traditional classroom versus multiple modes of digital delivery."

However, little research exists to allay the concerns of faculty, students, and employers and evaluate whether the desired interaction between faculty and students needs to be face to face in a traditional classroom or whether live course delivery through Zoom or other digital platforms is equally effective.

EMPIRICAL EVIDENCE

For over one hundred years, educators have been trying to evaluate the effectiveness of remote vs. face-to-face instruction. The findings, generally consistent over many dozens of studies, conclude "that there is no significant differences in learning outcomes achieved by students engaged in face-to face instruction compared to those participating in distance education" (Murphy, 2014) Another meta-analysis concluded "that, on average, students in online learning conditions performed marginally better than those receiving face to face instruction." (Means et al, 2013)

Protopsaltis and Baum (2019) similarly concluded that "more than one summative investigation has judged that the research does not yield conclusive evidence of a systematic difference in learning outcomes between on-line and classroom courses…"

In a review of hundreds of studies conducted from 1996 to 2008, the U.S. Department of Education, concluded that "there are no significant differences in learning outcomes achieved by students in face-to-face instruction or distance learning". (The Future of State Universities, 2011) A more recent eight-year study [2009-2016] comparing effectiveness of on-line versus traditional instruction in a college environmental science class, found no significant difference in overall student performance, even after factoring in gender and class rank. (Baber, 2020)

Finally, in a 2013 meta-analysis of on-line learning experiments, Means et.al (2013) noted that overall results actually favored the on-line modality: "...on-line learning appeared more effective than traditional face-to-face instruction in both older and newer studies, with both younger and older learners and in both medical and other subject areas."

With the dramatic increase of web based online education emerging particularly with the COVID-19 Pandemic, the issue needs to be reexamined in depth focusing in more detail on specific learning outcomes broken down by different delivery modalities and technologies, level of students, variations in types of content, etc. Future meta-studies can then be done to help identify conditions where remote, in-class, or hybrid might be superior and to help figure out why. Furthermore, since courses are likely to be taught in all modes moving forward, if the factors leading to superior outcomes in one mode can be identified, it might be possible to replicate those factors in the other modes.

THE STUDY

Like so many institutions, the authors' university taught most courses remotely from the Summer 2020 to August 2021. This provided a relatively "natural" experiment comparing outcomes in a course taught remotely and then in-person starting in the Fall of 2021.

The study covered four sections of a Negotiation course. One section was taught totally remotely in Spring 2021, and another remotely in Summer 2021. The other two sections were taught Fall 2021 and were fully in-person. All sections met once a week for four hours with the same structure, materials, and content. All students were asked to fill out a questionnaire before the course started and again at the end of the course. The questionnaire focused on self-perception of skills and tactics typically associated with negotiations. Among the remote sections, one was an MBA course, and other Undergraduate of Juniors and Seniors. The "in-class" sections had the same balance of MBA and Undergraduate Juniors and Seniors.

All sections of the course are synchronous and highly experiential with a large proportion of class time being spent in real time role plays involving negotiation scenarios. The structure of the course was identical in all four sections covered in the study. The remote sections were taught using ZOOM.

Experience has taught us that since many students feel they have little or no experience with negotiations, they have trouble filling out this questionnaire before taking the course. They feel they have little sense of how they negotiate. As a result, we give an extensive introduction to the questionnaire explaining that they have done a lot of negotiating with friends, family, and at work. Students are encouraged to think about some specific negotiations as they fill out the questionnaire. As they fill out the same questionnaire at the end of the course, they have numerous classroom negotiations to base their evaluation. In addition, students get extensive feedback from their negotiating partners.

We expected to find no significant differences in responses among the four groups on the "pre-test." That is, before taking the negotiation course, students in all four cohorts should be relatively similar on the measures. Using a t-test, we found (with one exception) no significant differences in any of the thirty-seven items among the various groups: remote vs. in-class or graduate vs. undergraduate. In one item (35. Self-confidence), the "remote" cohort showed significant lower self perceived levels of self-confidence compared to their "in-class" cohorts. So, generally, all four groups were similar as they entered the course.

Results (Table One)

Appendix One shows the results while Table One shows the results graphically. The first four columns show the average response for each of the four cohorts: the in-class and remote class averages before students took the course, and then the averages for the two cohorts after taking the course. The fifth column shows the average change from "pre" to "post", first for the in-class cohort, and then the average change for the remote cohort. The final column shows the t-test results (two tail) comparing the change in the "pre-post" for the in-class cohorts to the remote cohorts.

Only three out of the thirty-seven differences rose to a level of significance. In other words, for the most part there was no significant difference in change in these negotiation traits between the remote and in-class cohorts. This is consistent with the meta-analyses cited earlier.

For two measures (using a two tailed t-test), the "in-class" cohort showed a significantly greater amount of change compared to their "remote" counterparts. "In-class" students perceived a greater degree of improvement in "effectiveness" (question 1). Similarly, the "in-class" cohort perceived a significantly greater degree of change on the question of "finding out the other side's real interests." (question 11). The reverse was true on question 28 ("I show a good balance of empathy and assertiveness") where the "remote" students perceived a significantly greater degree of change as compared to their "in-class" cohort.

However, we should note that in twenty-seven out of thirty-seven measures, there was greater change for the "in-class" cohort compared to the "remote" cohort. Again few rose to the level of statistical significance using the t-test.

Clearly, we must be very careful not to generalize from the results given the serious limitations in the study. Rather, we will discuss later how a study like this can stimulate research that will dive deeper into the issue. Given the overall lack of significant differences, it seems more likely these three outliers are anomalies.

DISCUSSION

While the overall results showed very few significant differences between in-class and remote delivery of a highly experiential negotiation course, a majority of items suggest a case for in-class, although few rose to a level of significance. Below are some outcomes worth exploring.

Effectiveness: The "in-class" cohorts showed a significantly greater self-reported improvement compared to their "remote" counterparts. This runs counter to the general conclusion of no differences. This area certainly calls for further research that includes an external, objective measure of effectiveness. It would be helpful to see how accurate students are about their self-assessment of effectiveness. Further research needs to replicate the results here, ideally by adding external validity. And if this research finding stands up to further research, it would be necessary to try to identify if this outcome relates to conditions relating to a highly interactive experiential negotiations course.

Table One

: Comparing In-class to remote delivery on learning outcomes
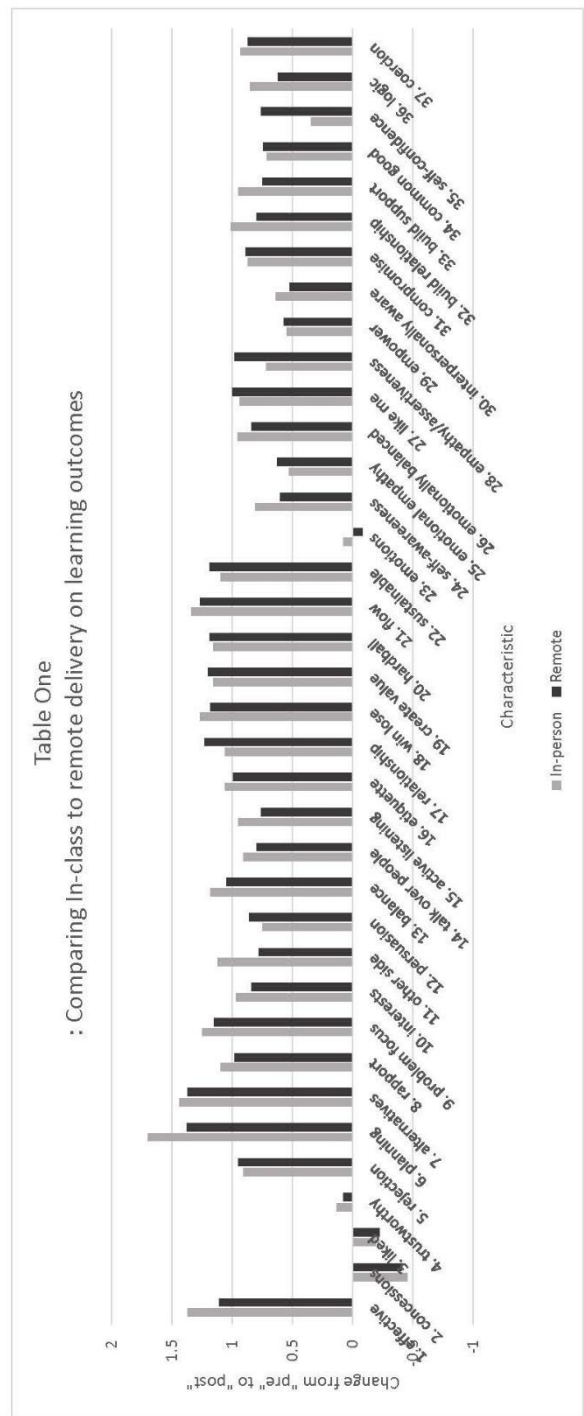
Another of the few items that reflected significant changes was the question about "finding out the other side's real interests and constraints." (Item 11) The "in-class" cohorts reported significantly higher levels of change compared to their "remote" counterparts. As with the previous item, these results need to be replicated before conclusions can be drawn. But it suggests an interesting line of research. If the relationship holds up under further research, we need to explore what it is about the in-class experience that might lead to this outcome.

There was a surprising outcome for item 28, "I show a good balance of empathy and assertiveness. Both groups ended up with virtually identical outcomes but the "remote" group came into the course with a lower "pre" score; this

accounted for the greater change for this cohort. This is probably an anomaly or artifact of the large "pre" score differences.

While not relating directly to the study, the data highlights a number of other issues
- Both remote and in-class cohorts showed a similar increase in comfort with conflict. Many students, like most people, tend to avoid conflict. A goal of virtually any negotiation course is to help students understand conflict and be more comfortable in dealing with conflict rather than avoiding it.
- Similarly, both cohorts showed a decrease in "need to be liked." Similar to conflict, many people avoid conflict feeling it will lead to their being "liked". The data for all cohorts could indicate a tendency to confront this dilemma.
- Trustworthy; there was virtually no change in this measure for all cohorts. This might indicate that students had an inflated sense of their trustworthiness before the course. Or possibly their self-assessments were pretty accurate and the course had little impact on this critical characteristic. This is a critical topic worthy of further study.
- Planning: not surprisingly, there was a substantial increase for all cohorts. Students are unlikely to think much about planning for negotiations and the course should generate much greater understanding of the process of planning for a negotiation. The "in-class" cohorts showed greater learning although not at a level of significance.
- Similar to planning, for other technical aspects of negotiation such as BATNA, all cohorts reported similar and substantial levels of improvement. Other areas such as "controlling the flow" of negotiations follow this same pattern.
- Also large increases for all cohorts on the measure of "win-win." This is encouraging since it is an objective of most negotiation courses to encourage students to question their "zero-sum" mentality and to think of "win-win" outcomes.
- The smallest change was seen in the question about the role of emotions in their negotiations. Students saw themselves the same at the end of the course compared to the beginning.

Caution
Researchers in this area have long warned about drawing any conclusions about differences that may be found. (Clark, 1983) Under some conditions, remote instruction is likely to produce superior outcomes to in-class alternatives and in other cases the reverse will be true. Generalizations will be hard to come by given the variety of courses, classroom pedagogies, individual modes of learning, technologies and their interactions. Research will need to provide information to help educators and consumers know when in-class design is critical to facilitate outcomes, and when remote or hybrid might be superior and under what conditions. The speed of the disruptions confronting higher education heighten the need for research to keep pace.

While in this study, the courses had identical content and pedagogy among various groups, other conditions varied. It may be the combination of elements in the treatment conditions that ultimately account for differences in learning outcomes. (Means et al, 2013) As future, more detailed research emerges, confounding variables may account for more of the differences in learning outcomes compared to the in-class versus remote distinction. For example, an earlier study found that the amount of time a student engages with the material plays a larger role in learning outcomes (Means et al., 2013) and this was not a variable in the study reported here. Similarly other variables such as learner type and subject area should be added to research studies before generalizations can be made. If possible, random assignment experiments should be carried out as well.

The question of the relative efficacy of online and face to face instruction needs to be revisited in light of the advent of fifth-generation distance learning and today's online learning applications, which can take advantage of a wide range of web resources, including web-based applications (e.g. audio.video streaming, learning management systems, 3D simulations and visualizations, multiuser games) and new collaboration and communication technologies (e.g chat, wikis, blogs, screen sharing, shared graphical whiteboards).

And of, course, new blended or hybrid models are emerging that combine elements of both on-line and in-class experiences. Some predict that the blended approach will come to dominate higher education (Watson, 2008)

CONCLUSION

The results of this study suggest that the online delivery of this experiential synchronous course via Zoom proved to

be as effective as via the more traditional face-to-face format. Yet this generalization is not intended to be a justification for moving all courses online. One size does not fit all.

The results of this study of outcomes in highly experiential negotiation classes are consistent with findings summarized in meta-studies comparing in-class with remote or online learning in a wide variety of educational settings, pedagogy, and content. In general, the outcomes for the remote classes studied here are similar to those for the in-class cohorts. There was an advantage for the in-class cohort on a majority of the measures, but too few of the differences rose to significant levels to allow for any reasonable generalization about in-class mode being superior for this course content.

If lack of student-instructor interaction has been the barrier that has prevented wide-spread acceptance of distance learning, then more studies like this can be used to highlight the possibility of creating meaningful learning through live online classes where the faculty member, delivering material remotely, can still be actively involved with students.

In addition, as on-line and blended programs proliferate in this massive market there should be growing opportunities to compare outcomes among programs with similar technologies, pedagogies, content, learner demographics and characteristics. This will allow educators to create a solid knowledge base on which to design educational programs, in-class, remote, or blended, that are most appropriate for particular learners, content, and desired levels of engagement and desired outcomes.

For two stakeholders (faculty and employers) it is important to forcefully counter the long-standing belief that online courses are less effective than their FTF counterparts. Allen et al. (2016) speak to this point in their 'report card' summary: "a continuing failure of online education has been the inability to convince its most important audience -higher education faculty members- of its worth." Once teachers endorse the efficacy of the distance model by showing that students in synchronous classes delivered remotely are as well served as their FTF counterparts, perceptions by hiring professionals may also change.

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Appendix One: Comparing changes in learning outcomes from "pre" to "post"

pre			post		average. change		t (two)		How characteristic is this for you? (5=very characteristic.. 1= not characteristic at all)
in	remote		in	remote	in	remote	tail		
2.88	2.89		4.25	4.06	1.37	1.11	0.10*	1. effective	Overall I consider myself an effective negotiator: I usually satisfy my interests
3.42	3.05		2.97	2.65	-0.45	-0.40	0.88	2. concessions	I tend to make concessions in order to avoid confrontation or conflict
3.17	3.20		2.98	2.98	-0.19	-0.22	0.81	3. liked	It is important to me to be liked; this can be a problem in my negotiations
3.80	3.78		3.93	3.88	0.13	0.08	0.57	4. trustworthy	Overall, I consider myself quite trustworthy; I don't bluff or lie in negotiations
2.90	2.81		3.81	3.76	0.91	0.95	0.73	5. rejection	Rejection doesn't bother me; I have no problem with "no"
2.86	2.87		4.56	4.25	1.70	1.38	0.19	6. planning	Planning and Strategy: I am usually prepared for my important negotiations;
2.84	2.80		4.28	4.16	1.44	1.37	0.9	7. alternatives	Alternatives: I am usually clear about my alternatives if a negotiation fails (BATNA)
3.39	3.33		4.49	4.31	1.10	0.98	0.5	8. rapport	At the beginning of a negotiation I try to establish rapport…a positive approach
3.09	3.00		4.34	4.15	1.25	1.15	0.71	9. problem focus	In negotiations I tend to focus on the problem, not the person.
3.41	3.19		4.38	4.03	0.97	0.84	0.53	10. interests	I am effective at making my interests clear to the other side;
2.78	2.91		3.90	3.69	1.12	0.78	0.04*	11. other side	I am effective at finding out the other side's real interests and constraints
3.00	2.93		3.75	3.79	0.75	0.86	0.46	12. persuasion	Persuasion: My persuasion skills are strong
2.97	2.96		4.15	4.08	1.18	1.05	0.57	13. balance	I am effective at balancing inquiry (asking questions) with advocacy (pushing my view.
3.32	3.20		4.23	4.00	0.91	0.80	0.66	14. talk over people	Communication: I don't talk over people
3.56	3.35		4.51	4.11	0.95	0.76	0.17	15. active listening	I practice Active Listening: (listen, ask questions, rephrase)
3.31	3.14		4.37	4.08	1.06	0.99	0.68	16. etiquette	I practice good negotiation etiquette:
3.25	2.90		4.31	4.13	1.06	1.23	0.24	17. relationship	Do my negotiations tend to result in improved relationships?
2.81	2.87		4.08	4.02	1.27	1.18	0.87	18. win lose	Do I tend to try to "win"; I view negotiations as "win-lose"

Appendix One (Continued)

pre			post		ave. change		t (two)		How characteristic is this for you? (5=very characteristic.. 1= not characteristic at all)
in	remote		in	remote	in	remote	tail		
2.78	2.77		3.94	3.98	1.16	1.20	0.88	19. create value	**I tend to "create value," in my negotiation;** I tend to maximize potential mutual gains;
2.31	2.23		3.47	3.43	1.16	1.19	0.89	20. hardball	**Hardball Tactics:** Particularly if the other side does.
2.57	2.50		3.91	3.75	1.34	1.27	0.74	21. flow	I tend to control the **flow** of a negotiation
2.98	2.78		4.08	3.90	1.10	1.19	0.42	22. sustainable	**My negotiation agreements are sustainable.**
3.00	2.98		3.08	2.90	0.08	-0.08	0.53	23. emotions	**Emotions often affect my negotiations**
3.29	3.34		4.10	3.94	0.81	0.60	0.48	24. self-awareness	**I have realistic self-awareness**
3.72	3.58		4.25	4.21	0.53	0.63	0.72	25. emotional empathy	**I am high on "emotional empathy":** I welcome other perspectives
3.41	3.23		4.37	4.07	0.96	0.84	0.53	26. emotionally balanced	I am **Emotionally Balanced in conflicts:** I don't usually "lose it."
3.08	2.93		4.02	3.89	0.94	1.00	0.89	27. like me	People like negotiating with me
3.19	2.90		3.91	3.94	0.72	0.98	0.07 *	28. empathy	**I show a good balance of empathy and assertiveness**
3.70	3.61		4.25	4.18	0.55	0.57	0.8	29. empower	**I tend to empower others… involve others in resolving conflict**.
3.63	3.53		4.27	4.05	0.64	0.52	0.43	30. interpersonally aware	**I tend to be Interpersonal Aware: i.e.** understand what motivates others
3.29	3.09		4.16	3.98	0.87	0.89	0.78	31. compromise	I will suggest mutual compromises in a negotiation impasse.
3.27	3.46		4.28	4.25	1.01	0.80	0.27	32. build relationship	**I am good at building and maintaining relationships.**
3.03	3.11		3.98	3.87	0.95	0.75	0.31	33. build support	I tend to persuade by enlisting the support of others.
3.42	3.36		4.13	4.10	0.71	0.74	0.67	34. common good	I like to persuade others towards a common good
3.62	3.08		3.97	3.84	0.35	0.76	0.35	35. self-confidence	**Impact management:** I present ideas convincingly and with self-confidence
3.25	3.25		4.10	3.88	0.85	0.62	0.43	36. logic	I am effective at persuading people with logic, relying on facts.
2.15	2.30		3.08	3.14	0.93	0.87	0.89	37. coercion	**Coercion:** If necessary, I will use the my position to gain concessions

Appendix Two: Glossary of Different Course Modalities

<u>Fully In-Person:</u> Students and professors meet face-to-face in a physical room at regular designated times.

<u>Fully Online</u>

Synchronous: Synchronous classes take place in real time with instructor and students interacting simultaneously in a virtual classroom. Students generally engage in the same learning activities as their face-to-face counterparts.

Asynchronous: Asynchronous classes do not have specific meeting times, though there are specific deadlines for assignments, quizzes, etc. Group projects may be required but team activities are wholly organized by students. In this anytime, anywhere modality, learning takes place independently.

<u>Hybrid</u>

There are two common types of hybrid configurations.
- In one scenario, there is a face-to-face course with a group of students in the classroom and another group streaming the sessions live. All students are 'attending' class at the same time. This format was particularly popular during the pandemic when international students could not acquire the necessary travel documents to enter the U.S.
- In another type of hybrid arrangement, classes may blend face-to-face on-campus instruction with a virtual component, either synchronous or asynchronous. Students and faculty typically meet face-to-face on scheduled days and engage in virtual learning on the non-campus days

Examining Self-Efficacy Change as a Mediator between Goal-Performance Discrepancy and Self-Set Goal Change

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ABSTRACT

This study investigates student goal setting in the undergraduate classroom environment. More specifically, this field study attempts to clarify the relation between goal-performance discrepancies and self-set goal change by examining student self-efficacy change as a mediator variable. Learning goal orientation and performance goal orientation were tested as moderators of the relationship between goal-performance discrepancy and self-efficacy change. The results clarify the goal-setting process over time, and the important role of student self-efficacy in goal revision and self-regulatory processes. Implications for instructors in higher education are discussed.

Keywords: goal setting, self-efficacy, self-regulation, goal-performance discrepancy, learning goal orientation, performance goal orientation.

INTRODUCTION

With more than 1,000 studies investigating goal-setting theory, it is one of the most supported theories of motivation (Locke & Latham, 1990, 2013). Goal setting has been shown to be useful in nearly all walks of life, including in learning, training, and higher education settings (e.g., Baldwin & Ford, 1988; Brink, 2021; Goldstein, 1993; Grant, Ratliff-Miller, & de la Rosa, 2016; Kraiger, Ford, & Salas, 1993; Martin, 2013; Mayer, Dale, & Fox, 2020; Morisano, 2013; Morisano, Hirsh, Peterson, Pihl, & Shore, 2010; Schunk, 1991; Wood & Locke, 1987). Indeed, in the context of business courses, nearly 80% of students indicate that they frequently engage in goal setting and planning related to exams (Kimmel, Trouard, & Robbins, 2020).

Although goal-setting theory has received extensive empirical support, the goal revision process and the mechanisms through which goal setting works over time are understood less well, especially in real-world settings outside of the laboratory (Bandura & Cervone, 1986; Brink, 2021; Day & Unsworth, 2013; Morisano, 2013). For example, one area needing further inquiry is how individuals respond to a goal-performance discrepancy (GPD). When individuals encounter a positive GPD (i.e., when performance exceeds goals, or goals are attained) they typically raise subsequent goals. However, when they encounter a negative GPD (i.e., when performance fails to reach goals, or there is failed goal attainment) goals are sometimes raised and other times lowered, suggesting that moderators may play a role.

Brink (2021) examined four moderators in the relationship between GPD and self-set goal change (SSGC) in the real-world undergraduate classroom environment and found that performance judgment accuracy, long-term goal discrepancy, and performance goal orientation (PGO) moderated the relationship whereas learning goal orientation (LGO) did not. Brink recommended that future research explore the role of self-efficacy in these relationships given that it is known to play an important role in the goal-setting process. The purpose of the present study is to extend Brink's research and examine the role that self-efficacy plays in the relationship between GPD and SSGC.

Self-efficacy

Self-efficacy is defined as "people's judgments of their capabilities to organize and execute courses of action required to attain designated types of performances" (Bandura, 1986, p. 391). Much like goals, self-efficacy has a direct positive relationship with performance (Button, Mathieu, & Aikin, 1996; Mathieu & Button, 1992; Phillips & Gully, 1997; Wood & Locke, 1987) regardless of whether or not goals are set. Wood and Locke (1987) found that self-efficacy has a significant relationship with academic performance, even when controlling for ability.

Self-efficacy affects performance through goal setting by influencing goal choice. Wood and Locke (1987) found that self-efficacy has an indirect effect on academic performance through its effects on self-set grade goals. The effect of self-efficacy on performance has been found to be partially mediated (Phillips & Gully, 1997) and fully mediated (Button, Mathieu, & Aikin, 1996) by personal goal level. In a laboratory study, Waung, MacNeil, and Vance (1995) found a self-efficacy by performance satisfaction interaction on self-set goal change. Goals were lowered when performance satisfaction and self-efficacy were both low. Participants who were higher in either or both variables (i.e., performance satisfaction and self-efficacy) tended to raise their goals, with the highest amount of goal raising

occurring when both self-efficacy and performance satisfaction were high. Bandura and Cervone (1986) indicated that there is a positive relationship between self-efficacy and goal level; the stronger a person's self-efficacy for goal attainment, the higher the goals he or she sets will be.

Self-efficacy has a bi-directional relationship with goals. It both affects self-set goals and is affected by goal-performance discrepancies (Bandura, 1991). Goal attainment increases self-efficacy, and those with higher self-efficacy set higher goals. Therefore, self-efficacy change (SEC) may mediate the relation between GPD and SSGC. In addition, much like goals, GPD influences self-efficacy for future tasks; as with goals, a positive GPD results in an increase in self-efficacy whereas a negative GPD has variable effects on self-efficacy (Bandura & Cervone, 1986). Therefore, moderators may play a role in the relationship between GPD and SEC. This study examines LGO and PGO as moderators.

Learning and performance goal orientation
Dweck and Leggett (1988) identified two types of goal orientation: LGO and PGO. People who are high in LGO strive to *improve* their abilities, whereas people who are high in PGO strive to *prove* their abilities. People high in LGO focus on increasing competence and acquiring knowledge and skills needed for enhancing or mastering task performance. They are not as worried about failure so long as they can learn from it and enhance future performance. In contrast, people high in PGO are concerned with positive appraisals of their competence and performance, and they desire to avoid negative appraisals which will display their incompetence or shortcomings. They would rather perform an easy task and succeed than fail at a difficult task.

Button, Mathieu, and Zajac (1996) indicate that individuals with high PGO are more inclined to believe that their ability is fixed and outside of their control, whereas individuals with high LGO are more likely to believe that performance is within their control and determined by their effort, ability, and experience. Therefore, those who have a high PGO may consider their ability and perceived ability (i.e., self-efficacy) to be more stable, whereas those who have a high LGO may consider their ability and self-efficacy to be more malleable. As such, when high PGO individuals face failure (or a negative GPD), they may adjust their self-efficacy downward to reflect past performance. In contrast, when high LGO individuals face a negative GPD they may be more accepting of failure as long as they can learn from it and improve task mastery. When failure is perceived as a learning opportunity, and learning is viewed as a pathway to higher performance, it may result in an increase in self-efficacy.

In sum, this field study investigates student goal setting in the undergraduate classroom environment. The main purpose is to clarify how the goal-setting process unfolds over time by investigating SEC as a mediator between GPD and SSGC. In addition, this field study attempts to clarify why a negative GPD has variable effects on SEC through the examination of two potential moderators of this relationship: LGO and PGO. A summary of the hypotheses is depicted in Figure 1. It is hypothesized that SEC will mediate the relation between GPD and SSGC. It is also hypothesized that two variables will moderate the relationship between GPD and SEC: LGO, and PGO.

Figure 1: Hypothesized Model
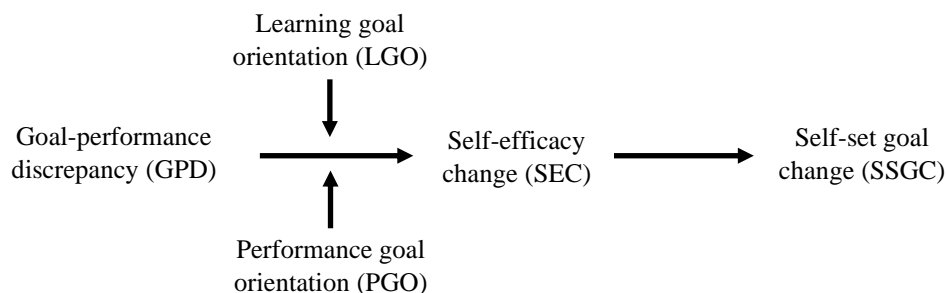
METHOD

The data included in the present study were collected as part of a larger study. Three surveys were completed by undergraduate students. The first survey (at T_1) was administered during the class period before an exam was taken. The second survey (at T_2) was administered the class period after the exam was taken, but before students received their exam grades. The third survey (at T_3) was administered after students received their exam grades. Grade point average (GPA) and scholastic aptitude test (SAT) scores were obtained from the university registrar with the students' permission. Complete data were available for 127 participants.

Instruments and variables

On the first survey, self-set grade goal for the exam (SSG) was measured using Wood and Locke's (1987) four-item scale. Self-efficacy was measured with an adaptation of the grade self-efficacy (GSE) scale shown in Locke and Latham (1990, p. 348). LGO and PGO were measured using Button, Mathieu, and Zajac's (1996) 16-item scale (8 items for each dimension). Gender and age were also gathered given that there may be demographic differences in goal orientation (Button, Mathieu, & Zajac, 1996). Variables measured on the second survey were not relevant to the present study and, therefore, were not included in any analyses. The third survey measured SSG and GSE again; however, the referent for the items on this survey was the next exam. Exam grades were provided by the instructors with the students' permission. GPD was calculated by subtracting a student's SSG at T_1 from their exam grade. SEC was calculated with a difference score by subtracting GSE at T_1 from GSE at T_3. SSGC was calculated with a difference score by subtracting SSG at T_1 from SSG at T_3.

RESULTS

Before testing the hypotheses, the relationships between self-efficacy and other key variables were examined to determine if they are consistent with previous research. There are statistically significant correlations between exam grade and GSE at T_1 ($r = .32$, $p < .01$) and GSE at T_3 ($r = .47$, $p < .01$). The correlations between goals and self-efficacy are also strongly positive: the correlation between SSG at T_1 and GSE at T_1 is significant ($r = .67$, $p < .01$) as is the correlation between SSG at T_3 and GSE at T_3 ($r = .66$, $p < .01$). These results are consistent with the findings from numerous previous studies (Locke & Latham, 1990, 2013).

All hypotheses were tested using hierarchical regression analysis. Age, gender, GPA, and SAT scores were controlled for in the regression analyses given that they are expected to be correlated with some of the variables of interest.

Effects of goal-performance discrepancy on self-efficacy change

As expected, GPD has a positive effect on SEC (see Table 1). The nature of the relationship is shown in Figure 2. The regression line nearly intersects the origin, indicating that a positive GPD leads to an increase in self-efficacy and a negative GPD leads to a decrease in self-efficacy. LGO neither moderates the effect of GPD on SEC nor has a main effect on SEC. PGO moderates (although marginally significant) the effect of the GPD on SEC. As expected, those who are high in PGO adjust their self-efficacy to reflect past performance, decreasing self-efficacy when there is a negative GPD and increasing self-efficacy when there is a positive GPD (see Figure 3). Surprisingly, the relationship between GPD and SEC is negative (albeit slightly) when PGO is low. When PGO is low, self-efficacy increases most when the grade is less than the goal rather than greater than the goal, and self-efficacy always increases (at least in the range shown) regardless of the direction or size of the GPD.

Table 1: Hierarchical Regression Analyses Results: Dependent Variable Self-Efficacy Change (SEC)

	R^2	ΔR^2	ΔF	Unst. b	SE	St. β
Step 1: Control variable[a]	.074 †	.074	2.440 †			
Age				-10.933	8.906	-.121
Gender				29.539	18.585	.141
GPA				36.451 †	18.827	.189
SAT				-.032	.070	-.047
Step 2: Independent Var.	.128 **	.055	7.698 **			
GPD				26.226 **	9.453	.256
Step 2: Main effects	.129 **	.056	3.860 *			
GPD				25.584 *	9.755	.250
LGO				2.966	10.466	.027
Step 3: Interaction	.140 *	.011	1.536			
GPD x LGO				-14.805	11.945	-.349
Step 2: Main effects	.129 **	.056	3.875 *			
GPD				25.828 **	9.563	.253
PGO				3.500	10.592	.028
Step 3: Interaction	.156 **	.027	3.823 †			
GPD x PGO				-29.692 †	15.185	-.652

[a]First step for all 3 separate regressions depicted in Table.
†$p < .06$. *$p < .05$. **$p < .01$.

Figure 2: Effect of GPD on SEC
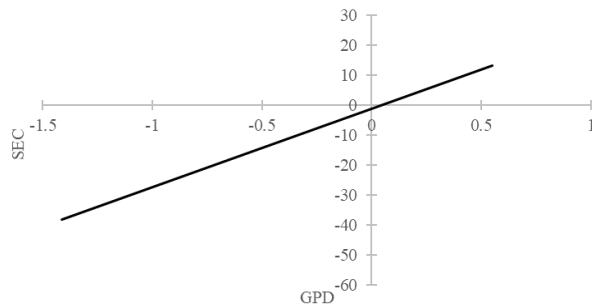
Figure 3: Effect of GPD on SEC Moderated by PGO
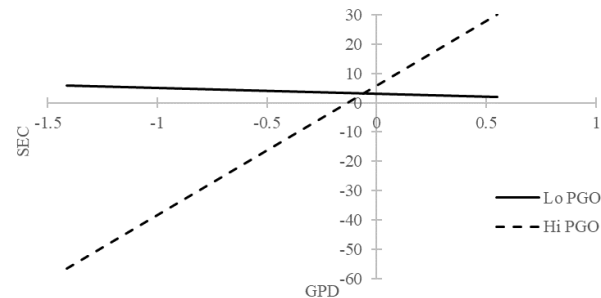
Effects of self-efficacy change on self-set goal change

To determine if SEC has a positive effect on SSGC, the four control variables and GPD were entered in the first step of the regression analysis with SSGC as the dependent variable (see Table 2). This determines if SEC accounts for significant variance in SSGC over and above the control variables and GPD. As shown in Table 2, GPD accounts for significant variance in the dependent variable, indicating the importance of taking GPD into account. In step 2, SEC was entered and the increment in R^2 was computed. The increment in R^2 is significant, indicating that SEC has a positive effect on SSGC. The relationship between SEC and SSGC is shown in Figure 4. As the figure indicates, the intercept is above the origin. Goals are raised when self-efficacy increases and also when self-efficacy decreases slightly. When there is a moderate to large decrease in self-efficacy, goals are lowered.

Since a decrease in self-efficacy results in both the raising and lowering of goals, exploratory analyses were used to determine if LGO and PGO are moderators in this relationship. PGO does not moderate the relationship between GSEC and SSGC. LGO moderates the relationship between SEC and SSGC. The significant results are summarized in Table 3 and the nature of the relationship is shown in Figure 5. When LGO is high, goals are raised when self-efficacy increases and also when it decreases moderately. The relationship is similar when LGO is low, except goals are less likely to be raised when self-efficacy decreases. Thus, LGO appears to be driving the inconsistent effects of a decrease in self-efficacy.

Table 2: Mediated Regression Analyses Results: Dependent Variable Self-Set Goal Change (SSGC)

	R^2	ΔR^2	ΔF	Unst. b		SE	St. β
Model 1: Control variable	.250 ***	.250	8.113 ***				
Age				-.012		.022	-.048
Gender				.109	*	.046	.193
GPA				.031		.049	.059
SAT				-.000		.000	-.108
GPD				.118	***	.024	.427
Model 2:	.399 ***	.149	30.063 ***				
GPD[a]				.089	***	.022	.321
SEC[b]				.001	***	.000	.414
Step 1: Controls	.318 ***	.318	11.372 ***				
Age				-.013		.021	-.054
Gender				.090	*	.044	.159
GPA				.066		.044	.127
SAT				-.000	†	.000	-.150
SEC				.001	***	.000	.488
Step 2:Independent Var.	.399 ***	.081	16.303 ***				
GPD[c]				.089	***	.022	.321

[a]Partial regression coefficient depicted as part of the test for mediation (not an increment over model 1). [b]Test of effect of SEC on SSGC (increment over model 1). [c]Test of full vs. partial mediation.
†$p < .1$. *$p < .05$. **$p < .01$. ***$p < .001$.

Figure 4: Effect of SEC on SSSGC
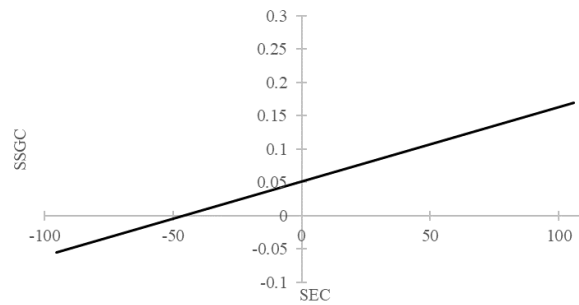
Figure 5: Effect of SEC on SSGC Moderated by LGO
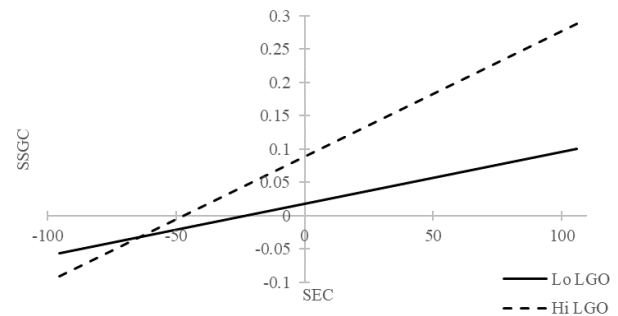
Table 3: Hierarchical Regression Analyses Results: Dependent Variable Self-Set Goal Change (SSGC)

	R^2	ΔR^2	ΔF	Unst. b		SE	St. β
Step 1: Control variable[a]	.250 ***	.250	8.113 ***				
Age				-.012		.022	-.048
Gender				.109	*	.046	.193
GPA				.031		.049	.059
SAT				-.000		.000	-.108
GPD				.118	***	.024	.427
Step 2: Main effects	.417 ***	.167	17.215 ***				
SEC				.001	***	.000	.418
LGO				-.045	†	.023	-.148
Step 3: Interaction	.452 ***	.035	7.654 **				
SEC x LGO				-.001	**	.000	-.673

[a]First step for 2 separate regressions depicted in Table.
†$p < .1$, *$p < .05$. **$p < .01$. ***$p < .001$.

Mediation analyses

Brink (2021) found a significant relationship between GPD and SSGC, and the present study found a significant relationship between GPD and SEC and between SEC and SSGC. Taken together, the results suggest that SEC partially mediates the GPD-SSGC relationship. Therefore, mediated regression analysis (Baron & Kenny, 1986) was used to determine if SEC mediates the relationship between the GPD and SSGC. To test for mediation, (1) SEC was regressed on GPD and the control variables (see Table 1), (2) SSGC was regressed on GPD and the control variables (see Table 2), and (3) SSGC was regressed on SEC, GPD, and the control variables (see Table 2). The mediation of SEC was supported. SEC was a partial mediator since GPD still had a significant effect when controlling for SEC ($b = .089, p < .001$).

DISCUSSION

Goal setting is a simple, quick, and highly effective technique that can be used to enhance student motivation and academic achievement (Anderman, 2013; Brink, 2021; Morisano, 2013). Despite numerous goal-setting studies and the widespread use of goal setting by business students in relation to exams, more research is needed to clarify how the goal-setting process unfolds over time in the classroom environment. Brink (2021) examined the relationship between GPD and SSGC. The present study extends his research by examining the role self-efficacy plays in this relationship.

Clearly, the results show that GPD is important. It has a positive effect on SEC. Initially, the magnitude of the GPD did not appear to be important for determining the direction of SEC, which was contrary to the expected relationship. There did not appear to be variable effects since self-efficacy increased when goals were attained (i.e., when performance exceeded goals), and it decreased when goals were not attained. However, the magnitude of the GPD did appear to be important for determining the magnitude of SEC. These results demonstrate that self-efficacy is not only affected by prior performance, but also by the relationship between prior goals and performance. These results demonstrate that students consider the relationship between prior goals and performance when making changes in self-efficacy. This is consistent with the theory of self-regulation (Bandura, 1986). Self-reaction (which influences self-efficacy, among other things) is a person's response to self-evaluation (i.e., the comparison between performance and a goal). The GPD is also important because it has a positive influence on goal change (Brink, 2021). As demonstrated in the present study, this relationship is partially mediated by SEC; achieving goals leads to an increase in self-efficacy which leads to the raising of subsequent goals.

The relationship between GPD and SEC is moderated (although marginally significant statistically) by PGO. Hence, the magnitude of the GPD is important for determining the direction of SEC depending on students' level of PGO. When PGO is high and ability is viewed as stable, perceived ability (i.e., self-efficacy) is adjusted to the degree of prior success or failure. They do not appear to believe their ability will be much above or below prior success or failure. However, there was a weak negative relationship, if any, when PGO was low. These students always increased slightly in self-efficacy regardless of the size or direction of the GPD. It appears that when PGO is low, students are not trying as hard to prove their ability and perceived ability hardly changes regardless of whether or not they have achieved their goals.

As noted by Brink (2021), the nature of the GPD independent variable could explain why PGO moderates the relationship whereas LGO does not. Student goals (which were used to derive the GPD) were based on performance rather than learning and, therefore, the performance goals may have been more relevant to PGO. If the GPD had been based on learning goals, it might have been more relevant to LGO. Interestingly, LGO moderates the relationship when GPD is the independent variable -- that is, the relationship between GPD and SEC (in the present study) and the relationship between GPD and SSGC (Brink, 2021). Alternatively, when SEC is the independent variable, the relationship is moderated by LGO. SEC may be more related to LGO since it is based on a change in perceived ability, which is often due to learning and experience.

It is also clear that SEC has an effect on SSGC. SEC is positively related to SSGC. In general, goals are raised as a result of an increase in self-efficacy and are lowered as a result of a decrease in self-efficacy. Students not only consider their level of self-efficacy when adjusting goals, but they also consider how much their efficacy has changed over time. Obviously, when ability increases, an individual should be able to perform better and would probably set higher goals. Similarly, when perceived ability increases individuals also set higher goals.

LGO moderates the relationship between SEC and SSGC. When self-efficacy decreases, goals are more likely to be raised when LGO is high than when it is low. Although LGO was not hypothesized to moderate this relationship, it is not surprising since students with high LGO are expected to be less likely to lower goals and more likely to push themselves by setting higher goals in response to negative feedback (i.e., a negative GPD). Even if students high in LGO do not think they will do as well (i.e., their self-efficacy decreases), they still try hard and set higher goals for the future task which can lead to higher performance. In addition, when self-efficacy does increase they set much higher goals than those low in LGO, which could also lead to higher performance.

Implications for business schools and higher education
This study further clarifies how the goal revision process unfolds over time, and how students' goals are revised in response to whether or not goals are attained. This study also shows that self-efficacy has an important role in the goal revision process. In general, when students successfully attain their goals, their self-efficacy increases, and, in turn, they set higher goals. When students fail to attain their goals, their self-efficacy decreases, and, in turn, they set lower goals. Therefore, self-efficacy is a key link in the goal-performance cycle. Indeed, Bartimote-Aufflick, Bridgeman, Walker, Sharma, and Smith (2016, p. 1918) state that "perhaps the single most important (and reliable) predictor of university student achievement in recent decades is self-efficacy."

Goal setting is a simple but impactful technique for enhancing student motivation and performance (Brink, 2021; Morisano, 2013; Morisano et al., 2010; Morisano & Locke, 2013), and introducing goal setting in the classroom should be seriously considered. In addition, given that SEC directly impacts SSGC, instructors should also consider implementing techniques for increasing student self-efficacy. Doing so can increase a student's subsequent goals, motivation, and performance. Bandura (1977) stated that judgments of self-efficacy are based on four general sources: performance accomplishments, vicarious experiences, verbal persuasion, and psychological states. Several review studies (e.g., Bartimote-Aufflick et al., 2016; Schunk, 1989; Usher & Pajares, 2008; van Dinther, Dochy, & Segers, 2011) have identified numerous factors and techniques that can be used to increase student self-efficacy. Some of these key strategies are summarized in the paragraphs that follow, categorized according to Bandura's four sources.

The first and most influential source is performance accomplishments. Successful performance tends to raise self-efficacy related to future tasks whereas failure tends to lower self-efficacy. For example, as shown in this study, the GPD directly impacts SEC. However, other types of performance accomplishments can influence student self-efficacy as well. For example, the use of low-stakes open-book quizzes can build self-efficacy for moderate-stakes closed-book quizzes, which can build self-efficacy for high-stakes exams. Similarly, using the scaffolding approach to learning, using proximal goals (in addition to distal goals), and creating "small wins" periodically throughout the semester can build and reinforce self-efficacy. Building practice sessions into the course (especially when supervised by the instructor) can also enhance self-efficacy. Both the amount of experience and types of experiences can influence student self-efficacy, and using a wider variety of pedagogies seems to enhance self-efficacy more than using one or very few teaching methods.

The second source is vicarious experiences. Observing others perform a particular task can increase a person's self-efficacy if the observed person succeeds, or decrease self-efficacy if the person fails. This is especially influential if the observer is inexperienced or uncertain of his or her performance capabilities. Therefore, modeling behavior can impact self-efficacy. Modeling can be in the form of an instructor explaining knowledge, demonstrating skills, or modeling behavior for students. However, it could also be other students or classmates modeling behavior through peer tutoring, cooperative learning, collaborative team or project-based learning, study groups, and so forth. Instructors could also share examples of past students' work (e.g., recorded presentations, sample writing assignments, etc.) or media resources (e.g., online tutorials or videos) as models for current students. Another form of modeling is providing students with normative feedback or social comparison information indicating where they stand relative to their classmates.

The third source described by Bandura is verbal persuasion. Persuasion and encouragement can increase a person's efficacy if perceived as being realistic and credible. Providing encouragement and praise is important, but feedback related to student competencies, motivation, and performance behaviors is important too. Although constructive feedback is crucial, and can actually enhance self-efficacy, it should be delivered in a way that builds self-efficacy; abrupt, caustic, or overly critical feedback will erode self-efficacy.

The final source of self-efficacy judgment is physiological states. Emotional arousal, stress, fear, illness, strength, as well as several other factors can result in different levels of self-efficacy. Too much stress and anxiety can negatively

impact performance, but too little stress and arousal can be indicative of low motivation, so a moderate level of emotional arousal is most ideal. Offering resources to enhance student strategies related to note-taking, learning, studying, and test-taking may increase self-efficacy and reduce dysfunctional anxiety and stress. Respecting and valuing student diversity and inclusion, accommodating students' disabilities and medical needs, and recognizing and acknowledging the stressors in students' lives may also help minimize dysfunctional anxiety and stress. Incorporating goal setting, engaging pedagogies, and variety into a course may motivate students who may be under-aroused. Instructors can also provide for students' psychological needs through using stories, building in student choice (e.g., on assignments), and connecting course material to students' lives.

Limitations and future research
This study is not without limitations. One limitation may be floor effects (since "F" is the lowest grade, yet spans a large range of values) and ceiling effects (since grades were positively skewed). Another limitation is that student performance data were not gathered longitudinally. Although this study examined SSGC and SEC, it was not possible to determine if subsequent performance changed as a result of SSGC or SEC. Future research should take a longitudinal approach and incorporate multiple performance events.

Another avenue for future research is how goals and self-efficacy may unfold over time in the absence of feedback. Most research related to GPD and goal and self-efficacy change provides explicit feedback to participants. However, in the real world, students and employees perform most day-to-day tasks without explicit, external, or objective feedback. They must operate under their own perception of performance based on internally generated feedback. Future research should explore how goals and self-efficacy may change as a result of the discrepancy between goals and perceived performance. Future research might also explore how goals and self-efficacy may change as a result of a discrepancy between perceived performance and actual performance, once external feedback is provided.

CONCLUSION

Using a classroom field setting, this study further clarifies how students use goals to self-regulate their behavior over time and provides support for goal-setting theory and self-regulation theory. More specifically, this study clarifies how SEC serves as an important mediator between GPD and SSGC. Student self-efficacy changes in response to a GPD, and goals are revised in response to self-efficacy change. When students achieve goals, their self-efficacy tends to increase and, in turn, they tend to raise their goals. When students do not achieve goals, their self-efficacy tends to decrease and, in turn, they tend to lower their goals. The extent to which student self-efficacy changes depends on their PGO. The extent to which student SEC leads to SSGC depends on their LGO. Goal setting can be a high-impact technique for enhancing student motivation and performance. However, when implementing goal setting, instructors should also consider techniques that can be used for enhancing student self-efficacy.

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Using a Staged Trial to Develop Critical Thinking and Teamwork in an Undergraduate Fraud Examination Class

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ABSTRACT

This article presents an active learning assignment with the purpose of enhancing student engagement in a fraud examination course. It achieves this goal by integrating the development of critical thinking and team-building skills within the context of a staged trial. Students identify a case of possible or actual fraud, develop a script based on public information and present a staged reading to a jury of their classmates. Recent cases tried by student teams have included Purdue Pharma, Wells Fargo, Valeant Pharmaceuticals, and Theranos.

Keywords: critical thinking, teamwork, accounting education, reflection, role-playing

INTRODUCTION

Sustaining a high level of student engagement in the curriculum is a challenging element in achieving learning goals for any business school faculty. Ideally, learners will "engage in experiential and active learning designed to be inclusive for a diverse student body, and to improve skills and the application of knowledge in practice." (AACSB International, 2020). Most, if not all, engaged in business higher education have encountered a lack of student interest in topics that seemingly should engender complete attention. Many of our students appear indifferent to whether a classroom presentation has any characteristics not captured by the rubric. This article describes how role-playing in the form of a staged trial evokes a high level of student engagement while promoting critical thinking and teamwork.

Forensic accounting educators have been engaged in developing innovative and effective approaches to what remains an emerging discipline. Alshurafat, et al. (2020) describe and evaluate the state of the pedagogy through interviews, and analysis of websites, syllabi, and other artifacts. Finding the pedagogy to be more nascent than mature, they note the relative sparseness of teaching notes directed at forensic accounting learning objectives. Some reported techniques are familiar: case studies, guest speakers, and videos. Innovative teaching approaches include preparing investigation reports, reading and analyzing novels with a forensic theme, and prepping for being expert witnesses. A recent example of integrating mock trials into the forensic curriculum was reported by Van Akkeren and Tarr (2022) who framed the students as expert witnesses in a mock trial conducted by barristers.

Mock trials are a consistent element in legal studies; in addition to teaching practical skills, they introduce competitive motivation to ensure full student engagement. The staged trial assignment described in this article is different, it does not have winners or losers but requires students, who will later appear to confront each other as prosecution and defense, to work cooperatively to develop a script that conveys key facts in a manner that sustains the interest of their classmates (the jury). Humor, pathos, and anger are included by agreement of the team and while a defendant may appear "clueless" the student acting the role is not. The present innovation relies on the perceived benefits of teamwork as the participants discover that an illuminating and interesting script benefits all. Teamwork is a learning goal for our school and this project fosters its development.

This paper describes how role-playing by students, in the form of a staged trial, can serve as an innovative, motivating tool. The described activity engages students in the learning process (Loeb, 2015) by allowing "students to put themselves in novel situations, providing them with greater opportunities to empathize with and understand other people's motivation" (Taplin et al., 2018). Student engagement is also increased when current business events are incorporated into a project. Raman et al. (2019) argue that "It should be exciting and engaging, with extensive media coverage and promise to linger in public memory in the foreseeable future." Increasing awareness is a key goal of ethics education (Williams and Dewett, 2005) as is adding realism (Loeb, 2015). Students' awareness can be heightened by well-publicized financial scandals; recent staged trials have included Purdue Pharma, Wells Fargo, Valeant Pharmaceuticals, and Theranos. Interest in the latter has crested due to the recent trial of its former CEO Elizabeth Holmes and documentaries; The Inventor: Out for Blood in Silicon Valley (2019), podcasts '20/20' The Dropout (28 episodes January 2019 to March 2022), and limited Hulu series The Dropout (March 2022).

THE ASSIGNMENT

Role-play enables students enrolled in an undergraduate fraud examination class to experience complex facts-sets as individuals and as members of a team. The assignment requires students to (1) research a case of proven or alleged fraud, (2) develop a trial script, and (3) rehearse, revise and stage a "trial" for the class. Students are formed into teams, 5-6 members being sufficient for the prosecutor, defense attorney, defendant, and witnesses. Students can fulfill multiple roles if needed. With instructor guidance, students research and choose cases that may be historical or prospective, with the latter picked for current topical interest. As the requirement is for a staged reading, students are expected to be familiar with their parts and speak with appropriate expression but are not graded on script memorization or acting ability.

A. The students are enrolled in sections of fraud examination with enrollments of approximately 20-25, divided into 4 teams. The assignment is worth 30% of the final grade, with 5% allocated to pre-trial and post-trial reflections.

B. Class Session 1 (50 minutes): Instructor presentation and class discussion on purposes, processes, and best trial practices. Student teams are formed. URL links to YouTube videos demonstrating trial basics such as preparing opening and closing arguments are posted on the class learning management system.

C. Pre-trial work (outside class):
   1. Student teams self-assign project management roles:
      a. Group Coordinator-Arranges meeting times, checks that each member is up to date on work, communicates with instructor
      b. Recorder-Maintains record of meetings and prepares timeline of the project: dates on meetings, group chats, and key emails
      c. Script manager-Coordinates integration of script elements
      d. Director-Coordinates trial and acquires basic knowledge of courtroom procedure
      e. Researchers (1-2)
   2. Case selection-requires instructor approval
   3. Research-Should include a search of primary news media sources, SEC and DOJ documents, as applicable
   4. Student teams assign trial roles- Prosecutor, defense attorney, defendant, prosecution and defense witnesses, expert witnesses, judge (instructor)
   5. Remainder of the class, 15-20 students are on the jury for each trial
   6. Draft script submitted-instructor reviews and critiques
   7. Pre-task reflection memo-Students individually write a 1page reflection graded using a simple, 3-row, 4-column rubric that evaluates content, format, grammar, and usage

D. Rehearsal with the instructor during office hours

E. Class Session 2: Trials (35 minutes per trial)
   1. Trials have been conducted during a single 150-minute class session as there are typically four trials per section. Usually staged during the scheduled final exam the trials can be staged at any point near the end of the semester. For larger sections, an additional session could be utilized.
   2. Scripted trial role-play presentation (25 minutes each trial)
   3. Deliberation, vote, and reading of the verdict (10 minutes each trial): The trial participants other than the judge leave the classroom, the judge provides brief instructions, and the jury members, consisting of the 18-20 remaining students discuss and vote. Full class reconvenes and the foreman reads the verdict.
   4. Full class wrap-up discussion (10 minutes): This de-briefing session can include the instructor opening a discussion about how the cases elucidate the ethical and/or criminology theories presented during the semester. But often, the students are most interested in sharing their experiences with their peers.

F. Post-task reflection memo: Students individually write 1-2 pages on their experience, graded using a simple, 3-row, 4-column rubric that evaluates content, format, grammar, and usage. Memo excerpts are included in the Reflections section.

LEARNING GOALS AND OBJECTIVES

The overall learning goals are the development of critical thinking and team-building skills with the specific objectives adopted from the AICPA Critical Thinking Model outlined in Table 1.

Table 1: Mapping of Learning Objectives to "Staged Trial" Exercise

Learning objective	How accomplished
AICPA Critical Thinking Model:	
1a) **Identify** the relevant information and issues needed to analyze the case or problem.	Students gain an in-depth understanding of a complex fact-set by reading SEC and DOJ documents and news articles. Students identify the key stakeholders, including defendants, attorneys, witnesses, judge, and jury, and develop an understanding of their specific motivations and goals.
1b) Students supplement their cognitive knowledge with an emotional connection to the case.	Emotional engagement is inspired by role play which is an important criterion for effective learning about complex ethical issues (McWilliams, V., & Nahavandi, 2006) that arise in fraud cases.
2) **Analyze**	Students scrutinize assertions and statements and integrate information to form plausible narratives for presentation by prosecution and defense. An interplay between prosecutor, defense attorney, and a witness can be critiqued by the entire team until it meets its goal, which might be introducing key evidence, undermining the prosecution or defense, or revealing a personality characteristic of the witness.
3a) **Conclude**	Students use judgment as a team to determine the final script. All voices should be heard; not all prevail.
3b) Reflect on strengths and weaknesses.	Students write pre-trial and post-trial reflection memos.
4) **Communicate**	
Oral communication:	
1a) Demonstrate professional behavior, including preparedness and respectful presentation.	Students adopt trial roles that generally require professional demeanor, speech, and appearance.
1b) Develop confidence about their presentation skills.	Students practice with their team and participate in a rehearsal with the instructor.
1c) Gain experience role-playing in front of an audience.	Scripted 25-minute trial. Students may have to improvise if off-script events occur.
Written communication:	
1) Demonstrate ability to express ideas clearly.	Students communicate by email and text messages. Students collectively write scripts.
Team-building skills:	
1) Gain experience working towards mutual agreement and common decisions in a team-based setting.	Each team allocates tasks and roles at the beginning of the assignment. Teams work together to collectively decide on scripts and dialogue that effectively moves the trial forward; pertinent facts are communicated in an informative and interesting manner.
2) Experience that dysfunctional competitive behavior doesn't achieve goals; cooperative behavior does.	Initially, students tend to compete as if in a mock trial, prosecution against defense. During development and rehearsals, it becomes clear that the script is a joint effort that needs to both elucidate the events and create an interplay between prosecution and defense that is interesting to the remainder of the class.

REFLECTIONS

The role and benefits of reflective writing as an active learning strategy have been addressed in the literature. Ganon, Donegan, and Rotondo (2017) discussed the benefits of reflection to encourage critical thinking skills in a client interview exercise. Loeb (2015) examined the advantages and benefits of using active learning strategies, including reflections when teaching accounting ethics. Massey and Van Hise (2009) incorporate reflection as an appropriate active learning methodology in designing an accounting ethics course.

During pre-trial work, individual students prepare an open-ended reflection writing, which contributes to their focus

on the upcoming activities. In this exercise, students are asked to consider any aspect of interest, such as what they expected to learn, how confident they are in their abilities and how they anticipate the trial to unfold. After the trial, the students write a post-task reflection memo; excerpts are provided below. Post-task reflection activities provide students with an opportunity to take a step back and critically evaluate their actions and those of other participants, assessing actual outcomes versus those anticipated. Students are afforded an opportunity to hold themselves accountable for their analysis and judgment. Reflections also provide an important opportunity to consider the interpersonal subtleties of team dynamics and individual effectiveness. Learning is reinforced as an active experience distilled into a critical personal evaluation. The following post-task questions were used in this activity:

1. Based on the trial, have your thoughts or opinions of the subject changed and, if so, how?
2. What skills have been affected by your involvement in the staged trial? How have they affected or been affected by your teammates?
3. Overall, what has the staged trial taught you about yourself?
4. What role did you assume on your trial team and why?
5. How effective were you in your role?
6. How effective was your team overall?
7. What surprised you about the outcome of the trial?
8. How has your thinking changed over the course of the assignment?
9. Would this experience make you choose different behavior in a real-world setting?

As noted above, the pre-task and post-task memos were graded. A team grade was assigned, but Individual trial performance was not evaluated as this task was an introduction to the dynamics of role-playing. If desired, evaluation of actual quality can be achieved through several methods: 1) Student self-assessments, 2) team peer assessments, and 3) recording of the trial by phone or other devices and posting on external or internal hosting sites for subsequent review.

Reflection Excerpts
Student 1: I thought I was effective in the role as one of the script managers. Obviously, there is room for improvement such as increased communication and meeting in person more often, however we set deadlines and often met them. Everyone was on task with their script and the group worked well together. I had a lot of help with the managing the script and I also helped with other parts which created a good working environment.

Student 2: I assumed the role of Prosecutor with really no knowledge of how I should proceed. During my research I was able to watch videos and read about what is expected from a prosecutor. I really enjoyed learning about the skills and knowledge a prosecutor must have to win the case. Learning how to write and present, opening and closing statements along with questioning the defendants and witnesses was a very nice learning experience

Student 3: Some of the skills affected by my involvement in this project were: communication, cooperation, and conflict management and negotiation skills. Initially, most of our communication was by email or text message, which is a lesson in conveying messages clearly.

Student 4: How important is team work to our group project? It is extremely important. As the old saying goes, there is no I in team. In my opinion, to be successful you have to assign tasks based on each individuals' strength to try to achieve the most effective product.

Student 5: Our team was effective in researching each part and then putting each role together like a puzzle. For example, since [X] was Maurice Greenberg, her main research was to find the information needed for this role. Since [Y] was Chairman Christopher Cox, he had to come up with questions that would be answerable by Maurice Greenburg based on his research but also in a way that it would address our fraud case overall. This was an area our team was strong in because when we met, we made sure to have the information at our hands so we would not waste time trying to find it and instead focused on putting the script together. [Z] and I were successful in figuring out the timeline of events so every role would be in an orderly fashion in which the events happened.

Student 6: It was surprisingly easy to come up with a defense for Wells Fargo Management. While it may seem sleazy, it's wasn't hard making a case for employee wrongdoing when you can support it with simple questions like 'was management involved?' and 'why didn't you tell anyone?' In doing it this way, the jury is able to see it from the perspective of what they would have done in that situation (or at least what they think they would have done). I believe

the results ending up being a 10-5 jury decision in favor of the prosecution which was still surprising. Even though I thought I made a good case, I thought it would still be a 15-0 decision.

Student 7: Overall, I had a great experience with our fraud trial and the other team's fraud trials. It was fun to see how each team came up with their scripts and learning about the other fraud cases that they chose, and everyone's thought process when it came to choosing a verdict. My group did a great job coming up with a script. We were worried after seeing some examples of online fraud trials that we would not find enough information and create a long enough script for our case, but we were successful in doing that…. Our team had no issues with communicating through-out the trial and we each gave our opinions and ideas each step of the way. I had a pleasant experience and it was much more engaging and interactive than a presentation, I would do it again.

CONCLUSION

This paper presents an active learning assignment with the purpose of enhancing student engagement in a fraud examination course. It achieves this goal by integrating the development of critical thinking and team-building skills within the context of a staged trial. Role-playing enables students to viscerally experience complex real-world facts-sets. Students were positive about their experience and one student even stated that "I would do it again." The exercise incorporates the AICPA Critical Thinking Model (2019). The staged trial presents an alternative that complements grade-driven compliance with extrinsic motivation and has reliably produced student teams that *cared* about the quality of their work product.

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I Can Relate to That: An Activity to Illustrate Segmentation and Targeting

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ABSTRACT

To increase student engagement and retention, many business professors have embraced active learning activities that reinforce the subject matter. The purpose of this paper is to describe an activity that can be used in marketing classes to illustrate the topics of segmentation and targeting. Since the topic of the activity is the segmentation of college students, students can easily relate to the subject matter.

Keywords: Segmentation, Targeting, Engagement, Active Learning, Principles of Marketing

INTRODUCTION

Marketing educators have noted the apathy of students in Principles of Marketing courses (Haytko, 2006; Vander Schee, 2007). One way to engage students and decrease this apathy is the use of active learning. Bonwell and Eisen (1991) note that active learning involves reading, writing, discussing, or solving problems. Multiple educators have found that various active learning activities have increased both student performance and perceptions of the course (e.g. Drea et al., 2005; Haytko, 2006).

Principles of Marketing is a core class in many business programs. As a principles course, it typically covers a wide variety of topics, including but not limited to consumer behavior, segmentation and targeting, marketing research, and promotions. Magnotta and colleagues (2021) argue that there is a need for short, topic specific activities that can engage business students across disciplines. Further, Vinuales and colleagues (2019) note that segmentation and targeting are less relatable to marketing students than topics such as consumer behavior.

While this paper describes an activity that can be used in an undergraduate Principles of Marketing course, the author of this paper has also used variations of the activity described in upper-level Marketing courses and as a discussion prompt in an online master's level Marketing Management course.

SEGMENTATION AND TARGETING

Segmentation has been an area of interest for marketing researchers since the 1950s (Alderson, 1952). Market segmentation involves separating a larger market into homogenous smaller markets (Marshall & Johnston, 2018). In the marketing literature, five broad bases for segmenting consumer markets have been identified: geographic, demographic, psychological, psychographic, and behavioral (Tynan & Drayton, 1987). Each of these bases of segmentation have multiple variables that can be used to segment the larger market. For example, geographic variables include climate, population size, and population density, among others. One undergraduate Principles of Marketing textbook lists 25 segmentation variables across the various segmentation bases (Kerin & Hartley, 2019).

Once an organization has identified all the market segments that make up the total market, the next step involves evaluating the various market segments and choosing which one(s) to target. This decision may be based on the market segment size or expected growth, the competition, the cost associated with reaching the segment, and/or the segments compatibility with the organization (Kerin & Hartley, 2019). Common targeting strategies include targeting all segments with similar marketing mixes, targeting some (or all) market segments with different marketing mixes, or only targeting one market segment (Marshall & Johnston, 2018).

Unfortunately, it is difficult to find real-world examples of businesses' segmentation and targeting efforts. Further, "limited resources are available to instructors that focus on generating student engagement and increased learning" of segmentation and targeting (Vinuales, et al., 2019, p. 24). Even when good examples are identified, it can be difficult for students (particularly undergraduates) to relate to and understand the example if they do not have any knowledge/experience in the context or industry of the example.

This paper describes a class activity that can be used to increase engagement and apply the concepts of segmentation and targeting to a "business" with which students are intimately familiar.

CLASS ACTIVITY

The activity uses information from a white paper entitled "The Differentiated University" (Ladd, Reynolds, & Selingo, 2012). The paper offers descriptions of six segments of undergraduate students identified by research conducted by the Parthenon group. The Differentiated University paper has divided potential customers (undergraduate college students) into six segments: aspiring academics, coming of age, career starters, career accelerators, industry switchers, and academic wanderers (Ladd et al., 2012). The paper includes descriptions of each of the six segments, a student story related to each segment, and some information about the methodologies used in identifying the segments (Ladd et al., 2012).

For undergraduate Principles of Marketing courses, the author of this paper first presents the six segments of undergraduate college students identified in the Different University article. This can either be done in a PowerPoint® presentation or by giving students a handout. An example handout is available in Appendix A. If this exercise or a variation of it is used in upper level undergraduate or graduate level classes, the instructor may have students read the entire article.

After presenting the six segments, students are asked which segment they think they belong to. It is recommended that a few students from each segment represented are given the opportunity to explain why they think they fit into that segment. Students are then asked which marketing segmentation strategy is being used by their current institution. The labels for marketing segmentation strategies vary by textbook but typical strategies include producing one product aimed at multiple market segments, producing multiple products each targeted toward different market segments, and mass customization.

Next, students are asked to identify which segment(s) are being targeted by their current University. Students will then be instructed to identify the product, place, price, and promotional tactics that are being used to target each segment. The author of this paper has created a worksheet for completing this exercise. A copy of the worksheet is in appendix B. Interested professors can contact the author of the paper for a copy of example answers.

A final question to ask students is whether the University is targeting the right segments. This follow-up question has the potential to generate significant discussion. As an example, this exercise is commonly used at a relatively small University (~3500 students). Yet, most students think that the University is targeting five of the six segments. This is an excellent opportunity to discuss whether organizations should try to be "all things to all people". For example, should a relatively small University invest resources in targeting most or all of the segments?

This exercise has been used in several different Principles of Marketing classes over the last few years. While anecdotal in nature, the students are highly engaged while discussing this class activity and seem to be genuinely interested in the discussion.

CONCLUSION

Research indicates that students more readily retain information through active learning. Since this exercise involves the segmentation and targeting of undergraduate college students, it is more likely to capture students' interest. Non-marketing business students will likely only be exposed to the concept of segmentation and targeting in their Principles of Marketing course. This paper presents a simple activity that engages students and helps them better understand the concepts of segmentation and targeting.

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Appendix A

Aspiring Academics (24%)	Coming of Age (11%)	Career Starter (18%)
"The Aspiring Academics are the segment most similar to the picture of the "traditional student" that most colleges are so aggressively seeking to serve. They are 18-to-24-year-olds with impressive academic profiles, and often come from wealthier families. They are academically driven with plans to go to graduate school, so the availability of a specific major and the presence of top-notch research faculty are valued by this group. While this segment is the largest of the segments found in the survey, it remains only a quarter of the market" (Ladd et al., 2012, p. 4)	"A second, smaller group of traditional-aged students, the Coming of Age segment, is not yet sure what they want to focus on when they "grow up," but have the luxury of taking the time to figure it out. These students are less academically driven than Young Academics and place little value on research opportunities, research faculty, or graduate school offerings. For them, college is about broad academic offerings, an active social culture, and trying a variety of activities without knowing exactly where it will lead" (Ladd et al., 2012, p. 4)	"The Parthenon survey revealed a third and distinct group of largely traditional age students. These Career Starters are extremely job oriented and use college to advance their specific career prospects. These students are focused on life after college, and are looking for a college that enables them to reach their ideal career position in the shortest amount of time. Career Starters are one of the more price-sensitive segments and value job placement rate and career placement services in making their college selection" (Ladd et al., 2012, p. 5)
Career Accelerator (21%)	Industry Switcher (18%)	Academic Wanderer
Typically older, Career Accelerators are going to college with the aim of advancing their career at their company or within their current industry. These are primarily working adults with some prior college experience and are likely to be most interested in institutions that award credit for their previous academic experience, as well as their job experience. These students value non-traditional delivery methods, particularly online courses. Career counseling and career placement services are strongly desired by this group (Ladd et al., 2012, p. 5).	While in many ways similar to Career Accelerators, Industry Switchers have a different motivation for going back to school to earn their bachelor's degree. Often in more precarious financial positions or unemployed, this segment is looking to start a career in a completely different field. Industry Switchers place a high value on an institution's link to labor markets and its ability to put them in touch with relevant employers and prepare them for their career transition (Ladd et al., 2012, p. 6).	Students attending college later in life, Academic Wanderers don't know exactly what they want out of college, but believe that obtaining a college credential will open doors for them. They are more likely to be unemployed and potentially have lower incomes. Academic Wanderers are the most "at risk" of the student segments. They are the least satisfied with their college experience, do not place high importance on their academic performance, and are the least likely to believe they will complete their degree (Ladd et al., 2012, p. 6).

Appendix B

Segments targeted:	Product	Place	Price	Promotion

Julie Steen, DBA is an Assistant Professor of Marketing at the University of South Carolina Aiken. She is passionate about teaching and prides herself on her ability to write cases and develop class exercises that help make marketing concepts more meaningful for her students. Her research interests include retailing and direct selling.

Prevailing Through Partnership: Take-Aways from Developing Data Analytics Programs in Collaboration with SAS Academic Programs

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ABSTRACT

As the need for data analytics skills in the workforce continues to grow, colleges and universities are creating new undergraduate and graduate academic programs to cover the scarcity of these competencies. While many professionals in the data analytics and data science fields agree on the important skills necessary to be data fluent, it can be difficult for an institution to curate and navigate the optimal curriculum for their student body. Decisions such as course content, software platforms, data sets, and rigor can seem overwhelming to faculty who have been tasked with the responsibility of creating these data analytics programs. This paper explores the experiences of two institutions who partnered with SAS Academic Programs to form and shape their curriculums with a Tier 3 Academic Specialization—one to create a master's degree in Data Analytics, and the other to create undergraduate certificates in Data Mining to meet the latest industry trends. The benefits of this unique partnership with SAS will be discussed, including access to free pedagogical materials and a suite of industry-standard software packages, enhancement of a program's visibility, and the encouragement of program growth and evolution over time. Solutions to potential tradeoffs will also be explored, such as supporting students' exposure to other programming languages and the reinforcement of conceptual understanding in SAS's task-based curriculum. The paper covers their journeys from the decision to partner with SAS, applying for Academic Specialization, crafting pedagogy around the partnership requirements, teaching and classroom experiences, and assessment of the academic programs.

Keywords: Curriculum development, corporate partnership, statistical language, statistical software, data analytics, data certification, SAS.

INTRODUCTION

The rapid explosion of data availability throughout industry has driven a corresponding demand for new members of the workforce able to derive meaningful and useful insight from this wealth of data (Columbus, 2017; Chang et al., 2018). Consequently, colleges and universities around the globe have found themselves scrambling to pivot their current academic programs to meet this demand (Cárdenas-Navia & Fitzgerald, 2015; Murumba & Micheni, 2017; Schwab-McCoy et al., 2021). Often, this task is placed on a handful of faculty who are experienced in more traditional mathematical or computer science courses of study. The data science/analytics skills gap is large, and there is a need for higher education institutions to partner with industry in order to determine what skills students need to be successful and serve organizations (Suryan & Gupta, 2021; Baumeister et al., 2020; Verma et al., 2019). A recent report published by Burning Glass, Business-Higher Education Forum, and IBM outlines this gap and the need for education-industry partnership (Miller & Hughes, 2017).

Several guidelines have been published by faculty and organizations—such as the American Statistical Association—describing a general curriculum that can be adapted by individual institutions to meet this demand (De Veaux et al., 2017; Horton & Hardin, 2015; Dumbill et al., 2013; Ding et al., 2021; Anderson et al., 2014). However, these guidelines are often vague and offer little in terms of specifics. There have also been several case studies published on the creation of individual courses (Donoghue et al., 2021; Asamoah et al., 2017; Baumer, 2015; White, 2019; Yan & Davis, 2019), but these again provide limited insight when developing an entire academic program. Institutions are left to develop their own learning materials and face the difficult decision of determining appropriate software platforms. This situation creates a conundrum whereby departments need to respond to the growing demand for skilled students, but often do not have the resources to efficiently and effectively spin up these programs.

A critical decision central to the creation of any statistical- or data science-oriented program is the choice of programming languages that will be incorporated into its courses. In making this selection, many institutions have discovered a solution to the other challenges they face by strategically partnering with industry. The statistical programming language SAS, in particular, has emerged as a leader in this field–with joint academic programs at over 300 institutions worldwide. In this paper we will discuss the experiences of the creation and implementation of two

such joint academic programs–a Master of Professional Studies in Data Analytics at Stonehill College and an Undergraduate Certificate in Data Mining at Bryant University.

PROGRAM DESCRIPTIONS

SAS Academic Programs offer three Tiers at which an institution can choose to set their program, with Tier 1 as the simplest and Tier 3 as the most advanced. What follows are brief descriptions of the programs that were created in partnership with SAS at each institution. We will later discuss the Tiers in more detail.

Master of Professional Studies in Data Analytics—Stonehill College

Stonehill College is a private Catholic institution located in Easton, Massachusetts, with an undergraduate enrollment of 2,500 and a graduate enrollment of about 50. Graduate programs at Stonehill are a new strategic initiative at the college, with its first graduate degree having started in 2018. The Master of Professional Studies in Data Analytics degree started its inaugural cohort in fall of 2020. The degree is housed within the Leo J. Meehan School of Business.

This degree is a one-year accelerated low-residency cohort model. It is important to note that this program is not a Master's in Data Science, but a program aimed at professionals who may not have any data analytics experience. One of the important parts of the program is that it does not require students to learn extensive programming skills, but to instead, break down the barriers of learning multiple programming languages, and teach students skills that they can apply immediately in the workplace. This is successfully accomplished due to the fact that most of SAS's suite can be used in a point-and-click manner.

By virtue of successfully completing the master's program, students are automatically awarded with a SAS Tier 3 Academic Specialization. Some of the courses in the program include: Structured Data Analytics Using SAS, Database & Data Warehouse Concepts, Statistics for Data Analytics, and Visualization & Digital Storytelling. Each course incorporates elements of the SAS suite, such as Enterprise Guide, Studio, Enterprise Miner, and Visual Analytics. The program culminates in a capstone where students must complete an end-to-end data analysis related to their careers. Students also have the opportunity to sit for two professional certification exams during the program. SAS certifications are among the choices of certifications. They are prepared for these exams in the program's classes.

Undergraduate Certificate in Data Mining—Bryant University

Bryant University is a private institution located in Smithfield, Rhode Island, with an approximate undergraduate annual enrollment of 3,200 students. The Mathematics department is housed within the College of Arts and Science, and offers majors in Actuarial Mathematics and Applied Mathematics and Statistics, and serves approximately 40 students in each graduating class.

As part of their program, the Mathematics department offers a SAS Certificate in Data Mining. First developed in 2003, the department has worked with SAS over time to continually improve and develop their program. In its current form, students must satisfactorily complete four SAS-based courses offered within the department: SAS Programming and Applied Statistics, Applied Data Mining, Applied Multivariate Statistics, and either Applied Analytics Using SAS or Statistical Design and Analysis of Experiments.

In order to receive certification, students must maintain a minimum 'B' average across all courses, with no grade lower than a 'C'. Each course incorporates elements of the SAS suite, such as Enterprise Guide, Studio, and Enterprise Miner, and concludes with a final project in which students obtain and analyze real-world data.

All of these courses have been incorporated into the majors and minors offered within the department, allowing graduates to supplement their degrees with this certification.

PROCESS OF SPINNING UP

To offer a SAS Academic Specialization, the participating school must decide the program "tier" in which they want to participate. SAS Academic Programs offer three tiers at which an institution can choose to set their program, with Tier 1 as the simplest and Tier 3 as the most advanced. Each tier comes with their own requirements of the institution. The most obvious trade-off when looking at these requirements is the requirement to incorporate SAS as the primary

software within the program and its courses. Fortunately, SAS has recognized the impracticality of this restriction and has made the requirement that fifty percent of each course incorporate SAS to establish an Academic Specialization. Previously, this still may have presented instructors with the cumbersome task of working in other languages such as R or Python disjointedly into their courses, but SAS has also recognized the utility in a user's ability to work fluidly between any of these languages and has begun allowing their direct incorporation into tasks and workflows.

In addition to increased rigor and requirements, each successive tier offers additional benefits to its participants such as access to teaching and pedagogical materials for faculty, free "e-Learning" online courses for students, free certification practice exams, and hefty discounts on the actual certification exams. Colleges also get free technical support for all SAS software. Exam preparation guides for students are not discounted. The requirements that institutions must meet for each specialization tier is shown in Figure 1.

Figure 1: SAS Academic Specialization Tier Requirements

SAS Academic Specialization	Tier 1	Tier 2	Tier 3
At least one (1) required or recommended reading material that uses SAS per class. Does not need to be SAS owned material.	✓	✓	✓
Programs require that students select any one (1) of the following hands-on components: • Lab with hands-on skill development where SAS is primary tool (50%) • Practicum, Thesis, or Capstone that uses SAS **(may also fulfill course credits)**. • Course project that uses using SAS. • Internship that uses SAS. • Presentation or poster accepted at a regional, national, or international conference (e.g., SAS Global Forum, SAS Users Group). • Innovative learning approach proposed by program and approved at discretion of GAP.	✓	✓	✓
Students must have clear understanding of the value of SAS certification and are informed of available resources for learning SAS (e.g., Communities, Users Groups, etc.).	✓	✓	✓
At least one (1) graded assignment with applied SAS usage per course	✓	✓	✓
Students are encouraged to attempt any SAS Certification Exam.	✓	✓	✓
At least six (6) credit hours of required courses that use SAS in each course at least 50% of the time (measured by number of weeks).	✓		
At least nine (9) credit hours of required courses that use SAS in each course at least 50% of the time (measured by number of weeks).		✓	
At least twelve (12) credit hours of required courses that use SAS in each course at least 50% of the time (measured by number of weeks).			✓
Academic Institution offers at least one (1) SAS practice or certification exam.			✓

Once a college decides on their preferred tier, they must complete a proposal outlining how the tier requirements will be met. As shown in Figure 1, this might mean including SAS software in one or more courses, assigning a reading or article in a SAS publication, etc. Once reviewed and approved, a memorandum of understanding is executed. This means that SAS has approved the program and will award an academic specialization to all students that meet the requirements laid out in the proposal. It also allows colleges to use SAS branding and promotional materials.

As part of the partnership, SAS provides free in person training for all software at their corporate campus. While the training was free, travel and lodging were not included. These workshops not only teach faculty how to use the various software they will be using for instruction, but they also provide faculty with pedagogical tips and tricks for use in the classroom. Faculty are provided with full course notes and PowerPoint slides and are encouraged to tailor the teaching materials for their classes. Once faculty are fully trained and syllabi are crafted, they can begin.

REALITY/IMPLEMENTATION

As with any new program, colleges will have successes and face hurdles. This implementation is no different. Both Bryant University and Stonehill College found the course notes which are distributed to students to be useful, but the level of detail in the notes between different courses varies quite a bit, and the task-focused design of the notes can sometimes assume a level of knowledge that is not present in a student who has never experienced data analytics. The faculty also felt that in some cases, important instruction was omitted. For example, in the course notes for data mining, there is no section on time series data analysis. It was also found that in some cases, homework assignments embedded in the notes were not very rigorous, and solutions could easily be found online. Luckily, course notes are provided in

Microsoft Word format. Therefore, faculty can add, edit, and delete portions with ease. The takeaway here is that while pedagogical materials are provided, they are not "plug and play." Thoughtful faculty will want to make multiple adjustments and additions to the notes.

The faculty at both colleges found the support provided by SAS to be very good. Support staff are responsive and very knowledgeable. Most issues are generally solved within 24 hours. While support is excellent, it is difficult for students to access directly. All support issues need to go through a point person at the institution. Another positive benefit of the partnership is the level of involvement by the SAS Academic Programs team. SAS has provided event sponsorship, judged at data analytics competitions, and provided free virtual certification test preparation sessions with students. SAS also provides many opportunities for students to get involved with analytics through special events, conferences, and competitions. It is not lost on the faculty that this partnership, however, is a two-way street. By having this level of involvement, albeit voluntary, SAS can get their product brand out there in multiple ways. We later discuss the importance of not solely teaching SAS to students in any program.

The largest hurdle faced by both colleges was implementation of software infrastructure. Colleges can offer students access to SAS software in a variety of ways. First, they can use SAS's OnDemand for Academics platform. This is a free semi-cloud-based service that allows students to login and use some SAS software on the web and some through a remote desktop-like experience. The main issue with this method is that it can be slow during peak usage times, and it is impossible for faculty to access any student work. Students must download their projects and submit it to faculty using alternative methods. Colleges can also opt to install SAS software on student laptops and/or lab computers. This solution, however, is not free. While colleges do get steep academic discounts on SAS software, a campus license for SAS's Academic Analytics Suite can cost several thousands of dollars per year. While it is not required that colleges purchase any software, it makes utilization much simpler. It is important to note that SAS software does not run on Apple computers, therefore, a Windows PC is required if this method is chosen.

All software companies are moving to cloud-based solutions, and SAS is no exception. In recent years, SAS has developed the SAS Viya platform. This is a completely cloud-based solution that requires no installation. SAS offers a version of the cloud solution free of charge for academics, but it lacks some critical features, such as allowing faculty and students to upload their own data sets. SAS states that this feature may be arriving in 2023. SAS seems to be in a period of growth with their software and how academic partners will access their software. Originally, the onboarding process for a student learner was very complex and often required multiple interventions from faculty. Since the creation of SAS's new Skill Builder for Students site, onboarding has become much more simplified, and students can gain access to all resources in minutes.

The final major drawback is a point of contention for data scientists and analysts. Because SAS is proprietary software, the major complaint from one side of the analytics camp is that it can seem very black box. There can be times when students ask faculty how a certain answer was derived or why something works the way it does, and often, faculty have no answers. If a faculty member digs deeply enough into documentation or searches on SAS's knowledgebase or conference proceedings, they may be able to find rationale for the way the software works. This is the nature of most closed-source software, not just SAS. However, while open-source software is mostly transparent, it comes with its own set of serious drawbacks. Users are at the mercy of a community of volunteer developers for major pieces of functionality of the software, not to mention support for that functionality when it does not work as expected. There are other drawbacks of open-source, but that is beyond the scope of this paper. The basic lesson is that there is not a perfect solution when it comes to closed- versus open-source.

OUTCOMES

Since its inception, Bryant's SAS joint academic programs have become a popular choice among students. Although created much more recently, the same can be said of Stonehill's program. Table 1 shows the number of students that have successfully completed each since their inception. Table 2 contains a selection of comments from students that have participated in these programs.

Table 1: Students Certified* Through 2021

College/University	Number of Students Certified
Bryant (2016-2021)	141
Stonehill (2018-2021)	96

* Students certified by either completing Academic Specialization or earned professional certification.

Bryant students often report back that interviewers were excited by the line on their resume. Both majors report being able to land high-valued internships in part due to their perceived analytics skills through the certification and their ability to discuss the details of hands-on "real world" projects they performed in their courses. These internships often lead to job offers after graduation. Alumni frequently report back that the hands-on experience of working with data and the SAS suite was some of the most valuable training they received.

As for Stonehill, because the college's master's program has only completed its first cohort, the evidence of improvements in job outcomes is somewhat limited. Several students in the program have indicated that they have been able to leverage the SAS skills they learned in the classroom almost immediately on the job, and at companies where SAS was not part of their software suite, the students were able to take the skills they learned in SAS and apply it to the software available. One graduate of the first cohort was able to obtain a sizable promotion at their healthcare organization due to their knowledge of not just SAS, but other platforms as well. Because this master's program is aimed at professionals who may be desiring a career change, it was also important to Stonehill that students are acquiring the skills they need to do so. Students have reported that in searching job postings, the SAS skills they have learned have contributed to their ability to apply for many more jobs than before.

Table 2: Student Comments from Bryant and Stonehill's programs

Student Comments
"Assignments for SAS were very useful in figuring out what I did know how to do and what I couldn't quite figure out. Lectures were useful in going over theory, math applications, and use of SAS to apply the concepts."
"I found the work in SAS miner to be most helpful because it was practical hands on experience."
"We are able to both understand the concepts behind the methods we are using in Miner as well as apply those concepts to Miner."
"I like the balance between using SAS and learning new material which is nicely balanced between the underlying math and the concepts themselves."
"As a student with no background in SAS whatsoever, [the professor] made it easy transitioning into using this program and applying what we learned to real life data sets."
"The software was really easy to use and the notes that the professor gave were very helpful for remembering steps."
"Getting my certification and putting it on my resume definitely helped me get my job in healthcare."
"It's really frustrating that the software doesn't work on Mac, but I still learned a lot in the course and the software was pretty easy to use."
"I am so glad this course didn't make me program. I feel I learned a lot more about data mining because I could just point and click."

CONCLUSION & LESSONS LEARNED

There is no doubt that the field of data analytics will continue to evolve, and consequently will continue to present challenges to institutions as they strive to prepare their graduates for the workforce.

It would be disadvantageous to students if the only technology used in the classroom was SAS, or any other singular platform for that matter. The field of data science and analytics is ever changing, and it is the responsibility of any degree program to ensure they are staying abreast of the latest developments within the field. Therefore, partnering with industry-standard software presents a viable solution for programs as long as that software continues to remain relevant, and the institution does not stop at that partnership.

SAS is unique in the breadth and depth of its available tools and shows a vested interest in developing and maintaining academic ties, recognizing the value in playing a role in the development of each new generation of data analysts. While both institutions partnered with SAS as a starting point for the development of their programs, neither have stopped there. Both have simultaneously incorporated other software and programming languages such as R, Python, Tableau, etc. within their courses as well to ensure that students are adequately equipped with the skills necessary for a constantly evolving industry.

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Everybody Works: A Post-Secondary Business Course For Disability Inclusion Practices

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ABSTRACT: Despite the establishment of the ADA 30 years ago, adults with disabilities are vastly underrepresented in work roles and are twice as likely to be unemployed compared to nondisabled adults. This employment inequality contributes to significant financial, health, well-being, and social outcome disparities for disabled adults. Current interventions are ineffective and often negatively perpetuate biases. They typically operate parallel to each other with little information sharing amongst policy makers, educators, and business professionals. Major contributing factors to disabled employment disparities include ambiguous disability policy, employer biases and misconceptions, and insufficient academic and professional business curricula. This paper proposes a disability theory informed curriculum, *Everybody Works*, to address current gaps in education by teaching undergraduate business students strategies for and benefits of implementing disability inclusive workplace practices.

Keywords: disability inclusion, disability inclusive practices, disability inclusive workplace

INTRODUCTION TO DISABILITY AND WORK PARTICIPATION

Despite the birth of the disability rights movement 60 years ago and establishment of the ADA 30 years ago, adults with disabilities are vastly underrepresented in work roles ultimately contributing to financial, health, well-being, and social outcome disparities. These persisting disparities in work engagement, health and wellness, and socioemotional outcomes suggest that current solutions to address the employment gap are inadequate. Even amidst the current reenergizing of civil and disability rights calls to action, employer biases and misconceptions remain major contributing factors that limit work opportunities for disabled adults. However, data consistently demonstrates that enacting disability inclusive practices is inexpensive, increases revenue, increases innovation, and decreases costs (Accenture, 2018; Butzer et al., 2020). This paper proposes an innovative business course, *Everybody Works*, to address gaps in academic and professional preparation of business students who will act as future peers, managers, employers, and employees of persons with disabilities.

Disability is a unique human identifier in its fluidity and continuum of experiences: it can be entered and sometimes exited, it can be chronic or acute, and it can intersect all ages, races, genders, sexualities, ethnicities, and cultures. The Centers for Disease Control and Prevention (CDC) defines a disability as "any condition of body or mind (impairment) that makes it more difficult for the person with the condition to do certain activities (activity limitation) and interact with the world around them (participation restrictions)" (Center for Disease Control and Prevention, 2019; p. 1). Global experts on disability further emphasize the impact of environmental factors and define disability as the result of limiting interactions between persons and their societal contexts (World Health Organization, 2011). Currently in the United States, the prevalence of disability has increased over time, growing from 19% of the U.S. population in 2010 to 25% today, representing the third-largest consumer market segment in the nation (Accenture, 2018; Brault, 2012; Iezzoni et al., 2014; Taylor, 2018). Following the COVID-19 pandemic, disability inclusion concerns will continue to impact all members of the workplace and thus, it is vital that employers and business education shift toward inclusive practices to prepare for an evolving workforce and marketplace.

Most of the workplace barriers that individuals with disabilities encounter can be easily accommodated with minimal to no costs. Accommodations are changes to a job, work environment, or hiring processes, that can increase a person's ability to fulfill and excel in their work requirements. Examples of accommodations are vast in number and variety: closed captioning or alternative text on audiovisual content, flexible interview styles or strengths-based job matching processes when hiring, flexible work schedules to accommodate appointment or medication routines, talk-to-text software to reduce typing demands, automatic or handsfree doorways, wide entrances and hallways, variable seating or workstation options, scent-free environments, etc. Research suggests that approximately 60% of accommodation requests could be met for free, and the remainder would require under $500. Financial incentives of completing such requests include improved productivity and employee retention (Loy, 2015). For example, Universal Design features (e.g., ramp entrances, automatic and wide doorways, accessible gym equipment, wheelchair sports storage room, pool transfer benches, and private locker rooms with transfer mats), or intentional features of a built environment to support accessibility for most people, in new workplace construction accounted for only 1.7% of the total cost and were

quickly recuperated by profit (Butzer, 2020). Additionally, companies identified as top performers in disability inclusion implementation demonstrated markedly higher profitability and overall company value compared to peers (Accenture, 2018). Indicators of greater company value include increased innovation, higher stakeholder value, higher productivity, greater access to market shares and new suppliers, and positive brand and reputation impacts (Accenture, 2018).

Despite the evidence for inclusive practices, disabled adults continue to be twice as likely to be unemployed compared to nondisabled adults (Cheatham & Rudolph, 2020; Taylor, 2018; U.S. Bureau of Labor Statistics, 2020). Decreased employment participation of disabled adults has been correlated with decreased independent living and inadequate financial earnings to sustain basic needs (MediSked & The Arc, 2018; Taylor, 2018). Lack of work is also associated with negative physical health (i.e., multiple chronic illnesses, poor healthcare access) and negative socioemotional outcomes (i.e., loneliness, depression, lacking friendship) for disabled adults (Hiersteiner & Butterworth, 2018; Iezzoni et al., 2014; Okoro et al., 2018; Petroutsou et al., 2018). Thus, work participation disparities exacerbate and perpetuate disparities and poor outcomes across multiple life domains.

Current available solutions to address employment disparities for people with disabilities include U.S. policy reform, direct training with persons with disabilities, employer-based training programs, and emerging disability studies academia to increase inclusivity in the workplace. Academic interventions typically address humanities or healthcare related fields, with little to no disability inclusive business education available at present. Additionally, policy, academia, and workplace interventions typically operate independently of each other and have not yet yielded meaningful, long-term change. Members of the business world and employers have called for better communication regarding disability policy and research implications for practice (Baker et al., 2018). Therefore, there is opportunity and demand for better workforce preparation and education to be better equipped to address workplace inequities.

THE CASE FOR DISABILITY INCLUSION IN BUSINESS EDUCATION

Most academic institutions and interdisciplinary accrediting bodies, including business-related organizations, now address standards for understanding social context, social responsibility, practices, and self-examinations as inclusivity and diversity as key principles for curricula or accreditation (Association to Advance Collegiate Schools of Business, 2021; American Psychological Association, 2015; Liaison Committee of Medical Education, 2021; National Architecture Accrediting Board, Inc., 2020). However, none of these organizations, outside of specific disability studies (DS) programs, explicitly cited disability-specific inclusion and diversity curricula. Academic and professional requirements for diversity and inclusion content are vague, subjective, and vulnerable to the effects of subjective opinion. Interpretation and enactment of diversity and inclusion education standards fall to individual academic institutions, which largely overlook disability as a diversity theme. This is equally true of business school curricula.

Business higher education institutions and professional accrediting bodies have a unique responsibility to address disability in diversity teachings as they are educating and preparing students to enter and lead the workforce. The potential impact of shifting to inclusive disability curricula is vast as business students constitute the largest proportion of degrees awarded each year. Nearly 20% (over 390,000) of all conferred bachelor's degrees were in the business field in 2019 (National Center for Education Statistics, 2021). Based on historical trends, that number can be expected to continue to increase annually. Without disability inclusion education, students are likely unaware of inclusive employment practices, the value of inclusive employment, or of the lived experience of one-quarter of the U.S. population (disabled persons) who may be their clientele, coworkers, employers, and employees in the future. Neglecting disability inclusion content creates and perpetuates the gap in professional preparation for nondisabled business students who will inevitably engage with disabled peers, employees, or consumers in the workplace and marketplace.

Current approaches to incorporating disability inclusion content in higher education range from infusing disability themes into interdisciplinary courses to creating specific disability anti-discrimination courses. Although studies on existing disability inclusion curricula in higher education, especially for business education, are lacking, the available evidence is promising. A small number of studies that qualitatively examined how inclusive curricula impacted non-business students without disabilities found greater positive attitudes towards people with disabilities, shifting of learners' career goals, and increased confidence in ability to recognize disability discrimination and latent biases after participation (Athamanah et al., 2020; Gitlow & Flecky, 2005; Matthews, 2010; Pitner et al., 2018, Shakespeare &

Kleine, 2013). However, a common concern across researchers was that the courses may inadvertently perpetuate hierarchical or "us-them" biases because they lacked disability justice language, lacked reciprocal relationships with persons with disabilities, and lacked representation of disabled persons as leaders or experts in the classroom (Athamanah et al., 2019; Gitlow & Flecky, 2005; Matthews, 2010). Therefore, it can be expected that including disability justice frameworks and expanding disability inclusion education to business students will positively impact learner outcomes and improve upon current practice.

Innovative and theory-driven education on inclusive disability employment practices for post-secondary business students may help to bridge information and preparation gaps, improve inclusive employment practices, reduce employer and peer biases, add value to the marketplace, and increase work participation of adults with disabilities. Additionally, careful consideration of course design to include disability justice frameworks is needed to avoid perpetuation of stigmatizing or "othering" attitudes. The sections below discuss the development of a business course informed by a disability justice framework that will uniquely improve post-secondary students' knowledge, skills, and attitudes regarding disability inclusive work practices, indirectly supporting a more inclusive social environment for disabled adults.

EVERYBODY WORKS COURSE DESCRIPTION

Everybody Works is a proposed education-based solution for closing the knowledge to practice gap by equipping business students with skills for analyzing and implementing disability inclusion and accommodation practices in the workplace. This course aims to bridge education, policy, and practice for disability participation by providing learners with 1) historical and political perspectives of disability, 2) knowledge of the impact on work participation, and 3) skills for analyzing and addressing work participation barriers to support their disabled employees, consumers, and peers. Students will examine and address real-world examples of physical and social accessibility and inclusion in the workplace from both employee and consumer perspectives. Using an innovative disability rights framework, students will create disability inclusion solutions and communicate their value to stakeholders. This course will uniquely prepare students to be leaders in innovation and inclusion in their future workplace.

While participating in this course, students will encounter asynchronous multi-media resources, engage in a synchronous live class, and complete asynchronous learning assessments to practice and apply their knowledge and skills. This introductory-level course will introduce students to:
- Sociopolitical history of disability in the U.S.
- Barriers to and misconceptions of employees with disabilities
- Strategies and principles for improving disability accessibility and inclusion
- Micro and macro-level advocacy strategies for employers and peers
- Principles for implementing Universal and Inclusive Design
- Bottom-line benefits of disability inclusive workplace practices

Examples of course modules with respective learning objectives, resources, and course assignments are illustrated in Table 1.

Guiding Theories for Inclusive Curricula Development
Critical Disability Theory
Critical Disability Theory (CDT) is the major guiding framework informing structure and content of this curriculum. CDT is a methodological approach rooted in disability justice lens used to empower disabled persons by examining and changing the societal context of disability (Hall, 2019; Meekosha & Shuttleworth, 2009). The CDT framework asserts that 1) qualitative research is vital to describing disability experiences, rather than reduction or numerical data, 2) autonomy is the rejection of normative values of participation rather than valuing personal independence only, 3) understanding historical, systemic, and social context of disability is paramount, and 4) communication among diverse cultures is vital for equity and inclusion (Meekosha & Shuttleworth, 2009). It is a departure from the medical model's pathologizing of disability as a condition needing curing and takes an action-oriented theoretical view, thus expanding upon the social model of disability (Berghs et al., 2019; Lawson & Beckett, 2021).

Table 1.

Module Title	Learning Objectives	Activities & Assignments
Introduction to Disability History	• *Review disability history and sociopolitical impact on inclusion and participation of disabled adults.* • *Recognize if/how the sociohistorical context of disability is implicitly internalize.*	*Learning Resources:* Articles, videos, and social media resources created by the disability community and allies that define key terms and discuss disability history in the U.S. *Assignment Learning Objectives:* • Discuss past experiences or introductions to disability. • Identify latent personal biases or assumptions about disability and the disabled experience. • Recognize how latent biases or assumptions may have influenced experiences with disability.
Disability & Physical Access in Workplaces	• *Critique barriers and create solutions for the physical accessibility and inclusivity of current business practices.* • *Identify realistic, readily available solutions to employment.*	*Learning Resources:* Articles, databases, and toolkits that describe the benefits of inclusive environments, examples of accommodations or modifications, and application-based tools for hands-on evaluation of a physical space. *Assignment Learning Objectives:* • Analyze the physical accessibility and ADA compliance of the physical space of a local place of business using an ADA checklist provided by the instructor. • Highlight pertinent findings and identify how those finding might support or hinder disability participation. • Propose immediate adaptation or modifications to address physical environment barriers.
Disability & Job Role Access in Workplaces	• *Critique barriers and create solutions for the social accessibility and inclusivity of current business practices.* • *Identify realistic, readily available solutions to employment.*	*Learning Resources:* Articles, databases, and toolkits that describe the benefits of inclusive work roles, examples of role accommodations or modifications, and application-based tools for hands-on evaluation of the workplace's social environment. *Assignment Learning Objectives:* • Using a checklist provided by the instructor, identify the job demands required of on job role at the same local place of business from Assignment 1. • Highlight demands that may act as barriers or facilitators to role fulfillment for employee with disabilities. • Propose immediate adaptation or modifications to address job role barriers.
Impact of Disability Inclusion on the Workplace	• *Communicate the cost of implementing or not implementing inclusion strategies.* • *Identify realistic, readily available solutions to employment.* • *Describe the value of inclusive employment as it relates to the four bottom lines.*	*Learning Resources:* Articles, databases, and social media resources that describe the bottom-line impacts of inclusive hiring to support knowledge and skills for objectively communicating the value to organizational stakeholders. *Assignment Learning Objectives:* • Using a template provided by the instructor, synthesize findings from previous assignments to identify physical accessibility, job role accessibility, marketing and/or product inclusivity, recommendations for improving accessibility/inclusion, and estimated costs for proposed recommendations. • Practice communicating these findings and recommendations to a key stakeholder in a brief recorded pitch.

The CDT framework values positive representation of disability, dignity of the lived disabled experience, advocacy for policy change, the voices of disabled individuals, and consideration of intersectionality (i.e., the compounded effects of claiming multiple marginalizing identifiers other than disability) as primary components of genuine disability inclusion (Hosking, 2008). Rather than identifying shortcomings of being disabled, CDT works to identify and address societal factors that limit participation. CDT principles for actively increasing disability justice and inclusion are present with key course components. Examples of imbedding CDT tenets into course content include centering the disabled voice by including resources from disability community members, directly addressing and challenging latent biases, highlighting a strengths-based view of disability participation, and including education on the historical political context of disability.

Adult Learning Theory
Adult Learning Theory (ALT) is a familiar educational framework used to inform pedagogical practices for adult learners (Knowles, 1978). Because many business students are adult learners in higher education settings, ALT is an appropriate model to guide teaching and learning approaches. In this instance, ALT has informed course activities and assessment to include self-directed learning, problem-oriented tasks, and incorporation of the learner's life experiences to promote motivation to learn. Examples include self-selection of case study examples, flexible prompts for assignments, and creative problem-solving learning assessments so that students have opportunities to apply or explore their personal interests in the context of this class.

All learning content and activities in this proposed course are informed by the Critical Disability Theory (CDT) and Adult Learning Theory (ALT) frameworks as described and illustrated below in Table 2.

Table 2.
Guiding Theory in Course Content and Design

Key Ingredients	Mechanism of Action	Primary Outcomes
• Module content guided by CDT: Disability policy, history, experience (CDT)	• Ability to identify disability (in)justices and inclusion strategies	• Increased knowledge of disability inclusive workplace practices
• Self-directed, problem-oriented learning activities (ALT)	• Representation and valuing of the disabled experience	• Increased skills for identifying and applying disability inclusive workplace practices
• Collaboration with disabled adults to create and teach content (CDT)	• Meaningful learning and internalization of content	• Improved attitudes towards disabled adults in the workforce/workplace.
• Strengths-based approach to disability inclusion (CDT)		• Internalization of disability inclusion practices.

MEASURING STUDENT OUTCOMES AND APPLICATION TO BUSINESS PRACTICES

Desired outcomes include increasing learners' knowledge of, skills for, attitudes towards, and internalization of disability inclusion practices in the workplace. In anticipation of future piloting or implementation opportunities, measurement tools and timelines were created to evaluate 1) learner outcomes and 2) quality improvement indicators. The following information reflects the anticipated measurement methods for when future implementation plans are secured. Course effectiveness for improving knowledge, skills, attitudes, and internalization will be assessed using a mixed-methods approach across multiple time points. As with most traditional academic courses, letter grades achieved on weekly assignments will be observed and coded on an ordinal scale (i.e., A = 4, B = 3, C = 2, etc.). The a*dapted Theoretical Domain Framework (TDF;* Huijg et al., 2014*) questionnaire* and an unstandardized knowledge survey will also be used at pre- and post-course time points to measure changes in actual knowledge, perceived knowledge, and internalization of disability inclusion practices.

Additionally, to support and assess course fidelity to objectives and key ingredients, process measures were developed to ensure that content and activities are being delivered as intended to support internal reliability and future replication of the course. Self-checklists will be completed weekly by the primary instructor and reviewed by a second rater to ensure that course content and instructor performance aligns with course learning objectives and imbedded CDT and ALT principles throughout the semester. Observational date of student participation will be gathered weekly to measure if students are consistently engaging with key ingredients of the theory-based content and activities. A summary of primary desired outcomes and how they could be measured are listed in Table 3.

Table 3.
Alignment Across Outcomes, Measures, and Real-World Application

Primary Desired Outcome	Outcome Measure Tool	Connection to Business Practices
Knowledge of workplace disability inclusion practices	• Assessments • Unstandardized knowledge survey • Adapted TDF	• Recognizing misconceptions of disability in onboarding or hiring processes • Using appropriate disability language when to meeting disabled peers
Skills for analyzing and applying workplace disability inclusion practices	• Assessments • Unstandardized knowledge survey • Adapted TDF	• Appraising/addressing disability stereotypes/biases in a marketing campaign • Creating more innovative solutions, products, or services by applying inclusion techniques
Positive attitudes toward workplace disability inclusion	• Assessments • Adapted TDF	• Adding to company value by hiring or recruiting employees with disabilities • Creating a more welcoming organizational and team environment
Internalization of disability inclusion practices	• Adapted TDF	• Sustaining disability inclusion in hiring, training, and fulfilling of job roles. • Enhancing organizational culture to embrace diversity and innovation.

DISCUSSION AND IMPLICATIONS FOR BUSINESS INNOVATION

Disabled work participation disparities and discrimination persists despite U.S. policy changes, the emergence of disability studies academia, and the modest success of discrete employee or employer training interventions. This is at least partially due to employer and peer misconceptions and biases and lack of professional preparation. Misconception and biases are prohibiting companies from reaching their maximum potential, as inclusive practices lead to numerous and measurable positive organizational profit and value outcomes. Thus, there is a clear need for innovative solutions that bridge policy, academia, and workforce or workplace to increase disabled work participation and innovative business practices. Educational interventions, such as *Everybody Works*, could fill that knowledge and skills gap for business students preparing for the workplace. It could replace biases and misconceptions about disabled work participation with understanding and valuing of disability inclusive workplace practices.

Innovative, disability-inclusive business curricula in higher education may be the key to increasing work participation of adults with disabilities, leading to improved social engagement, community engagement, health, and well-being outcomes. Accrediting bodies and academic institutions should examine their current requirements and more directly address disability inclusion criteria to proactively prepare competent and innovative workforce members. Business leaders and continuing education organizations should consider applying similar disability inclusive curricula to professional development expectations for existing workplaces to accommodate existing and prepare for future market

and workforce demands in response to the growing disability community. Overall, it is time for stakeholders to act on filling knowledge and skills gaps for supporting work participation of adults with disabilities to optimize performance, value, and equity, both financially and socially.

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Reflections on the Use of a Virtual Business Case Competition to Enhance Student Experiential Learning and Develop Business Partnerships

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ABSTRACT

The current AACSB standards emphasize student engagement and the application of knowledge and skills to real-world situations. Engagement and real-world application are important because they influence the depth of student learning and commitment to their academic program and provide value to the businesses the students work with on these projects. The Covid-19 pandemic has challenged us to provide the same type of learning project to our students in an online-only (virtual) context. Online classes without direct face-to-face sessions pose a significant challenge to the use of student teams to accomplish these projects. Furthermore, there appears to be little research in business education to guide educators in designing and executing such projects for a virtual context. In this paper we describe a client-based learning project that we designed and conducted in a virtual context, discuss the outcomes of the project, and describe the challenges and implications for future practice.

Keywords: virtual learning, experiential learning, engagement, stakeholders, case competition, business partnerships.

INTRODUCTION

Over the past decade, a great deal of focus has been placed upon a business school's responsibilities to its various stakeholder groups which have primarily included students, faculty, the university and the community (Workman and Berry, 2010). Indeed, although business schools often examined their graduates as their primary output in the past, increasingly schools are examining their multiple responsibilities to a broader variety of groups, as well as examining the interdependencies that exist among these groups (Gibb and Haskins, 2014; Workman and Berry, 2010), particularly the importance of student and employer expectations and interactions.

The focus beyond the classroom has also been noted by educational institutions that accredit business schools. AACSB International has addressed this exact issue in their new standards for 2020. In these standards there are three main categories: 1) Strategic Management and Innovation, 2) Learner Success and 3) Thought Leadership, Engagement, and Societal Impact (AACSB, 2020a). In virtually all areas, but particularly in the curriculum (Standard 4) and engagement (Standard 9) standards (AACSB, 2020a), AACSB encourages schools to examine how programs engage students and provide opportunities for application of skills in the real world. They note that pedagogies that integrate the classroom with professional experience are encouraged (AACSB, 2020b). In addition, schools are urged to give students every opportunity to be actively involved in their own learning to develop and apply the skills that they will use in their chosen field (AACSB, 2020b). Moreover, AACSB emphasizes that learners are not simply students; rather, learners are considered to be all stakeholders who seek to acquire knowledge or develop skills (AACSB, 2020b, p. 26).

This paper examines the use of an experiential exercise, the client project, to meet the stakeholder learning needs outlined by AACSB under a short deadline with limited funding. As an AACSB accredited business school, our mission and vision specifically address engaging students and faculty with the business community. We believe that offering students real-world business experience is a vital component of the business education we provide. We begin with a discussion of the impact of learning theory and engagement theory as it pertains to client-based projects. Next, we examine the client-based strategic case competition (SCC). Then we explore the reflections from our stakeholder groups: a) students, b) the business community, c) faculty and staff, d) university administrators and e) accrediting bodies. Finally, we discuss the overall challenges of the project, implications for future competitions and offer concluding statements.

PREVIOUS RESEARCH

Previous research examining how students best learn has centered around experiential learning theory and engagement theory. The works of Kolb (1984) and Kolb and Kolb (2005, 2009) examine experiential learning theory. Experiential learning theory (ELT) describes learning as a transformative experience, where knowledge results through construction, deconstruction and reconstruction via a cyclical process of experience, reflection, conceptualization and experimentation (Kayes, 2002; A. Y. Kolb and Kolb, 2005, 2009; D. A. Kolb, 1984). This form of learning, sometimes called authentic learning or learning-by-doing, is designed to bring reality into the classroom as well as to increase student engagement (Canhoto and Murphy, 2016; Dahl et al., 2018; Ritter et al., 2018). In addition, extensive integration through this cycle activates a process known as deep learning (Fredricks, Blumenfeld and Paris, 2004).

Experiential learning helps students take the knowledge that they have learned and developed in the classroom and apply that knowledge and its interpretation in real situations, much like that they may face in their future careers (Cooke and Williams, 2004; Hagan, 2012; Kosnik et al., 2013; McHann and Frost, 2010; Melton and Hicks, 2011; Reynolds, 2009), in essence, integrating various stakeholder needs. Common forms of experiential learning in many business schools typically involve role playing exercises (such as sales pitches or interviews), simulations, and team projects with clients (Baden and Parkes, 2013; Canhoto and Murphy, 2016; Clark and White, 2010; Kosnik et al., 2013). These exercises are lauded by accrediting bodies such as AACSB due to their ability to engage students in experience-based learning activities (Baden and Parkes, 2013) as well as the development of higher order thinking and increased self-awareness (Bonwell and Eison, 1991; Dallmore, Hertenstein and Platt, 2004; Kaufman, et al., 2019). A number of authors have argued that experiential learning in the form of client projects is an important way for students to apply their knowledge in a real-world environment, collaborate with teams, interact with business managers and develop bonds with the business community (Clark and White, 2010; Hagan, 2012; Kosnik et al., 2013; Morgan and McCabe, 2012; Nunamaker and Riley, 2007).

Engagement theory tells us that when students undertake activities that are realistic and meaningful, they are more likely to be engaged in the work as well as in their own learning (Kearsley and Shneiderman, 1998). Student engagement has become an important topic of interest for educators and researchers because engagement is expected to improve learning outcomes such as knowledge and skill development (Carini et al., 2006; Hu and Hui, 2012), self-regulation of learning (Fredricks et al., 2004; Wang et al., 2011), deep learning (Fredricks et al., 2004), perceived learning effectiveness (Hu and Hui, 2012) and general personal development (Carini et al., 2006; Ngai, 2009; Vayre and Vonthron, 2017). Engagement can also promote the student's satisfaction with their learning (Brault-Labbé and Dubé, 2010; Vayre and Vonthron, 2017), their psychological well-being (Brault-Labbé and Dubé, 2010; Vayre and Vonthron, 2017) and increase the retention of students in academic programs (Fredricks et al., 2004; Vayre and Vonthron, 2017).

Contextual aspects of the course also can have a profound impact on student engagement (Brown et al., 2014; Cajiao and Burke, 2016; Hu and Hui, 2012). In college business schools, faculty members have used a variety of instructional methods and projects to help improve skill development and student engagement and as discussed above. AACSB recommends these types of learning opportunities. These projects come in a variety of forms and are given various names, including "experiential learning," "active learning," "action learning," and "service learning" projects. What these forms have in common is the application of knowledge to real-world problems and situations, often in a collaborative setting, and relying on discussion, reflection, and action by the learners, consistent with Kolb's experiential learning model discussed above.

Kahn (1990) and May, Gilson, and Harter (2004) addressed a work-related type of engagement called psychological engagement. Engagement at work is positively related to the meaningfulness of the work, the level of psychological safety, and the availability of resources (Kahn, 1990; May et al., 2004). Thus, student experiential learning projects, especially those involving samples of real-world work, will be more engaging to the students when the work itself is meaningful to them, and when the learning and work environment is psychologically safe for them to express themselves (May et al., 2004). The psychological safety of the project work should have much to do with the relations among the student team members and also the relations between the students and their faculty and between the students and the client (Edmondson, 1999; May et al., 2004).

Finally, looking beyond only the students, Gibb and Haskins (2014) stress the importance of positioning universities as broad stakeholder learning institutions which need to design their future strategies in light of the interdependencies among all stakeholder groups. In addition to the benefits of engaged learning for students as discussed above, several

authors note that there are also great benefits that accrue to faculty, the university and the community when joint projects are undertaken (Kaufman, et al., 2019; Workman and Berry, 2010). For example, faculty involvement in a real-world student project increases faculty credibility with students, knowledge of research in the area, development of a cadre of guest speakers and relevance to current issues in the local community (Harkavy, 1998; Workman and Berry, 2010). Further, such projects can enhance faculty outreach into the community well beyond any increase to a faculty member's own research stream. Further related to the interdependency of stakeholders (Gibb and Haskins, 2014), outreach into the community by faculty meets university goals to become more responsive to community needs (Kezar and Rhoads, 2001; Workman and Berry, 2010) as well as increasing the value to the business community in terms of conceptual learning and partnership development with universities. These partnerships can be valuable not only for problem solving for local firms but also for future resource deployment in terms of grants, procurement of other types of funding, future human resource acquisition and achievement of community impact for accreditation purposes.

THE STRATEGIC CASE COMPETITION (SCC)

In the fall of 2020, the dean of the college commissioned a survey of all undergraduate business majors to determine the impact of virtual classes on student engagement. Results of that study showed that as students progressed from sophomore to senior, they felt increasingly less connected to the college and their classes than they had one year earlier (Fall 2019). The longer students had been in college, the less likely they were to believe that faculty were connected with students or that faculty even knew who they were. In addition, while students had communicated with faculty via email, overall very few had engaged virtually with business professionals or with real-world business projects. Finally, many students noted in open-ended questions that they wanted more face-to-face time with faculty (Zoom) and peers. Given the critical importance of experiential learning and student engagement in college business education coupled with the confirmation of lower student engagement, the dean initiated a virtual strategic case competition to be designed, marketed, implemented and completed in the spring semester of 2021, in fifteen weeks with a limited budget of $2,500 US dollars. The purpose of the competition was to provide a real-world learning experience for our students and engage them with the faculty, the college, and the business community especially during the COVID-19 pandemic. A strategic case competition task force was quickly formed in the Department of Management, and the competition was successfully launched during the second half of the 2021 Spring semester.

As a brief overview, the actual competition was a 3-week project from mid-March through the beginning of April in 2021 (for an implementation plan and timeline of weekly activities, see Table 1). The premise of the competition was to help a small business enhance its performance by strategizing ways to grow. We recruited a custom woodworking company from our local community as a client for the competition. The business owner shared the company's current strategic challenges which were to be tackled by interested students. The challenges included what businesses to focus on, how to find and compete for customers, how to improve efficiency of daily operations, and how to scale the business. Students signed up for the competition voluntarily and competed in teams. To attract participants, we offered monetary prizes to the top three performing teams and official certificates to all participants. Some faculty members also offered extra credit to encourage participation. A total of 10 teams joined the project. Three teams dropped out during the process due to schedule conflicts or family issues. Seven teams (ranging from 2 to 4 members) participated in the final presentation. In order to support our students in the competition process, faculty from different business disciplines provided subject content videos and offered Q and A consulting sessions. On the final presentation day, a judges panel consisting of four experienced business owners and executives evaluated each student team's performance based on four major criteria, including understanding of the problems (20%), quality of analysis (30%), quality of recommendations (30%), and presentation skills (20%). The following sections summarize the reflections from the perspectives of each of the stakeholder groups.

Table 1: Implementation Timeline

Week 1	Recruit 2 faculty leaders Dean, Chair and faculty leaders meet to discuss SCC and outcomes
Weeks 2 - 7	**Planning phase begins** Form SCC task force Develop and refine project design, timeline, and budget Recruit company for project Design project in conjunction with client company Work with marketing office to develop e-blast and signage to recruit students
Week 8	Recruit faculty as mentors (gurus), faculty begin video preparation Recruit faculty to promote competition in classes Begin recruitment of judges Develop project calendar
Week 9	Finalize financial rewards for student groups with dean and department chair Begin marketing of SCC Announce competition in classes to recruit students (virtual and face-to-face) Develop student application platform
Week 10	**Student application begins** Finalize judges Develop SCC platform in Canvas and begin to add project related materials, subject content videos, and other supporting resources
Week 11	Meet with client company to record videos of project for student reference Review of student applications Selection of student members Assignment of teams
Week 12 SCC Week #1	**SCC begins** Contact students to share project calendar Students meet virtually with project company owner Tasks outlined, faculty gurus announced Handle student dropouts and team rearrangement
Week 13 SCC Week #2	Student QandA with faculty mentors (gurus) Student QandA with SCC faculty leaders Presentation format discussion
Week 14 SCC Week #3	Finalize rubric to assess final presentations Practice presentations with faculty leaders Virtual final presentation Feedback from students
Week 15	Distribute financial awards and official certificates to student teams Feedback from faculty Feedback from judges and client

RESULTS

Student Reflections

On the last day of the competition, we invited students to participate in a survey and reflect on their learning experiences in the competition as a critical component of the experiential learning process (Kayes, 2002; A. Y. Kolb and Kolb, 2005, 2009; D. A. Kolb, 1984). We asked students whether they felt participating in this competition was a good opportunity for experiential learning, and how much they felt they learned. We also included three open-ended reflection questions, "What did you learn through participating in this competition?" "What did you not learn that you would like to?" and "What did you do well in preparing for the competition, and what could you have done better?" These questions not only helped students reflect on their own learning experience but also provided information for the project faculty to gauge learning outcomes and improve the competition in the future.

Eighteen of the 21 participating students completed the survey. Sixteen students stated they had never participated in a similar competition before, indicating this competition was a new learning experience for them. All of the students felt participating in the competition was a good opportunity for experiential learning, with 33.3 percent responding

"Probably yes" and 66.6 percent "Definitely yes." About 72 percent of the students felt they learned "Much" or "A great deal" by participating in this competition. The open-ended reflection questions provided more insights into students learning experience and generally fell into seven categories (See Table 2).

Table 2: Selected Student Reflections on the Strategic Case Competition

Real-world Experience
"I learned how to interpret knowledge learned from my previous classes and use that information in the real world."
"I like that we were able to help a business from the real world and get insight in his business and how we could help him."
Engagement
"It was interesting and new. Working with a real-life case is really cool."
"We had the opportunity to attend the QandA, meet with [the business owner], ask tons of questions, research, talk with other businesses that can help him improve. Fully understanding him and his challenges allowed us to find solutions that will actually help him."
Mentoring
"The judges spoke on how we could improve our analysis and I think that was very helpful! They told us we just needed to go the extra step to connect it all together and told us how to do that which will be great moving forward."
"[I wish I learned] how to strategize with financials [like ROI] and accounting involved."
Presentation Skills
"I learned how to take your information above and beyond to make your details really stick with the business owner and really persuade him to follow your plan."
"I learned the skills of [presentation] in order to affect someone's decision."
Teamwork
"[I learned] [h]ow to work with a team on a creative project. We were able to analyze a business and learn more about the process."
"I also learned how to make a team of complete strangers, in a virtual setting, work together for a common goal."
"I learned that there are a variety of strategies to grow a business and when individuals come together a variety of ideas and aspects come to life. When trying to improve your business, you should talk with a diverse group of individuals. This allows you to hear all sides and perspectives, and gains ideas you may not have thought about or knew how to accomplish."
"I think my team could have communicated a lot better…"
Networking
"I enjoyed being put into an opportunity where I had to work with strangers and expand my network."
Time Management
"Time management was bad- this jumped up on us."
"I wish I would have started earlier and planned out my timeline more efficiently."

Students believed that the SCC provided them with *real-world experience*. This competition allowed students to apply their knowledge in a real-world business setting and gain hands-on experience by helping a local company solve its strategic problems. As a custom woodworking business, our client company was struggling with challenges such as what businesses to focus on, how to find and compete for customers, how to improve efficiency of daily operations, and how to scale the business. Addressing these real challenges provided a great learning opportunity for our students because they were able to experience the complexity and ambiguity of strategic management in practice. Moreover, there were no "right" answers to the firm's struggles, and students needed to synthesize what they had learned in different business functional areas to develop their own solutions. Students also were able to experience working with budget limits and resource constraints, which led them to be practical and creative in problem solving.

A number of students noted that the SCC was highly *engaging*. The beauty of experiential learning lies not only in learning-by-doing, per se, but also in the excitement of working in a real-world situation. As noted earlier, existing research suggests that a sense of meaningfulness found in the significance of the task is a critical determinant of engagement (Hackman and Oldham, 1976; Kearsley and Shneiderman, 1998; May et al., 2004). Consistent with this research, our students expressed that it was both meaningful and fun to undertake a realistic task of helping a local company, and this greatly engaged them in the learning process. The SCC also provided an opportunity for students to interact with judges and faculty, thus contributing to students' learning experiences via *mentoring*. We had a panel

of four judges (including the client), all of whom were experienced firm executives, entrepreneurs, or business owners. While evaluating each team's performance, the judges shared real-world knowledge and provided feedback to students.

They particularly encouraged students to cultivate a practical business mindset. A good example was in highlighting the importance of providing projections of costs and return on investments (ROI) associated with the strategic recommendations made by students. While we as faculty had often emphasized the importance of data support both in the classroom and in this competition process, the concept seemed to have really clicked with students when they heard it from experienced professionals in a real-world situation.

In today's workplace, the so called "soft skills" have become increasingly important for career success. The SCC offered a great opportunity for students to learn and hone both their *presentation and teamwork skills*. Since the competition task was to recommend strategic solutions to the client company, students needed to be able to present a compelling and persuasive case to the client. We provided online resources about persuasive communication and offered a demonstration session to help students organize and present their ideas. In addition, we held rehearsal sessions with each student team to practice their presentations and provide coaching and feedback before the final competition day. In the *Financial Times* survey (Moules and Nilsson, 2017), the ability to work with a wide variety of people was rated as the most important skill that employers desire. We find this is also one of the most mentioned topics in our reflection survey. Most students joined the competition without a team and were assigned team members to work together. We were mindful to construct teams with students from different years and majors to make sure each team had a diversity of knowledge required and team members could learn from one another. While not denying the challenges of working with people who were strangers and from different backgrounds, students overall took a positive view and expressed what they learned from the experience.

Participating in the competition provided an opportunity for students to *network* as well as experience the value of networking. As mentioned above, many students joined the competition individually and got to know and work with new people in the process. This helped expanding their network. It is worth mentioning that some of the participating students were running their own businesses or in the process of starting their own businesses. When this was revealed during the final presentation, the judges suggested that students share information of their businesses with one another and with the judges to stay connected. This turned out to be a great networking opportunity for these young student entrepreneurs. While the other students without their own businesses may not have directly benefitted from the exchange of business information, they nevertheless witnessed the value of networking by watching contacts being established and new business opportunities happening in real time.

Although student comments by far were very positive, the SCC was not without its challenges. It is noteworthy that *teamwork* was frequently mentioned in students' reflections on what they did well or could have done better in preparing for the competition. This indicates that students recognized the critical role of teamwork in high performance and success. The importance of *time management* was another topic that emerged in students' reflections. The entire competition process from getting to know the client company to the final presentation was three weeks in length. This short timeframe presented many challenges to the participating teams. At the same time, we also consider this quick turnaround a valuable experience for students as real-world business situations rarely have the luxury of long time periods to solve problems. Indeed, the ability to prioritize and manage time effectively was rated as the most difficult to find skill by employers in the *Financial Times* survey (Moules and Nilsson, 2017).

Business Community Reflections
Case competitions have often been considered as a way for schools to connect with the local business community (Baden and Parkes, 2013; Canhoto and Murphy, 2016), but most of the literature examines the benefits for the students or the college. Reflections from the judges and the client offer us a view into the benefits they received (see Table 3).

Table 3: Selected Business Community Reflections on the Strategic Case Competition

Building relationship with the College/University
"[I will] benefit from the expertise of the students, faculty and other local business owners in supporting [my company's] growth." (Client)
"It will be my first time participating in such case competition, I don't know what to expect. The Dean [of the College of Business] asked me to participate, and it will be an honor to be a jury member. I will try my best to give constructive feedback to the students based on my years of experience managing companies." (Judge 1, business owner)
"This competition motivates me to connect our two Colleges for futures projects. I can envision a future competition dedicated to supporting a company that provides a product or service in the health industry. We could create multidisciplinary teams to combine the strengths of both colleges and prepare students to what is next in their career." (Judge 2, business owner)
Knowledge of students/business curricula
"I left school a while ago. So, it [is] interesting to see how students are developed nowadays." (Judge 2, business owner)
"I was impressed by the quality of the presentations, the depth of the analysis and the level of engagement". (Judge 2)
"The students were well trained. The presentations were clear, the concepts were mastered, and the ideas were good. In comparison to the consultants we use, I would say that the students were at the same level." (Judge 1)
"Students were extremely professional and well prepared." (Judge 2)
Networking
"I discovered a new business. My company is in the beer industry, we need suppliers who can manufacture beer tap, counter tops, tables etc. This competition allowed me to discover a potential supplier." (Judge 3)

One of the most prevalent comments related to *building a relationship with the college and university* as well as *getting to know the students and the curricula* within the college. Our client saw this experience as one where he would learn from students and faculty as well as support the college. Judges, on the other hand, were comprised of business leaders from the Advisory Board of the College of Business. This was an enlightening experience for them, and most were eager to give back to the school as well as witness new educational methods. The virtual case competition also helped to develop future relationships between the students, faculty, college and university. For example, one of the judges, in addition to being on the business Advisory Board of the College of Business is also an entrepreneur in residence at the Institute for Health Innovation in the College of Health and Human Services. His experience working with students in our College led him to believe that there is potential for students from both colleges to work together on future projects.

The competition provided a way to expand the *network* of all of the participants. During the presentations, one jury member realized that the client company had great potential to be a future supplier. The judges also discovered during the presentations that a number of the student participants were either running their own businesses or in the process of developing a new business. In an attempt to support these businesses and potential start-ups, the judges asked for the contact information of each of the students. The potential for networking benefits not only the students but the judges as well. Again, although the feedback from the client and judges was primarily very positive, the judges did express some room for improvement. They noted in particular a need to enhance the way students presented financial data even though overall they were very pleased with the quality of the presentations.

Faculty and Staff Reflections
The case competition would not have been possible without the support of many faculty and staff from the College of Business (see Table 4). Given the very tight timeline for project implementation in addition to the challenge for faculty to convert classes to an online format, we prioritized keeping any additional faculty workload to a minimum. We encouraged faculty to share a short video *highlighting key areas of their functional area* with students so that student participants would be able to contact faculty for questions in any functional area as they made recommendations. In addition, faculty members opened their regular office hours to student teams. This gave student participants a way to easily contact faculty yet reduced the faculty workload by not creating additional hours for team consultation. While a few professors declined to participate, most faculty were delighted to share a summary of their courses and serve as consultants. Again, faculty noted a number of challenges, particularly in getting students to contact consulting faculty with whom they had no relationship. In part this may have stemmed from the fact that the entire SCC was conducted virtually, and as a result, students were hesitant to attend faculty office hours. However, even virtual office hours had little attendance, leading faculty to consider possible changes to the SCC in the future.

Table 4: Selected Faculty/Staff Reflections on the Strategic Case Competition

Highlight key areas
"This project challenged [me] to create a short video summarizing of [my] course".
Challenges with students
"No students joined today's session either, so may want to rethink this approach for the future. Doesn't seem to be much uptake. You could make it mandatory but then you might get forced compliance
"What if they had to include as part of their case study, something they learned from each QandA session and how that helped them with the project?"

Administrator/Accreditation Reflections

We have already noted the potential for the interaction of faculty and students from multiple colleges within the university along with business clients in an earlier section. Another concern among administrators at both the college and university level is the engagement of students and faculty (See Table 5). This has been a concern during the pandemic, but it has also been a trend with declining university enrollments over the last several years (Sedmak, 2020). Our belief is that this experiential exercise can increase student engagement in the (virtual) classroom with faculty and peers, increase student interaction with the business community and give students a sense of accomplishment in a real-world business experience which will be seen by students as a valuable part of their education and will engage students in a way that will help them stay on track to complete their degree.

In addition to providing an engaging experience, we also used this exercise to demonstrate to students the wide variety of skills that are extremely beneficial in a real-world scenario and which they have developed, and can continue to hone, during their university education. We often tell students in our classrooms about the value of presentation skills or networking but showing students a situation where the value of these skills is evident puts this knowledge in an entirely different perspective. This exercise was also a way to build excitement not just among students, but also among faculty, staff and the business community participants who worked with the teams. Faculty from a number of functional areas were involved in assisting students in their particular areas. Both the client and the judges were able to meet with each of the teams as well as hear their final presentations and see the end result of student work. In addition, we were able to promote this activity in both the college and university, so that both internal and external stakeholders were able to better understand some of what we do both inside and outside of the classroom.

Finally, our accreditation in the business school is dependent upon whether we meet our mission and how we are positioning the school to achieve its vision in the future. The 2020 AACSB business standards emphasize that experiential learning should be a focus of what we do in the classroom to ensure that students are developing knowledge and skills that are applicable in the marketplace in their individual careers (AACSB, 2020a, 2020b). We believe that this exercise addresses all three pillars of the new standards: engagement, innovation and impact. First, the exercise engages students in an activity directly applicable to their degree program. All students undertake a capstone strategy course, and this exercise examines not only strategy, but also the interaction of the various functional areas on strategy. Next, we believe that the exercise is innovative. Using both the client and judges as mentors helps students develop and apply key concepts as well as build the skills noted above. Finally, we also believe that this exercise will have impact on both the business community and the students, although it may take several years before we are able to measure overall impact.

Table 5: Administrator/Accreditation Reflections on the Strategic Case Competition

Building Student/Faculty/Business Community Engagement
"One of the main problems that we have seen over the last year or two is disengagement of students…..disengagement with faculty, with the college and with the business community. This has been especially true with students taking online classes during the pandemic. This competition is a way to provide experiential learning that truly engages them in a way to enhance what they have learned in the classroom and apply that in a real-world experience." (Dean, College of Business, AACSB)
Skill Development
"The use of experiential exercises to apply classroom concepts and enhance skills needed in the workplace is a very important part of what we do. Not only is it a key component of our mission and vision, but it is also an essential element of our brand." (Dean, College of Business, AACSB)
"We wanted to develop a real-world experience that would give students a way to enhance many of the skills needed for the workplace, such as public speaking, problem solving, time management, strategic thinking, teamwork, leadership, networking and professionalism." (Dean, College of Business, AACSB)
Networking
"We also saw this as a way for students to develop friendships as well as mentoring relationships with students and members of the business community, perhaps even resulting in future internships or job opportunities." (Dean, College of Business)
Marketing
"This competition was able to show the business community (i.e. the judges and the client) what many of our students are capable of doing." (Dean, College of Business)

DISCUSSION AND CONCLUSION

In this paper we have described an experiential learning project for college students that we designed to enhance student engagement in a virtual setting and to provide a way for students to apply their knowledge and build skills, including teamwork and collaboration skills in a way that benefits all College stakeholder groups. The project, that was developed, implemented and assessed in one semester with a very limited budget, involved real-world, meaningful work and students received learning feedback from their peers, faculty coaches, the client and the competition judges. We believe the project was successful in helping students apply their knowledge and develop their skills and team-work capabilities.

The project was not without its challenges. One major challenge was that due to the Covid-19 pandemic, we required students to operate as a virtual team in an online environment rather than in a blended environment combining face-to-face with online activity. As expected, this added some difficulty in communication and may have promoted less student engagement than we hoped due to the isolating nature of online-only collaboration. This was particularly evident in the lack of student contact with faculty gurus, most of whom they had never met. Nevertheless, we believe that this online format was a valuable learning experience for our students as virtual working environments have become increasingly common in today's workplace. To alleviate challenges with online communication and collaboration, it might be helpful to provide training prior to the project on virtual working technologies such as how to set up and hold an online meeting or use an application for project collaboration. It might also be desirable to organize online activities for team building and student-faculty engagement at the early stage of the project.

In addition to examining the various learning outcomes discussed in earlier sections, students' and client feedback also helped us reflect on what we could have done better to improve the student and client learning experiences. One challenge related to project length and scope. We limited the competition to a three-week timeframe for the purpose of making it short and manageable for students. As mentioned earlier, some teams experienced difficulty planning their work and managing time efficiently due to the quick turnaround. It might have been more desirable if we extended the timeframe and broke down the project into smaller "chunks" so that students could better pace themselves and diagnose work processes when needed. This would also allow faculty to check in with each team and provide feedback between the "chunks" to improve learning (Wageman et al., 2009). In addition, some content areas could be stressed more when working with students. This was particularly evident with financial analysis as well as some team communication challenges.

A crucial part of holding a successful real-case competition is the recruitment of companies and judges. Our experience suggests that the College's Advisory Board and faculty networks are particularly valuable resources. With the help of

our dean and department chair, we were able to effectively leverage these resources and quickly bring on board the right company and judges. As we continue to develop and scale the competition in future semesters, it will be desirable to keep marketing the competition among the Advisory Board and faculty as well as to engage them earlier in the recruitment and project planning process. We also hope to involve both the Advisory Board and the career development arm of the business school in reaching out to companies that may be interested either in becoming a future client project or in financially supporting the competition. In spite of various challenges and time constraints, we believe that our first SCC competition was an excellent learning experience addressing the perspectives of all five stakeholder groups. As we continue to reach out to more companies, we believe that the SCC will become an even more valuable exercise as it is developed and improved in the future.

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TOPIC AREAS (BUT NOT LIMITED TO THESE):

- Course design – current courses, new courses, new trends in course topics
- Course management – successful policies for attendance, homework, academic honesty …
- Class material
  - Description and use of new cases or material
  - Lecture notes, particularly new and emerging topics not covered effectively in textbooks
  - Innovative class activities and action-learning – games, active learning, problem based
- Major or emphasis area program design that is new or innovative.
- Assessment – all aspects including AACSB and university level assessment strategies and programs
- Integration of programs or courses with other academic disciplines
- Internship programs
- Business partnerships
- Successful student job placement strategies
- Any topic that relates to higher education business education.

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- See the Style Guideline page for specific instructions.
- Articles must make a contribution to business education innovation.
- Manuscripts should be limited to 8 to 10 pages or less, although longer will be accepted if warranted.
- Articles can be either regular research papers, or shorter notes that succinctly describe innovative classroom teaching methods or activities.
- Manuscripts should be completely finished documents ready for publication if accepted.
- Manuscripts must be in standard acceptable English grammatical construction.
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    - Accept with minor revisions.
    - Not accepted.
- Reviews will be returned promptly. Our commitment is to have a decision to you in less than two months.
- If your paper is not accepted, the evaluation may contain comments from reviewers. You are invited to rewrite and submit again.

If your paper is accepted

- Minor revision suggestions will be transmitted back to you.
- Revise and send back as quickly as possible to meet printer deadlines.
- Upon final acceptance, we will bill you publication fees. See www.beijournal.com for latest per page fees. Sole author fees are discounted.
- The fees include all costs of mailing a copy of the issue to each author via standard postal ground.
- Delivery to locations outside the continental US will cost an additional $10 per author for 5 day delivery.
- Faster delivery methods are available for US and international delivery. Contact the editor for a specific pricing.
- All publication fees should be remitted within 10 business days of acceptance, if possible.
- If you decide not to publish your paper with BEI Journal after submitting payment, we will refund publication fees less $200 to cover costs of review and processing.
- Cancellation cannot occur after the paper has been formatted into the final printer's file.

Manuscript Style Guide and Example

An example is provided following these instructions.

This style guide represents style guidelines in effect for future issues, but always check for updates online.

Authors are responsible for checking for correct grammar, construction and spelling. Authors are also responsible for formatting pictures, tables, and figures such that a pdf black and white file sent to the publisher will reproduce in a readable manner.

General Setup:
- All fonts other than exceptions noted below: Times New Roman. 10 point for text. Other sizes as noted below
- Margins: 1 inch on all sides of 8½x11 inch paper size.
- No headers or footers.
- Absolutely no footnotes or endnotes via footnote or endnote formatting. For footnotes or endnotes, place a number of the footnote in the proper location as a superscript. Then at the end of the paper or bottom of the page, add the footnote as text with a superscript number to correspond to that footnote.
- Page numbering bottom centered.
- No section breaks in the paper.
- No color, including url's. Format to black. No color in tables or figures. Use shading if necessary.
- All pages must be portrait orientation. Tables and figures in landscape orientations should be reformatted into portrait orientation.
- All paragraphs should be justified left and right, single spaced, in 10 point Times font, no indent on first line, l line between each heading and paragraph.
- One line between each paragraph.

Titles, Authors, and Headings:
- # Title centered 14 point bold. One line between title and author's name.
- ## Authors: centered, 12 point. Name, affiliation, state, country.
- One line space to **ABSTRACT** (title 10 point, bold, all capitalized, aligned left; text of abstract 10 point, no bold)
- After **ABSTRACT**, one line space, then **Keywords**. Followed by one line space to first major heading.
- **HEADINGS, MAJOR**, 10 point, bold, all capitalized, aligned left.
    The specific headlines will be based on the content of the paper, but major sections should at a minimum include an abstract, keywords, introduction, conclusion, and references.
- **Sub-headings**: 10 point, bold, first letter capitalized, no line to following paragraph. Align left.
- *Third level headings: Italic*, 10 point, first letter capitalized, no line to following paragraph. Align left.
- **Keywords:** heading: 10 point, bold, first letter capitalized, no line to following paragraph. Align left.
    Your list of keywords in 10 point, no bold.

Tables, Figures and Graphs:
- All fonts 10 point.
- Numbered consecutively within each category. Table 1, Figure 1 etc.
- Title: 10 point, bold, left justify title, one space, then the table, figure, etc.
- Example: **Table 1: Statistical Analysis**

References:
- APA format when citing in the text. For example (Smith, 2009).
- References section: 8 point font, first line left margin, continuation lines 0.25 inch indent. Justify left and right. No line spacing between references. List alphabetically by first author.
- Specific references: Last name, First initial, middle initial (and additional authors same style) (year of publication in parentheses). Title of article. *Journal or source in italics.* Volume and issue, page number range.
- Example: Clon, E. and Johanson, E. (2006). Sloppy Writing and Performance in Principles of Economics. *Educational Economics.* V. 14, No. 2, pp 211-233.
- For books: last name, first initial, middle initial (and additional authors same style) (year of publication in parentheses). *Title of book in italics.* Publisher information.
- Example: Houghton, P.M, and Houghton, T.J. (2009). *APA: The Easy Way!* Flint, MI: Baker College.

Example (note that this example represents a change from previous style guides)
Evidence to Support Sloppy Writing Leads to Sloppy Thinking

Peter J. Billington, Colorado State University - Pueblo, Colorado, USA (12 point)
Terri Dactil, High Plains University, Alberta, Canada

ABSTRACT (10 point, bold, all capitalized, left justified)

(text: 10 point Times font, no indent, justified, single space, 150 words maximum for the abstract)
The classic phrase "sloppy writing leads to sloppy thinking" has been used by many to make writers develop structured and clear writing. However, although many people do believe this phrase, no one has yet been able to prove that, in fact, sloppy writing leads to sloppy thinking. In this paper, we study the causal relationship between sloppy writing and sloppy thinking.

Keywords: sloppy writing**,** sloppy thinking (**10 point, bold title, first letter capitalized, left justified).**

INTRODUCTION (10 point, bold, all capitalized, left justified).

The classic phrase "sloppy writing leads to sloppy thinking" has been used by many to make writers develop structured and clear writing. However, since many people do believe this phrase, no one has yet been able to prove that in fact, sloppy writing leads to sloppy thinking. Is it possible that sloppy writing is done, even with good thinking. Or perhaps excellent writing is developed, even with sloppy thinking.

In this paper, we study the writing of 200 students that attempts to test the theory that sloppy writing leads to sloppy thinking.

PREVIOUS RESEARCH

The original phrase came into wide use around 2005 (Clon, 2006), who observed sloppy writing in economics classes. Sloppy writing was observed in other economics classes (Druden and Ellias, 2003).

RESEARCH DESIGN

Two hundred students in two business statistics sections during one semester were given assignments to write reports on statistical sampling results. The papers were graded on a "sloppiness" factor using…

Data Collection (Sub-heading, bold but not all caps, 10 point, aligned left, bold, no line after to paragraph)
The two hundred students were asked to write 2 short papers during the semester…

Data Analysis(Sub-heading, bold but not all caps, 10 point, aligned left, bold, no line after to paragraph)
The two hundred students were asked to write 2 short papers during the semester…

DISCUSSION

The resulting statistical analysis shows a significant correlation between sloppy writing and sloppy thinking. As noted below in Figure 1, the amount of sloppy writing increases over the course of the spring semester.

Figure 1: Sloppy Writing During the Semester
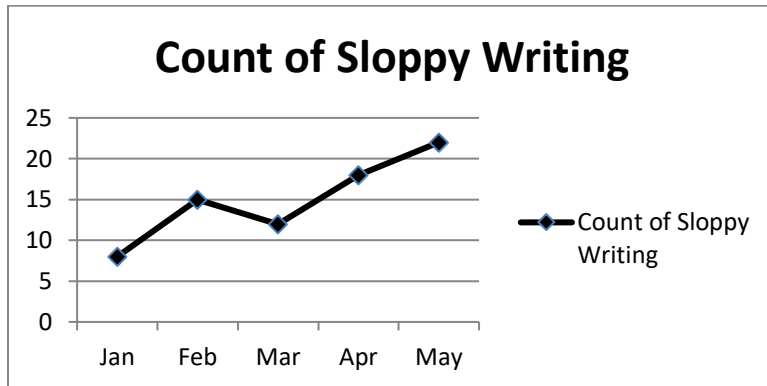
The count results were compiled and shown in Table 1 below.

Table 1: Counts of Good and Sloppy Writing and Thinking (bold, 1 line after to table, left justify)

	Good Thinking	Sloppy Thinking
Good Writing	5	22
Sloppy Writing	21	36

*-Indicates significance at the 5% level)

As Table 1 shows conclusively, there is not much good writing nor good thinking going on.

CONCLUSIONS

The statistical analysis shows that there is a strong relation between sloppy writing and sloppy thinking, however, it is not clear which causes the other…

Future research will try to determine causality.

REFERENCES (title10 point, all caps, bold, align left, one line to first reference)
        (1line spacing) (All references 8 point, indent second line 0.25 inch, justify left and right)

Clon, E. (2006). Sloppy Writing and Performance in Principles of Economics. *Educational Economics*. V. 14, No. 2, pp 211-233.
Devad, S. and Flotz, J. Evaluation of Factors Influencing Student Class Writing and Performance. *American Journal of Farming Economics*. V. 78, Issue 3, pp 499-502.
Druden, G. and Ellias, L. (1995). *Principles of Economics*. New York: Irwin.

        (short bio section optional, can run longer than these examples; removed before sent to reviewers)
Peter J. Billington, Ph.D., is a professor of operations management at Colorado State University – Pueblo. His research interests include lean six sigma and innovative education.

Terri Dactil, Ph.D., is a professor of business communication in the College of Business at High Plains University, Alberta, Canada. His research interests include instructional methods to improve student communication skills.

Endnote: (do not use word footnote or endnote formatting to accomplish this; see comments above)