Exploring a problem-based learning approach to improve the quantitative skills of marketing undergraduates

Fernanda Muniz, Guanyu Geng, and Gopala "GG" Ganesh

Purpose of the Study: This paper describes the implementation of a semester-long rigorous drill exercise in an undergraduate Marketing Metrics class to better prepare the students in marketing math and metrics.

Method/Design and Sample: The drill assignment, implemented over eight semesters, used the website Management-by-the-numbers.com (MBTN). It consisted of a problem-based approach covering a large number of Marketing Metrics. In addition, the authors collected data on student performance during this time from a total of 902 students, about 80% of whom took the class face-to-face or F2F and 20% online or INET.

Results: These responses reveal that exercises like the MBTN assignment are a practical resource and learning opportunity for cultivating students' quantitative skills and analytical abilities. Marketing educators would benefit from such exercises to enhance students' experience and learning in their programs.

Value to Marketing Educators: This paper adds to existing pedagogical knowledge by exploring in detail one way to cultivate marketing students' quantitative analytical abilities. Businesses that hire marketing students increasingly expect them to be well-trained academically, including in good number skills. Therefore, developing these in undergraduate and graduate marketing students assumes greater importance for universities that offer these programs of study.

Keywords: Marketing metrics, MBTN, marketing education, quantitative skills, marketing math

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INTRODUCTION

The growth of digital media and marketing channels in combination with advances in mobile, sensor, computing, and cloud storage technologies are producing a flood of data that can be measured and used to compute many metrics, including those that fall in the marketing domain. Analysis of these would provide meaningful insights for strategic and tactical decision-making of business organizations (Spiller and Tuten, 2015; Wilson *et al.,* 2018). The flood of data has also led to a change in the marketing landscape by increasing the importance and value of quantitative analysis in marketing decisions and significantly increased the demand for business graduates with quantitative skills (Wilson *et al.*, 2018). Nevertheless, marketing students generally demonstrate a deficiency in the quantitative side of the marketing discipline (Aggarwal *et al.*, 2007; Pilling *et al.*, 2012; Tarasi *et al.*, 2013). For instance, a recent survey conducted among recruiters indicated that 71% had encountered a shortage of qualified marketers (i.e., strong communication and quantitative skills) available for hire (Lasonde, 2016). Besides, Schlee and Karns (2017)

conducted a study to understand the knowledge and skills specified in typical listings for entry-level marketing jobs in the United States, along with their salaries. They found that knowledge related to technology such as Internet marketing and quantitative analysis skills such as statistics, budgeting, and forecasting find mention in most listings for entry-level marketing jobs, especially those listed at higher salaries. Consequently, strengthening the quantitative and analytical skills of marketing students has been of great concern among marketing professors (Pilling *et al.*, 2012).

Marketing faculty have tried to improve their students' quantitative and analytical skills through the development and addition of new courses or with the creation of quantitative assignments (Pilling *et al.*, 2012). Courses such as business analytics, marketing analytics, marketing metrics, and marketing math are increasingly present in the marketing curriculum at most business schools (Mintu-Wimsatt and Lozada, 2018). Marketing educators have explored various approaches to design (e.g., Ganesh *et al.*,2010; Liu and Burns, 2018; Liu and Levin, 2018) and introduce (e.g., Wilson *et al.*, 2018; Weathers and Aragon, 2019) such courses.

Inside those courses, instructors rely on various in-class and out-of-class teaching tools and methods – e.g., excel spreadsheets, case analysis, Google Analytics – to cultivate students' quantitative analytical abilities. For instance, Ganesh *et al.* (2010) describe a new marketing math course using Excel spreadsheets to solve cases involving calculation and interpretation of various marketing metrics. Pirog (2010) discusses a specific exercise designed to teach how to perform and interpret conjoint analysis. Yet, given the challenge presented in teaching quantitative analysis to marketing students (Schlee and Harich, 2010), marketing educators must further explore teaching resources for marketing courses to enhance students' quantitative skills.

The purpose of this paper is to describe the experience of using an out-of-class exercise, namely "management-by-the-numbers" (MBTN), designed to provide students an opportunity to engage in and practice quantitative managerial problems through a self-paced, interactive approach. Here we explore the overall research question of whether a problem-based assignment (i.e., MBTN) can contribute and encourage students to improve their quantitative skills. MBTN incorporates an active and problem-based learning approach, which requires students to engage throughout the learning process. Although MBTN has been present in various marketing quantitative courses across U.S. universities since about 2012, there is no previous research on the use of MBTN by instructors, its reception, and perception by students. Using performance data from 902 students collected throughout eight semesters, this article contributes to the marketing education literature by showing how this exercise was implemented and received in a marketing metrics class.

BACKGROUND AND CONCEPTUAL FRAMEWORK

Marketing Metrics
This assignment was part of a marketing metrics course in which the intent was to increase students' quantitative skills. A metric refers to a measuring system used to quantify a trend, dynamic or characteristic (Farris *et al.*, 2006; Hopkins *et al.*, 2011). Marketing metrics, then, are measures used to help organizations quantify, compare, and interpret the impact of marketing activities (Kotler and Keller, 2007; Spiller and Tuten, 2015). Metrics are also helpful for practitioners while explaining phenomena, diagnosing causes, presenting findings, and forecasting future results (Hopkins *et al.*, 2011). As a result, measuring the impact of marketing activities through metrics is gaining even more attention as more marketers recognize the strategic and tactical value that actionable data bring to businesses.

Mintz and Currim (2013) discussed the factors that motivate managerial use of marketing and financial metrics and developed a conceptual model that illustrated their decision-making use. Through an empirical study of U.S. marketing managers, the authors show that several characteristics of the firm, such as firm strategy, metric orientation, type of marketing mix activity, and firm and environmental factors, influence the firm's use of financial and marketing metrics. In addition, they show that the use of metrics is positively related to marketing mix performance. Marketing metrics, then, are used to help organizations to quantify, compare, and interpret the impact of marketing activities (Kotler and Keller, 2007; Spiller and Tuten, 2015) and involve a variety of calculations such as Growth Rates, Net Present Value, Break-Even Point, etc.

Active Learning and the Problem-Based Metrics Assignment
Active learning proposes that "knowledge is actively constructed, rather than passively received" (Diamond *et al.*, 2008, p. 118). This dynamic approach requires students to fully immerse themselves in the learning process (Inks and Avila, 2008). Contrary to the passive approach in which students learn through lectures only, the active approach allows students to interact with the presented information (Diamond *et al.*, 2008). One approach used in conjunction with active learning is problem-based learning (PBL). According to Wee *et al.* (2003), "PBL is a method of instruction that uses problems to encourage students to learn, to think, to acquire knowledge, and to frame and solve problems" (p. 151). As a learner-centered approach, PBL empowers learners to investigate and apply knowledge and skills to solve a defined problem (Savery, 2015).

Nevertheless, marketing students generally demonstrate a deficiency in quantitative problem solving (Pilling *et al.*, 2012; Tarasi *et al.*, 2013). In addition, many of these students show uneasiness, reluctance, and even fear of math, which makes it an even more significant challenge to teach students quantitative marketing courses (Tarasi *et al.*, 2013). However, according to Cochran (2005), active learning exercises have been an effective tool to address this issue. This type of learning has become increasingly prominent in marketing education since it allows students to deal with concepts in their way and work through uncertainties and misconceptions (Cochran, 2005; Franco and Cervantes, 2018). MBTN takes a student-centered and active learning approach and can be a handy tool for reducing the emphasis on passive learning to increase the students' responsibility for their education.

MBTN Exercise and Intended Outcomes
This paper focuses on an undergraduate Marketing Metrics course at a major public university in Southwestern USA. One of the authors introduced the Face-to-Face (F2F) format in 2000 and added the asynchronous online version (INET) in 2003. Since Fall 2017, students have been completing, entirely as an outside class activity, drill exercises from the website www.management-by-the-numbers.com. Currently, the MBTN site includes 28 marketing modules, of which 24 are metrics modules, two are experimental design, one deals with conjoint analysis, and the other involves perceptual mapping. Only 16 of the 24 marketing

metrics modules, each consisting of four problem sets, were used in the focal class. Each module includes an online overview PDF presentation that briefly explains the concepts covered and includes worked examples.

Each problem set begins with a short description of a marketing management decision situation, followed by a set of four to ten, primarily non-multiple-choice questions that students must solve by actually calculating the answer. Students develop and improve their knowledge, skills, and understanding through their efforts to solve each question in each problem set. Please see Figure 1 for an example of a problem set and the type of question the students must answer.

Figure 1: Example of an MBTN Problem Set and Question
(reproduced with permission from MBTN)

As they begin each module, students start at the MBTN-level of Mail Room Clerk. Next, they move to the level of Brand Assistant upon solving one problem set completely OR 60% of all questions across all four problem sets in that module. Next, they reach the Brand Manager level by solving two problem sets completely OR 80% of all questions across all four problem sets in that module. Finally, they get to the crowning level of CEO/CMO by solving 100% of all questions correctly across all four problem sets in that module. These different levels may help motivate students to complete the assignment by giving them a sense of autonomy, competence, and accomplishment. According to the cognitive evaluation theory, perceived competence and autonomy influence motivation (Deci and Ryan, 1985). Autonomy is the perception of having an internal locus of control and the notion of freely choosing behaviors, whereas competence is the notion of being effective in what one does (Deci and Ryan, 1985; Young, 2005). More importantly, achieving competence and autonomy are fundamental human needs (Deci and Ryan, 1985; Young, 2005). Therefore, having control over achieving higher levels at their own pace gives students a sense of autonomy. Moreover, when they accomplish each level and move higher up, e.g., from Mail Room Clerk to CEO/CMO, students may experience mastery and effectiveness, which constitute competence.

The student gets two attempts to answer each question correctly. After the second wrong answer, the student can opt to display the correct answer and the mechanics of calculating it and then they move on to the next question. MBTN keeps track of the questions missed by the student after two (or more) attempts in each problem set. Upon completion of that problem set, it gives the student the option of repeating it with new numbers or returning after they have attempted all questions in all four problem sets in that module. This approach follows the spacing effect (i.e., having the review of material or practice spaced out over time), which has been demonstrated to benefit memory and improve generalization and transferring of learning (Kang, 2016).

When repeating a problem set, the student may skip previously correctly answered questions but must answer those that they answered incorrectly. Thus, the goal is 100% correct answers to ALL the questions in all four problem sets in each module and reach the CEO level. They only need to answer each question right once to be considered as "done." With an average of 7 questions per problem set, the students have approximately 16 X 4 X 7 = 448 questions to answer. Only about 10% of this pool is multiple-choice. The four practice sets in each module and the questions that accompany each reinforce the learning of the relevant

marketing metric through the process of a problem-solving drill.

The intended outcome of the Marketing Metrics course is to improve students' quantitative skills. According to Weathers and Aragon (2019), to become proficient in analytics, there are six core competencies that students must master: (1) assessing data, (2) understanding measurement, (3) managing datasets, (4) analyzing data, (5) interpreting results, and (6) communicating results. The developers of MBTN have designed each module to help students develop these competencies by introducing them to specific skills within each marketing metrics topic. For instance, in the "Growth Rates" module, students go through descriptions and problem sets that cover the following: the importance of growth rates (core competence #2 above, understanding measurement), what is needed to calculate growth rates (cc #1, assessing data), critical business contexts for the use of growth rates (cc #'s 3,

4, and 5, managing datasets, analyzing data, and interpreting results, respectively). Lastly, they also learn how to communicate their understanding by entering the correct answer (cc #6, communicating results). Therefore, after completing MBTN, students should be able to: describe the metrics for marketing decision making, recognize the data requirements for each marketing metric, compute each marketing metric correctly, interpret each marketing metric in managerial marketing contexts, and explain how such interpretation would inform and influence marketing decisions – which are the learning objectives of the exercise. MBTN helps students achieve these core competencies by implementing learning methodologies such as the student-centered approach, active/problem-based learning, and spaced repetition (described before). Table 1 summarizes specific competencies for each module along with the learning objectives and learning methodologies.

Table 1 – MBTN Modules, Specific Competencies, Learning Objectives, and Learning Methodology

Module	Topic	Specific Competencies	Learning Objectives	Learning Methodology
1	Percentages	• Importance of percentages • How to calculate percentages	• Describe the metrics for marketing decision making • Recognize the data requirements for each marketing metric • Compute each marketing metric correctly • Interpret each marketing metric in managerial contexts • Explain how the metric, as interpreted, would inform and influence marketing decisions	• Student-center approach • Active/problem-based learning • Spaced repetition
2	Growth Rates	• Importance of growth rates • How to calculate growth and growth rates • Important business contexts for use of growth rates • Combining growth rates • Multi-period growth rates • Average annual return vs. compound average annual return • Converting growth rates between different time periods		
3	Financial Statements 1 - Introduction	• Importance of financial statements such as Balance Sheet, Income Statement, and Cash Flow Statement • Describe the purpose and format of each statement • Recognize the various account categories within each statement		
4	Margins 1: Introduction to Margins	• Explain margins, the relationship between selling price, cost and margins, and total contribution margin		
5	Margins 2: Channels (Calculating Margins)	• Describe the difference between margins and markups • How to calculate margins from selling prices and costs and vice versa • How to calculate margins in multi-level distribution channels		
6	Breakeven Analysis	• Explain the concepts of variable, fixed, average and marginal costs, contribution,		

		contribution margin, unit, and dollar breakeven analysis • Calculate costs, contribution, contribution margin • The benefits of contribution analysis (what questions contribution analysis can help answer) • Calculate breakeven point and understand the importance and when to use it		
7	Profit Dynamics	• Understand the concepts of target profit and volume and price-volume interaction • How to calculate and apply target profit in units and in dollars for estimating sales targets, price pints, and budget allocations • Price-volume interaction		
8	Market Share Metrics	• Describe the concept of market share, market penetration, relative market share, and market concentration • Explain how market share can be applied in many different contexts – goods, services, segments, regions, channels, units, dollars, etc. • How to calculate unit market share, revenue market share, market penetration, relative market share		
9	Market Share Metrics II	• Describes decomposition of market share • How to calculate and apply share of penetration, usage index, share of requirements, brand and category penetration, brand development index (BDI), and category development index (CDI)		
10	Cannibalization	• Describes cannibalization and the concept of fair share draw as applied to cannibalization or a new competitive entry into a market. • How to calculate and apply fair share draw for competitive entry		
11	Advertising Metrics	• Explains the concepts of impressions, gross rating points, CPM (cost per thousand impressions), reach, frequency, and share of voice • How to calculate and apply impressions, gross rating points, CPM, frequency, and share of voice.		

12	Web	• Describes page views, visits, visitors, clickthrough rates, cost per click, cost per order, cost per customer acquired, bounce rate, and abandonment rate • How to calculate, interpret and apply clickthrough rates, cost per click, cost per order, cost per customer acquired, bounce rate, and abandonment rate		
13	Pricing I: Linear Demand	• Describes the relationships between price and quantity • How to calculate and apply maximum willing to buy, maximum reservation price, profit maximizing price, and price elasticity, assuming a linear relationship between price and demand.		
14	Distribution Metrics	• Describes the concept of measures of Distribution • How to calculate and apply numeric Distribution, all commodity volume (AVC), and product category volume (PVC), including the impact of out-of-stocks on PCV.		
15	Net Present Value I: Time Value of Money	• Describes the concepts of Time Value of Money, interest rates, and discount rates • How to calculate and apply the future value of an investment, present value of a future payment, and NPV (net present value) of a series of future cash flows.		
16	Customer Lifetime Value I	• Describes the concept of Customer Lifetime Value (CLV) • How to calculate and apply customer profitability, CLV, and its impact on future cash flows		

Implementation of MBTN in a Marketing Metrics Course

The following steps describe how MBTN was implemented in an undergraduate marketing metrics course:

1st Step: On the Friday before starting the semester, the professor sent an email including students' names and email addresses to MBTN's customer support. The current implementation split the16 modules into two sets of eight modules, with each set worth 10% of the semester grade. This division was judgmentally decided by the primary author, based on perceived difficulty, after completing all these modules themselves. Table 2 shows the modules included in each set during Spring 2020 with due dates.

Table 2: Typical MBTN Schedule

SET	MBTN module	Deals with these Metrics	Goes with MMGG Chapter
Set I: Due at the end of 7 weeks, Extended Deadline at the end of dead week			
I	1	Percentages	Chapter 1
I	2	Growth Rates	Chapter 1
I	3	Financial Statements 1: Introduction	Chapter 2
I	4	Margins 1: Introduction to Margins	Chapter 3

I	5	Margins 2: Channels (Calculating Margins)	Chapter 3
I	6	Breakeven Analysis	Chapter 4
I	7	Profit Dynamics	Chapter 4
I	8	Market Share Metrics I	Chapter 4
Set II: Due at the end of 14 weeks, Extended Deadline at the end of dead week			
II	9	Market Share Metrics II	Chapter 4
II	10	Cannibalization	Chapter 5
II	11	Advertising Metrics	Chapter 6
II	12	Web Metrics	Chapter 6
II	13	Pricing I: Linear Demand	Chapter 7
II	14	Distribution Metrics	Chapter 8
II	15	Net Present Value I: Time Value of Money	Chapter 9
II	16	Customer Lifetime Value I	Chapter 9

Scoring MBTN:

Syllabus score ?/100 on **Sets I** and **II**: For each Set, average the % scores earned in the 8 modules of that Set, first by the Due date and then again by the Extended deadline. Then average these two averages. The resulting % determines the score for the Set, e.g., 100% = 100 points, 94% = 94 points, etc.

There is nothing to upload to Canvas for MBTN, which automatically keeps track of student progress in the post-login page of each student and the professor.

2nd Step: On the first day of class, MBTN sent each student an email with their unique User ID, initial password, and instructions on how to complete the purchase to access MBTN's website. MBTN cost each student about $25 for semester-long access, and the textbook added another $40. For college students, the national average textbook cost per course is about $135 (Kristof, 2018). Therefore, the "textbook" prices for the class were quite reasonable compared to other courses.

3rd Step: An introductory MBTN video previously recorded by the professor was made available to the students on Canvas, the Learning Management System used by the university, on the first day of class. In this video, the professor explained the purpose of MBTN and took students through "Percentages," the first MBTN module, showing how it is structured and how to answer the questions. Next, students were able to preview the PDF for each module and proceed to the first of its four problem sets.

METHODOLOGY

Since the implementation of MBTN, the professor has tracked students' class attendance (only in F2F class using the iClicker REEF tool), MBTN performance, class letter grade, and background information. The authors extracted MBTN performance data using individual student-level data on the professor's MBTN website throughout the semester. The information for each semester was collected and stored for future analysis. In the Spring of 2020, the data for eight semesters (Spring 2018, Summer 2018, Fall 2018, Winter 2018, Spring 2019, Maymester 2019, Fall 2019, and Winter 2019) were combined and analyzed, which resulted in a total of 902 students' performance information.

Table 3 summarizes the background characteristics of the students. About 80% of them took the traditional F2F class. Although only 20% took the INET class, that group has nearly 200 students and is substantial enough for comparisons. About 60% are Marketing majors, and an additional 8% are students with multiple majors, including Marketing. Nearly a third are non-marketing majors, and of those, about half are non-business majors (merchandising, hospitality, journalism, etc.). Finally, about a third took the class to meet a degree requirement.

Table 3: Background of Students

		n	%
Semester of class	Spring 2018	187	18%
	Summer 2018	38	4%
	Fall 2018	176	17%
	Winter 2018	56	5%
	Spring 2019	172	16%
	Maymester 2019	52	5%
	Fall 2019	158	15%
	Winter 2019	63	6%
	Total	902	100%
Instructional Format	F2F	693	77%

	INET	209	23%
	Total	902	100%
Current Major	Business w Marketing	67	8%
	Business wo Marketing	6	1%
	Finance	6	1%
	ITDSBCIS	2	0%
	ITDSDSCI	27	3%
	LSCM	47	6%
	Management	12	1%
	Marketing	485	57%
	Non-Business	139	16%
	Other	53	6%
	Total	844	100%
Why take this class	Other student recommended	18	5%
	Its availability	39	10%
	Improve job or internship prospects	45	12%
	Department required	124	33%
	Department recommended	46	12%
	Entrepreneurial plans	31	8%
	Other	73	19%
	Total	376	100%
Marketing vs Rest	Marketing	485	57%
	Rest	359	43%
	Total	844	100%

Individual student performance was measured using (1) #modules for which students viewed the online tutorial, (2) #minicase completed, (3) module score, (4) accuracy score for each module, (5) # modules in which the students achieved CEO/CMO level, and (6) average minutes across modules. Many previous studies have demonstrated the differences and importance of students' major (marketing vs. other) and course modality (F2F vs. INET) on performance (e.g., Pilling *et al*., 2012; Tarasi *et al*., 2013; Xu and Jaggars, 2014; Ganesh *et al*., 2015; Fischer *et al*., 2020). Therefore, this paper reports all analyses comparing students majoring in marketing versus non-marketing and taking the class in F2F versus INET format.

We measured student perceptions about the MBTN instrument by analyzing students' responses to the end-of-semester, anonymous, and voluntary participation course-evaluation survey called Student-Perceptions-of-Teaching. The SPOT responses collected came from six semesters (Spring 2018, Fall 2018, Winter 2018, Spring 2019, Fall 2019, and Winter 2019). In addition, we added two multiple-choice questions about MBTN to the standardized instrument – whether MBTN was a useful learning opportunity (0 to 5 scale where 5 was most positive evaluation) and whether the resources available were adequate to complete the assignment (1 to 5 scale where 5 was the most positive). A total of 446 responses were collected and analyzed.

In addition to the multiple-choice questions, SPOT also included five open-ended questions. Four of these were part of the standardized instrument – whether the class was intellectually stimulating, in what ways it contributed, how it detracted, and how to improve the course. Besides these, the professor added a fifth open-ended question requesting comment on any aspect of the course. Over the six semesters, 446 students provided a total of 1,672 open-ended comments about the course. The professor went through these open-ended responses, identified responses that contained an MBTN-related comment, and judgmentally coded these as MBTN positive, MBTN negative (time or workload aspect), MBTN-other-negative, and MBTN neutral.

RESULTS

Students' performance on MBTN: marketing vs. non-marketing majors
Table 4a compares the Marketing and non-Marketing majors on seven summary characteristics. Compared to non-majors, the Marketing majors viewed fewer tutorials and achieved a higher average for CEO/CMO status across the modules. They also solved a higher average number of problem sets across the modules, registered a higher average score across the modules, and a higher accuracy score (Accuracy is a measure of the difficulty of a module, e.g., Growth Rates, experienced by an individual student. The percentage measure results from dividing the total number of successful attempts by the total number of attempts made by the student across all the four problem sets in the Growth Rates module and all the 21 questions included in those problem sets. We summarize and report the mean and median for each interest group, such as Marketing majors, non-Marketing majors, etc. Therefore, higher accuracy % results when successful attempts are a greater % of all attempts, indicating a lower level of difficulty than lower accuracy.). The two groups did not significantly differ in average minutes per module or total minutes across the modules. We also note that while the average minutes per module across modules is about 40 minutes for the entire sample, the

maximum is more than three times at about 149 minutes. Likewise, the total minutes across modules have a mean and maximum of about 612 and 2390 minutes.

Table 4a: Summary Characteristics by Major
(significantly different at * α = 0.05; @ = α = 0.10)

| Criterion | Marketing vs Rest | | | | | | | | |
| | Marketing | | | Rest | | | Total | | |
	Mean	Median	n	Mean	Median	n	Mean	Median	n
#modules viewed tutorial*	6.2	3.0	485	7.3	6.0	359	6.7	4.0	844
#modules CEO/CMO*	15.0	16.0	485	13.3	16.0	359	14.3	16.0	844
#problem sets solved across modules*	3.3	3.5	484	3.2	3.5	353	3.2	3.5	837
score across modules*	87.4	93.7	484	85.1	91.5	353	86.4	93.2	837
accuracy across modules@	57.4	59.2	484	55.9	58.5	353	56.8	58.9	837
avg minutes across modules	40.0	38.2	484	42.3	39.7	353	41.0	38.6	837
total minutes across modules	690.2	669.0	484	719.7	672.1	353	702.7	669.0	837

Next, we move onto several mostly clustered charts that compare three sets of groups: Marketing, non-Marketing, and Total Sample. We have sorted all charts in descending order by the total sample. In addition, we have indicated details of all significance tests performed on the data. For example, chart 1 compares the Marketing, non-Marketing, and Total Sample groups for each of the 16 modules on whether or not they viewed the MBTN tutorial before tackling each module. Students in both groups (Marketing and non-Marketing majors) referred less to the PDF tutorials as the semester went by. However, in most instances, non-Marketing majors viewed more PDF tutorials than Marketing majors.
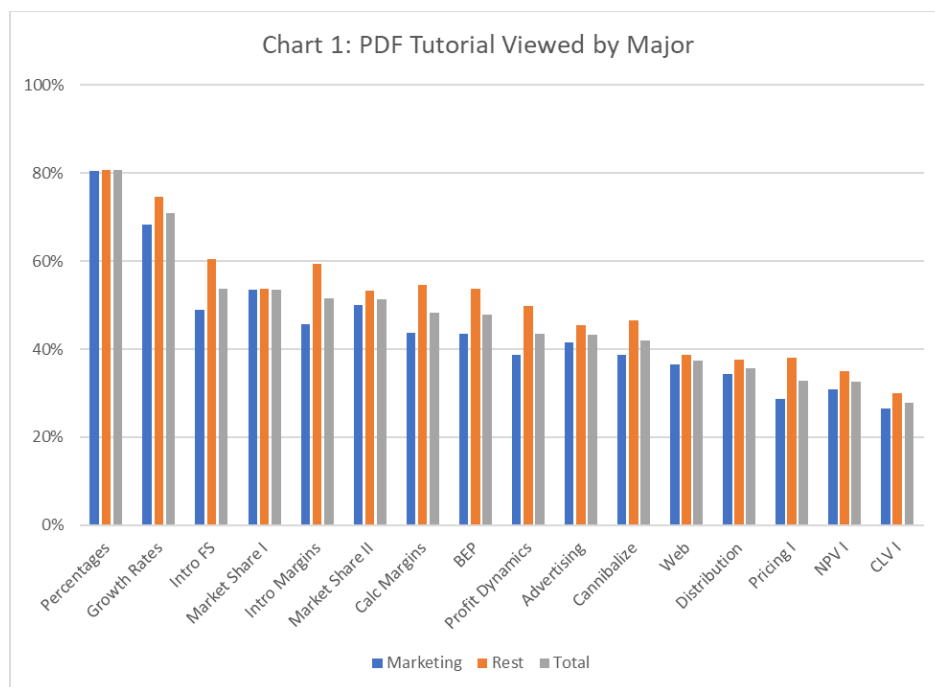
Chi-square test significant at α=0.05 indicates significant difference between Marketing and Rest for: Intro to FS through Profit Dynamics, Cannibalization, and Pricing I.

Chart 2 compares the mean number of problem sets completed (out of four available in each module) by the Marketing and non-Marketing groups. Please note that completion means answering every question for each problem set correctly, scoring 100%, and thereby achieving the CEO/CMO status for the module. The results indicate a significant difference between Marketing and non-Marketing majors for market share through NPV I modules. Marketing majors had a higher completion rate than non-Marketing majors. Furthermore, while the median number of problem sets for every module, not shown in the chart, was 4.0, there is evidence that the Set II modules have a slightly lower median, and hence they rate more difficult than Set I. This finding vindicated the initial judgmental grouping of the 16 modules by the instructor into 2 sets.
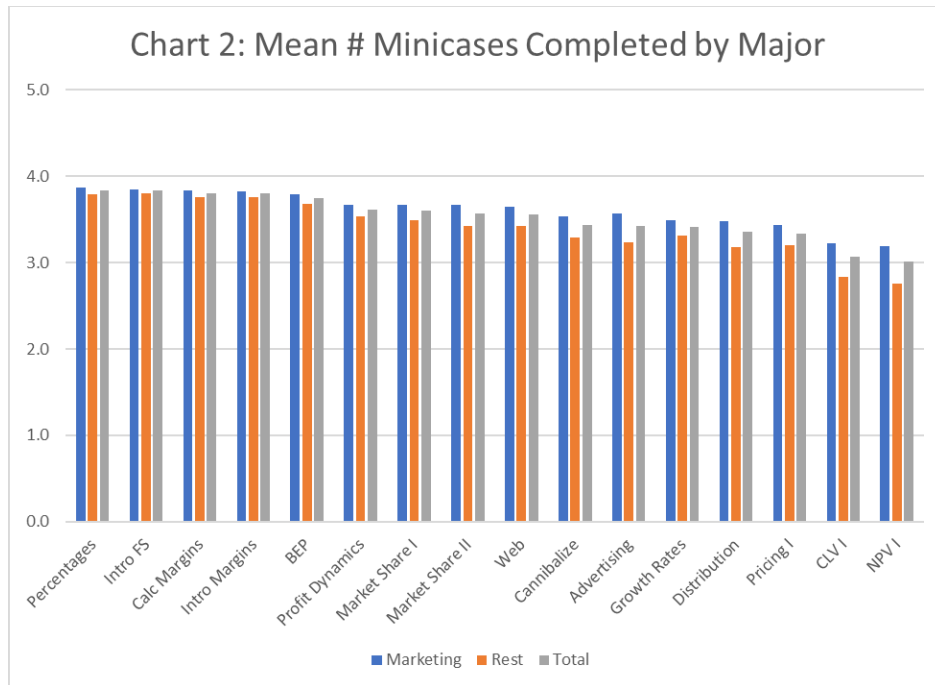
Chart 2: Mean # Minicases Completed by Major

Independent samples t-test significant at α=0.05 indicates significant difference between Marketing and Rest for: Market Share I through NPV I.

Chart 3 compares Marketing and non-Marketing on average module score by module. The median score for every module, not shown in the chart, is the highest possible 100. The results here are very similar to Chart 2, indicating that there is a significant difference between Marketing and non-Marketing majors for Market Share I and II, and Advertising through CLV I modules. In all of these, Marketing majors had a higher score by module compared to non-Marketing majors. Therefore, similar to Chart 2, Set II modules appear to be relatively more difficult than Set I.
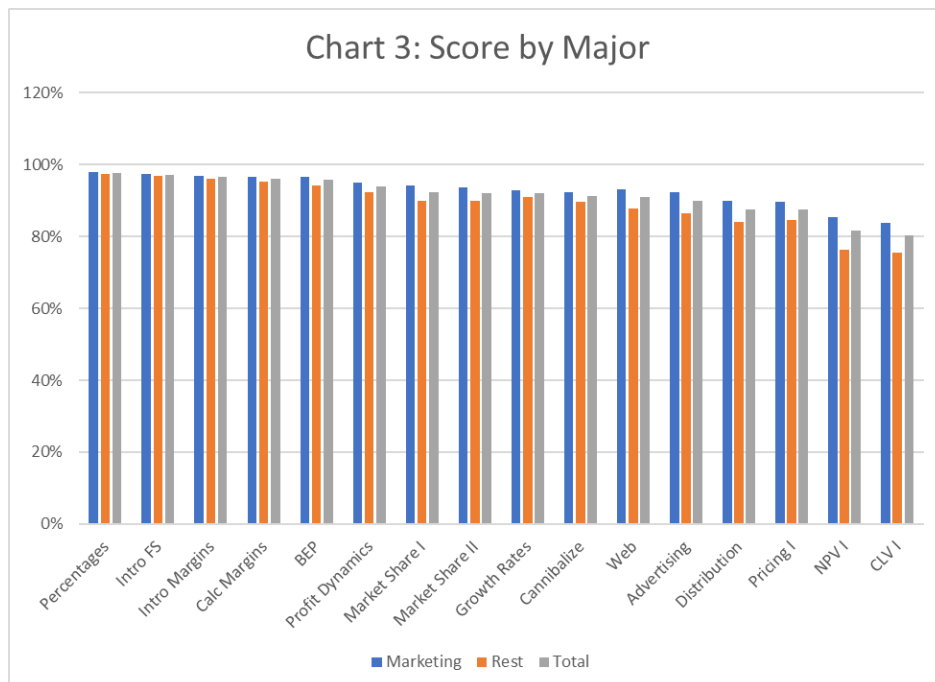
Chart 3: Score by Major

Independent samples t-test significant at α=0.05 indicates significant difference between Marketing and Rest for: Market Share I and II, Advertising through CLV I

Chart 4a compares the Marketing and non-Marketing groups in mean accuracy by module. Recall that a higher accuracy score for a group indicates that they experienced lower difficulty in the module by registering a higher average for % of success in all the attempts they made in completing all the questions in the module. Again, Marketing majors performed better on this measure than non-Marketing majors, and students appeared to experience more difficulties with Set II. To explore further, descend-sorted Chart 4b was

prepared to look at the mean accuracy for just the Marketing students, placing the more difficult modules lower. Again, six of the modules with relatively low Accuracy scores, Cannibalization, Advertising, CLV I, Market Share II, NPV I, and Growth Rates, stand out. Of these, Growth Rates and NPV I come across as the most challenging modules.

Chart 4a: Mean Accuracy by Major

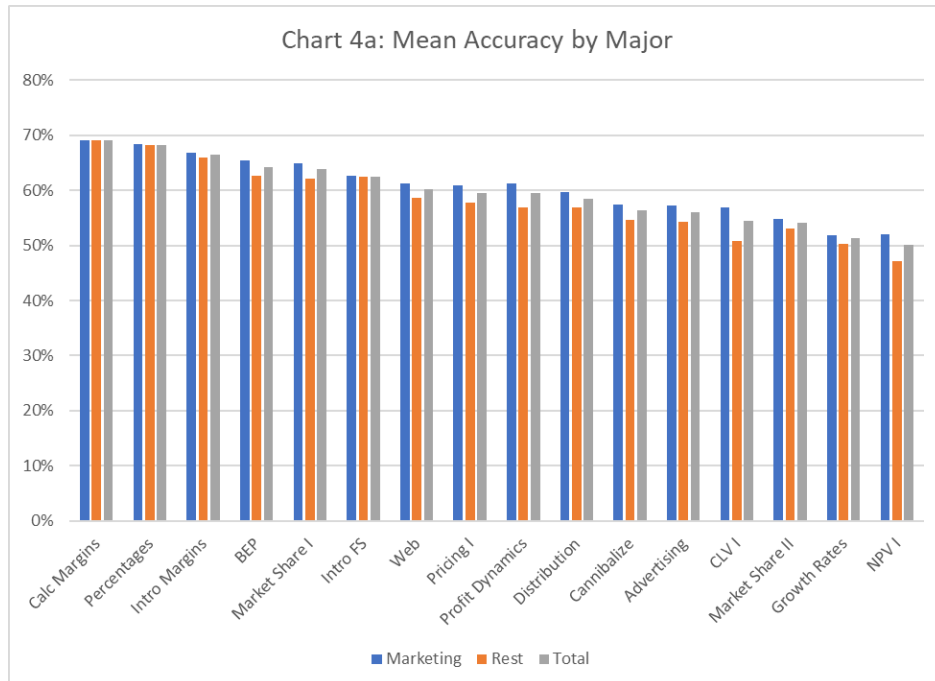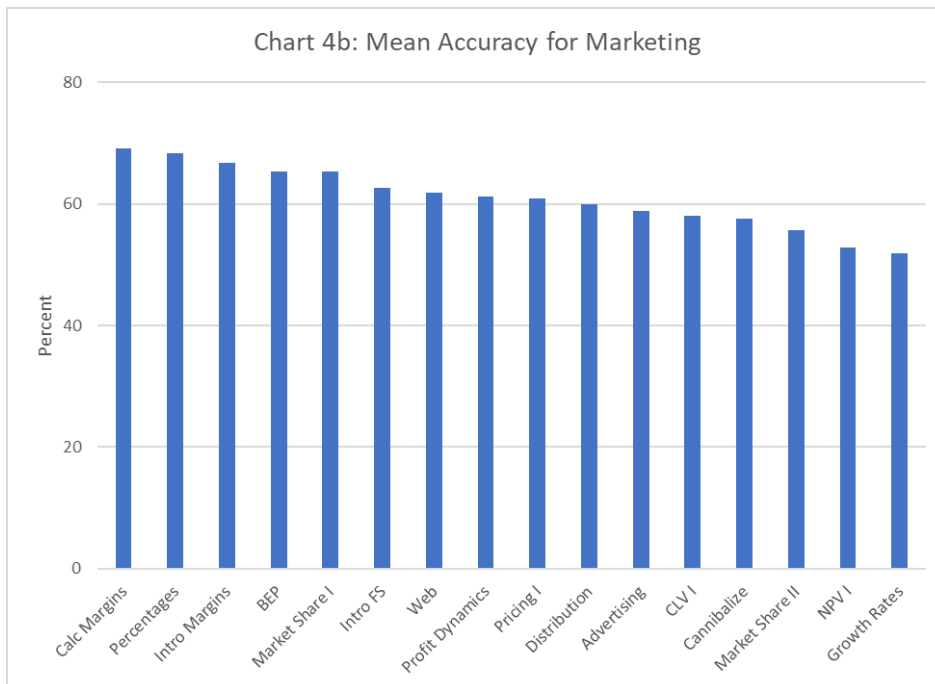Independent samples t-test significant at α=0.05 indicates significant difference between Marketing and Rest for: Profit Dynamics, NPV I, CLV I.

Chart 4b: Mean Accuracy for Marketing

Overall F from Repeated measures ANOVA is significant at α=0.05 indicates means are not all the same.

Chart 5 compares the % achieving the CEO/CMO status by the module for Marketing and non-Marketing majors. Students accomplish the CEO/CMO status by completing all four problem sets in the module, answering every question correctly. Therefore, this chart looks pretty much identical to Chart 2 (mean number of problem sets completed by module) and Chart 3 (mean score by module). Marketing majors had a significantly higher performance than non-Marketing majors in the Market Share I through CLV I modules. Overall, all students performed quite satisfactorily. The mean percentage of marketing students achieving CEO/CMO status is 87% across the 16 modules compared to 81% for non-Marketing students.
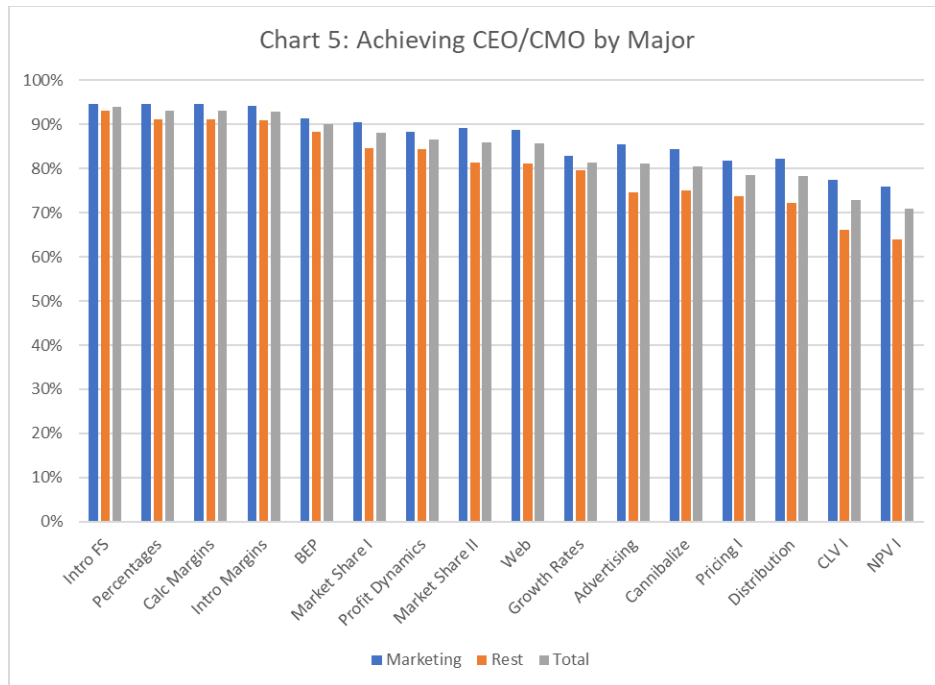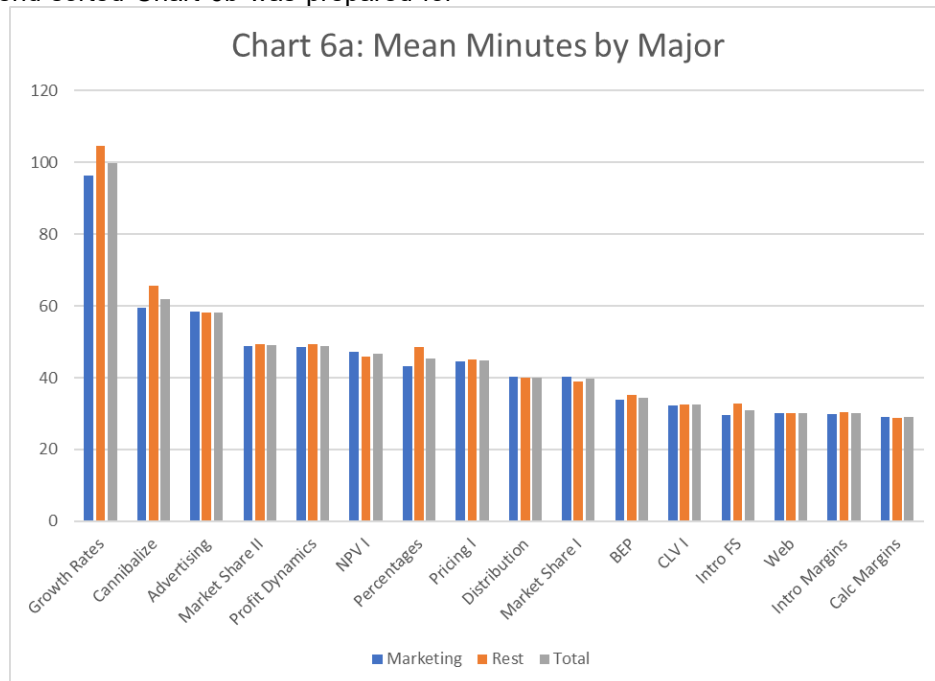
Chart 5: Achieving CEO/CMO by Major

Independent samples t-test significant at α=0.05 indicates significant difference between Marketing and Rest for: Market Share I through NPV I.

Chart 6a compares the average number of minutes taken by the Marketing and non-Marketing groups to complete each module. Non-Marketing majors took significantly more time to complete Percentages, Growth Rates, Intro to F.S., and Cannibalization than Marketing majors. In addition, the amount of time taken to complete modules is another indicator of module difficulty or challenge. Therefore, to clarify the issue a little more, descend-sorted Chart 6b was prepared for just the Marketing students. The top eight modules in terms of the mean number of minutes are Growth Rates, Cannibalization, Advertising, Market Share II, Profit Dynamics, NPV I, Percentages, and Pricing. Growth Rates, whose correct calculation, interpretation, and use are probably essential for all business students as future managers, is an outlier, all by itself, taking significantly more time than any other module.
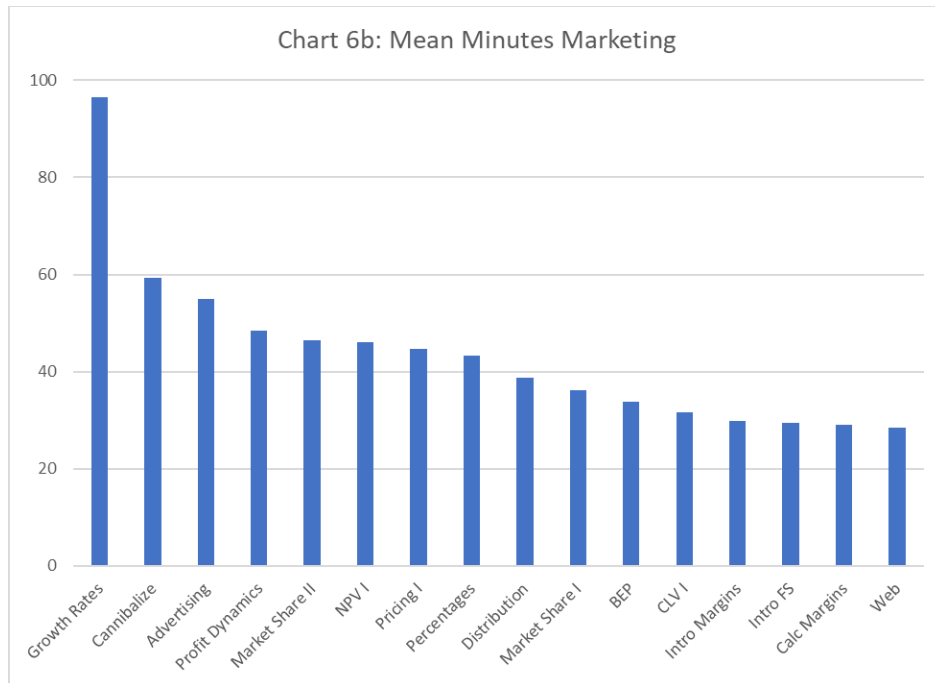

Chart 6a: Mean Minutes by Major

Independent samples t-test significant at α=0.05 indicates significant difference between Marketing and Rest for: Percentages, Growth Rates, Intro to FS, Cannibalization.

Chart 6b: Mean Minutes Marketing

Overall F from Repeated measures ANOVA is significant at α=0.05 indicates means are not all the same.

Students' performance on MBTN: F2F vs. INET

Let us start by returning to Table 4b and comparing the F2F group of students with the smaller INET group. The F2F students viewed fewer tutorials, solved fewer problem sets on average, had a lower average score and lower accuracy (that is, they felt greater difficulty) across the modules. However, they did not significantly differ on average minutes and total minutes across the modules. We note that while the average minutes per module across modules is about 40 minutes for the entire sample, the maximum for this is more than three times that at about 149 minutes. Likewise, the total minutes across modules have a mean and maximum of about 609 and 2390 minutes.

Table 4b: Summary Characteristics by Format
(significantly different at * α = 0.05; @ = α = 0.10)

Criterion	Instructional Format								
	F2F			INET			Total		
	Mean	Median	n	Mean	Median	n	Mean	Median	n
#modules viewed tutorial*	6.2	3.0	693	7.4	6.0	209	6.5	4.0	902
#modules CEO/CMO	14.6	16.0	693	12.8	16.0	209	14.1	16.0	902
#problem sets solved across modules*	3.2	3.4	685	3.4	4.0	209	3.2	3.5	894
score across modules*	85.4	89.8	685	89.1	100.0	209	86.3	93.8	894
accuracy across modules@	56.5	58.9	685	57.8	60.5	209	56.8	59.0	894
avg minutes across modules	40.3	37.7	685	42.0	41.2	209	40.7	38.5	894
total minutes across modules	702.0	667.0	685	671.4	659.0	209	694.9	666.1	894

Moving to the charts, with some exceptions, the F2F versus INET comparisons were very similar to those involving the Marketing and non-Marketing majors and hence not discussed here to keep the length of the paper reasonable. Instead, we chose to focus on areas where we noticed differences. Specifically, for the mean number of problem sets completed, the pattern for the F2F and INET groups, not shown, is almost similar to Chart 2. The differences are in Introduction to Financial Statements, Percentages, Pricing I, and Distribution, all of which have relatively lower means. Regarding Chart 3, the pattern for F2F versus INET is very similar to Marketing versus Non-Marketing except for two changes: Growth Rates moves after Market Share I and II, and Distribution moves ahead of Pricing I. Finally, in Chart 5, which compares the % achieving the CEO/CMO status by module, the pattern is very close to the Marketing and non-Marketing majors with the mean of 87% for F2F and 81% for INET.

Students' perceptions about MBTN

Tables 5 and 6 summarize students' SPOT feedback about the MBTN assignment. Table 5 shows average and median ratings on the previously described 5-0 scale for assessing MBTN as a learning opportunity and the 5-1 scale on the issue of resources available for completing the assignment. Table 6 presents open-ended feedback about MBTN. Although only about 10.5% of all the open-ended comments (175/1672) are MBTN-related, it is interesting to note that nearly 19% of the "contributors" or course enhancing aspects (63/334) relate to MBTN, while only 6% of the "detractors" (19/336) are MBTN-related. Table 7 includes examples of positive feedback that students provided regarding MBTN when asked about aspects of the class that contributed most to their learning. These comments support the idea of MBTN helping students learn the material and improving their quantitative skills, which was the objective of both the course and the assignment. On the other hand, when asked about aspects of the class that detracted from their learning, most comments related to the heavy work content or time requirement of MBTN, as expected (see Table 7). As previously noted, about 11 hours was the norm to complete the assignment.

Table 5: Student Ratings of MBTN								
As a Learning Resource 5-0 Excellent - Poor scale								
Resources were Available to complete it 5-1 Strongly Agree-Strongly Disagree scale								
Semester		n		Learning Value			Resources Available	
				Mean	Median		Mean	Median
Spring 2018_1		76		3.41	3.40		4.40	4.60
Spring 2018_2		56		3.94	4.10		4.46	4.60
Fall 2018_1		46		3.76	3.90		4.47	4.70
Fall 2018_2		59		3.45	3.50		4.18	4.30
Winter 2018		23		3.99	4.40		4.36	4.60
Spring 2019_1		63		3.26	3.30		3.91	4.20
Spring 2019_2		34		3.38	3.60		4.14	4.30
Fall 2019_1		43		3.62	4.10		4.39	4.60
Fall 2019_2		25		3.72	4.10		4.24	4.60
Winter 2019		22		3.52	4.00		3.98	4.30
		447	Average	3.61	3.84		4.25	4.48
			Median	3.57	3.95		4.30	4.60

Table 6: Analysis of Open-Ended Comments about MBTN						
		MBTN Comments				
Aspect	All SPOT	Positive	Negative: Work or Time	Negative: Other	Neutral	Total
Intellectual	333	0	0	7	0	7
Contributors	334	63	0	0	0	63
Detractors	336	7	6	13	2	28
How Improve	337	3	3	18	5	29
Other Open	332	16	10	19	3	48

Table 7: Students' Feedback about MBTN	
Positive	**Negative**
"The MBTN homework assignments were understandable which made me feel better."	"Heavy amount of MBTN exercises, maybe have a bit less."
"The MBTN really helped me grasp concepts I was struggling with."	"Although I think MBTN is useful and informative, I believe requiring a lower number of MBTN module topics to be completed would be sufficient."
"The MTBN exercises really helped me learn the material."	"How long the MBTN sets were"
"The MBTN's were very awesome. I loved doing those and I liked that they always showed the method used after."	"MBTN could be a bit distracting and unnecessary. Although it may be intended to put lecture work and notes into play, it did not feel that way for me."
"I loved the MBTN assignments. I really felt like I was able to learn from them and understand how I would use them in my future career."	"Possibly making the MBTN modules slightly shorter. It felt like a lot of repetition which almost seemed like a waste of time with such a short class."

However, it is essential to note that 89 or nearly half the 175 MBTN-related comments are positive, whereas 76 were negative comments. Taken together, the scaled response and open-ended questions in the SPOT survey provide positive, reassuring feedback about MBTN.

CONCLUSIONS AND IMPLICATIONS

Basing marketing decisions on quantitative analysis is of great value to business organizations providing benefits that go from managing customer relationships profitability to understanding and managing the profitability of channels (Gupta and Lehmann, 2005; Farris *et al.*, 2006; Pilling *et al.*, 2012). Therefore, marketing students must have strong quantitative skills to be competitive in the job market. This paper describes a class assignment, namely MBTN, designed to boost the marketing metrics knowledge of students through an intensive drill. The assignment was part of an undergraduate marketing metrics course and consisted of 16 marketing metrics modules organized into two sets and covered various topics. A comprehensive analysis of the performance of 902 students who completed the assignment provided significant insights for marketing educators interested in helping students to develop more robust quantitative skill sets.

Previous studies have indicated that marketing students are expected to be less proficient quantitatively than other business students (Aggarwal *et al.*, 2007; Pilling *et al.*, 2012; Tarasi *et al.*, 2013). Nevertheless, our analyses revealed that in this study, compared to non-Marketing majors, Marketing majors performed better by experiencing lower difficulty in completing the assignment. They viewed fewer tutorials, achieved higher average CEO/CMO status across the modules, and solved a higher average number of problem sets. They also registered a higher average score across the modules and a higher accuracy score. One possible explanation for this winding could be that within the non-Marketing majors' group that constituted 43% of the sample of 902 students, 51% are non-business majors (e.g., merchandising, hospitality, journalism, etc.). Given the competitive nature of the job market, it is not unusual to find students in non-business fields such as merchandising, hospitality, and journalism competing with marketing students for marketing jobs.

Nevertheless, the value and importance of quantitative analyses in marketing decisions keep increasing the demand for employees with strong quantitative skills (Wilson *et al.*, 2018). Therefore, our finding contributes to the marketing education literature by being one of the first studies to compare marketing students' quantitative skills to non-business students. Furthermore, it suggests that although the improvement of quantitative skills of marketing students ought to be a continuing high priority for marketing professors, this group of marketing students does look reassuring in terms of their employment outcomes.

Regarding the class format, past studies have investigated whether students' performance in quantitative business courses differs by delivery method (i.e., face-to-face vs. online). They have either found that students in face-to-face (vs. online) classes tend to perform better (e.g., Lawrence and Singhania, 2004; Farinella, 2007; Chen *et al.,* 2010; Verhoeven and Wakeling, 2011) or found that there's no difference in performance between face-to-face and online courses (e.g., McLaren, 2004). Our findings, however, indicate that compared to students in the F2F class, students in the INET format viewed more tutorials, solved higher average problem sets, had a higher average score, and higher accuracy (i.e., felt lower difficulty) across the modules. This finding may be because MBTN is an "online" assignment completed outside of the classroom. By being already "online," students in INET courses may feel more motivated to complete this type of assignment than F2F students who have to attend class at a specific time physically and then complete this assignment outside of the classroom (Chou, 2012.) Therefore, these findings suggest that MBTN may be a very practical assignment to use in an online course, and is of substantial value to marketing educators given that online courses have become a significant educational delivery tool for universities (Rajamma and Sciandra, 2018; Khan, 1997; Dinc, 2017, Wang *et al.*, 2013), especially post the Covid-19 pandemic (Schlegelmilch, 2020; Drehmer and Gala 2021)

As previously discussed, marketing students tend to have less affinity for the quantitative side of the business discipline (Aggarwal *et al.*, 2007; Pilling *et al.*, 2012; Tarasi *et al.*, 2013). However, it is still unclear what specific quantitative and analytical courses students struggle with the most. Knowing this may be helpful for marketing educators while developing and designing their quantitative courses to assist students in their journey to improve their quantitative skills. Therefore, this study contributes by identifying marketing metrics topics that students seem to struggle with the most. Our findings reveal that students, regardless of major or instructional format, experienced greater difficulty with Set II modules. In particular, Set II includes topics such as Cannibalization, Advertising, Market Share II, NPV I, and Pricing are worth pointing out.

Moreover, the module on Growth Rates metrics was one in which students had lower scores and took more time to complete. The time aspect could have resulted from the higher percentage of students viewing the tutorial on this topic. Growth Rates are a crucial topic and beneficial to managers for assessing their organizations' performance and predicting future performance. Therefore, a way must be found to help students understand Growth Rates better.

Finally, students' positive feedback about the assignment suggests that MBTN is a practical resource and learning opportunity. When students show interest in an assignment or course, they are more likely to be engaged, which is the primary, fundamental element for learning (Goslin, 2003; Perrotta and Bohan, 2013).

Overall, these findings contribute to marketing education by highlighting an assignment for cultivating marketing students' quantitative skills. In addition, they point out specific topics with quantitative content that need further attention from marketing educators as they continue to work on helping students to develop their skill set in these areas.

LIMITATIONS AND FUTURE RESEARCH

While this initial study tried to understand the effect and perception of a problem-based drill exercise, its limitations point out directions for future research. First, given the method used to collect data for this study, demographic variables, such as gender, age, and race and ethnicity, were not collected. Therefore, it would be advantageous for educators to know if this type of exercise is equally beneficial across different demographic grouping variables. Next, although this study demonstrated students' performance and perception about MBTN, future research could include pre-test and post-test measures to illustrate the extent to which this exercise improved students' quantitative skills. In addition, investigating the effect of MBTN on reducing students' math anxiety and increasing openness to new career paths may be beneficial to understand the consequences of this type of exercise fully. Finally, Growth Rates (an essential metric used to assess organizations' performance and predict future performance) was one topic in which students had lower scores and took more time to complete even with a high percentage of tutorial views. This finding indicates that additional work may be necessary to identify the reason behind students' deficiency in this specific topic.

REFERENCES

Aggarwal, P., Vaidyanathan, R., & Rochford, L. (2007). The Wretched Refuse of a Teeming Shore? A Critical Examination of the Quality of Undergraduate Marketing Students. *Journal of Marketing Education*, 29 (3), 223–233.

Chen, C. C., Jones, K. T., & Moreland, K. (2010). Distance Education in a Cost Accounting Course: Instruction, Interaction, and Multiple Measures of Learning Outcomes. *Journal of Educators Online*, 7(2), n2.

Chou, P. N. (2012). Effect of Students' Self-Directed Learning Abilities on Online Learning Outcomes: Two Exploratory Experiments in Electronic Engineering. *International Journal of Humanities and Social Science*, 2(6), 172-179.

Cochran, J. J. (2005). Active Learning for Quantitative Courses. In *Emerging Theory, Methods, and Applications* (pp. 237-256). INFORMS.

Deci, E., & Ryan, R. (1985). *Intrinsic Motivation and Self-Determination in Human Behavior*. New York: Plenum.

Diamond, N., Koernig, S. K., & Iqbal, Z. (2008). Uniting Active and Deep Learning to Teach Problem-Solving Skills: Strategic Tools and the Learning Spiral. *Journal of Marketing Education*, 30(2), 116-129.

Dinc, E. (2017). Web-Based Education and Accessibility. *International Journal of Technology in Education and Science*, 1(1), 29-35.

Drehmer, C., & P. Gala (2021). Breaking Down Classroom Walls: Teaching Moments for Online Learning Excellence. *Marketing Education Review,*

Farinella, J. (2007). Professor and student performance in online versus traditional introductory finance courses. *Journal of Economics and Finance Education*, 6(1), 40-47.

Farris, P. W., Bendle, N., Pfeifer, P. E., & Reibstein, D. (2006). *Marketing Metrics: The Definitive Guide to Measuring Marketing Performance*. (2nd ed.). Upper Saddle River, NJ: Pearson Education/Wharton School Publishing.

Fischer, C., Xu, D., Rodriguez, F., Denaro, K., & Warshchauer, M. (2020). Effects of Course Modality in Summer Session: Enrollment Patterns and Student Performance in Face-to-Face and Online Classes. *The Internet and Higher Education, 45,* 100710.

Franco Valdez, A. D., & Valdez Cervantes, A. (2018). Retailing laboratory: Delivering skills through experiential learning. *Journal of Marketing Education*, 40(1), 17-30.

Ganesh, G., Sun, Q., & Barat, S. (2010). Improving the Marketing Math Skills of Marketing Undergraduate Students Through a Unique Undergraduate Marketing Math Course. *Marketing Education Review,* 20(1), 47-64.

Ganesh, G., Paswan, A., & Sun, Q. (2015). Are Face-to-Face Classes More Effective than Online Classes? An Empirical Examination. *Marketing Education Review, 25*(2), 67-81.

Goslin, D. A. (2003). *Engaging minds: Motivation and learning in America's schools*. Scarecrow Press.

Gupta, S., & Lehmann, D. R. (2005). *Managing Customer as Investments: The Strategic Value of Customers in the Long Run*. Upper Saddle River, NJ: Pearson Education/Wharton School Publishing.

Hopkins, C. D., Raymond, M. A., & Carlson, L. (2011). Educating Students to Give Them a Sustainable Competitive Advantage. *Journal of Marketing Education*, 33(3), 337-347.

Inks, S. A., & Avila, R. A. (2008). Preparing the Next Generation of Sales Professionals through Social, Experiential, and Immersive Learning Experiences. *Journal for Advancement of Marketing Education*, 13(4), 47-55.

Kang, S. H. (2016). Spaced Repetition Promotes Efficient and Effective Learning: Policy Implications for Instruction. *Policy Insights from the Behavioral and Brain Sciences*, 3(1), 12-19.

Khan B. (Ed.). (1997). *Web-Based Instruction. Englewood Cliffs*, NJ: Educational Technology Publications.

Kotler, P., & Keller, K. L. (2007). *Marketing Management (12th ed.)*. Upper Saddle River, NJ, Prentice Hall.

Kristof, K. (2018). What's Behind the Soaring Cost of College Textbooks. Retrieved from *https://www.cbsnews.com/news/whats-behind-the-soaring-cost-of-college-textbooks/*.

Lasonde, J. (2016). 2016 Trends Survey Data Shows Major Talent Shortages across Industries. Bullhorn. Retrieved from *http://www.bullhorn.com/blog/2016/03/recruiting-talent-in-talent-shortages/*.

Lawrence, J. A., & Singhania, R. P. (2004). A Study of Teaching and Testing Strategies for a Required Statistics Course for Undergraduate Business Students. *Journal of Education for Business*, 79(6), 333-338.

Liu, X., & Burns, A. C. (2018). Designing a Marketing Analytics Course for the Digital age. *Marketing Education Review*, 28(1), 28-40.

Liu, Y., & Levin, M. A. (2018). A Progressive Approach to Teaching Analytics in the Marketing Curriculum. *Marketing Education Review*, 28(1), 14-27.

McLaren, C. H. (2004). A comparison of student persistence and performance in online and classroom business statistics experiences. *Decision Sciences Journal of Innovative Education*, 2(1), 1-10.

Mintu-Wimsatt, A., & Lozada, H. R. (2018). Business Analytics in the Marketing Curriculum: A Call for Integration. *Marketing Education Review*, 28(1), 1-5.

Mintz, O., & Currim, I. S. (2013). What Drives Managerial Use of Marketing and Financial Metrics and Does Metric Use Affect Performance? *Journal of Marketing,* 77(2), 17-40.

Perrotta, K. A., & Bohan, C. H. (2013). "I Hate History": *A Study of Student Engagement in Community College Undergraduate History Courses*.

Pilling, B. K., Rigdon, E. E., & Brightman, H. J. (2012). Building a metrics-enabled marketing curriculum: The cornerstone course. *Journal of Marketing Education*, 34(2), 179-193.

Pirog, S. F., III. (2010). Promoting statistical analysis in the marketing curriculum: A conjoint analysis exercise. *Marketing Education Review*, 20, 249-254.

Rajamma, R. K., & Sciandra, M. R. (2018). Planning and Implementing a Graduate Online Team-Taught Marketing Course. *Journal of Marketing Education*

Saber, J. L., & Johnson, R. D. (2008). Don't Throw Out the Baby with the Bathwater: Verbal Repetition, Mnemonics, and Active Learning. *Journal of Marketing Education*, 30(3), 207-216.

Savery, J. R. (2015). Overview of Problem-Based Learning: Definitions and Distinctions. *Essential Readings in Problem-Based Learning: Exploring and Extending the Legacy of Howard S. Barrows*, 9, 5-15.

Schlee, R. P., & Harich, K. R. (2010). Knowledge and Skill Requirements for Marketing Jobs in the 21st Century. *Journal of Marketing Education*, 32, 341-352.

Schlee, R. P., & Karns, G. L. (2017). Job Requirements for Marketing Graduates: Are There Differences in the Knowledge, Skills, and Personal Attributes Needed for Different Salary Levels?. *Journal of Marketing Education*, 39(2), 69-81.

Schlegelmilch, B. B. (2020). Why Business Schools Need Radical Innovations: Drivers and Development Trajectories. *Journal of Marketing Education*, 42(2), 93-107.

Spiller, L., & Tuten, T. (2015). Integrating Metrics Across the Marketing Curriculum: The Digital and Social Media Opportunity. *Journal of Marketing Education*, 37(2), 114-126.

Tarasi, C. O., Wilson, J. H., Puri, C., & Divine, R. L. (2013). Affinity for Quantitative tools: Undergraduate Marketing Students Moving Beyond Quantitative Anxiety. *Journal of marketing education*, 35(1), 41-53.

Verhoeven, P., & Wakeling, V. (2011). Student Performance in a Quantitative Methods Course Under Online and Face-to-Face Delivery. *American Journal of Business Education* (AJBE), 4(11), 61-66.

Wang, C. H., Shannon, D. M., and Ross, M. E. (2013). Students' Characteristics, Self-Regulated Learning, Technology Self-Efficacy, and Course Outcomes in Online Learning. *Distance Education*, *34*(3), 302-323.

Weathers, D., & Aragón, O. (2019). Integrating Analytics Into Marketing Curricula: Challenges and Effective Practices For Developing Six Critical Competencies. *Marketing Education Review*, 29(4), 266-282.

Wee, L. K. N., Alexandria, M., Kek, Y. C., & Kelley, C. A. (2003). Transforming the Marketing Curriculum Using Problem-Based Learning: A Case Study. *Journal of marketing education*, 25(2), 150-162.

Wilson, E. J., McCabe, C., & Smith, R. S. (2018). Curriculum Innovation for Marketing Analytics. *Marketing Education Review*, 28(1), 52-66.

Xu, D., & Jaggars, S. S. (2014). Performance Gaps between Online and Face-to-Face Courses: Differences Across types of Students and Academic Subject Areas. *The Journal of Higher Education,* 85(5), 633-659.

Young, M. R. (2005). The Motivational Effects of the Classroom Environment in Facilitating Self-Regulated Learning. *Journal of Marketing Education*, 27(1), 25-40.