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**Leading Horses to Water During a Pandemic:
Assuring Communication Learning for “Quants”**

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ABSTRACT

Students attracted to quantitative disciplines of study can be reluctant to devote much attention to the critical task of communicating, and previous research (Hostager, 2018) has identified statistically significant differences in learning approaches by major among undergraduate business students. This paper presents results of learning assurance for writing skills (direct measures) even when the course content relates to the highly quantitative topics of data analytics and finance. The approach combines various pedagogical methods in an undergraduate, writing-intensive setting: traditional testing in an iterative framework, “flipped classroom” intensive work using spreadsheet software, repeated submission of brief papers incorporating analytical finance work, and student research presentations (including at an undergraduate research conference). We present quantitative and qualitative data demonstrating assurance of learning for evaluation purposes, including the recently announced (2020) competency-based Assurance of Learning standards from the Association for the Advancement of Collegiate Schools of Business (AACSB). To assess the robustness of our findings, we also report results using alternate learning resources (old and new) and delivery methods (in-person, hybrid, fully online), taking advantage of the pandemic natural experiment. We found that learning progress was assured in each context for hybrid and fully online delivery; however, learning was not as monotonic as for fully in-person implementation.

Keywords: Learning assurance, communication, pedagogy, data-driven, competencies

In this paper, the researchers present an innovative approach to teaching writing in a context that can, for some students, be characterized as, at best, “unwilling”. The problem is familiar to many instructors: students drawn to heavily quantitative approaches, including analytics and finance, are often reluctant to devote much attention to how findings generated from rigorous work should be communicated to other humans. Yet employers seek students with communication skills, which is one of the critical areas that companies have asked the educational establishment to improve. For example, a recent survey of over 400 employers states:

Echoing findings from previous . . . surveys, employers say that when hiring, they place the greatest value on demonstrated proficiency in skills and knowledge that cut across all majors. The learning outcomes they rate as most important include written and oral communication skills, teamwork skills, ethical decision-making, critical thinking, and the ability to apply knowledge in real-world settings. Indeed, most employers say that these

cross-cutting skills are more important to an individual's success at their company than his or her undergraduate major (Hart, 2015, p. 1).

The survey showed that 82% of employers gave an 8, 9, or 10 rating (on a 10-point scale) to the question, "The ability to effectively communicate in writing" and another 83% for the question, "The ability to effectively communicate orally" (Hart, 2015, p. 4). Clearly, this is something employers value and a skill that undergraduates, whether business or analytics majors, will probably enhance their likelihood of obtaining employment and career success as well. The class also included teamwork skills, another sought-after ability of job applicants.

One challenge teachers face in communication in a business school setting is that, based on personal experience and confirmation by numerous other teachers, many students drawn to quantitative disciplines are reluctant to value communication of those findings to others. Hostager (2018) found that finance majors, for example, use different learning methods than some other business majors. We now turn to a deeper look into previous pedagogical research in the areas of communication, analytics, and finance. Our paper addresses two lasting problems we face as business educators: how to encourage quants to improve their ability to communicate and how we can measure their progress in doing so.

Literature Review and Hypotheses

We address recent literature in three key areas: business communication and writing, analytics and computer use, and finance. We will focus on each of these areas, cognizant of their place in overall business pedagogy research, as reviewed by Blaszczyński (2016).

The literature on business education indicates that the latter has generally included a communications class for many decades, and some such courses have incorporated writing specifically for "quants" (e.g., finance majors studied by Golen, 2012). Accountants must produce written audit reports, so there has been a long-standing recognition of teaching at least some writing skills to accounting majors (Phillips & Davis, 2010). In the related area of finance, the use of the *Wall Street Journal* has been found to help students appreciate appropriate and up-to-date terms of art and rhetorical tools (Moy, 2010). Many undergraduate business programs include communication as a key skill, and writing skills have been found to be lacking vis-à-vis oral communication for finance majors (Marshall & Roland, 2007).

Another strand of the literature relates to the use of computers in finance classrooms, dating back at least to the mid-1980s (Bialaszewski & Bialaszewski, 2014). The use of large databases in a finance setting was discussed by Maher et al. (2010). Although a full consensus on what constitutes "big data" differs among scholars (Ahmadi et al., 2016), a working definition often found in practice relates to the volume, variety, and velocity of data production. A relatively early study (Dolvin et al., 2006) of instructional methods in the finance classroom found that the use of technology in the classroom can be beneficial, but also that students with different majors are likely to approach classroom technology in different ways. For example, finance majors tended to prefer more process-oriented techniques as opposed to simply using PowerPoint slides. The approach outlined in this paper employs several hands-on teaching techniques, including the "flipped classroom" model, in the context of finance. To that extent, we contribute to the effort of assessing digital technologies (computers, online delivery) covered

by Kamsker, et al (2020). Scott (2019) has also argued for alternative pedagogies other than lecture as being more appropriate for the future of business education.

Previous research (Shrader et al., 2010) found that finance students, in particular, can benefit from learning research methods; in our case, we use applied statistics approaches currently often characterized as business analytics. Fitzpatrick and Ali (2019) find that a multiple-choice format works well for pre- and post-test comparisons. According to Beierlein (2019), a set of written assignments throughout the semester served as a useful complement to the primarily quantitative tasks typical of finance classwork.

When constructing the pedagogical approach outlined in this paper, we considered two initiatives specific to our university. First, students must take at least two “writing intensive” courses as a condition for graduation, irrespective of their chosen field of study. These courses involve several guidelines that are fairly uncommon in analytics and finance pedagogy, including reliance on communication (*vis-à-vis* testing); dual submission whereby an assignment is graded once, returned to the students, and then graded again; and a minimum of 12 pages assigned writing. (We solved this problem by assigning four separate three-page papers, which forced students to be concise—this is a valuable skill given that investors and analysts have limited time and attention to spend on a given financial report.) Second, at the time of data collection, our university used a “Quality Enhancement Plan” related to undergraduate research literacy fostered by our regional accrediting body¹.

Another strand of relevant literature concerns the broader learning context, which relates to business schools’ accreditation standards. A well-known advocate for student progress is the AACSB, which, over many years, has promulgated a series of standards for learning assurance using a “closing the loop” method (Iriberry & Stengel, 2021). The latest guidance document, *2020 Guiding Principles and Standards for Business Accreditation*, mentions “Standard 5. Assurance of Learning” as one of nine assessment standards. Specifically, “the school identifies learning competencies for each business degree program as well as appropriate direct and indirect measures...” (AACSB, 2022: 46) Such direct measures include “examinations, quizzes, assignments and ... feedback that is based on direct observation of individual behaviors or outcomes.” (AACSB, 2022: 45) Given that communication is a key competency for many business professionals, the direct measures proposed in this paper are consistent with the latest AACSB Assurance of Learning standards. Other accrediting agencies also mention communication as an important outcome of a business education².

In sum, our study contributes to this literature in three ways: we provide new data relating to communication in the quantitative context, we provide a transparent method for determining student progress, and we provide analysis of novel data for three delivery modes: fully in-person, online, and hybrid.

Methods

Communication Quizzes

¹ SACS, the Southern Association of Colleges and Schools, <http://sacs.org/>

² EQUIS uses a Quality Assurance scheme (item h, page 15 of *Equis*, 2023). AMBA covers graduate schools, which is not the subject of the current paper.

Students, especially seniors in a selective university, tend to feel that class time should not be spent reviewing basic grammar rules³. However, pre-tests provided on the first day of class show that many basic errors occur. For example, students mix up the proper use of “its” and “it’s,” do not consistently and correctly identify subject-verb agreement, etc. It bears remarking that these students already passed the rigorous entrance requirements to be admitted into the business school in the first place—second-semester Sophomores apply and are accepted only with a 3.0-grade point average or higher.

The direct testing of communication competencies worked as follows for a class meeting on Tuesday and Thursday. On Tuesday, the students were given a multiple-choice test (a few example questions are listed in Appendix A) with grammar and usage questions specifically related to the subject matter of the class (financial data analytics and business writing more generally). The test was distributed on Tuesday, and students were allowed to use one⁴ resource, so the quiz was somewhat of an “open book” exercise. This was done to encourage them to become familiar with the resource so that they would learn where specific rules could be found and would be able to do so in the future during their actual career. After the quizzes were graded, the marked copy was given to the students on Thursday. They had 20 minutes to look up the answers to questions they missed. Quantitative results of the quiz portion of the class are presented below. In subsequent iterations of the class, the students were only allowed to retake the quiz if they turned in homework that corrected any errors from Tuesday’s quiz and had to submit the page number of the relevant section of the resource. For example, if they missed a simple usage question on the Tuesday quiz, they could retake it on Thursday if they turned in a homework assignment, correcting that mistake and citing the page number where that topic is covered in the communication text we used.

Spreadsheet Training

Employers seek new hires with specific computer skills, such as spreadsheet experience, especially in finance and analytics. For example, many entry-level and even mid-level positions in finance require proficiency in Microsoft Excel (or its close competitors such as Google Sheets), and many indeed require knowledge of specialized functions in those software packages. The formulas associated with the time value of money (familiar on a financial calculator) form the building blocks of a large number of financial analytical tasks, such as determining the present value of a stream of cash flows, discovering a discount rate, calculating a payment, or determining a future value. Given the highly structured nature of financial data that is contained in income statements, balance sheets, and statements of cash flows, spreadsheet-type applications are still the work-horses of financial analysis, despite some incursions by data analytics programs such as R. At the same time, applied data analytical approaches as basic as providing descriptive statistics of a data set are important. For example, the ability to set up, run, and interpret findings from multiple regression analysis has value in entry-level jobs dealing with data analytics. Given that Microsoft Excel is highly developed, ubiquitous, and well-supported, we employed its analysis “toolpak” (which includes multiple regression analysis) to introduce these to our students.

³ We used two different basic grammar and style resources over the five-year period covered in this paper. Initially, we used the classic Strunk and White’s classic work, *The Elements of Style* (Strunk and White, 1918). Just before the pandemic, we began using a more modern resource: Brown (2019).

⁴ As mentioned above, in 2017 we used Strunk and White (1918) but replaced that with Brown (2019) subsequently.

In the approach we describe in this paper, several classroom exercises were conducted. The students were given in-class assignments based on actual financial statements of real companies, which are available on websites such as Yahoo!finance, MacroTrends, www.Zacks.com, and the *Wall Street Journal* are also available on the Bloomberg system, which we used, given that the class was taught in our trading room facility. The professor showed the students how to download this information and then use the spreadsheet functions to analyze it in various ways. Each of the four specific projects (described next) utilized this approach.

Student Research Papers

Four papers were assigned based on the university-level requirement of 12 writing pages as mandatory for a “writing-intensive” course. Each paper was confined to three pages, and students were assigned an initial paper subject to rigorous grading for content, grammar, and usage. Then, they could re-submit the paper after they had made the suggested changes. The weighting for the two versions was about 80 percent on the second version and 20 percent on the first, but was adjusted somewhat to achieve an average class grade of 85. This was done to not “penalize” students who all had at least a 3.0 GPA coming into the business school⁵.

In the first paper, students used a proprietary “big data” set of basic accounting data encompassing over 9,400 firm-year observations and developed and tested hypotheses using multiple regression analysis. In papers two through four, students were encouraged to perform Internet research (Laudeman, 2010) on publicly traded companies—such as that available to investors—as well as to employ the various Bloomberg terminals in the trading room (Li and Wang, 2017; Keys, 2016; Gehy & Smith, 2016).

Paper #1: Data analyst. Here, students were provided with a proprietary data set of balance sheets and income statements from privately held (and some publicly traded) companies in Europe. The dataset had over 9,500 observations from four countries (Finland, France, Germany, and the United Kingdom). Students were required to produce basic descriptive statistics, create categorical (e.g., dummy or Bernoulli-distributed variables taking the value of 1 or 0) and truncated continuous variables (e.g., total assets), etc. For many students, this was the first time they had used a large data set. Examples of the hypotheses they tested include:

- Do Manufacturing Firms Have a Tighter Relationship between Leverage and the Employee-Asset Ratio?
- What Role Does the US Trade Relationship have on UK & France Manufacturing Companies’ ROA?

Paper #2: CFO. This paper utilized and reinforced financial analysis tools from earlier in the curriculum at our university. Each student was to provide an in-depth analysis of a real company covered by analysts and for which sales forecast data existed (analysis of financial firms and non-US firms was discouraged). Students downloaded monthly stock prices (adjusted for dividends and splits) for their companies and

⁵ Meaning, if we set the average grade to a 75, which is often done in undergraduate economic classes in the freshman and sophomore year, students on average would see their GPA decline from the 3.0 level it had been when they entered the business school. The writing intensive class discussed in this paper was available almost exclusively to senior finance majors.

S&P using web resources such as Yahoo!finance. They then used an Excel scatterplot to generate a characteristic line, the slope of which is beta from the Capital Asset Pricing Model, which is covered in Finch, et al (2011). Then, they supplemented CAPM analysis with other analytical tools such as weighted-average cost of capital (WACC) and pro forma analysis.

Paper #3: CEO. For this paper, students took the role of a CEO whose job is to provide a positive “spin” on the business results of their firms. They were instructed only to make arguments based on actual information and not to overstate or present too rosy a scenario. In addition to the analytical tools from the CFO paper, they performed additional analyses such as an industry-wide SML analysis (showing where different firms in the same industry landed on an SML graph), Porter's five-factor analysis, Sharpe and Treynor ratios, etc. In addition, they researched qualitative arguments made by the CEO of the actual companies using resources such as conference calls (often found under the “investor relations” tab on the company websites) and annual reports.

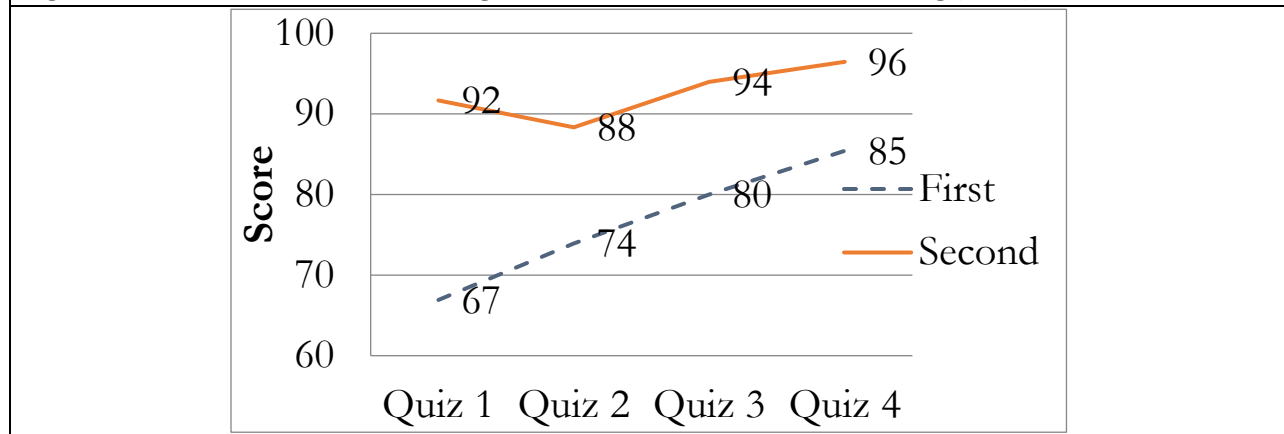
Paper #4: Wall Street analyst. For this paper, students took on the role of being an analyst whose job it was to recommend which stocks in a particular industry should be given a buy, hold, or sell rating.

Findings

Data and Analysis--Assurance of Learning: Style and Usage Quizzes

Santos, et al (2014) presented an approach for integrating multiple-choice assurance of learning models for AACSB purposes in finance. We designed a series of grammar and usage quizzes, allowing students to retake them if the homework (correcting mistakes from the first time a student took the quiz) is submitted. From 2017, when the class was first offered, we repeated it in 2020, 2021, and 2024, each time including a sequence of grammar and usage quizzes. Each class had ten to twenty students, and the tests were originally administered via Scantron, but eventually, we used the testing software embedded in the course management system Scholar. For sample quiz questions, see Appendix A.

Figure 1 shows the average number of correct answers on the grammar quizzes in the first year the class was offered in 2017. The figure indicates that the average grade for the first quiz (given on Tuesday) was 67. Upon re-administration of this quiz on Thursday, the average grade went up to 92. Students generally scored better on each test's first administration (scores improving from 67 to 85 on Tuesdays). Eventually, for the final quiz, the second administration was associated with an average grade of 96. This is an obvious “direct” AoL method to demonstrate to AACSB that learning took place in the wake of this class.

Figure 1: AACSB Assurance of Learning Based on Quiz Scores, Initial Offering (2017)

Excel Procedures and Student Research Papers

Two types of teacher feedback were obtained for the class: quantitative and qualitative. The quantitative feedback was based on the administration of the IDEA system used by many universities to assess teaching quality. Students assessed the class based on two learning objectives:

1. “Developing specific skills, competencies, and points of view needed by professionals in the field most closely related to this course,” and
2. “Developing skills in expressing myself orally or in writing.”

On the first question, 100% of respondents agreed (4) or strongly agreed (5), with an average ranking of 4.8. In contrast, 83% of students provided a 4 or 5 answer for the second question, with an average ranking of 4.4 (raw) or 4.5 (adjusted based on other classes in the IDEA database).

In addition to the quantitative scores on the grammar quizzes, students were also allowed to give qualitative feedback on the class. Appendix B provides these comments (unedited)—the response rate to the solicitation for written advice was 75% (9 out of 12 enrolled). Although a few students made comments best characterized as constructive criticism, the bulk of the feedback was positive, and they generally advocated that this experimental class be integrated into the curriculum.

Participation in Undergraduate Research Conference

In addition to the class's quantitative and qualitative teacher feedback, another measure of student engagement with the material relates to their willingness to present their findings at a student research conference hosted on campus. Each year, our university provides undergraduates from across all disciplines the chance to give an academic-style presentation based on how research is disseminated at professional academic conferences in their discipline. In the first iteration of this class in Spring 2017, the entire business school provided six presentations (dozens were presented from across the university), four of which came from this class. Students valued the opportunity to make these presentations, and some parents of the students showed up to watch them.

Robustness

Since 2017, the course was launched and has been taught several more times. The pedagogical conditions changed, sometimes by choice and sometimes by necessity. Taken together, the varying circumstances can be viewed as a natural experiment as to whether learning was assured using different resources (communication “textbooks”), different delivery (entirely in person, fully online, combination), and different levels of case analysis (as few as four cases per semester to as many as ten).

In 2019, we adopted a new communication resource. The Strunk and White (1918) content had become outdated, given social changes and modern culture surrounding gender, ethnicity, and inclusion. Even prior to the pandemic, we identified a new resource (Brown, 2019) that covered not just formal report and paper writing but also business communication in a more broad way, including presentations and more informal platforms such as texting and email.

Second, we were forced to adapt some teaching procedures due to the pandemic. In Spring 2021, the class was taught in a fully online format but to a much larger number of students (despite writing-intensive classes generally capped at 12 to 14, we enrolled 40 students). The Spring 2020 semester began in person but became fully online about halfway through the semester. By Spring 2024, the pandemic was essentially behind us, so that class was delivered fully in person. Throughout, we preserved the essential learning methods of the class, including iterative quizzes and brief papers that were graded both as a draft and as a final submission.

As Figures 2, 3, and 4 indicate, a similar pattern to Figure 1 emerges: students did better on the retake (solid orange line) than the initial run (dotted blue line). At the same time, the students on average progressed from lower scores on Quiz 1 and generally increasing scores on the three subsequent quizzes (2, 3, and 4). Notice that in Figures 2 and 3, the scores are relatively flat on the first try of quizzes 1 and 2—this could mean the students are getting used to the testing format. Apparently, as they became more familiar with the evaluations, they improved their scores even on the first iteration. In the very first iteration (2017) is there a monotonic (meaning, about equal increases per quiz) increase in quiz scores. The 2024 data, however, also indicate a steady increase, reflecting consistent progress over time in the initial take of the quiz.

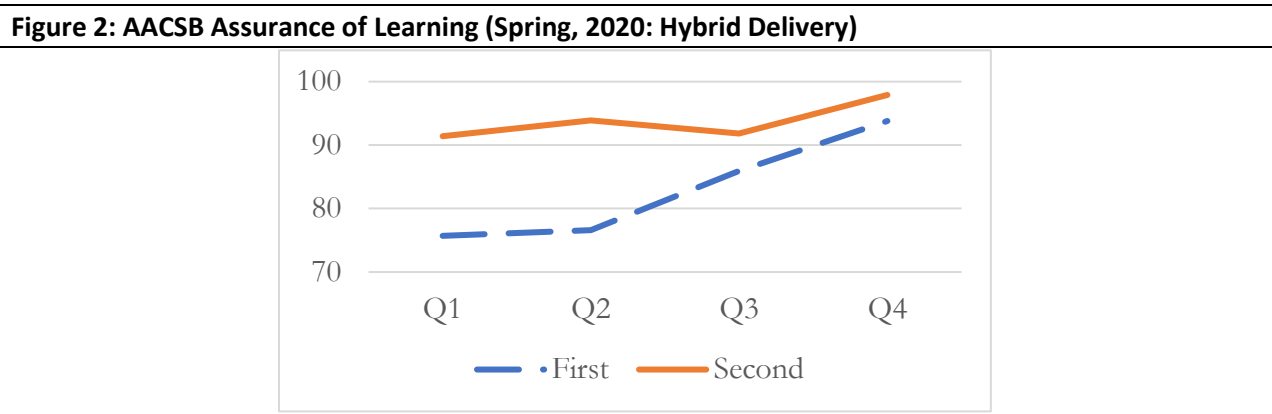


Figure 3: AACSB Assurance of Learning during Covid (Spring, 2021: fully online)

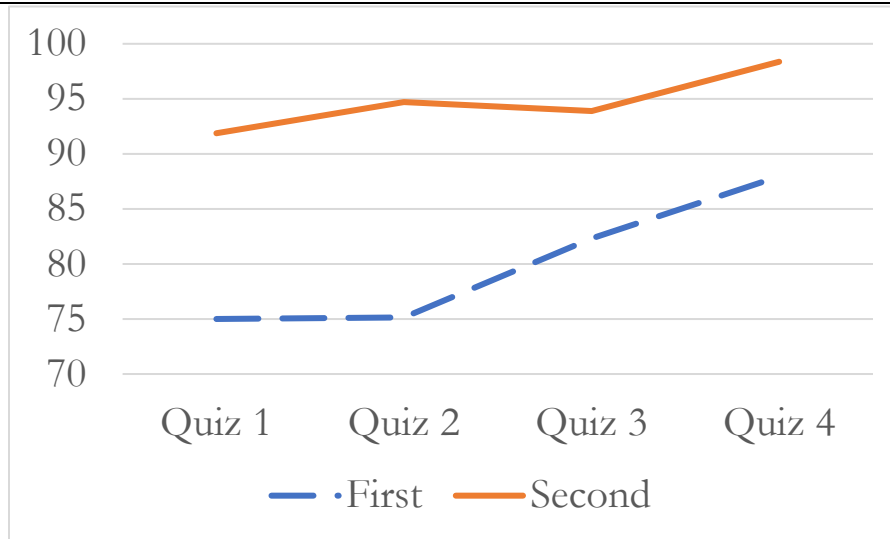
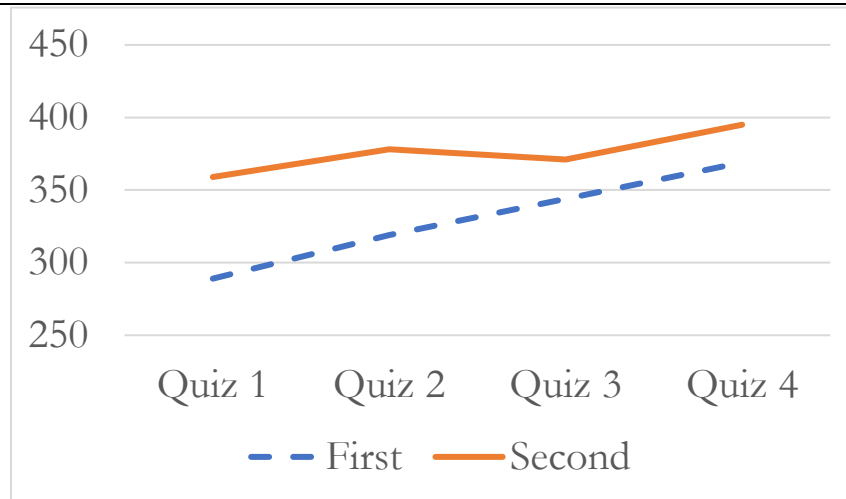


Figure 4: AACSB Assurance of Learning Post-Covid (Spring, 2024: fully in person)



Conclusion

The purpose of this paper was to present information on a natural experiment of teaching communication skills to students with a quantitative predilection. We provided both quantitative (direct) and qualitative (indirect student comments and participation in a student research conference) data to show that they made meaningful progress in both the subject matter (content) of the class as well as in writing and communication.

Instructors of highly quantitative students often struggle to find assignments that encourage communication skills. We provide data on the efficacy of several methods whereby writing progress is

measured and quantitatively demonstrated. Such efforts can help schools comply with the goals accreditation agencies require, such as fostering skill acquisition in business schools.

Limitations and Further Research

Two limitations or caveats should be clarified. First, our students may be unique in some way, which makes the model less applicable elsewhere, but given the robustness of the findings during very different conditions, this seems unlikely. Second, the limited class size of only 12 students at the outset of teaching this class in 2017 was a luxury not always possible in undergraduate education. So, our results may not be replicable in circumstances involving more students.⁶ Future research on the results of this new information will be useful to test the larger applicability of the findings to other business education programs.

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⁶ We thank anonymous reviewer #2 for identifying these concerns.

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Appendix A: Example of Business Communication Usage/Style Quiz

1. Which of the following is correct?

- (a) The CEO of the firm is retiring, she is only 50 years old.
- (b) The CEO of the firm is retiring; she is only 50 years old.**
- (c) The retiring CEO, is only 50 years old.
- (d) All of the above
- (e) None of the above

2. Choose the best answer among the available choices to complete this sentence: “Managers of well-run companies have a lot to worry about; _____ goal of adding value for shareholders can be very difficult.”

- (a) their**
- (b) they’re
- (c) there
- (d) All of the above
- (e) None of the above

3. Choose the best answer among the available choices to complete this sentence: “ ___ a hard task to run a company.”

- (a) Its
- (b) It’s**
- (c) Its’
- (d) All of the above
- (e) None of the above

4. Choose the best answer among the available choices to complete this sentence: "Apple stocks today held their own despite a wide sell-off of technology shares. _____ cited strong performance as a key ingredient to the share price's resilience."

- (a) Their managers
- (b) Its management team**
- (c) Their management team
- (d) All of the above
- (e) None of the above

5. Choose the best answer among the available choices to complete this sentence: "The CEO is trying her best ____ the job is difficult."

- (a) ,
- (b) ;**
- (c) :
- (d) All of the above
- (e) None of the above

6. Choose the best answer among the available choices to complete this sentence: "The companies I chose all outperformed the market; every one of the _____ positions in the CAPM diagram are above the SML."

- (a) firms
- (b) firm's
- (c) firms'**
- (d) All of the above
- (e) None of the above

7. Choose the best answer among the available choices in terms of style:

- (a) The best writers will chose structures and vocabulary that are not too long-winded.
- (b) Brevity in writing is a most important skill to which all who want to sound smart should aspire because it is more convincing to an audience and makes a favorable impression on anyone who is important that might be listening or reading.
- (c) Vigorous writing is concise.**
- (d) All of the above
- (e) None of the above

Appendix B: Student Feedback (initial offering, 2017, taught as an elective)

The writing component was more useful than the current Finance writing intensive class. I felt like I learned more about actually writing, and knew what was expected.

I think this class is great, it allows students to learn how to compute things that we would use in the real world and understand what they mean.

There was a lot of time spent developing a knowledge of writing style, but not enough time spent learning what to write about.

I think this class is more useful to finance majors than the current writing intensive, but not much of the information is new. Intermediate corporate finance already covered most of these topics, if I remember correctly. Personally, I loved this class. I think the other writing intensive is too focused on the amount of writing, not the quality.

Although this class was difficult, it did improve the quality of my writing substantially. It also has a good balance between the analytic/real-life application material which you would usually expect in a finance class and the writing/rhetoric material. I would honestly recommend offering this class again in the future.

I have always wanted to be in a class where you get to use/strengthen your analytical skills. This class has come fairly close to that opportunity, but can still grow with the appropriate amount of attention. Our current FINC-WI class does not expand our knowledge like this class does. I would definitely look into developing this course.

As a fairly new student to the Finance major, I was nervous about how much I would understand. All the topics covered in class have been well explained and we are encouraged to go to office hours if we have any questions. I have not taken the FINC writing intensive yet, but from what I have heard from fellow students, I think this class would be more applicable to life post-graduation. We learn how to properly write for the professional world. If this class were to be offered again, I would highly recommend it to any finance major regardless of how far they are into the major.

One of the main objectives for the course is to develop skills and competencies relevant to finance. I feel as though this course does a good job at preparing students for a job in finance with the utilization of excel as well as papers, or reports, geared towards learning about the world of finance. The only problems I have are that I am a sophomore with junior standing, and therefore (*sic*) have not taken many finance courses as of yet. In fact, only one. So the terminology is difficult to take in while also trying to learn about the reports we make. My recommendation is to only let students with senior standing or certain prerequisites of 422 to avoid this issue.

Should be incorporated into the Finance curriculum.