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Self-reported Practices of Self-compassion of Business Students at Times of COVID-19

Volume 65, 2025 | *Dr. Donna Wampole, Dr. Amarpreet Kohli, Dr. Hermeet Kohli, John Grigas*

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Abstract
Self-compassion focuses on personal well-being, self-forgiveness, and connection to others who may also be struggling with life stressors. Self-compassion practices have been found to support well-being across a variety of populations, including individuals in intellectually and emotionally demanding professional or academic environments. A significant body of research has focused on the impact of self-compassion and associated mindfulness interventions for practitioners and students within the helping professions; however, there is a dearth of research examining self-compassion among those in business and business students. In addition, the COVID-19 pandemic created a challenging environment marked by disconnection, isolation, and health-related stressors that affected everyone. The following study examined how business students practiced self-compassion, noted changes in said practice, and how said practice changed during the COVID-19 pandemic.

Keywords: self-compassion, COVID-19, business, business education, wellness

In early 2020, the COVID-19 pandemic swept through the United States, causing unprecedented shutdowns of educational, work, and home environments. The worldwide experience of distress resulting from the pandemic has been well documented (McGinty et al., 2020) including the challenges placed upon students. Previous research has examined the definitions of self-compassion and how social work students who utilized self-compassion during the pandemic (Wampole & Kohli, 2022, 2023); however, the literature remains limited on the use of self-compassion in business education programs and its role in COVID-19-related distress among this population. Given the known stressors in business education (Dahlin et al., 2011; Law, 2010), a focus on self-compassion could be beneficial to student wellness.

Literature

Self-compassion
In comparison to compassion, which is an experience of caring emotions and empathy for the world external to oneself, self-compassion reflects this same empathy and non-judgment inward for well-being and regulation. Best researched and defined by Neff (2003), self-compassion is "experiencing feelings of caring and kindness toward oneself, taking an understanding, nonjudgmental attitude toward one's inadequacies and failures, and recognizing that one's own experience is part of the common human experience" (p. 224). Self-compassion notes human fallibility and focuses on the need for forgiveness of oneself and our own mistakes. Neff's definition also includes six elements-

self-kindness versus self-judgment, common humanity versus isolation, and mindfulness versus over-identification (Neff, 2023). Those practicing acts of self-kindness, recognition that humanity shares common bonds of suffering, and practicing mindfulness of suffering and pain, all can lessen the experience of distress and help one decrease chronic suffering. Participating in self-judgment, isolation, or overidentification with pain can lead one to be absorbed in pain.

Research has grown by examining the use of self-compassion as a means for mitigating work distress in a variety of professions, including social work (Miller et al., 2020), nursing (Joy et al., 2022), and education (Ragni et al., 2023). Additionally, research on self-compassion in university students is growing (Wampole & Kohli, 2022; Kotera, Green, et al., 2019; Lee et al., 2022). Research is now expanding outside of more traditional "helping" professions to explore self-compassion in the business world.

Business

Much of the interest in self-compassion in the business world focuses on the role of self-compassion to promote mental well-being and as a protective factor against burnout. In a study on measuring burnout levels among business students, Law (2010) found that business students reported extreme burnout before final exams and exhibited high levels of emotional exhaustion, even compared to other professions with high rates of burnout. Likewise, Dahlin et al. (2011), discuss the prevalence of stress and mental health concerns among business students and the hesitance of those students to seek help, largely due to a psychosocial climate that stigmatizes mental illness and discourages members from taking actions that can be perceived as a show of weakness.

For individuals in business, whether academically or professionally, self-compassion can be an important tool for improving both their success and mental well-being. Breines and Chen (2012) found that self-compassion improved feelings of well-being and mental health while also helping individuals to perceive their weaknesses as changeable, an attitude that led to greater engagement with self-improvement. Additionally, self-compassion was noted to act as a buffer between evaluative concerns, perfectionism (or the placing of rigidly high expectations on oneself), and feelings of depression (Abdollahi et al., 2020). Likewise, Leary et al., (2007), Shepherd and Carlson (2009), and Rukundo et al. (2020) discuss the value of self-compassion as a tool for managing stress in adverse situations, whether unpleasant life events or failed business projects, and having the resilience to recover from those situations and learn from them.

In a study focusing more specifically on college students, Neely et al. (2009) found that self-compassion had a greater and more reliable impact on well-being than goal management, stress, and availability of support. Additionally, Bui et al (2021) found that students who practiced mindfulness and scored higher on self-compassion also reported significantly lower levels of perceived stress. In another study, Kotera et al. (2019) compared business students to social work students and found that the former showed lower levels of self-compassion, higher levels of shame, were more likely to have reduced mental health, and were generally more prone to help avoidance. The authors of the study attributed the difference between the groups to the fact that self-care and self-compassion are part of the social work curriculum. In contrast, these topics receive little to no attention in business school curricula.

COVID-19

The onset of the COVID-19 pandemic caused an unprecedented experience of distress and mental challenges worldwide. University students were noted to report ongoing anxiety, depression, and feelings of isolation (Son et al., 2020; Fruehwirth, 2021; Patankar, 2023). Garvey and colleagues (2023) specifically noted an increase in anxiety of a variety of levels, specifically with business students, during high lockdown times of the pandemic. A concern exists for those areas of education which have had limited to no focus on wellness prior to this unexpected crisis. For some career paths, such as social work and psychology, interpersonal challenges and stressors, including secondary trauma, can be expected. As such, focus has been made on teaching self-care and self-compassion as a foundation for professional well-being. Similarly, the use of self-compassion by university students during the COVID-19 pandemic has been studied in social work (Wampole & Kohli, 2023), yet a dearth of literature exists examining the same topic in business students.

Given the above noted need for business students to manage mental wellness, the increased distress experienced as a result of the pandemic, and the knowledge that self-compassion can be a buffer against negative emotions, the following research explored these questions:

1. How are you practicing self-compassion at this time of the COVID-19 pandemic?
2. How has your view of self-compassion changed due to the pandemic and related stressors?
3. Has your frequency of self-compassion practice changed with the spread of COVID-19? If yes, how?

Methodology

This exploratory qualitative research is part of a larger, mixed-methods, multistep research project. This research was approved by the University's Office of Research Compliance, and the respondents were guaranteed anonymity. We employed a qualitative systematic content analysis (SCA) approach as defined by Krippendorff (2019) and Schreier (2012). SCA is an appropriate design for analyzing pre-collected data to excavate meaning and key themes.

Research Team

The research team consists of three individuals. The primary author holds a Doctorate of Clinical Social Work and was a tenure-track faculty member in the School of Social Work in the New England region. The second author holds a Ph.D. in business and is a tenured professor in Operations and Supply Chain Management in the School of Business. The third author is a tenured professor in the School of Social Work and has examined self-compassion for several years. The fourth author worked as a graduate student assistant, examining and preparing literature to inform the study.

Trustworthiness

Throughout the study, we employed strategies to ensure rigor and soundness. Using a research team, our rigor was enhanced through the researchers serving as a check and balance for all research activities, including research design, sample selection, and analysis (Denzin & Lincoln, 2011). Our work was collaborative and utilized a consensus coding process as described by Halpin (2024). Additionally, we engaged in team discussions to reduce the impact of our assumptions on the research.

Sampling Procedures and Inclusion Criteria

A convenient sampling strategy was employed, as participants were undergraduate students enrolled in the School of Business at a northeastern metropolitan university where all researchers were employed. All students enrolled in the Spring 2020 semester were invited to participate in this web-based survey descriptive research project. The data were collected online using the Qualtrics Survey Software during four months beginning in March, 2020. Participation in the study was voluntary, and participants received $5 Amazon gift cards. Students were presented with the Informed Consent form as the first page of the Qualtrics survey and were able to proceed to the study questions once they confirmed their consent.

Participants

In total, 109 undergraduate and graduate business student responses were received for the larger research project, representing a response rate of 27% from the sample size of 400 business students. From the 109 respondents who completed the multiple surveys, 82 students provided codable information on how they were practicing self-compassion during the pandemic, 78 provided codable data on how the pandemic affected their views of self-compassion, and 69 provided information on whether and how the frequency of self-compassion practice changed with the spread of COVID-19. About 81% of the respondents identified as Caucasian. According to the United States Census Bureau (2024), 93.7% of the residents in the study area identify as White/Caucasian only; therefore this study's participants may reflect those of a more diverse racial background. Only 22% of the respondents identified as male, 83% were heterosexual, about 62% were single, and 20% of the respondents reported being either married or in a civil union. About 24% lived in urban areas, about 21% lived in rural areas, and the remaining lived in suburban areas. Forty-four percent of respondents identified as Democrats, 16% Republicans, and the remaining identified themselves as Independent. Forty-four percent identified as atheist, 10% agnostics, and 39% Christian. Nineteen percent of the respondents identified as having a disability.

Data Analysis

We utilized Krippendorff's (2019) four-step process of unit identification, sampling, coding, and reducing. The unit to be analyzed was the data collected from a multi-step mixed-method study on the students' practices of self-compassion during the COVID-19 pandemic and how student views of self-compassion were changed by the pandemic. The raw data for the two qualitative questions were cleaned, and the transcripts were coded and analyzed. After careful and repeated examination of the transcripts, categories and subcategories of analysis were developed and defined. As noted above, inter-coder agreement (Halpin, 2024) was employed for accuracy and trustworthiness. The categories of themes evolved during the analysis as more patterns,

variations, and concepts were identified. Analysis was further accomplished by identifying the themes that emerged most frequently across the transcripts.

Results

How were students enrolled in business programs practicing self-compassion during the COVID-19 pandemic?

A total of 82 students provided feedback related to our first research question. The results from our respondents yielded six thematic areas: Hobbies, Physical Care, Mental Health Care, Relationships, Pandemic Practices, and Self-prioritization.

Participants noted that engaging in hobbies helped defray the stress brought on by the pandemic. Activities included gaming, reading, spending time with pets, and investing in the stock market. In addition, others noted that focusing on their physical care includes cooking nutritious meals, hiking, practicing yoga, and even smiling. Participants frequently mentioned mental health skills. Many noted they continued to attend therapy and practice skills learned in treatment. Others journaled, practiced self-forgiveness, acceptance, and meditation to care for their internal selves. Participants also noted the importance of focusing on their relationships with others, including maintaining socially distanced connections with friends and family as a means to practice self-compassion. Others also noted that setting boundaries with loved ones at this time was critical to their needs. Respondents also noted that they felt engaging in pandemic practices including social distancing and safety measures was their means of practicing self-compassion. Finally, self-prioritization included responses that noted pacing oneself and challenging old self-expectations as well as reorienting to the here and now and taking things one step at a time. As one respondent noted:

> I have truly discovered self-compassion during the pandemic. I've been at a job that's mistreated me for years, and I've finally built up the courage to leave. I discovered self worth as well as self-compassion. The job had a negative impact on my mental health, and I really had to discover self-compassion to get me through the difficult time.

One participant noted, " …it's okay for things to feel out of control emotionally and out of sorts during this time." Another participant stated, "Trying to go easy on myself when something bad/sad/irritating happens while also allowing myself to feel my real emotions."

Eight participants noted having no change or no use of self-compassion during this time. Little information was provided to expand upon their answers. In another case, one participant shared a concerning view on the space for self-compassion and feelings of perfectionism:

> I'm not able to practice this as everything I do effects (sic) my life and those involved in it. I have no room for failure and this is very hard on me as I am a young growing adult trying to navigate life.

Yet another participant answered the prompt, "falling into a depression."

How did the pandemic affect students' views of self-compassion?

A total of 78 students provided responses related to our second research question. Sixteen of our participants noted that their self-compassion views were not changed by the pandemic. The remaining responses resulted in two major themes: Interpersonal and Personal. Some respondents noted that during the pandemic, they had a greater focus and appreciation for time with family and noted how much they missed social connections. As one student noted,

> I had not realized how much of a role socializing (sic) played in my self care(sic). It has been difficult to meet friends for coffee or lunch. This has contributed to my feelings of isolation and loneliness.

Others noted the pandemic led to greater self-reflection, a realization of the need for their own independence and self-care, and permission to be flexible with their own self.

> I realized that I was too hard on myself in the first year of college (last year) and was filling my schedule with way more than I could handle. I usually do not like the term (sic) of "self-compassion" but I have more respect for it now.
>
> I realized that being very hard on myself will only foster failure, not success
>
> I am more grateful for what I have, and have been practicing different techniques to not be as hard on myself
>
> Before the pandemic, I was a waitress working a full schedule in addition to upper level college courses. I was busy, always moving, and when I have a day off I spent it catching up on work and chores. Now, I spend all my days at home. I

am working less in a physical sense, which makes me feel less deserving of rest. I feel like I am less deserving of tenderness because I am in the comfort of my home office space all day.

How did the frequency of self-compassion practice change with the spread of COVID-19?

Finally, 69 students provided responses related to our third research question. Regarding this question, 36 respondents reported no change to their practice, while 19 and 2 respondents noted increased and decreased practice, respectively. An additional three students noted that although they did not specify a change in frequency of practice, they did share how their practice had changed. For instance, one participant noted, "I do not track any practices of self-compassion. My focus has been on creating and maintaining a new routine which keeps me busy and complies with public health best practices."

For those reporting a decrease in practice, most noted that either their practice fell out due to the stress of the pandemic, or because their prior practice involved socialization, which was then compromised by social distancing. As one respondent shared

> ...it's not as frequent. For example, I used to workout daily, now I just do a workout a couple of times a week. Also, all my favorite activities that I used to do with my friends are non-existent (sic) now. It's a little more isolating in my self-compassion practices.

Students who reported an increase in self-compassion practice predominantly attributed it to the additional time available due to the lockdown. For instance, "...I have more time to do things for myself like take nature walks, read, and meditate," and "there has been more time to be home and have time to do things that are therapeutic for me." Others noted that the pandemic and ensuing stress caused a response of self-reflection. "I am much more mindful of being compassionate to myself now," noted one respondent, while another stated, "I have been focusing more on myself and loving myself in a time of isolation."

Discussion

With the onset of the COVID-19 pandemic, students and faculty faced unprecedented changes to education and wellness. As such, students' self-compassion needs were evident. Students reported a variety of themes related to self-compassion practices, including hobbies, physical self-care, mental health care, relationships, pandemic-related practices, and prioritizing the self. Many students shared similar practices or an overlap of different themes, all of which were used during the pandemic. As noted above, a concern was raised given two respondents' expressions around depression and perfectionism. This highlights the need for students in business programs to receive education on wellness and self-compassion, not just during stressful times, but also for personal health and life balance, aligning with prior research findings (Abdollahi, 2020).

A challenge with this question is determining the differences between students' understanding of self-compassion versus their actions of self-care. It is recommended that in future research, participants be provided with definitions of self-compassion and self-care to assist in their responses and self-evaluation.

Regarding pandemic-related changes in views of self-compassion, the responses from participants who noted changes were focused on both the interpersonal and personal aspects. Many respondents shared that the pandemic brought about a realization of the importance of connection with family and friends, and that social distancing took a toll on their emotional well-being. This aligns with the self-compassion element of common humanity (Neff, 2003), which prompts the recognition that not only do all beings experience pain, but that connection with one another can also lift us from feelings of isolation and loneliness.

For many, the pandemic altered their perspective on self-compassion, leading to a realization of the need to focus on the self. This includes recognizing when students are too hard on themselves, practicing self-forgiveness, and giving themselves permission to rest. These findings mirror the elements of self-kindness and mindfulness (Neff, 2003). By practicing self-kindness over judgment, students give themselves room to recognize the normalcy in life's ups and downs and create validation and warmth for themselves. Similarly, mindfulness in self-compassion involves creating space between the suffering and the self. Students who recognize their pain mindfully can note that such discomfort is a natural response to a pandemic, which may then lessen their tendency to personalize pain.

Along similar lines, some respondents noted that they turned to the practice of gratitude for what they did have and how others may be in more need. This again highlights the understanding of common

humanity and mindfulness (Neff, 2003), noting that all are experiencing the pain of a pandemic and that this pain is not a singular, individual experience. One challenge with this question was that it invited a closed-ended answer of not experiencing change to practice. With this in mind, future research is needed in the form of in-person interviews with follow-up probing questions to gain a deeper understanding of how current practices benefit individuals in challenging times.

A limitation of this study is the overall homogeneity of demographic identifiers of our participants. Since the study's population reflects a majority white demographic, future research must include a more diverse student population to ensure broader representation and applicability.

The researchers encountered a limitation with the use of a closed-ended question on changes in self-compassion practices during the pandemic, which led to many responses lacking detail and depth. Of those who did answer, results varied. It is worth noting that the social distancing measures implemented during COVID-19 affected many participants who referenced the inability to connect to others as a barrier to self-compassion practices. For many, the pandemic itself drew attention to the need for self-compassion practices, and some reported increasing these practices in response to this realization.

It is apparent from our findings that many student participants used self-compassion practices during the pandemic and that many had such practices in place prior to the pandemic. It remains essential to ensure that all students are provided with resources such as self-compassion education to support their personal and professional well-being. Despite this need, little is known about the existence of self-compassion training in business programs. As such, programs can benefit from collaborating with other educators in areas such as social work (Kotera et al., 2019), nursing, and education. While these professions focus on managing and supporting others through growth and change, incorporating self-compassion practices for those in business programs can reframe students' perception of failure and growth.

Conclusion

While it is hoped that a worldwide traumatic experience will not recur soon, much can be learned by examining how students define and practice self-compassion as it can be applied to everyday life and acute stress events. The COVID-19 pandemic affected education in various ways, including removing students from community living, altering communication, and switching classroom-based education to online platforms. As such, many students experienced anxiety, depression, and a sense of disconnection. Our study notes that self-compassion became a means for participants to reframe their situation and note the importance of both caring for oneself and connecting with others. Future research should expand on understanding how interconnectedness and focusing on the self can enhance one's well-being in times of distress to improve student mental health and success.

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Active Learning, Real-Time Feedback, and Academic Integrity in Business Statistics: A Study Using Scoreboard for Excel

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Abstract
Three of the Guidelines for Assessment and Instruction in Statistics Education (GAISE) emphasize fostering active learning, using technology to explore concepts and analyze data, and using assessments to improve and evaluate student learning. We incorporate these principles into an undergraduate business statistics course through a free educational technology tool called Scoreboard for Excel. Scoreboard facilitates active learning by providing real-time formative feedback, scaffolding complex tasks, and increasing student engagement. It also benefits faculty by making it easy to create assignments, automate grading, and reduce opportunities for academic integrity violations. Does the integration of Scoreboard in the classroom improve learning and performance? In a controlled experiment at a small Northeastern state college, students using Scoreboard for Excel outperformed a control group on all measured outcomes in an undergraduate business statistics class. Survey data suggest that the tool increases engagement, is well-received by students, and is useful beyond the classroom. Integrating Scoreboard into the curriculum aligns closely with GAISE guidelines and can be easily expanded to other quantitative disciplines.

Keywords: Excel, Business Statistics, Student Learning, Student Engagement

In 2005, the American Statistical Association released the GAISE College Report, later revised in 2016, which provides recommendations for improving the teaching of undergraduate statistics (Carver et al., 2016). These guidelines include teaching statistics as an investigative process, focusing on conceptual understanding, integrating real data, fostering active learning, using technology to explore and analyze data, and employing assessments to both improve and evaluate student learning. While traditional lecture methods and publisher-produced resources offer some support, they often lack immediate feedback mechanisms, limit instructor customization, and may not effectively promote active learning or protect academic integrity.

This paper examines an innovative approach to teaching undergraduate business statistics using a free educational technology tool called Scoreboard for Excel. Scoreboard transforms Excel assignments into interactive, self-grading learning experiences. Can we improve student performance and learning using this tool? It provides real-time, formative feedback as students complete tasks, aligning well

with the GAISE principles. The design leverages three pedagogical theories to foster active learning, deeper understanding, and intrinsic motivation: scaffolding, real-time formative feedback, and self-determination. Additionally, Scoreboard relieves faculty of grading burdens, offers robust academic honesty controls, and allows full customization of assignments. The Scoreboard for Excel website (https://www.scoreboardexcel.com/) offers instructors a free download of the program and tutorial videos for assignment creation.

Our study took place at a small Northeastern state college with the appropriate IRB approval. Students in one section of an undergraduate business statistics course used Scoreboard for Excel, while students in two control sections did not. We compare their performance on objective measures from a publisher's homework manager system. Students taught with Scoreboard for Excel exhibited significantly improved performance across all examined areas, from descriptive statistics to hypothesis testing and regression. Survey responses show that students find the tool engaging, supportive, and valuable.

The remainder of this paper is organized as follows. The following section discusses the GAISE guidelines and how Scoreboard aligns with them. We next present the theoretical foundations of scaffolding, real-time feedback, and self-determination that underpin active learning. Then we address faculty needs for customization, automated grading, and academic integrity. We review the existing literature on integrating Excel and technology in teaching statistics and describe Scoreboard's mechanism with illustrative examples and figures. We present our analysis starting with an outline of the experimental design, data, and methods. A presentation of the results and discussion follows. We supplement the analysis by discussing survey findings and student feedback, followed by concluding remarks.

Aligning with GAISE Recommendations

The GAISE College Report's recommendations (Carver et al., 2016) guide educators toward more effective statistics instruction. Three of these recommendations are particularly salient to our approach:

1. Foster active learning: Students learn best when actively engaged. Instead of passively receiving information, they should discover solutions through hands-on tasks.
2. Use technology to explore concepts and analyze data: Technology can simplify complex calculations, allowing students to focus on interpreting results and understanding concepts.
3. Use assessments to improve and evaluate student learning: Assessments should provide timely feedback, helping students learn from errors and build conceptual mastery.

Scoreboard for Excel aligns with these goals by integrating technology directly into assignments, providing immediate feedback, and enabling students to learn actively. The tool encourages students to manipulate data, apply formulas, create graphs, and interpret outputs, all while receiving guidance. This strengthens their understanding of statistical concepts and improves their competency in Excel, which, on its own merit, is considered an essential workplace skill.

Pedagogical Foundations: Scaffolding, Real-Time Feedback, and Self-Determination

Three overlapping pedagogical frameworks support the use of Scoreboard for Excel:

Scaffolding (Vygotsky & Cole, 1978)

Scaffolding involves providing just enough support to help students bridge the gap between their current skill level and their potential capability. Scoreboard's design alerts students immediately when errors occur and provides minimally revealing hints. This allows learners to correct mistakes on their own, preserving task integrity and encouraging deeper engagement. For example, if a calculation is off, the tool indicates "Value too low, please try again" rather than giving the answer. Students learn the correct approach by refining their calculations until the cell turns green, signifying mastery.

Real-Time Formative Feedback (Hattie & Timperley, 2016; Epstein et al., 2001)

Feedback is most effective when it is immediate, goal-oriented, and delivered in a self-paced, computer-assisted environment. Many learning management systems delay feedback until after submission, which can be too late for productive learning. Scoreboard provides feedback on each cell in real-time. This immediate correction helps students understand the nature of their mistakes right at the point of error when it is most useful.

Self-Determination Theory (Ryan & Deci, 2000)

Intrinsic motivation flourishes when learners experience autonomy, receive feedback on their performance (competence), and can interact with others (relatedness). Scoreboard supports autonomy by allowing students to navigate assignments in the order they prefer, competence by providing instant performance feedback and a progress bar to show incremental successes, and relatedness by encouraging collaborative consultation among peers and with faculty. Students gain confidence as they see their correct answers turn cells green and accumulate points.

Meeting Faculty Needs: Customization, Automated Grading, and Academic Integrity

While GAISE focuses on student learning, instructors have their own needs. Scoreboard for Excel addresses these challenges:

Easy Customization of Assignments

Instructors can create assignments that align perfectly with their course objectives. They begin with an Excel file containing desired data, formulas, and questions, which can include multiple-choice, numeric answers, or complete analyses. With one click, Scoreboard converts the file into a self-grading assessment. This design gives instructors unlimited control over content, unlike many publisher tools that limit customization.

Automated Grading

Time-consuming manual grading can deter faculty from assigning frequent, robust assessments. Scoreboard automates the grading process. Students submit their auto-graded assignments through the learning management system (LMS). The instructor downloads them in bulk, and Scoreboard records all scores in minutes, eliminating grading drudgery and freeing time for more meaningful faculty-student interactions.

Academic Integrity Controls

Academic dishonesty is a concern in online assignments. Publisher resources, widely used across many courses, often have their answers posted on cheating websites. Scoreboard mitigates this by randomizing data values, shifting formula references for each student, and generating individually named start files. This reduces the benefit of copying a peer's work or searching for an identical solution online.

Literature Review: Technology Integration and Excel in Statistics Education

The educational literature supports the integration of technology, including Excel, to enhance statistics learning. Garfield and Ben-Zvi (2007) survey the effectiveness of active learning and note that structured activities, like those Scoreboard supports, improve conceptual understanding. Moore (1997) emphasizes problem-solving practice, which aligns with allowing students to use Excel to carry out statistical procedures rather than relying solely on pen-and-paper calculations.

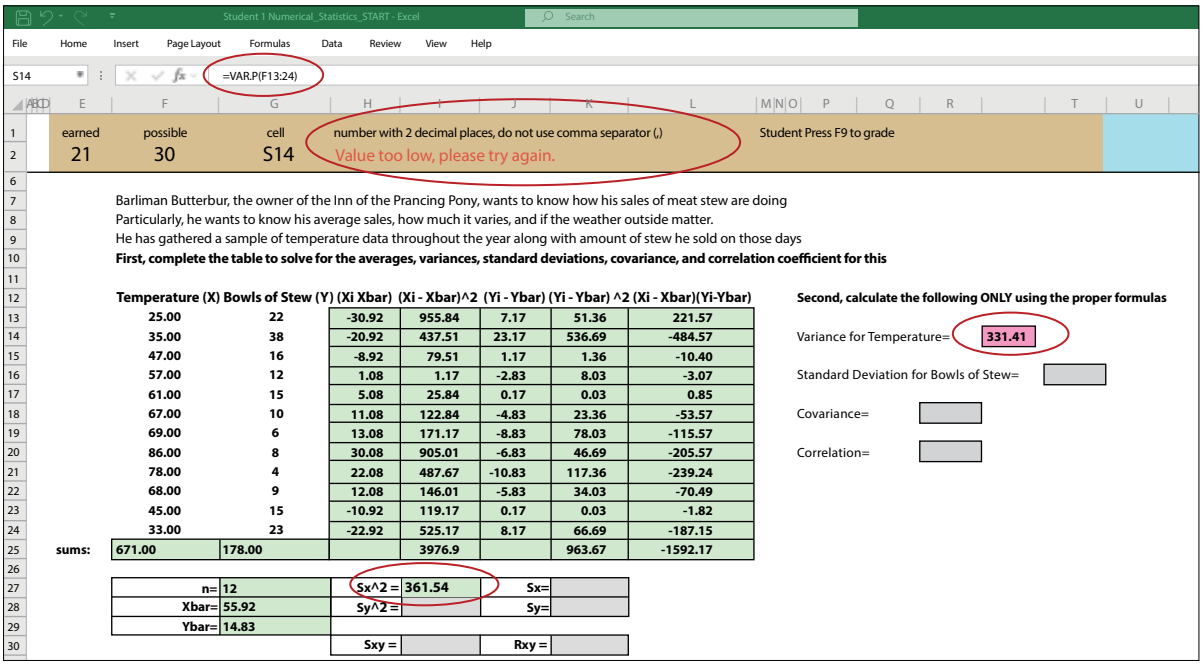
Contemporary students are comfortable with technology. TikTok and web-based applets (Lee et al., 2018; Kusumadyahdewi & Kusumarasdyati, 2021; Variyath & Nadarajah, 2022) have been used successfully to engage learners. Computer simulations (Corredor, 2008; Jamie, 2002) and spreadsheet-based assignments (Liang & Martin, 2008) have improved conceptual understanding. However, time-consuming development of spreadsheet assignments and lack of immediate feedback have posed challenges.

Excel remains a valuable and in-demand skill (Dobson, 2024; University of Reading, n.d.). Studies show that proficiency in Excel is critical for business graduates (Formby et al., 2017; Ragland & Ramachandran, 2014; Palocsay et al., 2010). Yet, many students lack basic Excel proficiency upon entering college (Creighton et al., 2006). Integrating Excel into the statistics curriculum is a natural fit. McCloskey and Bussom (2013) find that Excel better engages students and improves learning in statistics. The Technology-enhanced Supportive Instruction (TSI) model for teaching statistics promotes usage of computing software like Excel in flipped classrooms, online, and face-to-face deliveries. (Soesmanto & Bonner, 2019; Burckhardt et al., 2021; Reyneke et al., 2021). Using Excel reduces tedious manual calculations, allowing students to focus on interpretation and conceptual analysis (Bell, 2000; Erfle, 2001; Convery & Swaney, 2012; Willis, 2016; Zhang, 2014). Al-Haddad et al. (2024) promote learning through purposeful use of technology and faculty feedback to support the student. In the absence of faculty, Scoreboard can provide formative feedback to the student. By embracing Excel-based learning, Scoreboard helps students gain not only statistical knowledge but also a "transportable skill" (Velleman & Moore, 1996) applicable to future coursework and employment.

Scoreboard for Excel Mechanism and Examples

Scoreboard solves a practical problem: How can faculty provide a large workload of meaningful assignments while still offering timely, customized feedback? Faculty create an Excel "answer key" with data, formulas, pivot tables, graphs, multiple-choice questions, etc. Scoreboard converts this file into a self-grading version for students. Students complete the assignment directly in Excel and receive instant feedback. When a cell is correct, it turns green, and points are awarded. Incorrect entries turn pink, and formatting issues turn cells yellow, guiding students to correct their errors. A tutor-like environment is thus simulated.

Figure 1 • Numerical Statistics Example



Example: Numerical Statistics

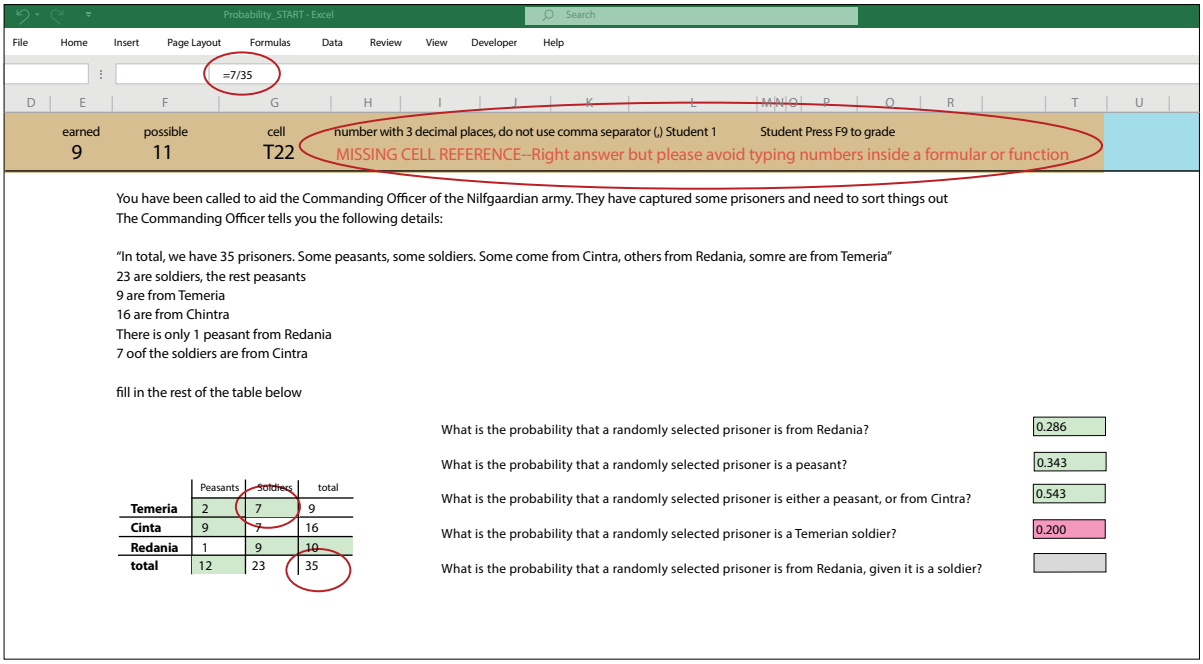
Imagine a scenario where students must calculate correlation coefficients. They are first taught to break down the formula step-by-step, computing sums of squared deviations, sample variances, and standard deviations manually. The assignment portion on the left takes the student through these steps, making use of formulas taught in class for mean, variance, standard deviation, covariance, and correlation. Seeing these cells turn green with each correct step is affirming. The second portion on the right emphasizes the use of Excel functions, which should match the answers obtained through the step-by-step route. If they err, the cell turns pink. A common example that is shown in Figure 1 is using the population variance function VAR.P instead of VAR.S. A subtle hint indicates the issue without revealing the correct function. This nudges students to recall the difference between population and sample formulas. Because Scoreboard randomizes data values and cell references, copying another student's solution is ineffective.

Example: Probability

In a probability assignment, students must identify simple events, joint events, and complements. Probability questions require the students to calculate simple probabilities, unions, intersections, and conditional probabilities. Linking the calculations to the table requires the student to deduce the empirical outcomes first and then construct the probability calculations. The error illustrated in Figure 2 showcases that typing in the numerical calculation is not accepted, forcing the student to

select the values from their own created table. Points are awarded for calculations referencing cells in the table. This cuts back on sharing answers. Faculty can also instruct Scoreboard to produce multiple variants of the questions.

Figure 2 • Probability Example



Example: Confidence Interval

In a confidence interval assignment, students must use appropriate formulas to identify critical z-scores or t-scores, calculate approximate standard errors, and combine them to create the margin of error. The estimated confidence interval is then constructed using these components. Faculty have the flexibility to adjust the formatting such that the values are relevant to the interpretation of the question. The color and message in Figure 3 indicate that the calculation is correct, but the formatting does not match the intended outcome. The requested format is also displayed at the top so students can adjust their input. No points are awarded until this step is completed.

Example: Single Population Hypothesis Testing

For hypothesis tests, students must determine test type, tail direction, decision criteria, and interpret the conclusion. Figure 4 illustrates how Scoreboard makes use of pull-down menus and CONCAT functions to create an answer block consisting of steps 1, 2, 12, and 13. An answer block is like a parlay in betting where all items in an answer block must be correct at the same time before the answer block turns green. This prevents "guessing to green" from pull down menus. Instructors can increase assignment difficulty simply by adding more items to the answer block. This forces students to logically connect each step of the hypothesis testing process. Instead of revealing the final correct conclusion outright, Scoreboard encourages students to integrate their statistical reasoning skills, guiding them to identify test statistics, compare them to critical values or p-values, and interpret results in context.

These examples differ from publisher materials, which often provide feedback only after submission. With Scoreboard, each step is a learning opportunity. Assignments can reflect the instructor's style and desired level of rigor. Once completed, students upload their already graded files. Scoreboard runs through the submissions and creates a spreadsheet of grades.

Data and Experiment Design

We conducted a study in Fall 2023 with three sections of an undergraduate business statistics course at a small Northeastern state college. The classes covered identical content, used the same textbook, and assigned homework through a

Figure 3: Confidence Interval Example

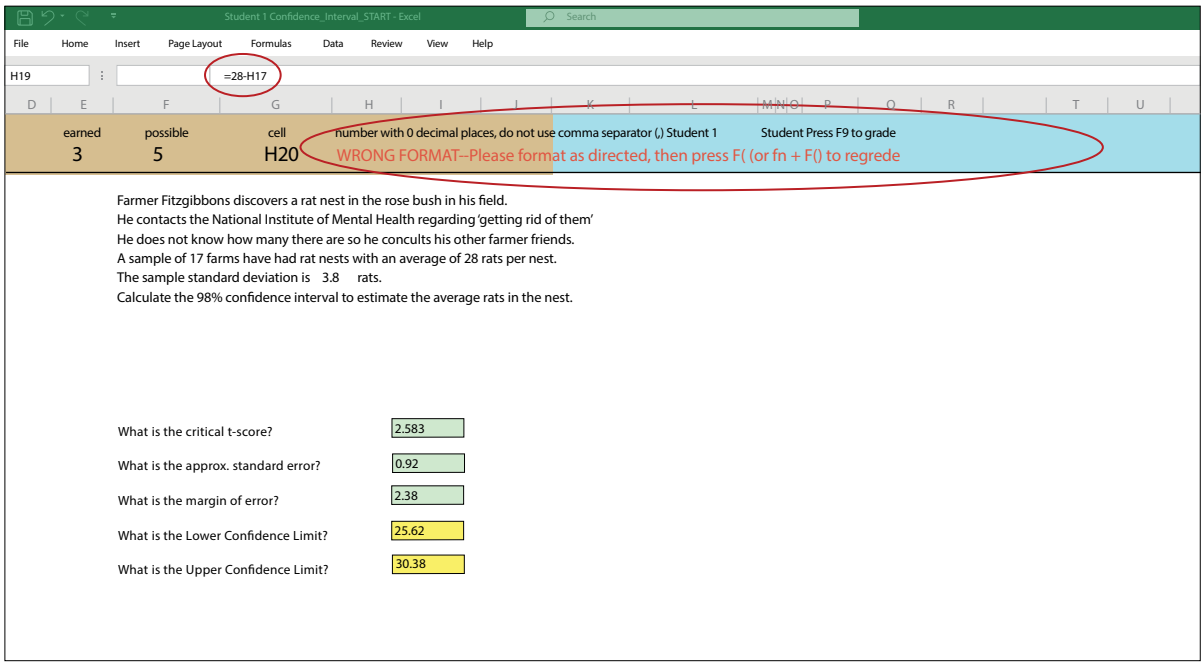
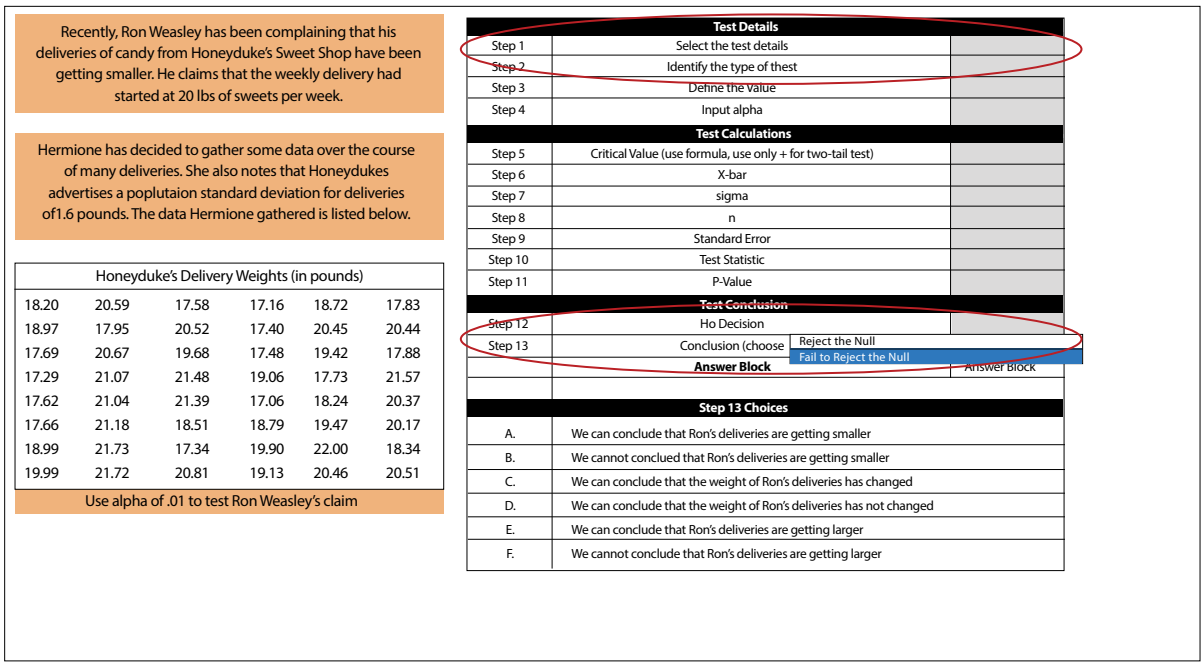


Figure 4: Single Population Hypothesis Testing Example

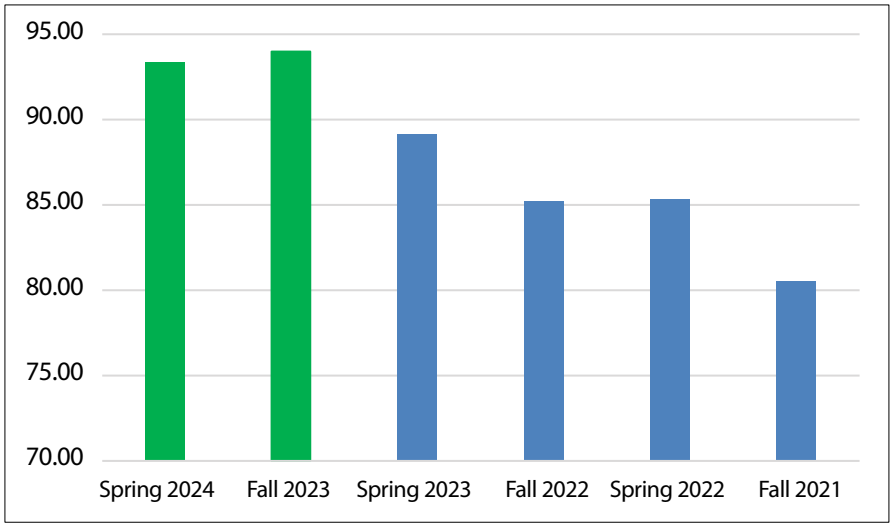


These courses were taught by two faculty members from the same department that coordinated the business statistics course in question. As a committee, the faculty work together to choose a text, course tools such as MyLab, and use a common syllabus. The two instructors have worked together teaching this same course for 15 years. In addition, one of the instructors was a student of the other when they were in college 20 years prior. The senior faculty member instructed the two control groups in the same fashion that has been upheld in the past; the other faculty member taught the section introducing the Scoreboard software. Considering the 15-year baseline of any differences in student performance, we are confident that the difference in the studied semester was due to the introduction of Scoreboard.

We also looked longitudinally at historic courses taught by the Scoreboard instructor. Figure 5 displays aggregate mean MyLab scores for six semesters taught by the instructor who used Scoreboard. Aggregate class averages increase with its introduction in Fall 2023 and a single-factor ANOVA test confirms the difference in means is significant. Summary statistics and ANOVA results are posted in Tables 1a and 1b in the appendix. Therefore, the difference in performance of the treatment group we believe is attributable to Scoreboard.

Treatment vs. Control: One section of 35 students (the Scoreboard class) integrated Scoreboard for Excel assignments throughout the semester. Two sections totaling 68 students served as the control group, taught traditionally. All sections completed publisher assignments as part of their grade.

Figure 5: Mean Overall MyLab Scores by Semester



Note: Mean performance scores are calculated by the authors. They represent the students taught by the instructor who introduced Scoreboard in the Fall 2023 semester. The semesters when Scoreboard is used have been colored green.

Instructional Differences: The Scoreboard class received the same theoretical instruction but focused practice sessions on Excel-based tasks. Students learned how to use Excel formulas, the data analysis toolpak, and other functionalities. Each chapter had a Scoreboard assignment tailored to that chapter's content, ensuring alignment with GAISE goals.

Performance Measurement: We used the publisher's companion site data as an objective measure of performance. Students completed assignments with algorithmic questions that varied slightly between students. We aggregated performance by topic, such as measures of central tendency, variability, distributions, and hypothesis testing. Survey responses provided additional insight into student backgrounds, attitudes, and perceived usefulness of the tool.

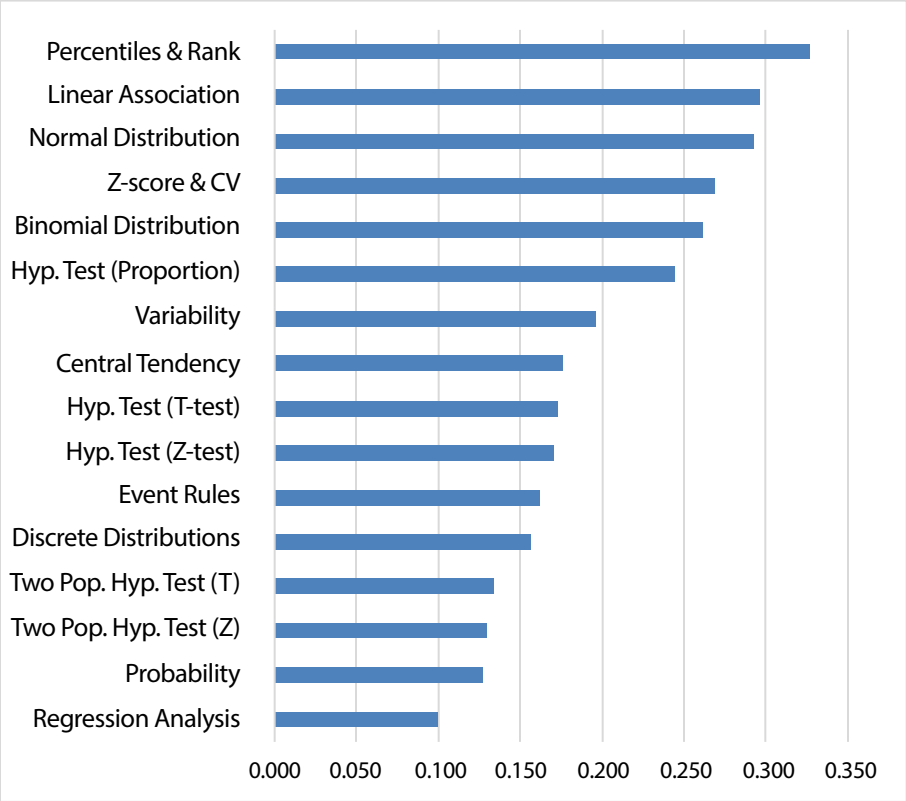
Sample Size: A total of 103 students participated. Approximately 68% completed the survey. Thirty-four percent reported familiarity with spreadsheet programs before enrolling.

Results and Discussion

Overall Performance Improvements

Figure 6 displays the difference in average performance scores between the Scoreboard class and the control group for all completed assignments. The results consistently favor the Scoreboard class. For instance, Scoreboard students outperformed by 17.6 percentage points on questions pertaining to central tendency (Cohen's d = 0.732). On questions about variability, Scoreboard students scored 19.7 percentage points higher (Cohen's d = 0.741), and they outscored the control group by 32.6 percentage points on questions about percentiles and rank (Cohen's d = 1.083). These substantial differences and effect sizes suggest that real-time feedback and guided practice improve comprehension, reducing calculation errors and enhancing conceptual understanding. See Table 2 in the appendix for more details.

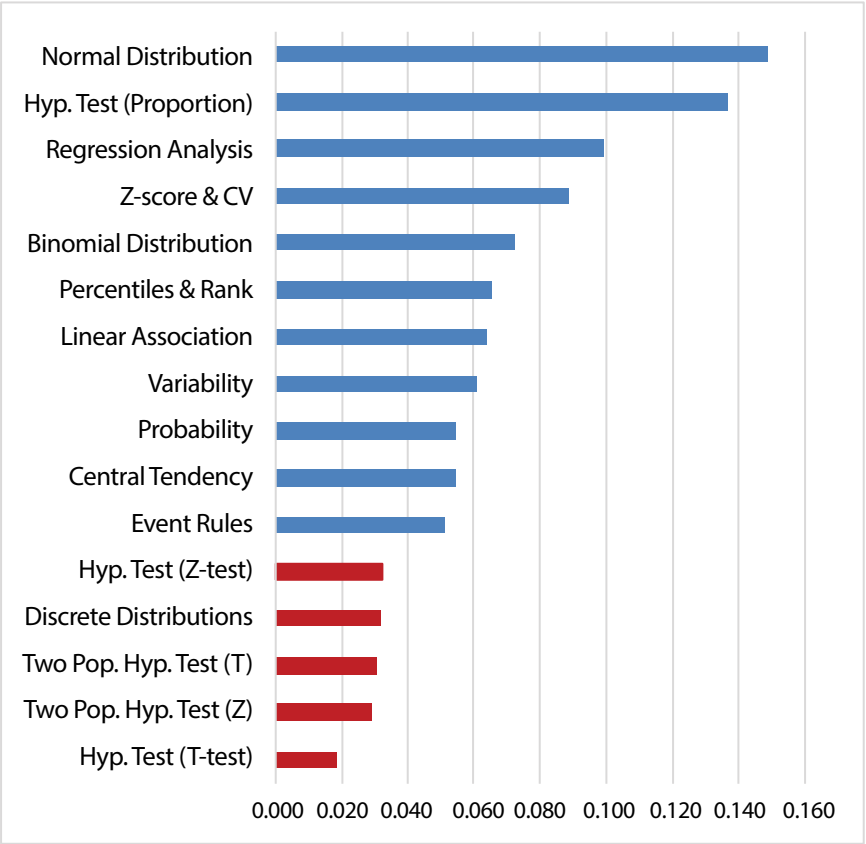
Figure 6: Difference in Mean Section Score: All Students



Note. Graphed values represent the difference between the mean MyLab section score from the Scoreboard section and the mean MyLab section score from the Control group. Scores are measured objectively on a scale of 0 to 1 where 1 represents 100% correct responses.
Two Pop. Hyp. Test (T) and Test (Z) are significant at the 5% level; Regression Analysis is significant at the 10% level; all others are significant at the 1% level. The corresponding Table 2 is located in the Appendix.

The benefit extends to probability distributions (binomial, normal) and hypothesis testing. For instance, the Scoreboard class significantly outperformed the control group on discrete probability distributions and normal distributions. The improved performance on hypothesis testing is particularly noteworthy, given its complexity. By simplifying calculations and providing immediate feedback, Scoreboard helps students focus on interpreting results rather than getting lost in computation.

Figure 7: Difference in Mean Section Score: Incompletes Omitted



Note. Graphed values represent the difference between the mean MyLab section score from the Scoreboard section and the mean MyLab section score from the Control group. Scores are measured objectively on a scale of 0 to 1 where 1 represents 100% correct responses. Students who did not finish the assignment are omitted. The categories in red do not have any statistical significance. The blue categories are significant at the 1%, 5%, or 10% level. The corresponding Table 3 is located in the Appendix.

Controlling for Completion and Attempts

Some students did not complete every assignment. Figure 7 focuses on those who finished their work. Many differences remain significant, indicating that the advantage is not merely due to completion rates. Omission of incomplete assignments does lower the effect size as measured by Cohen's d. Every significant difference does yield an effect size larger than the threshold of a small effect with some notable differences. Central tendency, percentile and rank, and hypothesis tests for the proportion have medium effect size values, while the normal distribution maintains a large effect. See Table 3 in the appendix for more details.

We also examined the average number of attempts per question to gauge efficiency. Figure 8 shows minor differences; Scoreboard students required fewer attempts in certain areas (e.g., Probability, Binomial and Normal Distribution), though not universally. The effect size for these significant differences is categorized as a medium effect for the binomial distribution, and a large effect for probability. Even when attempts did not drop, the quality of learning, measured by final accuracy, increased. See Table 4 in the appendix for more details.

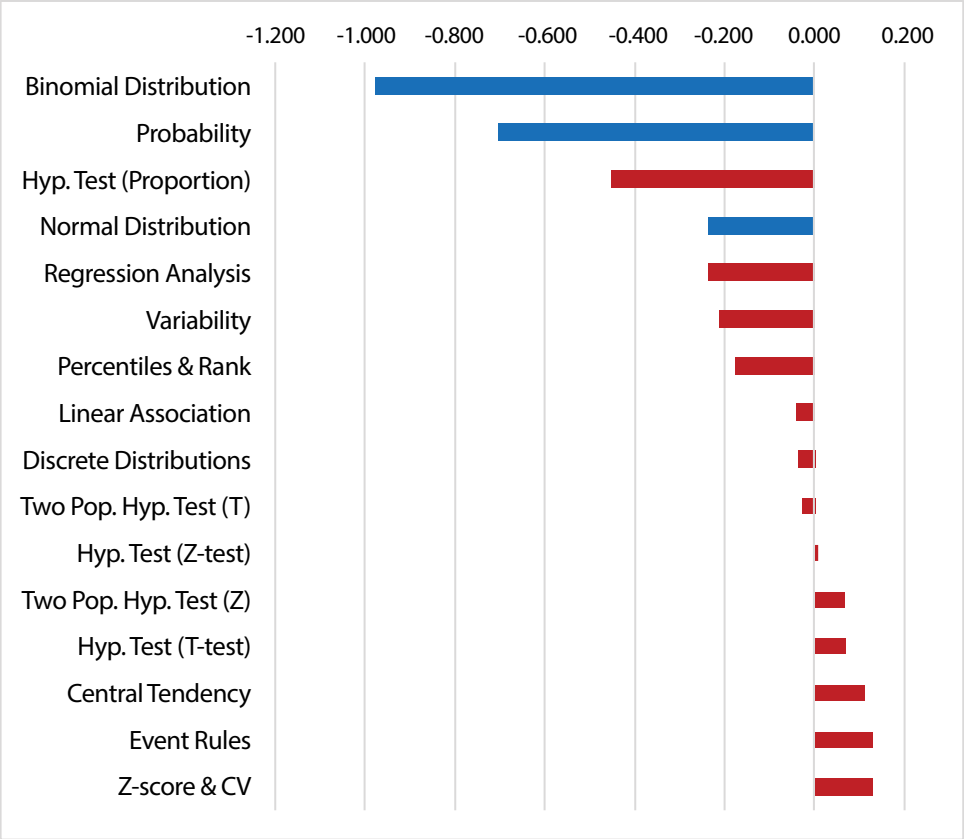
Performance Across Topics and Backgrounds

Breaking down performance by topical sections highlights the consistent advantage of Scoreboard-based learning. Students also outperformed in more advanced areas such as regression analysis, although significance levels slightly decreased as fewer students completed late-semester assignments.

Survey Results and Student Feedback

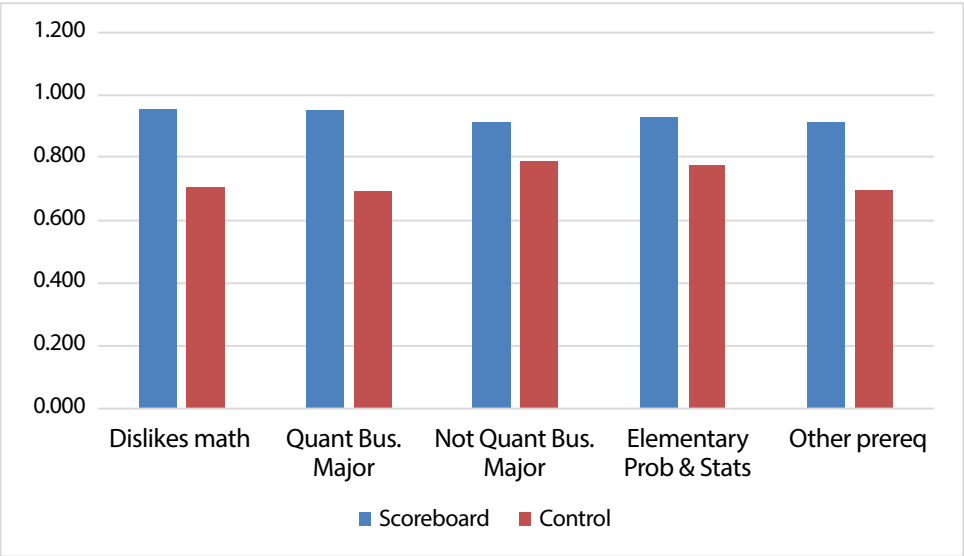
We administered an end-of-semester survey to gather qualitative feedback. Institutional Review Board approval was obtained for this survey. Figure 9 displays the summary findings. Of 103 students, 70 responded: 32 from the Scoreboard class (91.43% response rate) and 38 from the control group (55.88% response rate). The higher response rate suggests greater engagement in the Scoreboard class.

Figure 8: Difference in Attempts by Section: Incomplete Assignments Omitted



Note. Graphed values represent the difference between the mean MyLab section attempt from the Scoreboard section and the mean MyLab section attempt from the Control group.
The categories in red do not have any statistical significance. The blue categories are significant at the 1%, 5%, or 10% level. The corresponding Table 4 is located in the Appendix.

Figure 9: Summary of Assignment Performance by Survey Responses

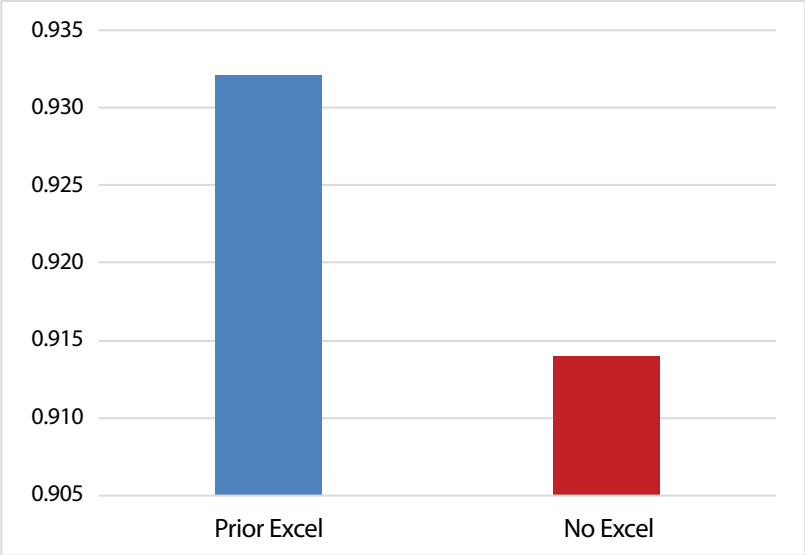


Note. The corresponding Table 5 is located in the Appendix

Students who disliked math but learned with Scoreboard still performed significantly better, by about 25 percentage points, than similar students in the control group. Students with previous exposure to introductory statistics also benefited more in the Scoreboard section, scoring 93% compared to 77.7% in the control group. Both quantitative and non-quantitative majors in the Scoreboard class outperformed their counterparts.

We included a question in the Scoreboard class's survey to gauge prior familiarity in Excel. Out of the 32 respondents, 24 claimed to have familiarity with Excel. This group's MyLab average score was 93.2%. The group of students who were not familiar had an average MyLab score of 91.4%. Figure 10 displays these means. A test for difference in means indicates the means are not uniquely different.

Figure 10: Assignment Score by Excel Familiarity: Scoreboard Section



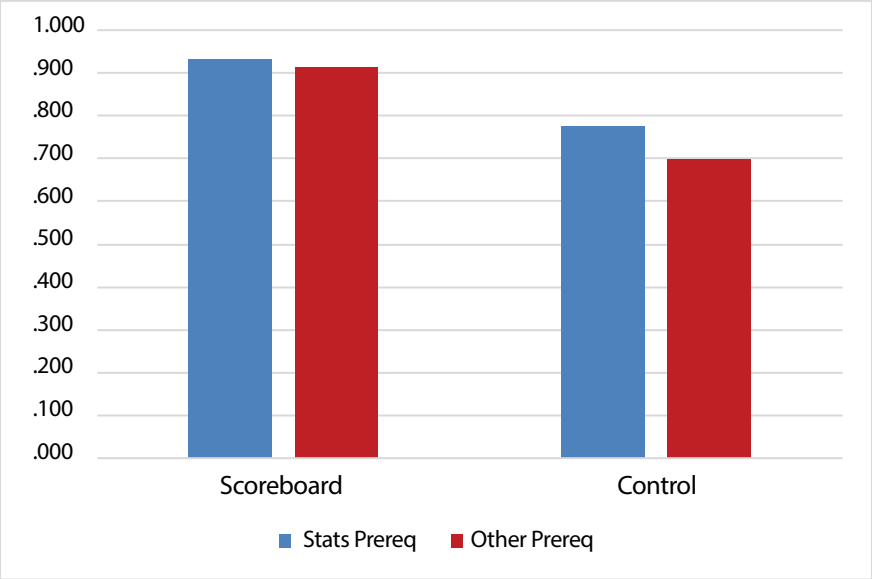
Note. The blue bar represents the overall MyLab assignment average for students in the Scoreboard group who disclosed that they had prior familiarity with Excel. The red bar represents students from the Scoreboard group who claimed no prior familiarity with Excel. The difference is statistically insignificant at all levels. The corresponding Table 6 is located in the Appendix.

Lastly, we compare subsets of students based on their prior knowledge. Figure 11 highlights the overall average MyLab score for students who stated they previously enrolled in the elementary statistics prerequisite and for students who disclosed they enrolled in a different prerequisite. We display these averages for both the Scoreboard and Control groups. A simple test for the difference in means suggests there is no significant difference based on prerequisite in either group.

Figure 12 displays the difference in performance for individual topic sections in the Scoreboard group compared to the Control group. Only students who enrolled in the elementary statistics prerequisite course are considered. Even those previously exposed to statistics improved with Scoreboard, suggesting that prior course completion alone does not guarantee mastery, but active, feedback-rich practice does. The subjects with significant differences maintain effect size values above the low effect threshold. Central tendency, percentile and rank, probability, and hypothesis tests for the proportion all have Cohen's d values considered as medium effect; the normal distribution subject still maintains a large effect. See Table 8 in the appendix for more details.

Open-ended survey comments reinforce that students found Scoreboard helpful. Some called it a "great learning tool," while others recognized the importance of Excel proficiency for business students. A few found it challenging, reflecting normal variation in learning styles, but overall responses were positive.

Figure 11: Assignment Performance by Prerequisite: Section Comparison



Note. Blue bars represent the overall MyLab assignment average for students who disclosed that they took the elementary statistics prerequisite. Red bars represent students who took a different prerequisite. The difference is statistically insignificant for both course groups. The corresponding Table 7 is located in the Appendix.

Broadening the Scope: Applications Beyond Statistics

While our study focused on business statistics, Scoreboard's principles and approach are transferable. Any quantitative domain, such as accounting and finance to economics and operations management, can benefit. In accounting, for instance, Scoreboard can guide students through adjusting journal entries, highlighting formatting or calculation issues and prompting them to learn from mistakes (Sasmaz, et al., 2025). In finance, assignments might involve computing various investment metrics or analyzing financial statements, with immediate feedback ensuring that students understand not only how to run calculations but also how to interpret results meaningfully.

Because Excel remains ubiquitous in professional settings, developing these skills in an educational environment where feedback is immediate prepares students more effectively for the workforce. As hiring managers consistently value Excel proficiency, Scoreboard helps bridge the gap between academic exercises and professional analytical tasks. This approach can enrich internship readiness, job market competitiveness, and long-term professional development.

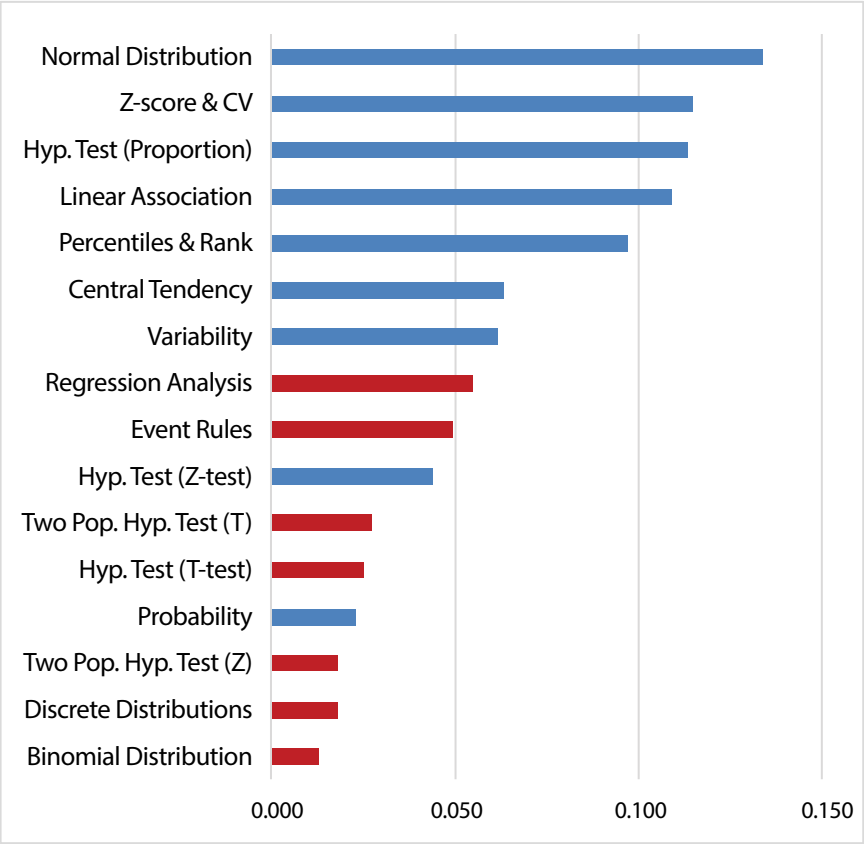
Future Directions and Limitations

Several avenues for future research and development arise from this study. One direction is exploring the long-term retention of material. While Scoreboard improves immediate performance, do students remember these concepts a semester or a year later? Another area involves adaptive complexity. Faculty can design assignments using Scoreboard that reduce scaffolding as students demonstrate mastery. Similarly, faculty might experiment with varying feedback intensity or delaying certain hints to encourage deeper reasoning.

There is also the question of scaling. For larger courses or cross-institutional collaborations, could Scoreboard files be shared, adapted, and improved upon by multiple instructors? A community of practitioners could emerge, exchanging best practices and innovative assignment designs. Additionally, investigating how Scoreboard interacts with different learning styles, or how it may benefit students with varying levels of technological fluency, would provide valuable insights. Students struggling with Excel basics may initially need more explicit scaffolding, while advanced users may appreciate more open-ended tasks.

We also acknowledge certain limitations. The study took place at one institution with a relatively small sample size, focusing on one semester and one particular course context. Further replication across different institutions, student populations, and course formats would strengthen the case for generalizability. Moreover, while we observed

Figure 12: Difference in Assignment Performance: Stats Prerequisite



Note. Graphed values represent the difference between the mean MyLab section score from the Scoreboard section and the mean MyLab section score from the Control group. Only students who disclosed that they took the elementary statistics prerequisite are considered. The categories in red are not statistically significance. The blue categories are significant at the 1%, 5%, or 10% level. The corresponding Table 8 is located in the Appendix.

positive student feedback and engagement, more detailed qualitative research, such as focus groups or interviews, could reveal nuanced insights into how students experience Scoreboard and which features they find most beneficial.

Conclusion

This study demonstrates that integrating Scoreboard for Excel in an undergraduate business statistics course leads to significant improvements in student performance, engagement, and overall learning quality. By aligning with the GAISE recommendations of fostering active learning, using technology to deepen conceptual understanding, and employing assessments as tools for learning improvement, Scoreboard transforms assignments from static tasks into interactive, feedback-rich experiences.

Students using Scoreboard performed notably better in fundamental and advanced statistical topics. They received immediate, formative feedback that guided them to correct errors in real time, strengthening their understanding and reducing guesswork. Survey data indicated that students valued this approach, found it engaging, and saw its utility beyond the classroom. Faculty benefited from customizable assignments, automated grading, and robust academic integrity controls, freeing them from tedious tasks and allowing them to focus on teaching excellence.

Scoreboard is not limited to statistics. Its flexibility and principles apply broadly, potentially raising the bar for technology integration and active learning in various quantitative disciplines. As data literacy becomes increasingly important, equipping students with both conceptual knowledge and practical tool proficiency positions them for success in their academic and professional journeys.

In essence, Scoreboard for Excel offers a way to systematically incorporate GAISE-aligned practices into the heart of course assignments. By doing so, it helps bridge the gap between theoretical ideals and practical classroom realities, ultimately fostering a learning environment where students become more confident, skilled, and engaged analysts of data.

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Appendix: Tables 1-8

Table 1a • Summary Statistics by Semester

Statistic	Spring 2024	Fall 2023	Spring 2023	Fall 2022	Spring 2022	Fall 2021
n	67	35	34	71	70	72
M	93.32	93.91	89.13	85.22	85.26	80.58
Mdn	98.59	94.67	94.73	94.10	91.98	87.46
SD	10.26	6.91	17.64	19.42	22.57	20.88

Note. These mean performance scores represent the students taught by the instructor who introduced Scoreboard in the Fall 2023 semester. This table displays population standard deviations since the entire class was utilized for each semester.

Table 1b • Single Factor ANOVA

Source	*SS*	*df*	*MS*	*F*	*P*	*F crit*
Between	8806.957	5	1761.391	5.077964	0.000166	2.240228
Within	119323.2	344	346.8696			
Total	128130.1	349				

Table 2 • Assignment Performance by Section: All Students

	SCOREBOARD			CONTROL			Difference			
Course Section	n	*M*	*SD*	n	*M*	*SD*	*M*	*SE*	*p*	*d*
Central Tendency	35	0.993	0.042	68	0.817	0.338	0.176	0.057	0.001***	0.732
Variability	35	0.983	0.069	68	0.787	0.369	0.197	0.063	0.001***	0.741
Z-score & CV	35	0.939	0.177	68	0.671	0.402	0.269	0.071	0.000***	0.866
Percentiles & Rank	35	0.975	0.069	68	0.649	0.420	0.326	0.072	0.000***	1.083
Linear Association	35	0.929	0.134	68	0.632	0.438	0.296	0.076	0.000***	0.914
Probability	35	0.998	0.014	68	0.870	0.303	0.128	0.051	0.007***	0.595
Event Rules	35	0.930	0.102	68	0.768	0.321	0.162	0.056	0.002***	0.680
Discrete Distributions	35	0.929	0.151	68	0.772	0.337	0.156	0.060	0.005***	0.598
Binomial Distribution	35	0.934	0.195	68	0.673	0.410	0.261	0.073	0.000***	0.813
Normal Distribution	35	0.989	0.036	68	0.697	0.351	0.292	0.060	0.000***	1.169
Hyp. Test (Z-test)	35	0.930	0.102	68	0.759	0.349	0.170	0.060	0.003***	0.662
Hyp. Test (T-test)	35	0.832	0.246	68	0.659	0.377	0.173	0.071	0.008***	0.542
Hyp. Test (Proportion)	35	0.844	0.284	68	0.600	0.378	0.244	0.073	0.001***	0.732
Two Pop. Hyp. Test (Z)	35	0.848	0.271	68	0.718	0.393	0.130	0.074	0.042**	0.384
Two Pop. Hyp. Test (T)	35	0.765	0.298	68	0.632	0.398	0.133	0.076	0.042**	0.380
Regression Analysis	19	0.900	0.164	45	0.801	0.300	0.099	0.073	0.091*	0.410

*Note. *, **, *** indicate significance at the 10%, 5%, and 1% levels*

Table 3 • Assignment Performance by Section: Incomplete Assignments Omitted

	SCOREBOARD			CONTROL			Difference			
Course Section	n	*M*	*SD*	n	*M*	*SD*	*M*	*SE*	*p*	*d*
Central Tendency	35	0.993	0.042	60	0.939	0.144	0.054	0.025	0.016**	0.512
Variability	35	0.983	0.069	58	0.922	0.180	0.061	0.032	0.029**	0.447
Z-score & CV	35	0.939	0.177	54	0.851	0.224	0.089	0.045	0.026**	0.440
Percentiles & Rank	35	0.975	0.069	50	0.910	0.144	0.065	0.026	0.007***	0.580
Linear Association	35	0.929	0.134	51	0.865	0.259	0.064	0.048	0.093*	0.308
Probability	35	0.998	0.014	63	0.943	0.164	0.054	0.028	0.027**	0.466
Event Rules	35	0.930	0.102	61	0.879	0.162	0.051	0.030	0.047**	0.377
Discrete Distributions	35	0.929	0.151	60	0.897	0.152	0.032	0.032	0.163	0.211
Binomial Distribution	35	0.934	0.195	55	0.862	0.237	0.072	0.048	0.068*	0.333
Normal Distribution	35	0.989	0.036	62	0.840	0.211	0.149	0.036	0.000***	0.983
Hyp. Test (Z-test)	35	0.930	0.102	58	0.897	0.138	0.032	0.027	0.118	0.264
Hyp. Test (T-test)	35	0.832	0.246	57	0.813	0.183	0.018	0.045	0.341	0.085
Hyp. Test (Proportion)	33	0.895	0.195	56	0.759	0.258	0.137	0.052	0.005***	0.597
Two Pop. Hyp. Test (Z)	34	0.873	0.231	57	0.844	0.243	0.029	0.052	0.288	0.122
Two Pop. Hyp. Test (T)	32	0.837	0.188	55	0.806	0.249	0.031	0.051	0.273	0.140
Regression Analysis	19	0.900	0.164	45	0.801	0.300	0.099	0.073	0.091*	0.410

*Note. *, **, *** indicate significance at the 10%, 5%, and 1% levels*

Table 4 • Attempts by Section: Incomplete Assignments Omitted

	SCOREBOARD			CONTROL			Difference			
Course Section	n	*M*	*SD*	n	*M*	*SD*	*M*	*SE*	*p*	*d*
Central Tendency	35	1.471	0.606	60	1.358	0.471	0.114	0.112	0.311	0.209
Variability	35	1.343	0.684	58	1.554	0.818	-0.211	0.165	0.205	0.279
Z-score & CV	35	1.571	1.112	54	1.443	0.443	0.129	0.169	0.448	0.152
Percentiles & Rank	35	1.447	0.950	50	1.624	0.748	-0.177	0.184	0.339	0.207
Linear Association	35	1.400	0.736	51	1.439	0.526	-0.039	0.136	0.776	0.061
Probability	35	1.371	0.587	63	2.075	0.872	-0.704	0.165	0.000***	0.947
Event Rules	35	1.750	0.600	61	1.622	0.615	0.128	0.129	0.323	0.211
Discrete Distributions	35	1.857	1.287	60	1.895	1.295	-0.038	0.275	0.890	0.030
Binomial Distribution	35	1.143	1.309	55	2.119	1.906	-0.976	0.368	0.009***	0.597
Normal Distribution	35	1.357	0.589	62	1.592	0.652	-0.235	0.133	0.081*	0.378
Hyp. Test (Z-test)	35	1.762	0.731	58	1.755	0.750	0.007	0.159	0.964	0.010
Hyp. Test (T-test)	35	1.714	0.972	57	1.646	0.721	0.068	0.177	0.701	0.080
Hyp. Test (Proportion)	33	1.743	1.502	56	2.195	0.132	-0.452	0.307	0.144	0.318
Two Pop. Hyp. Test (Z)	34	1.912	1.422	57	1.844	1.101	0.068	0.266	0.799	0.053
Two Pop. Hyp. Test (T)	32	1.609	1.014	55	1.636	0.662	-0.026	0.180	0.884	0.031
Regression Analysis	19	1.457	1.540	45	1.691	0.674	-0.235	0.275	0.397	0.197

*Note. *, **, *** indicate significance at the 10%, 5%, and 1% levels*

Table 5 • Summary of Assignment Performance by Survey Responses

	SCOREBOARD			CONTROL		
Survey Feedback	n	*M*	*SD*	n	*M*	*SD*
Dislikes math	8	0.957	0.040	16	0.706	0.219
Quant Bus. Major	13	0.949	0.061	14	0.693	0.244
Not Quant Bus. Major	19	0.913	0.077	24	0.789	0.201
Elementary Prob & Stats	27	0.930	0.072	27	0.777	0.207
Other prereq	5	0.914	0.077	11	0.697	0.248

Table 6 • Assignment Score by Excel Familiarity:Scoreboard Section

Student Group	n	*M*	*SE*	p
Prior Excel	24	0.932	0.028	
No Excel	8	0.914	0.014	
Difference		0.018	0.030	0.532

Table 7 • Assignment Performance by Prerequisite: Section Comparison

	Stats Prereq			Other Prereq			Difference		
Course Section	n	*M*	*SD*	n	*M*	*SD*	*M*	*SE*	*p*
Scoreboard	27	0.930	0.014	5	0.914	0.035	0.016	0.036	0.646
Control	27	0.777	0.039	11	0.697	0075	0.079	0.078	0.318

*Note. *, **, *** indicate significance at the 10%, 5%, and 1% levels*

Table 8 • Assignment Performance by Section: Stats Prerequisite

	SCOREBOARD			CONTROL			Difference			
Course Section	n	*M*	*SD*	n	*M*	*SD*	*M*	*SE*	*p*	*d*
Central Tendency	27	0.991	0.048	25	0.928	0.169	0.063	0.034	0.035**	0.506
Variability	27	0.978	0.079	24	0.917	0.170	0.062	0.036	0.048**	0.465
Z-score & CV	27	0.921	0.199	23	0.807	0.301	0.115	0.071	0.057	0.450
Percentiles & Rank	27	0.968	0.077	22	0.871	0.177	0.097	0.038	0.007***	0.710
Linear Association	27	0.932	0.131	22	0.823	0.294	0.109	0.063	0.045**	0.478
Probability	27	0.997	0.016	25	0.974	0.050	0.023	0.010	0.014**	0.614
Event Rules	27	0.917	0.111	25	0.867	0.173	0.049	0.040	0.111	0.340
Discrete Distributions	27	0.917	0.165	25	0.899	0.156	0.018	0.045	0.345	0.111
Binomial Distribution	27	0.924	0.217	23	0.911	0.178	0.013	0.057	0.411	0.064
Normal Distribution	27	0.991	0.033	26	0.857	0.200	0.134	0.039	0.001***	0.933
Hyp. Test (Z-test)	27	0.938	0.091	26	0.894	0.149	0.044	0.034	0.099*	0.356
Hyp. Test (T-test)	27	0.862	0.209	26	0.836	0.189	0.025	0.055	0.323	0.127
Hyp. Test (Proportion)	27	0.887	0.204	26	0.774	0.246	0.113	0.062	0.037**	0.502
Two Pop. Hyp. Test (Z)	26	0.888	0.202	26	0.870	0.251	0.018	0.063	0.389	0.079
Two Pop. Hyp. Test (T)	25	0.852	0.200	25	0.825	0.212	0.027	0.058	0.322	0.132
Regression Analysis	16	0.885	0.175	20	0.831	0.287	0.055	0.082	0.254	0.230

*Note. *, **, *** indicate significance at the 10%, 5%, and 1% levels*

Teaching a HyFlex Class for the First Time: What to Expect

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Abstract
This paper provides advice to business instructors who will be preparing and delivering a HyFlex class for the first time. This small-scale exploratory study investigates student evaluations of the instructor and course the first time two professors taught HyFlex accounting business classes and compares those results with results obtained when they taught the same classes in a non-HyFlex (online asynchronous) delivery mode. Outcomes are also compared across the two concurrently-taught sections of the same HyFlex class where possible. Results show that average instructor evaluations were significantly lower in the online-attendance-only section of one HyFlex class compared with the in-person-attendance-allowed section of the same HyFlex class. There is weak evidence that average course evaluations were significantly lower in the HyFlex section of another class than in the non-HyFlex (asynchronous) section of that same class. There were no other significant differences found in instructor or course evaluations.

Keywords: first-time HyFlex; instructor evaluations; course evaluations

The number of colleges of business offering HyFlex classes has increased in recent years. A HyFlex (or Hybrid-Flexible) class may be defined as a class in which some students "may choose to attend face-to-face synchronous class sessions in-person (typically in a traditional classroom) or complete course learning activities" remotely online. Some HyFlex courses allow students attending class online a choice of delivery modes – i.e., either synchronously or asynchronously (Beatty, 2019, p. 35). Thus, HyFlex classes offer students as many as three modalities for attending class: face-to-face live, online live (synchronously), and online prerecorded (asynchronously). Importantly, in a HyFlex class, students generally have the flexibility to move across all three modalities as they need or wish to. Some schools restrict attendance in face-to-face live modality to students who have registered to take classes face-to-face (and paid any requisite fees for the right to do so, such as parking fees).

An advantage to business schools of offering HyFlex classes is that offering a single section of a HyFlex class accommodates the preferences and needs of students regardless of their preferences among the three modes of delivering course content. This increases the efficient deployment of faculty in terms of the number of sections of a class that need to be offered. Another important advantage to business schools of offering HyFlex classes is that doing so offers a potential way of increasing or stabilizing enrollments at a time of decreasing enrollments across many universities (Conley, 2024).

This paper provides advice to business instructors who will be preparing and delivering a HyFlex class for the first time, based on two of the authors' first-hand experiences. It also compares outcomes from those same authors' first accounting business classes taught in HyFlex format with the outcomes from non-HyFlex sections of those same two classes, taught by the same instructors in the prior (non-summer) semester. Those outcomes consist of student evaluations of the course and instructor. Thus, the paper offers instructors first-hand knowledge of what they might expect as they prepare to teach and actually teach a HyFlex business class for the first time.

Literature Review

In a non-HyFlex context, a number of studies compare student achievement across various delivery modalities. Such studies yield apparently conflicting results on whether delivery modality affects student success in the class, other things equal. Some studies show no significant difference in student achievement between in-person vs. online classes (Meyer, 2004; Mullen, 2020; Simonson, 2002; Zhao et al., 2005), whereas others revealed only small differences between the two (Umutlu & Akpinar, 2020). For example, Means et al. (2013) found that online students performed slightly better than students in face-to-face classes. On the other hand, online courses tend to negatively impact student grades (Bettinger et al., 2017). As a result, it is difficult to draw broad conclusions about whether, other things equal, student achievement is higher in online vs. in-person classes because of a variety of possible factors that are difficult to control for (Larson et al., 2023; Xu & Xu, 2019).

HyFlex courses were introduced in 2006 by Brian Beatty (Beatty, 2019), and they have become much more prevalent since the COVID pandemic (Lederman, 2020; Keiper et al., 2021; Kohnke & Moorhouse, 2021; Raman et al., 2021). HyFlex courses offer both advantages and disadvantages, as Kohnke and Moorhouse (2021) found that students liked the flexible option to choose their learning style, but they also claimed that the HyFlex model was not as productive as in-person offerings, and communication can sometimes be an issue. Prior studies have found no significant differences between student achievements in HyFlex vs. in-person and/or online courses (Green, 2021; Mentzer et al., 2023; Miller et al., 2013).

Hybrid classes, also known as blended classes, meet both face-to-face and online, often once per week each, where the online component will usually be either synchronous or asynchronous. Weldy (2018) found that business school students prefer traditional in-class offerings over blended or online offerings. Students also claimed that they learn more in person, spent more time studying, and obtained higher grades when taking a course in person. The majority (88%) surveyed stated that online courses require more self-teaching, but only 9% feel that way about blended course designs. Arbaugh et al. (2009) performed a robust review of each business discipline and examined learning outcomes in online and blended modalities. They state that many researchers look at works in their specific discipline when investigating online and blended course modalities, but business researchers could benefit from general business research. Cosgrove and Olitsky (2015) tested learning and knowledge retention for online and blended courses in economic principles courses. They found no difference in learning, but in-class offerings improved retention. Here's how Cosgrove and Olitsky (2015) summed up blended learning: "Blending has the potential to give students the best aspects of traditional classes and online classes without the drawbacks of either."

Adult student learning options need to be flexible (Koskinen, 2018) as adults prefer a self-directed approach to their learning choice (Knowles, 1984). Research has shown that the traits of individual students (such as self-motivation, learning goals and interests) affect engagement (Martin et al., 2020), and student engagement plays a critical role in student success (Kahu & Nelson, 2018; Toma & Berge, 2024; Trowler et al., 2022). Researchers believe that the HyFlex model has potential, but its success depends on many factors, such as course design, instructor delivery, and student engagement (Bartolata et al., 2024; Raes et al., 2019).

Research Questions

Student evaluations of instructors play a significant role in higher education, as they offer feedback to the instructor, while also providing administration with data on an instructor's performance and their effectiveness in delivering the course material (Marzano & Allen, 2016). Prior research has shown that student evaluations of courses and/or instructors are lower in online courses versus in-person courses (Bhave & Murthi, 2024; Bono et al., 2025; Marzano & Allen, 2016; Rovai et al., 2006; Young & Duncan, 2014). Since HyFlex courses offer a flexible learning format by combining in-person and online instruction, the authors were interested in the impact of HyFlex instruction on instructor and course evaluations. While prior studies document what students liked and disliked about HyFlex courses (Buckley et. al, 2024; Eduljee et al., 2023; Kohnke & Moorhouse, 2021), the authors could not find any prior studies of the direct effects of HyFlex delivery on student evaluations of instructors or courses. The authors hope to begin to fill that gap with this research.

The authors examine the following research questions:

> RQ1: Do course evaluations and/or instructor evaluations improve, decline, or stay the same when the delivery method changes from asynchronous online to HyFlex?
>
> RQ2: Are course evaluations and/or instructor evaluations higher, lower, or the same in the HyFlex section in which students are allowed to attend class face-to-face compared with the HyFlex section in which students are not allowed to attend class face-to-face?

As explained later in the paper, during the first six weeks of the semester, the weekly live face-to-face sessions of Instructor Y's HyFlex class commenced later than the scheduled start time. Primarily because of these delays (especially on the first day of class, when class started 20 to 25 minutes late due to technical issues), Instructor Y expected his first HyFlex course and instructor evaluations to drop substantially from levels obtained in prior semesters teaching sections of the same class in online non-HyFlex (asynchronous) format. Instructor X expected his first HyFlex course and instructor evaluations to not differ significantly from levels obtained in the prior (non-summer) semester teaching sections of the same class in online non-HyFlex (asynchronous) format. Given prior research findings on the effects of online vs. in-person course delivery on course and/or instructor evaluations, and the fact that students registered in a HyFlex class section in which face-to-face attendance is allowed are perfectly free to attend online most or all of the time, Instructor Y expected that his first HyFlex course evaluations and instructor evaluations would not be lower but might be higher in the section in which face-to-face attendance was allowed than in the section in which face-to-face attendance was not allowed.

The authors also examined whether, on average, grades earned in HyFlex classes differed from those earned in asynchronous online versions of the same classes. The authors/instructors obtained Institutional Review Board (IRB) approval to utilize student grade information for this study. Consistent with prior research, the authors found no significant differences in grades earned between the two delivery modes. The authors chose to omit from the paper the research questions, methods and results where grades are the dependent variable because the results were consistent with prior research, and in order to keep the length of the paper within acceptable limits. Those results are available from the authors upon request.

Methods

In Fall semester 2023, two of the authors each taught a different accounting business class in HyFlex format for the first time. Each had taught that class in online (asynchronous) format during Spring semester 2023 and had taught that class at least four times recently prior to 2023 at the same university. Fall 2023 was the first time either had taught any class in HyFlex format.

For one of the authors (hereafter, Instructor X), that first HyFlex class was Taxation of the Individual; for the other author (hereafter, Instructor Y), that class was Intermediate Financial Accounting II. Both HyFlex classes met "live" one day per week for 75 minutes, and asynchronously another day of the week for 75 minutes. The "live" session could be attended in person by students registered to take classes on campus, or online synchronously or asynchronously by all students in the class.

Taxation of the Individual focuses on federal and state tax laws and regulations as they pertain to both individuals and business entities. Students in the class use tax forms and software to determine the appropriate taxes in cases involving individual and business scenarios. They analyze tax strategies and their implications for personal and business decision making and financial planning. The course emphasizes professional ethics for tax practitioners. It is delivered primarily through lectures, practical

instructional examples, tax simulations, preparing an actual 1040 federal tax return, and traditional assignments, homework and exams.

Intermediate Financial Accounting II covers accounting for the acquisition and disposition of property, plant and equipment, depreciation, impairments, depletion, intangible assets, current liabilities, contingencies, long-term liabilities, stockholder' equity, investments, and revenue recognition. It is delivered primarily through lecture, Q&A, in-class work, homework, and exams.

For each of these accounting business classes, the authors compared instructor evaluations from the first semester in which the instructor taught a HyFlex class (Fall 2023) with instructor evaluations for the same class taught by the same instructor in a non-HyFlex (online asynchronous) modality in Spring 2023. The authors made the same comparison for course evaluations as well. Then, for one of the instructors, the authors compared both instructor evaluations and course evaluations for the two HyFlex sections taught simultaneously for each HyFlex course: one in which students were allowed to attend classes face-to-face, and one in which students were not allowed to attend classes face-to-face (as explained later, the data required for such a comparison for the other instructor was not available due to FERPA rules).

The authors/instructors obtained IRB approval for this study to gain access to detailed student feedback for the course and instructor evaluations.

Findings

Course evaluations consisted of three questions, and instructor evaluations consisted of fourteen questions, all answered near the end of the semester (the questions asked on the course and instructor evaluations are shown in Appendix A).

Please note that because only three students were enrolled in the "Face-to-Face Attendance Allowed" section of Instructor X's HyFlex Taxation of the Individual class in Fall 2023, and FERPA (The Family Educational Rights and Privacy Act of 1974) rules at the university did not allow students enrolled in a section with fewer than 5 students enrolled to fill out the student evaluations of instructor or course, the data analyzed did not include the evaluations of Instructor X or of the course by students enrolled in that section of that course in Fall 2023, the first time Instructor X taught that class in HyFlex modality.

1. Asynchronous vs. (Combined) HyFlex Classes:

Tables 1A and 1B show the average Course and Instructor Evaluations for both Instructor X's and Instructor Y's first semester teaching their accounting business courses in HyFlex format, and the previous (non-summer) semester, teaching the same courses in asynchronous online format. Table 1A shows the results for Instructor Y's Intermediate Financial Accounting II class, while Table 1B shows the results for Instructor X's Taxation of the Individual class.

Table 1A • Comparison of Instructor Y's Course and Instructor Evaluations between Asynchronous and HyFlex Sections

Intermediate II Class Format	Asynchronous	Combined HyFlex	Increase (Decrease) From Asynchronous to HyFlex
Semester / Year	Spring 2023	Fall 2023	
Number of students assigned grades*	17	18	1
Number of students who filled out the evaluations	14	12	(2)
Number of Instructor Evaluation data points (14 x 14; 12 x 14)	196	168	
Number of Course Evaluation data Points (14 x 3; 12 x 3)	42	36	
Average instructor evaluation score*[1]	4.61	4.47	(0.14)*[3]
Average course evaluation score*[1]	4.64	4.39	(0.25)*[4]
Average instructor evaluation score*[2]	92.1%	89.3%	(2.8%)
Average course evaluation score*[2]	92.8%	87.8%	(5.0%)

Note:
** Includes grades of A, B, C, D, F, W, and Incomplete (grades of WF counted as F) *[1] Maximum of 5 possible*
**[2] As a percentage of the maximum possible*
**[3] The difference in means is not statistically significant at the 5% level (t-stat = 1.75; p = 8.1%). *[4] The difference in means is not statistically significant at the 5% level (t-stat = 1.62; p =11.1%).*

Table 1b • Comparison of Instructor X's Course and Instructor Evaluations between Asynchronous and HyFlex Sections

Taxation of the Individual Class Format	Asynchronous	HyFlex*	Increase (Decrease) From Asynchronous to HyFlex
Semester / Year	Spring 2023	Fall 2023	
Number of students assigned grades*[1]	34	19	(15)
Number of students who filled out the evaluations	7	3	(4)
Number of Instructor Evaluation data points (14 x 14; 12 x 14)	98	42	
Number of Course Evaluation data Points (14 x 3; 12 x 3)	21	9	
Average instructor evaluation score*[2]	3.37	3.29	(0.08)*[4]
Average course evaluation score*[2]	3.90	2.89	(1.01)*[5]
Average instructor evaluation score*[3]	67.3%	65.7%	(1.6%)
Average course evaluation score*[3]	78.1%	57.8%	(20.3%)

Note:
** Only includes students in the "Face-to-Face Instruction Not Allowed" section (please see text for explanation).*
**[1] Includes grades of A, B, C, D, F, W, and Incomplete (grades of WF counted as F). *2 Maximum of 5 possible.*
**[3] As a percentage of the maximum possible.*
**[4] The difference in means is not statistically significant at the 5% level (t-stat = 0.36; p = 71.9%).*
**[5] The difference in means is statistically significant at the 1% level (t-stat = 4.01; p < 0.1%), but these results should be interpreted with a great deal of caution due to the relatively low number of data points in each of the two comparison groups (21 and 9).*

Instructor Evaluations

Relative to the prior semester, when the course was taught fully online (in asynchronous format), the first time that Instructor Y taught his course in HyFlex format in Fall 2023, the average instructor evaluation score dropped from 4.61 to 4.47, a decrease of 0.14 (see Table 1A). As a percentage of the maximum possible score of 5.00, this represented a drop in the average instructor evaluation score from 92.1% to 89.3%, a drop of 2.8%, which is much less than Instructor Y expected, given the technical difficulties in course delivery noted earlier. An unpaired t-test of the difference of means between the instructor evaluations in the HyFlex class as a whole (Fall 2023) and the instructor evaluations in the Asynchronous class (Spring 2023) was conducted. The difference is not statistically significant at the 5% level (t-stat = 1.75; p = 8.1%). Thus, the authors conclude that the difference between Instructor Y's average instructor evaluations in the Intermediate Financial Accounting II business class delivered asynchronously and his average instructor evaluations in the same class delivered in HyFlex modality is not statistically significant at the 5% level.

Relative to the prior semester, when the course was taught fully online (in asynchronous format), the first time Instructor X taught his course in HyFlex format, the average instructor evaluation score decreased from 3.37 to 3.29, a decrease of 0.08 (as noted previously, these evaluations were only collected in the Asynchronous class and the "Face-to-Face-Attendance Not Allowed" section of the HyFlex class). As a percentage of the maximum possible score of 5.00, this represented a drop in the average instructor evaluation score from 67.3% to 65.7%, a decrease of 1.6% (see Table 1B). An unpaired t-test of the difference of means between the instructor evaluations in the HyFlex class (Fall 2023) and the instructor evaluations in the Asynchronous class (Spring 2023) was conducted. Consistent with the Instructor X's expectations, the difference is not statistically significant at the 5% level (t-stat = 0.36; p = 71.9%).

Course Evaluations

Relative to the prior semester, when the course was taught fully online (in asynchronous format), the first time that Instructor Y taught an accounting business class in HyFlex modality, the average course evaluation score dropped from 4.64 to 4.39, a decrease of 0.25 from the previous (non-summer) semester (see Table 1A). As a percentage of the maximum possible score of 5.00, this represented a drop in the average course evaluation score from 92.8% to 87.8%, a drop of 5.0%. An unpaired t-test of the difference of means between the course evaluations in the HyFlex class as a whole (Fall 2023) and the course evaluations in the Asynchronous class (Spring 2023) was conducted. The difference is not statistically significant at the 5% level (t-stat = 1.62; p = 11.1%). Thus, the authors conclude that the drop in average course evaluations in the Intermediate Financial Accounting II business class from the Asynchronous class (Spring 2023) to the combined HyFlex class (Fall 2023) is not statistically significant at the 5% level.

Relative to the prior semester, when the course was taught fully online (in asynchronous format), the first time that Instructor X taught an accounting business class in HyFlex modality, the average course evaluation score dropped from 3.90 to 2.89, a decrease of 1.01 (as noted previously, these evaluations were only collected in the Asynchronous class and in the "Face-to-Face Attendance Not Allowed" section of the HyFlex class). As a percentage of the maximum possible score of 5.00, this represented a drop in the average course evaluation score from 78.1% to 57.8%, a decrease of 20.3% (see Table 1B). Because the number of data points in each section was less than 30, Welch's t-test of the difference of means between the course evaluations in this HyFlex class (Fall 2023) and the course evaluations in the Asynchronous version of the same class (Spring 2023) was conducted (assuming unequal variances between sections). The difference is statistically significant at the 0.1% level (t-stat = 4.01; p < 0.1%).

The authors conclude that the drop in average course evaluations in the Taxation of the Individual class from the Asynchronous class (Spring 2023) to the HyFlex class (Fall 2023) is statistically significant at the 0.1% level, but this conclusion should be interpreted with a great deal of caution because of the low number of data points in each of the two comparison groups (21 and 9).

2. Course and Instructor Evaluations in the two HyFlex Sections: Face-to-Face Attendance Allowed Section vs. Face-to-Face Attendance Not Allowed Section

As mentioned earlier, each HyFlex class consisted of two sections: one in which the students were enrolled as on-campus students (so they were allowed to attend live classes face-to-face if they wished), and the other in which students were enrolled as online students only (so they were not supposed to attend live classes face-to-face). The section in which students were allowed to attend live class sessions face-to-face is referred to below

as "Face-to-Face Allowed," whereas the section in which students were not supposed to attend class sessions face-to-face is referred to below as "Face-to-Face Not Allowed."

As noted earlier, because of FERPA rules, neither the instructor evaluations nor the course evaluations were collected in the "Face-to-Face-Attendance Allowed" section of Instructor X's HyFlex Taxation of the Individual class. As a result, it is not possible to compare either the instructor evaluations or the course evaluations between Instructor X's two sections of that class for the semester analyzed.

Instructor Evaluations:

Table 2 shows the average instructor evaluations assigned by students in Instructor Y's Intermediate Financial Accounting II business class the first time he taught that course in HyFlex format (Fall 2023), broken out by the Face-to-Face Allowed vs. the Face-to-Face Not Allowed sections.

Table 2 • Comparison of Instructor Y's Instructor Evaluations between HyFlex Sections*

Intermediate II HyFlex Class Format	Face-to-Face Allowed	Face-to-Face Not Allowed	Increase (Decrease) From Face-to-Face Allowed to Face-to-Face Not Allowed
Semester / Year	Fall 2023	Fall 2023	
Number of students assigned grades (other than I or W)	7	10	3
Number of students who filled out the instructor evaluations*[1]	6	6	0
Number of Instructor Evaluation questions	14	14	0
Number of data points	84	84	0
Average instructor evaluation score*[2]	4.631	4.298	(0.333)*[4]
Average instructor evaluation score*[3]	92.62%	85.96%	(6.66%)

Note:
** These results are for the evaluations of Instructor Y's HyFlex class. Please note that Instructor X's evaluations in the Face-to-Face Allowed section of his HyFlex class are not available, so a comparison of evaluations between sections of Instructor X's HyFlex class is not possible (please see text for explanation)*
**1 These numbers are equal by coincidence*
**2 Maximum of 5 possible*
**3 As a percentage of the maximum possible*
**4 The difference in means is statistically significant at the 5% level (t-stat = 2.45; p = 1.5%)*

The instructor evaluations in Instructor Y's HyFlex Intermediate Financial Accounting II business class were higher in the Face-to-Face Allowed section than in the Face-to-Face Not Allowed section. An unpaired t-test of the difference of means between the instructor evaluations in the two sections of this HyFlex accounting business class in Fall 2023 (Face-to-Face Allowed vs. Face-to-Face Not Allowed) was conducted. The difference is statistically significant at the 2% level (t-stat = 2.45; p = 1.5%). Thus, the authors conclude that Instructor Y's average instructor evaluations in the HyFlex Intermediate Financial Accounting II business class section in which students were allowed to attend class face-to-face is significantly higher than the same instructor's average instructor evaluations in the same semester's HyFlex Intermediate Financial Accounting II class section in which students were not allowed to attend class face-to-face.

Course Evaluations

Table 3 shows the average course evaluations assigned by students in Instructor Y's class the first time he taught that course in HyFlex format (Fall 2023), broken out by the Face-to-Face Allowed vs. the Face-to-Face Not Allowed sections.

Table 3 • Comparison of Instructor Y's Course Evaluations between HyFlex Sections*

Intermediate II HyFlex Class Format	Face-to-Face Allowed	Face-to-Face Not Allowed	Increase (Decrease) From Face-to-Face Allowed to Face-to-Face Not Allowed
Semester / Year	Fall 2023	Fall 2023	
Number of students who filled out the instructor evaluations*[1]	6	6	0
Number of course evaluation questions	3	3	0
Number of data points	18	18	0
Average course evaluation score*[2]	4.500	4.278	(0.222)*[4]
Average course evaluation score*[3]	90.00%	85.56%	(4.44%)

Note:
** Please note that Instructor X's evaluations in the Face-to-Face Allowed section are not available, so a comparison of evaluations between sections of Instructor X's HyFlex class is not possible (please see text for explanation).*
**1 These numbers are equal by coincidence.*
**2 Maximum of 5 possible.*
**3 As a percentage of the maximum possible.*
**4 The difference in means is not statistically significant at the 5% level (t-stat = 0.83; p = 41.4%). However, this result should be interpreted with a great deal of caution because of the low number of data points in each of the two comparison groups (18 and 18).*

The course evaluations in Instructor Y's HyFlex Intermediate Financial Accounting II business class were higher in the Face-to-Face Allowed section than in the Face-to-Face Not Allowed section. Because the number of data points in each section was less than 30, Welch's t-test of the difference of means between the course evaluations in the two sections of the HyFlex Intermediate Financial Accounting II business class in Fall 2023 (Face-to-Face Instruction Allowed section vs. Face-to-Face Instruction Not Allowed section) was conducted (assuming unequal variances between sections). The difference is not statistically significant at the 5% level (t-stat = 0.83; p = 41.4%). The authors conclude that Instructor Y's mean course evaluation in the HyFlex Intermediate Financial Accounting II business class section in which students were allowed to attend class face-to-face is not significantly different from the same instructor's mean course evaluation in the same semester's HyFlex Intermediate Financial Accounting II business class section in which students were not supposed to attend class face-to-face. However, this result should be interpreted with a great deal of caution because of the low number of data points in each of the two comparison groups (18 and 18).

To summarize the findings for RQ1, the authors found no evidence that instructor evaluations change in a statistically significant manner when the delivery mode of the two accounting business classes changes from asynchronous to HyFlex.

The authors found weak evidence that course evaluations declined in one of the courses studied (Taxation of the Individual) when the delivery mode changed from asynchronous to HyFlex. The authors found no evidence of a significant change in course evaluations for the other course studied (Intermediate Financial Accounting II) when the delivery mode changed from asynchronous to HyFlex.

To summarize the findings for RQ2, the authors found evidence that instructor evaluations are higher in the face-to-face attendance allowed section of the HyFlex business class studied (Intermediate Financial Accounting II) than in the face-to-face attendance not allowed section of the same HyFlex business class. The authors found no evidence that course evaluations differed between the face-to-face attendance allowed section of the HyFlex business class studied (Intermediate Financial Accounting II) and the face-to-face attendance not allowed section of the same HyFlex business class.

This findings section describes the results that two of the authors obtained the first time they taught HyFlex business classes. Notwithstanding the title of this paper, readers (of course) may obtain different results the first time they teach HyFlex business classes than those reported above by the authors.

Discussion

Preparing To Teach a Hyflex Business Class for the First Time

If a business instructor has been asked to teach a HyFlex class, it is likely that they already have experience teaching face-to-face classes, online classes (either synchronous or asynchronous, or both), and perhaps hybrid classes as well. That experience will be invaluable in preparing to teach a HyFlex class, but it will not be sufficient.

The instructor will need their "live" HyFlex class sessions to take place in a classroom that has been outfitted with the equipment and software necessary to teach a HyFlex class. At the university where two of the authors taught HyFlex classes for the first time, these tools included two ceiling-mounted webcams controlled from the instructor's podium, several ceiling-mounted microphones, a HyFlex touch panel on the podium (in addition to the control panels already in most classrooms), and typically three monitors/screens. The monitors allow the instructor as well as the students in the physical classroom to see which remote students are raising their hands or speaking in real time.

The instructor of a HyFlex class needs to consider three groups of students simultaneously: those in the physical classroom, those watching online synchronously, and those who will later watch the session recording online (asynchronously). Depending on how active the in-class discussion is, it can be helpful to have a teaching assistant in the room during the live classroom sessions for at least two reasons. The first is to help the instructor keep track of who online wishes to speak (and the approximate order in which online students have raised their hands). The second is to potentially resolve technical issues that can come up during class. For that reason, it can be invaluable that the teaching assistant be trained in the HyFlex hardware and software.

Adequate Training is Critically Important

It is imperative that instructors receive high-quality training in the use of the necessary equipment and software prior to teaching a HyFlex class. The trainer should not only understand the technical aspects of what instructors need to learn, but also have some experience and/or training in how to teach. Well-prepared written materials should be distributed in advance to trainees. This gives trainees the opportunity to familiarize themselves with the material ahead of time and to follow along during training without the distraction of taking notes while learning (research suggests that when people try to multitask, and one of those tasks is learning, the learning will be less effective (Poldrack, 2007)).

Prior to each live-in-the-classroom HyFlex class session, instructors must carry out up to a dozen or more steps, often in order. The written materials should cover these steps and any order in which they need to be taken. It is helpful if the materials explain what each of these steps accomplishes, rather than simply show a list of steps to take ("buttons to push"). The materials should include ways in which the instructor or teaching assistant can reach out during class for technical help if needed. It is very helpful for the written materials to cover common situations that could go wrong and how to resolve them. The department that provides the training should provide each trainee with the means to provide feedback on the effectiveness of the training.

According to the design framework created by Bower et al. (2015), HyFlex training should include a hands-on component that requires the trainee to set up the hardware and software in the HyFlex classroom prior to a class, followed by a simulated brief segment of a class period (it is common during class to answer questions from both face-to-face and online students, and to need to switch between, for example, PowerPoints, Excel, Word documents and a document camera). Their study noted benefits for faculty who had practiced with the technology in advance. This hands-on training component gives each trainee the opportunity to make technical mistakes and learn in real time how best to recover from or avoid such mistakes, in a setting where the cost of making mistakes (in terms of class time wasted) is very low. It is not terribly unlikely that something will go wrong the first time most instructors try taking these steps if they do not get this sort of hands-on training.

If a business instructor will be teaching a HyFlex class for the first time soon and any of the above elements are missing from his or her training, the authors strongly recommend that the instructor find a way to compensate for such missing elements. For example, if hands-on training is not offered, the authors encourage the instructor to ask for one-on-one hands-on training as outlined above.

Finally, the authors recommend that the instructor find a mentor – ideally, someone with a deep understanding of the HyFlex classroom's hardware and software who is available when the instructor's class meets, in the non-zero likelihood that the instructor will encounter hardware or software problems during class, especially during the first half of the term.

Going Live

At the university where two of the authors taught HyFlex classes for the first time, each HyFlex class administratively consists of two sections: one labeled "hybrid," the other labeled "asynchronous." Students whose registration status allows them to take on-campus, face-to-face classes (i.e., they have paid any necessary fees) may enroll in either the "hybrid" or "asynchronous" section. Students who enroll in the "hybrid" section are free to attend "live" classes in person, and/or synchronously online, and/or asynchronously online. Students who enroll in the "asynchronous" section may only attend classes online (synchronously and/or asynchronously) and are not supposed to attend "live" classes in person. Students whose registration status is solely as an online student may only enroll in the "asynchronous" section. The software used for recording the live sessions is MS Teams. In order to deal with problems that might occur with recording the live sessions, one of the authors (hereafter Instructor Y) posted prerecorded lectures before each class on the course's Brightspace/D2L/Desire2Learn website, covering the same material covered that day.

The training that two of the authors received prior to their first day teaching a HyFlex class did not include all of the features mentioned earlier (HyFlex training at their university has since improved significantly). During the first six weeks or so of the semester, Instructor Y had technical issues at the start of every week's live session that he couldn't resolve using the training he'd received, and the university's technical support was invariably busy when he needed assistance. Instructor Y called his department chair, who took the 30-second walk to the classroom and, in each case, had the problem resolved within a few minutes (Instructor Y took careful notes during these sessions).

Challenges of HyFlex Courses

HyFlex business courses can be demanding, as the instructor must manage the technical aspect of the online stream along with any other programs they may be using for instruction, while also being aware of student participation/questions in both the live and online environment (Educause Learning Initiative, 2020; Stephenson & Torn, 2023). Every little detail of the technology used is important to the success of the HyFlex course, as even the choice of microphone can have a significant impact on the audio quality and accuracy of subtitles (Sanchez-Pizani et al., 2022). Additional studies found that sound quality and visualization made remote participation difficult and recommended investing in better audiovisual equipment to improve communication (Boehm & Boerboom, 2023; Zehler et al., 2021). Leijon and Lundgren (2019) found that communicating with both the in-person and online students at the same time was difficult, and having to manage multiple spaces at once can lead to less be "overwhelming" (Boehm & Boerboom, 2023). Wong et al. (2023) analyzed 86 HyFlex publications over a ten-year period and found that technical issues were the most often reported challenge that comes with HyFlex courses. They also report other challenges, such as the lack of familiarity with HyFlex, limited interaction between students and faculty, low levels of student engagement, difficulty providing attention to both in-person and online students simultaneously, students feeling ignored, and increased workload for instructors.

Recommendations for HyFlex Courses

Institutions should use high-quality technological tools and provide extensive pedagogical training for faculty (Detyna et al., 2023; Song et al., 2024). Song et al. (2024) proposed three suggestions for an ideal learning environment for HyFlex courses. "Technology infrastructure" requires that the classroom be furnished with all the necessary equipment and software to allow students to interact seamlessly and without problems. "Classroom norms" focus more on the online students and efforts to avoid misinterpreting their behavior, such as students leaving their screen to go to the restroom or looking down while taking notes. "Community building" might involve intentionally devoting time for students attending classes in person as well as online to get to know one another to facilitate communication and trust between one another.

The Columbia University Center for Teaching and Learning (2020) offers three suggestions for faculty teaching HyFlex courses. First, plan ahead. They recommend checking out the technology in the classroom in advance so the faculty member can become comfortable with the setup before the class begins. They also suggest preparing plans for each individual class in advance. Second, connect with all students. It is important to communicate with both the in-class and online students and make them feel engaged in the course material. Make resources available to everyone and encourage them to participate. Third, ask for help. Utilize teaching assistants (TAs) if they are available, and if not, ask for help from students. Teaching a HyFlex course will be tough to manage and coordinate on your own, so do not hesitate to ask for help.

Conclusions, Limitations and Opportunities for Future Research

This paper provides business instructors with information about what they might expect when teaching a HyFlex class for the first time and includes suggestions on how they might maximize the likelihood of success when they do so. The paper compares student evaluations of the instructors and courses the first time two of the authors taught HyFlex accounting business classes with the outcomes when they taught the same classes in a non-HyFlex (asynchronous) delivery mode. It also compares outcomes for one of the instructors ("Instructor Y") across the two HyFlex sections taught simultaneously that first semester. The authors are not aware of any prior studies that examine the direct effects on student evaluations of instructors or courses of changing a course's delivery mode to HyFlex.

Results show that the instructor evaluations for Instructor Y were significantly higher in the face-to-face attendance-allowed section of his HyFlex accounting business class than in the online-attendance-only section of the same class, but show that there was no difference significant at the 5% level ($p = 8.1\%$) in instructor evaluations between the HyFlex class as a whole and the non-HyFlex (asynchronous) section of the same class. In addition, there is weak evidence that course evaluations for the other instructor (Instructor X) were significantly lower in the HyFlex section of his accounting business class than in his non-HyFlex (asynchronous) section of the same class. Although the difference in means for that comparison is statistically significant at the 1% level ($p < 0.1\%$), those results should be interpreted with a great deal of caution because of the relatively low number of data points in each of the two comparison groups (21 and 9). There were no other significant differences found across sections or classes in course or instructor evaluations.

Several limitations of the paper should be noted. First, the analysis of course and instructor evaluation outcomes is exploratory in nature, in that although the instructors whose data are analyzed herein offer their expectations regarding such outcomes, the authors offer no (theory-based) hypotheses. Future research might study in greater detail how student evaluations of courses and instructors of HyFlex classes compare with such evaluations of non-HyFlex classes, and how such evaluations differ between HyFlex sections (e.g., sections where face-to-face attendance is allowed vs. not allowed) to see if the results found in this paper replicate, and if so, the conditions under which they replicate.

In addition, the data reported in the tables in the paper were gathered in accounting business classes. The authors sometimes refer to such classes as accounting business classes because accounting classes are typically part of the curriculum at AACSB-accredited colleges of business (Romano, 2018). Since the authors are not aware of any prior research on the effects of HyFlex vs. non-HyFlex delivery mode on course or instructor evaluations, it is an open question as to whether the results found in this paper on that issue would be found for courses in other business disciplines (or non-business disciplines for that matter), making that a topic for future research. In addition, the mix of teaching techniques used in non-accounting business classes (for example, brainstorming or group discussions) might, in general, be different than in accounting business classes. That could lead to differences between adapting non-accounting business classes for delivery in HyFlex mode vs. adapting accounting business classes for delivery in HyFlex mode.

Another limitation is that in two of the six statistical tests conducted, the number of data points in each of the two comparison groups is particularly low (i.e., less than 30 in each cell). As a result, the outcomes of those tests need to be interpreted with a great deal of caution. Despite this limitation, the authors present those results because for those two tests (presented in Tables 1B and 3), the authors could not find any prior studies of the direct effects of HyFlex delivery on student evaluations of courses. The authors hope that future research using more data points will provide more definitive results for comparisons of course evaluations between Asynchronous and HyFlex sections of the same class for the same instructor, and between Face-to-Face Allowed versus Face-to-Face Not Allowed sections of the same HyFlex class taught by the same instructor.

Another limitation is the relatively small number of students enrolled in the Face-to-Face Attendance Allowed section of Instructor X's HyFlex class. The absence of that limitation would have allowed the authors to test for a statistically significant difference in course and instructor evaluations between the face-to-face attendance allowed vs. not allowed section of Instructor X's HyFlex class.

Finally, the authors did not look for possible differences in outcomes in the HyFlex sections between students who attended class online mostly synchronously versus those who attended

mostly asynchronously. The authors also did not look for possible differences in outcomes within the face-to-face attendance allowed section of the HyFlex classes (between those who attended face-to-face vs. online). If such comparisons were to yield persistent and significant differences, further research might lead to reasons for such differences.

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Enhancing Student Communication Skills through Inductive Teaching

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Abstract
Global literature and national industry reports consistently highlight deficiencies in the professional communication skills of college graduates. Despite employers stressing the need to improve these skills in future specialists, students often perceive themselves as proficient in this area. This study, grounded in constructivism, examined the gap between student perceptions and actual proficiency levels in professional communication skills and proposes the use of the inductive teaching methodology to address it. The effectiveness of the proposed methodology was assessed using a combination of quantitative and qualitative analyses. The findings confirm that inductive teaching methodology can be effective in revealing student misconceptions about their proficiency in communication skills and promoting the development of these skills. They offer valuable insight into how professional communication competencies develop in learners under different teaching interventions and suggest practical recommendations to enhance current pedagogical practices to support the acquisition of professional skills in students.

Keywords: Inductive Teaching, Communication Competencies, Constructivism, Student Overconfidence

A significant share of a practicing specialist's time involves communicating with a variety of audiences, including clients, managers, and colleagues (de Souza Almeida et al., 2019). Not surprisingly, professional communication skills are ranked among the top competencies sought by employers worldwide and are considered an essential part of the hiring process (Scott, 2015; The Foundation for Young Australians, 2017; Taylor et al., 2022; Hickman & Stoica, 2023; NACE, 2024).

Professional communication skills can be broadly defined as a socially complex phenomenon related to interpersonal interactions and community engagement, i.e., being able to express one's thoughts and ideas clearly (orally and in writing), being a good listener, and proactively engaging in constructive communication (Nicometo et al., 2010). To supply the industry with high-quality employees who can successfully navigate modern work environments, higher education institutions have

engaged in various curricula initiatives like offering communication electives, technical and business writing modules, and implementing integrated curriculum and communication centers, to support the development of professional communication skills in college students (Drake & Reid, 2018; Paretti et al., 2014). However, industry leaders remain skeptical about what they see as a growing problem in college graduates: while most employers rate professional communications as an 'essential' or 'absolutely essential' for a modern workforce, less than half of them believe novice specialists are proficient in these critical abilities (NACE, 2024). In stark contrast, more than 80% of students think they are highly competent and possess all the necessary communication skills (written, oral, presentational, etc.) to succeed in the workplace (NACE, 2019).

Overconfidence in one's abilities, marked by an excessive sense of knowledge and skills, can lead to complacency and reduced effort and hinder student development, diminishing their prospects for employability (Hack-Polay, 2020). Educators must aid students in recognizing their overly optimistic views of communication proficiency, acknowledging the need for improvement, and assisting them in developing robust professional communication competencies during their college years (AACSB, 2020).

Extant literature demonstrates that student-centered pedagogies can boost student engagement and significantly improve learning outcomes across different fields (Ballesteros et al., 2021; Eagan et al., 2014). Among these, inductive teaching stands out by emphasizing learners' crucial role in knowledge construction and engaging them in active self-discovery. Through introspection and self-analysis, students uncover prior (often erroneous) beliefs about their abilities and initiate remediation, fostering the acquisition of relevant new knowledge (Prince & Felder, 2007).

Inductive teaching's efficacy for student learning in the core discipline skills is well-supported by established learning theories and substantiated in empirical studies (Felder et al., 2014; Nguyen et al., 2016; Prince et al., 2013). However, there is limited evidence about the role of inductive teaching in forming student professional competencies, such as professional communication skills (Lai et al., 2017).

Given the importance of communication skills to graduate employability, it appears beneficial to examine the applicability of inductive teaching in fostering professional communication at the college level. To this end, this study aimed to empirically validate an inductive teaching methodology to uncover students' self-perceptions of professional communication skills and explore how they evolve under different teaching interventions. The proposed research question guiding this study is as follows:

> *How effective are inductive teaching methods in revealing and remedying student misconceptions regarding proficiency levels in professional communication skills?*

Literature Review

Understanding how people learn is important for designing effective teaching methods. Learning can be broadly defined as a process of gaining new understanding, knowledge, and skills through experience, study, or by being taught. People are generally more motivated to learn things that they perceive as valuable and in which they feel deficient (Fischhoff et al., 1977; Han et al., 2021).

Constructivist Perspective on Learning

One of the dominant theories that explains how people learn is constructivism. Constructivism posits that in the process of knowledge development, individuals take information from the environment and selectively store it in their memory. The learners then make connections between the new information and their prior knowledge and beliefs to make sense of their experiences (Piaget, 1978). Individuals thus actively "reconstruct" new meanings of the world around them via interactions with information and learning environments (Vygotsky, 1978). Further developments in constructivism argue that knowledge can also be socially constructed through interpersonal communication and collaborative meaning-making (Delia, 1977; Pearse & Cronen, 1980). Individuals engage in an ongoing exchange, verbal or non-verbal, to collectively construct shared meaning (Pickering, 2006). In this process, participants send and receive feedback and compare it to their pre-existing mental models. They then adjust behaviors and mental constructs in light of this new information (Hargie, 2019; Waltman, 2002). Thus, communication plays a vital role in the learning process (Pearce & Cronen, 1980). Applying Gerbner's general communication theory (1956) to the learning context, individuals' abilities to communicate in social situations vary. The outcomes of communication (success or failure in learning) are influenced by one's pre-existing perceptions and situational factors. Gerbner's model of communication posits that a sender of a message in the communication process formulates (encodes)

the message based on their individual perceptions, while the receiver interprets (decodes) it in the context of their own understanding. Because the sender and receiver may perceive the same situation differently, this may lead to wrong interpretation and miscommunication. Thus, application of Gerbner's model is two-fold in the context of this study:

1) Effective learning requires aligning new information with learner's pre-existing beliefs and knowledge (which parallels the inductive teaching methodology where students gradually build understanding by connecting new concepts to what they already know), and

2) Gerbner also emphasizes the critical role of feedback for effective communication. Strong professional communication skills enable individuals to send clear, well-structured messages and apply clarification strategies (i.e., follow-up questions and feedback to prevent misunderstanding and miscommunication). These skills are especially relevant to business specialists because poor professional communication at the workplace (miscommunication, misunderstanding, and lack of communication) results in an average cost of $62.4 million per company per year (Grossman, 2011).

Importance of Motivation for Learning

Constructivism views learners as the primary agents, who determine what is learned from the experience, assuming full responsibility for the process (Biggs, 1996). Thus, the learner's active engagement and cognitive effort become the key drivers of knowledge creation (Biggs, 1996; Felder, 2014; Trigwell & Prosser, 1991). According to the self-determination theory, a learner's engagement and motivation can be fostered through the mechanisms of autonomy, relatedness, and competence (Ryan & Deci, 2017). People perform better when they make choices aligned with one's values and engage in autonomous, self-directed behaviors, i.e., assume responsibility for one's learning (Benson, 2001). Relatedness entails a sense of social connectedness and being valued in the community. Finally, competence, a feeling of being effective in the context of one's social environment, drives a desire to take on the learning challenge. When these psychological needs for autonomy, relatedness, and competence are fulfilled, students are intrinsically motivated to engage in the learning process because they want to achieve their goals and personal growth (Ryan & Deci, 2017).

To sustain student engagement, intrinsic motivation should be supported by external factors like social and environmental conditions. External events such as relevant teaching interventions and positively framed instructor feedback promote greater perceived competence. Greater perceived autonomy enhances student motivation and learning effort (Deci & Ryan, 1985; Vallerand & Reid, 1984).

Inductive Teaching to Support Motivation and Learning in Students

An emphasis on the active role of a learner in knowledge construction suggests a shift from the traditional teacher-centered forms of instruction to more student-oriented methods (Felder et al., 2014; Prince et al., 2013). One such popular approach to practicing student-centered pedagogies is inductive teaching. It posits that individuals must actively construct their own understanding of reality rather than simply absorb the version presented by instructors. In this approach, responsibility shifts to students, with instructors acting as facilitators to guide, encourage, and mediate the learner's knowledge (re)construction process (Prince & Felder, 2007). In line with the constructivism paradigm, inductive teaching "induces students to construct knowledge for themselves, help them reveal inconsistencies in their prior knowledge and, when necessary, adjust or reject their prior misconceptions in light of the evidence provided by the experiences" (Prince & Felder, 2006, p.125). While there are many definitions and descriptions of misconceptions in the Scholarship of Teaching and Learning (SoTL) literature (McAffee & Hoffman, 2021), we define misconceptions as epistemically mistaken beliefs about an individual's knowledge and skills.

Inductive teaching has demonstrated high effectiveness for teaching core technical or subject-specific competencies (Felder et al., 2014; Nguyen et al., 2016), but little is known if it can be leveraged for teaching professional skills such as communication. Common communication deficiencies reported in students are weak listening skills, reluctance to connect due to communication apprehension, and, often, overconfidence about their communication abilities (Beardsley, 2001; Collins, 2009; Ehrlinger & Shain, 2014). Because they regularly engage in commonplace communications in their daily lives, students often automatically assume themselves effective communicators and feel no need to improve (Metcalfe & Finn, 2008). Similarly, Hendricks and Pappas (1996) report "the apparent resistance from students to developing English writing skills" (p. 343) and complaints about too many unnecessary writing assignments and presentations.

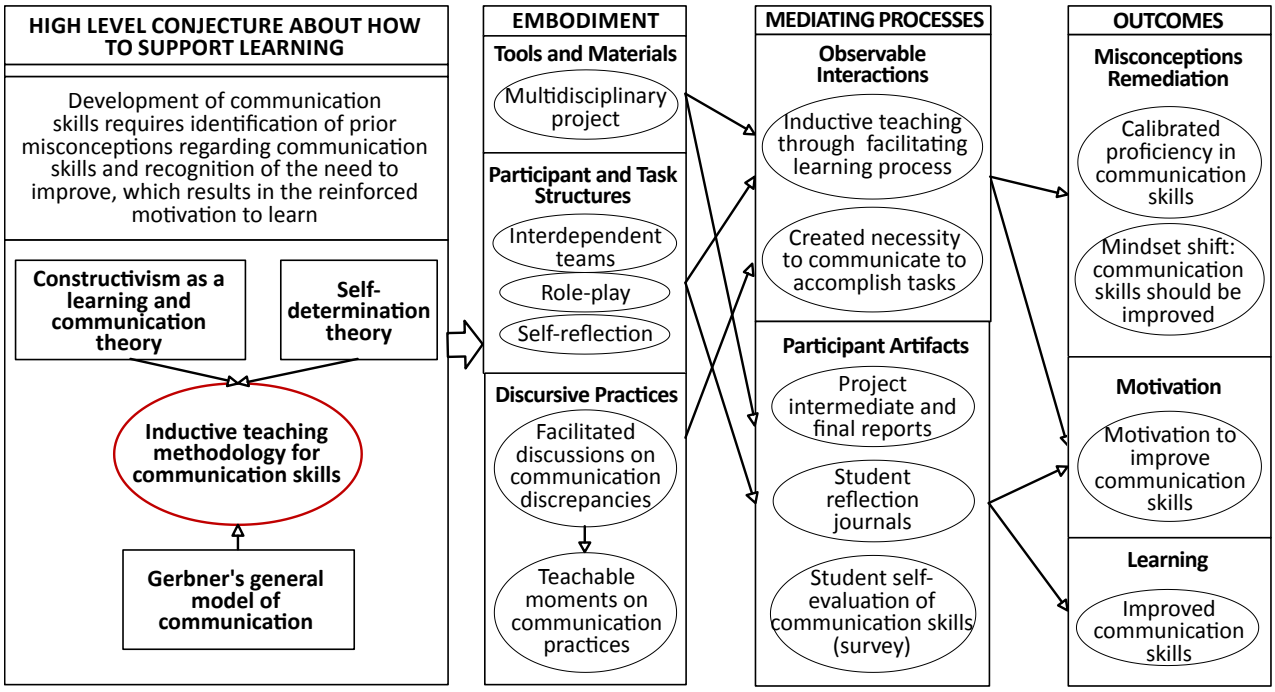
Teaching professional skills alongside the core subject skills creates synergies and enhances the learning process (Froyd & Ohland, 2005). It enables a contextual application of professional skills to achieve the core subject goals, supports critical thinking in students, broadens student's perspectives, and helps to recognize their deficiencies, motivating more learning efforts (Matusovich et al., 2012; Paretti & McNair, 2008). Therefore, it is argued that:

> *Hypothesis 1: Inductive teaching interventions will effectively reveal and help adjust students' misconceptions of proficiency levels in professional communication skills. Hypothesis 2: Student learning outcomes (SLOs) for professional communication skills will improve as a result of applying inductive teaching interventions.*

Conceptual Framework

To empirically test the proposed research hypotheses, appropriate learning environments must be designed. The conjecture mapping approach (Sandoval, 2014) was used to develop targeted teaching interventions to support the overall goal of developing strong professional communication skills in students. The process starts with the high-level conjecture: Development of professional communication skills in students requires the identification of prior misconceptions regarding professional communication skills and recognition of the need to improve, which results in the reinforced motivation to learn. The conjecture then is reified through the elements of the learning environment: tools and materials (a collaborative multidisciplinary project), task and participant structures (teams assigned to interconnected tasks requiring extensive coordination and informational exchange), and discursive practices (discussions and reflections on errors and discrepancies in communications causing teams' incohesion). Interactions between the participants and the learning environment produce artifacts (intermediate and final group reports, individual reflection journals, and survey data) to validate the effectiveness of the proposed instructional design (i.e. students recognizing their communication deficiencies and adjusting learning efforts), as shown in Figure 1. More details on the implementation of the instructional design are provided in the next section.

Figure 1 • Conjecture Mapping of the Proposed Instructional Design



Instructional Design Implementation

A research team consisting of faculty from two different universities designed a multidisciplinary collaborative project by integrating two courses offered by their institutions. The participating colleges were four-year schools within their respective regional non-profit educational systems. The colleges report similar entrance test scores, acceptance rates, and grade point averages (GPAs). They offer a comparable variety of degrees (undergraduate, graduate, and professional programs), enjoy similar class sizes, slightly below national average student-faculty ratios, and have comparable demographic composition of the student body. Thus, they appear suitable for an integrative collaborative project (Corker et al., 2017).

The integrated courses were parts of the core curriculum in each institution and included the Supply Chain Management (SCM) class and the Principles of Marketing (PM) class offered to business majors. The multidisciplinary nature of the Project provided an additional benefit in the context of professional communication skills as it required participants to understand and appreciate inputs presented by other disciplines, beyond their own professional focus areas of business (Nicometo et al., 2010).

Project Design

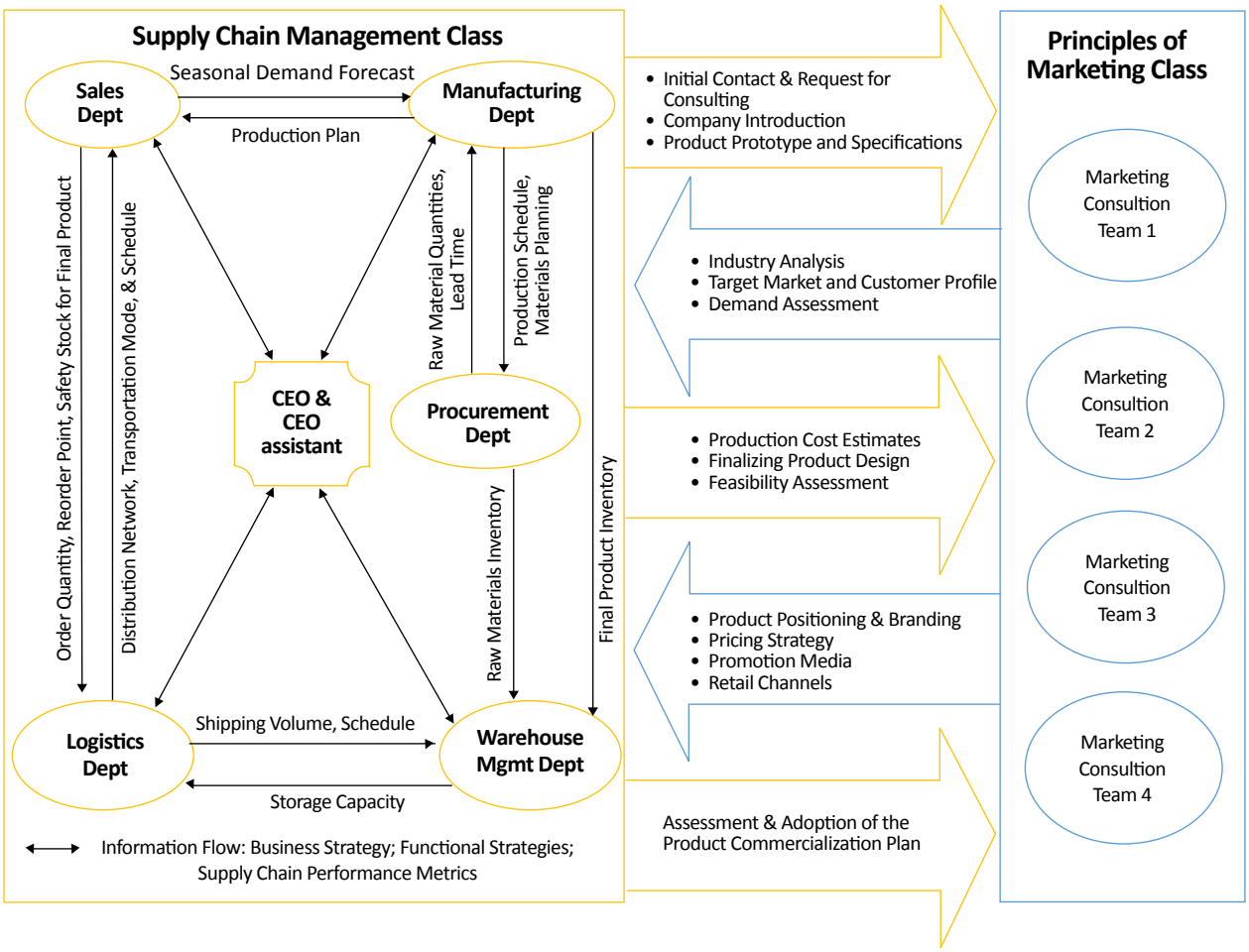
In line with the principles of inductive teaching, the Project was organized as a collaborative problem-based project with loosely defined parameters to simulate a real-life situation. Participants were to develop a comprehensive business plan for a new product by a nationally recognized shoe producer, including manufacturing operations, warehousing, procurement, logistics, and market commercialization strategy. The SCM students were responsible for the manufacturing operations, warehousing, procurement, and logistics functions. The PM students were responsible for the market assessment and commercialization strategy.

In each class, groups were formed of three to five students. Each SCM group was responsible for one of the organizational functions (manufacturing, warehousing, procurement, or logistics department) and had to communicate extensively with other SCM groups as well as the PM groups. The PM teams all worked on the market assessment and alternative commercialization strategies and communicated with SCM groups, but not other PM groups.

At the beginning of the semester, both classes received an introductory presentation on the Project, highlighting the collaborative multidisciplinary nature and its objectives. From week one of the semester, each class received lectures on the core subject material relevant to their respective coursework as well as instructions pertinent to the Project. Starting week five, groups from both classes began meeting using ZOOM technology to work on the Project jointly. The instructors were present at the meetings to observe and facilitate student communications.

At the end of the semester, the PM teams submitted a detailed market analysis and several alternative commercialization strategies. SCM teams jointly assessed and adopted the best commercialization strategy to be incorporated as a part of the overall business plan. As a final submission, the teams in both classes submitted written reports and made presentations to their peers and instructors, summarizing what was done and the expected outcomes if the business plan were to be implemented. Figure 2 provides a visual model of the Project structure.

Figure 2 • Project Structure



Project Teaching Interventions: Procedural Validity

An ability to demonstrate effective professional communication skills was included in the student learning outcomes (SLOs) in both courses, along with the core subject SLOs. To ensure that the instructors did not directly influence students' self-perceptions of professional communication skills, and remediation of misconceptions (if any) happens naturally in line with the inductive teaching philosophy, the research team took several important steps. First, neither instructor made any explicit comments regarding students' professional communication skills during the Project. Second, all formative feedback in each class was centered solely on the core subject contents and not on students' professional communication skills.

Although both classes practiced collaborative multidisciplinary problem-based learning, students in the two classes were exposed to different teaching interventions. While the PM instructor employed primarily deductive teaching strategies, the SCM instructor applied both the traditional deductive methods and inductive teaching interventions. Thus, the SCM class served as an experimental group, and the PM class was a quasi-control group in the experiment, thus allowing for a comparison of progress toward effective professional communication skills between the two classes.

A summary of the conceptual differences in teaching instructions between the PM and SCM classes is presented in Table 1 below.

Table 1 • Conceptual Differences in the Project-related Teaching Interventions, PM vs SCM Class

PM class	SCM class
Similarities Problem-based learning Teamwork & shared decision-making Required communications between the two classes	
Differences	
Primarily deductive approaches: lectures with elaborate and structured theoretical background & exercises to apply theory, i.e., quizzes Videos observing experts solving the problems	Primarily inductive approaches: a brief theoretical introduction with gradual enhancement of theoretical concepts; role-play excercises Videos on the relatedness of theoretical concepts to real-world situations
Scheduled communications with the SCM groups No required communications with other PM groups Instructor feedback on the individual parts of the Project	Scheduled communications with the PM groups Active regular communications within and between the SCM groups Instructor feedback on three iterations of the whole Project (starting with a rough model and adding more details with each iteration) All-group's open in-class discussions and collaborative effort to ensure effective & accurate communications across teams and classes
Group-based revisions based on instructor feedback.	

PM Class: Deductive Teaching Interventions

PM students followed a traditional college-level curricular schedule that primarily employed the conventional deductive teaching practices addressing both the core discipline competencies and professional communication skills. More specifically, Project-related materials were presented in a very structured way: first, PM students were exposed to the theory (i.e., lectures). Subsequently, they explored the practical application of the theories (examples and videos showcasing best practices in the field) and completed exercises (i.e., case analyses) to reinforce understanding. Finally, they were asked to apply the same logic to the Project assignment. Each PM group was working independently, with communications limited to the partners from the SCM class.

SCM class: Inductive Teaching Interventions

The SCM groups, in addition to the core discipline requirements addressed through the traditional deductive teaching methods (lectures, quizzes, videos, etc.), also received inductive teaching interventions related to the Project.

At the outset, the Project was introduced to the SCM students in very broad terms as an open-ended problem with loosely defined parameters. Such ill-structured tasks reflect real-world scenarios that can provide effective learning environments and cultivate professional skills in students (Hauer & Daniels, 2008). The meta-analysis by Dochy et al. (2003) empirically supports the notion that loosely structured problem-based learning can enhance interpersonal communication skills. Consistent with this perspective, students in this Project were tasked with designing a comprehensive business plan, with minimal guidance offered. Initially perceived as a unique challenge, this approach afforded students considerable freedom and authority in decision-making. More importantly, it fostered interpersonal interactions and facilitated effective communications within and between the SCM teams.

The Project was structured as a role-play scenario, with each SCM group assuming the role of the functional departments within the organization. Several meta-analytical reviews highlighted the effectiveness of role-playing and cooperative

learning in communication training (Jin et al., 2018; Lane & Rollnick, 2007). The teams-departments (manufacturing, procurement, sales, warehousing, or logistics) were all interconnected and interdependent. To fulfill the Project objectives, departments needed to coordinate their activities across the functional areas and at the global corporate level, while extensively communicating with the external audiences (PM groups), as well. This design facilitated cross-functional and multidisciplinary communications.

Thirdly, throughout the Project duration, the SCM students were required to submit regular work-in-progress reports. The instructor used them to provide formative feedback and encourage student reflection and discussions. For example, in the initial intermediate report, SCM teams provided a rough outline of the global business strategy for the firm and outlined departmental plans to support the global strategy and specific performance metrics. Upon submission, during the in-class review session, the SCM instructor summarized the departmental proposals and facilitated student analysis of areas of agreement and discrepancies. For example, while the manufacturing department modeled the production levels based on the average monthly demand estimates, the procurement department factored seasonal fluctuations in demand and alternative cost structures into their plans. The review session revealed multiple mismatches in the departmental strategies, prompting a brainstorming session on how to enable effective communications for timely and accurate information exchange among the departments. With each round of intermediate feedback, discrepancies in departmental submissions gradually reduced to become fully eliminated in the final Project report. Below are some SCM student quotes to illustrate the gradual refinement of student communication patterns through this calibration process:

> *"We realized that there were discrepancies between each of the departments due to the lack of communication and doing a lot of the work on our own in our departments."*

> *"It was very hectic because the several groups were not on the same page for many of the parts and it caused some chaos but was resolved later on after we received the comments back."*

Finally, to further enhance their learning experience, at the beginning of the Project students were directed to extra-curricular resources, such as the professional communication services offered by the university Writing Center. Additionally, the SCM instructor presented how to conduct effective professional business meetings after the first virtual meeting with the PM teams. The SCM students were encouraged to reflect on their experiences during the meetings with the PM teams to identify the best communication practices and suggest improvements when necessary.

In summary, the inductive teaching interventions in the SCM class aimed to "immerse" students and experience each step in the Project first-hand, then reflect on their experiences, discuss achievements and missed expectations, and finally, propose strategies for deficiency remediation. Importantly, the suggested changes and improvements originated from the students rather than the instructor.

Methodology

Sample

The study participants were students from the Supply Chain Management (SCM) class from one University and the Principles of Marketing (PM) class from another University who participated voluntarily. The participants were mostly males (68%), who previously completed the foundational General Education requirements of their respective degrees that were similar in length and composition. They were working towards their majors, on average in their 6th or 7th semester of coursework and had comparable GPA scores. All the participants remained engaged in the Project from the inception to the conclusion, providing reliable empirical data to test the theory. Detailed demographic data is provided in Table 2.

Table 2 • Participant Demographics

Course	Major	Gender		Year	GPA_{avg}	Total
		Male	Female			
SCM Class	Business	13	0	3rd or 4th year in a Bachelor program	3.1	13
Total		13	0			13
PM Class	Business	11	10	2nd or 3rd year in a Bachelor program		21
	Music Management	2	1	3rd or 4th year in a Bachelor program	3.2	3
	Communication Studies	0	1			1
Total		13	12			25

Data Collection

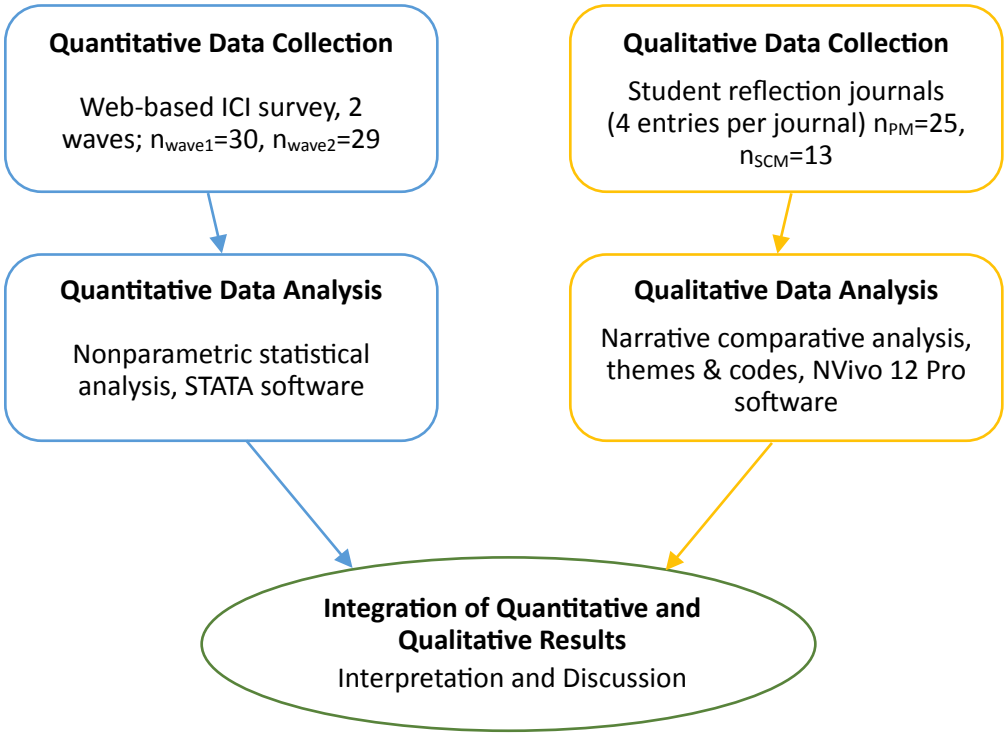
Data were collected using a concurrent (convergent parallel) mixed study design that offers the advantage of integrating both quantitative and qualitative data within a single study, to gain a better understanding of the research problem (Creswell et al., 2003). While quantitative data allow for hypothesis testing and specific recommendations, qualitative data provide a richer interpretation of the statistical results. Combined, quantitative and qualitative datasets heighten the validity of the methodologically different inferences and produce more comprehensive insight into how students' self-perceptions of professional communication skills evolve under different teaching interventions (Ivankova et al., 2006).

Quantitative data were collected through online surveys to yield numerical information on student learning outcomes related to professional communication skills. Qualitative data were collected through self-reflection journals, where students reported on their experiences in the Project and the coursework. The visual map of quantitative and qualitative data collection and integration process is presented in Figure 3.

Before the start of data collection, ethical approvals were received from the Institutional Review Board of each college (IRB-1901009-EXM). The appropriate guidelines were strictly followed. The informed consent was obtained from the participants via email. They were also informed about voluntary participation and the opportunity to withdraw at any time.

Quantitative data was obtained via an electronic survey administered in both classes in two waves (once during week one and again in week 14 of the 15-week semester), using the well-established Interpersonal Communication Inventory (ICI) survey (Bienvenu, 1971) that measures the process of communication as an element of social interaction and focuses on the patterns, characteristics, and styles of communication, but, importantly, not on the contents of communication. These attributes were defined by employers as important in professional communication (Coffelt et al., 2019). The survey includes 40 questions covering five categories: listening skills, ability to send clear messages, giving/receiving feedback, ability to handle emotionally sensitive interactions, and willingness to trust other people. The ultimate score is obtained by summing up the scores of all the questions, where the higher scores indicate more advanced professional communication skills. The ICI has proved to be gender-neutral and consistent across different age groups, with validity and reliability confirmed in multiple studies (Bienvenu & Stewart, 1976), which makes it suitable to assess professional communication skills across diverse disciplines like engineering and business majors.

Figure 3 • Visual Model of Data Collection and Analysis Procedures



At the beginning of the semester (week one), the participants in both classes evaluated their professional communication skills using the ICI prior to engaging with the Project (survey wave 1). In week 14, students were asked to re-evaluate their professional communication skills retrospectively at the beginning of the semester and also to assess their current professional communication skills upon completion of the Project (survey wave 2). Importantly, the two-wave design allowed us to establish the baseline in student self-perceptions of professional communication skills and control for differences between the two classes prior to engaging with the Project. Also, it allowed the researchers to measure changes (if any) in student perceptions regarding their professional communication skills as the Project progressed, for each participant individually and between the classes. The observed response rates were reasonably high for the internet-based surveys, 85% for the SCM class and 72% for the PM class, and, thus, acceptable to proceed with statistical analyses (Selm & Jankowski, 2006). Responses with missing data were removed from further analysis. Cronbach's alpha of 0.78 obtained in this study was consistent with other studies using the ICI instrument (Herzog & Cooney, 2002).

Qualitative Data Collection

To complement the quantitative results and provide deeper insight into student experiences in developing professional communication skills, participants were asked to complete individual self-reflection journals to track their learning and professional growth throughout the semester. The journaling assignment included four entries and was submitted electronically via the university learning management systems. In the initial entry, due in week 2, students had to review the learning objectives set by instructors in the course syllabus and articulate their personal and professional goals in the course. In the subsequent journal submissions, students reflected on their experiences, exploring how the coursework and the Project contributed to their learning and the achievement of their professional goals. A sample of the journaling assignment is available in Appendix A.

Qualitative cross-case narrative comparative analysis was conducted using the NVivo 12 Pro software to compare student perceptions of the effectiveness of learning processes and their progress in the development of professional communication skills. The research team developed a codebook derived from the research question. Using the codebook, two independent coders completed the initial round of coding with five journals. Notably, the coders did

not participate in the earlier stages of the Project and, therefore, did not have any research-related bias. The initial round of data coding revealed some disagreements between the coders, and through deliberation, the research team revised and refined the code definitions and rationales for data assignment, using methods outlined in Creswell et al., (2003). The same coders then coded an additional set of five student journals to confirm the consistency, validity, and reliability of the updated codes. After that, all the remaining journals were coded using the revised codebook. Excerpts from the codebook and examples of quotes are provided in Table 3.

Table 3 • Excerpts from the Codebook Relevant to the Research Question and Hypotheses

Theme	Statement Focus	Examples of Student Quotes
The goal to improve professional communication skills is stated.	The student states an improvement of professional communication skills as a personal goal for the course.	*"I hope to be able ... to hone my social and communication skills."*
Evidence of remediation of misconceptions is present.	The student mentions any 'aha' moments of the class: ideas that they originally perceived differently but later recognized their wrong perceptions and adjusted in the course of the Project. Include any contextual factors related/contributed to the remediation of misconceptions.	*"I realized that there were discrepancies between each of the departments due to the lack of communication and doing a lot of work on our own in our departments." "I have especially changed my mind in thinking that marketing was just advertising. Throughout the course I have realized I'm wrong with that assumption more and more every week."*
The Project helps with professional communication skills.	The student mentions that the Project helped develop their professional communication skills.	*"I believe that over the semester I have improved my communication skills quite a bit due to several things. First was the project that we have been working on all semester."*

Results

Quantitative Analyses

To test the proposed hypotheses, a series of nonparametric statistical tests were employed, with the results reported below. First, to account for any pre-existing differences in students' perceptions regarding their professional communication skills between the two classes before the Project's start, the data collected in the first wave of the survey (week 1) was analyzed. On a scale from zero to 120 (where a zero score means no professional communication skills and a 120 score corresponds to superior professional communication skills), SCM students (n=13) reported a mean (median) score of 97.00 (96.00), and the PM students (n=17) reported the mean (median) of 96.59 (96.00). The nonparametric Mann-Whitney test revealed no statistically significant difference (p=0.32) between student self-perceptions about their professional communication skills in the two classes. These results suggest that before engaging with the Project, students in both classes had similar, reasonably high opinions about their levels of mastery of professional communication skills. Thus, the participants in the two classes can be considered reasonably similar in terms of their backgrounds and self-perceptions regarding their professional communication skills before engaging with the Project.

Next, data collected during wave 2 of the survey (week 14) was used to examine how student self-

perceptions of professional communication skills changed because of participating in the Project. The Wilcoxon sign-rank test was used to compare student self-perceptions at the start of the Project, as reported in wave 1, with their self-perceptions at the beginning of the Project, as reported in wave 2. The results indicate that in the PM class, there was no statistically significant difference (p = 0.65) between student self-evaluations of professional communication skills before the Project start (wave 1) and the adjusted self-perceptions at the Project start, as reported in wave 2. However, in the SCM class, there was a statistically significant difference (p = 0.02) between how students perceived their professional communication skills before the Project start (wave 1) and adjusted professional communication skills at the Project start as reported in wave 2. The SCM students, who were exposed to the proposed inductive teaching interventions, decreased perceptions of the professional communication skills they held previously. The PM students, who were not exposed to these teaching interventions, did not change their perceptions of their pre-Project communication skills and reported similar mean (median) scores for the retrospective assessment of their initial proficiency (Table 4). Thus, Hypothesis 1: Inductive teaching interventions will effectively reveal and help adjust students' misconceptions of proficiency levels in professional communication skills, was supported.

Next, the efficacy of the inductive teaching methodology to improve student proficiency in professional communication skills was assessed. The Wilcoxon signed-rank test was conducted to test differences in student perceptions of their progress in professional communication skills via a comparison of the retrospective assessment of the initial levels and their reported levels after completion of the Project. In the PM class, there was no statistically significant difference between student retrospective evaluations of their professional communication skills at the Project's start and their evaluation of professional communication skills upon the Project completion (p=0.31). Conversely, in the SCM class, there was a statistically significant difference (p=0.03) between student retrospective evaluations of their professional communication skills at the Project start and their evaluations of professional communication skills at the Project end (Table 5). Notably, at the end of the Project, SCM students reported improved professional communication skills in comparison to the adjusted levels of professional communication skills before the Project start, in support of Hypothesis 2: Student learning outcomes (SLOs) for professional communication skills will improve as a result of applying inductive teaching interventions.

Table 4 • Differences in Students' Self-Perceptions of Professional Communication Skills Assessed at the Project Start (wave 1) and Re-assessed Retrospectively at the Project End (wave 2), on a Scale from 0 to 120

	Student perceptions of professional communication skills at the Project start	Student perceptions of professional communication skills at the Project start re-assessed retrospectively	*Wilcoxon sign-rank test*
Class	Mean (Median)	Mean (Median)	*p-score*
PM (n=18)	90.59 (96.00)	89.31 (93.00)	*0.65 (n.s.)*
SCM (n=11)	97.00 (90.59)	85.78 (87.00)	***0.02***

Table 5 • Differences in Student Self-Perceptions of Professional Communication Skills at the Project Start Assessed Retrospectively at the Project End, on a Scale from 0 to 120

	Student perceptions of professional communication skills at the Project start assessed retrospectively	Student perceptions of professional communication skills at the Project end	*Wilcoxon sign-rank test*
Class	Mean (Median)	Mean (Median)	*p-score*
PM (n=18)	89.31 (93.00)	94.00 (94.00)	*0.31 (n.s.)*
SCM (n=11)	85.78 (87.00)	101.00 (96.50)	***0.03***

Overall, students in the two classes reported different levels of progress in developing professional communication skills. PM students, not exposed to the inductive teaching interventions, maintained a high regard for their communication skills and did not actively work on improvements. On the other hand, SCM students benefitted from the proposed teaching interventions, recognized their deficiencies, and reported progress toward higher proficiency levels by the end of the Project.

Qualitative Analyses

To gain a more comprehensive understanding of the observed numerical evidence, a qualitative analysis of the student reflection journals was conducted to complement the quantitative results. Several important themes and factors emerged as discussed below.

The theme 'Goal to Improve Professional Communication Skills is Stated' captures student intentions (if any) to improve these skills at the Project's outset. Analysis of the reflection journals revealed that despite effective professional communication skills being listed among the SLOs in both courses, only seven SCM students (54%) and six PM students (24%) explicitly indicated the improvement of professional communication skills as their personal goal in the course. Instead, many participants in both classes prioritized other professional skills like teamwork, time management, and research skills. The qualitative data suggest that the majority of students do not see the need to work on their professional communication skills, either due to a lack of appreciation for their importance or because they perceive themselves as already proficient.

The theme 'Evidence of Remediation of Misconceptions is Present' includes students' 'aha' moments: something that initially they perceived or understood differently, but later realized their perceptions were wrong and adjusted them. There was a dramatic difference in the two classes' responses. PM students mostly identified 'aha' moments related to the core subject (marketing), reporting no remediation of misconceptions concerning professional communication skills. In contrast, for the SCM students, the fundamental misconceptions and most surprising 'aha' moments related to communication functions in the Project. The example quotes from the PM students and SCM students are provided below:

> *"Prior to this semester, I did not realize how vital a function marketing is to a business's success. […] I was ignorant to the level of research and effort that goes into preparing a business's marketing program" (PM student's quote about marketing misconceptions).*

> *"I believe that without this project, we would not have realized just how important communication is…, [before] we had a lot of differences in our parts of the projects due to a lack of communication. As of now, we have worked better together and communicated a lot more with each other in order to make sure that we are all on the same page and can put together a good project and product for the project" (SCM student's quote about communication misconception).*

The observed difference between the two classes in misconception identification and remediation supports the quantitative results and provides empirical evidence that students' preconceptions of proficiency in professional communication skills were adjusted during the Project to varying degrees. The inductive teaching interventions the SCM students received were successful in calibrating students' perceptions of their professional communication skills and motivating them to work on improvement.

The theme 'Project Helps with Professional Communication Skills' reports student progress attributed to the Project. Overall, students from both classes reported some improvement in professional communication skills. However, a remarkably higher proportion of the SCM students (46%) reported progress compared to the PM class (20%). The difference in the improvement rates corroborates with the results of the quantitative analyses (Table 6), reporting statistically significant improvements in professional communication skills for the SCM students, but not the PM students. Furthermore, different aspects of professional communication skills were reported as improved by the two classes. For example, the PM students mentioned mostly their writing skills improved:

> *"My communication skills through email improved because I would write detailed descriptions of what we had to do for the three reports."*

In contrast, the comments from the SCM students painted a much more complex picture of the communication competencies, like the importance of timely communications, the disadvantages of working in a silo, the importance of asking questions, creating clear messages to pass information to various stakeholders, and the value of accurate interpretation of received information:

"I have also learned communication is a key in a successful project. The CEO needs to communicate to department heads, and the department heads need to relay those messages clearly and accurately in order to have the most likely success on the project. Department heads also need to have a full understanding on not just their departments but everyone else's as well, so we can all work together to reach the end goal."

> *"This is harder than it looks because in order to get information from other groups we go through our "boss" to gain information and if he doesn't asks the right questions when he is talking with them then we won't get an answer at first."*

Overall, students from both classes indicated improvements in both core subject and professional communication skills, with many attributing their progress to the Project. Also, many students recognized the relevance of the Project to their future careers (85% in the SCM class and 72% in the PM class) and appreciated its real-world scenario. Both classes found value in the multidisciplinary collaboration, embracing the opportunity to learn from the different disciplines' perspectives.

While a small number of references suggested limited or no progress in the student learning outcomes in both classes initially, by the end of the semester these respondents also reported some improvements. Also, one student (8%) in the SCM class and four students (16%) in the PM class did not submit their reflection journals. Applying a conservative approach, these instances were considered negative cases, implying that these students may have been reluctant to report limited progress or lack of progress in student learning outcomes.

Discussion

Communication is an integral part of a business specialist's professional life, alongside technical or subject-specific or subject-specific expertise. Yet, despite efforts in higher education, global labor markets continue to report a persistent noticeable deficit in critical communication competencies among college graduates (NACE. Job Outlook, 2024; Taylor et al., 2022).

Traditional teaching methodologies in higher education programs, while reliable for skill acquisition, may fall short in assisting learners in recognizing their deficiencies in communication in the first place and motivating them to improve. To bridge this gap, a novel application of inductive teaching methodology is proposed to help learners discover misconceptions regarding their proficiency in professional communication skills, alert them to the need for improvement, and create effective learning environments to enhance their communication competencies.

The conjecture mapping approach, rooted in constructivist theory, serves as a foundation for the proposed inductive teaching methodology (Sandoval, 2014). Central to this approach is a multidisciplinary problem-based project emphasizing teamwork and informational exchange, key components of effective professional communications. Student development is emphasized via multiple opportunities for inquiry, self- and peer-teaching, and supported by positively

structured instructor feedback. As students reflect on their experiences in the Project, the instructor facilitates the process by asking leading questions, offering debriefing sessions, and learning opportunities (teachable moments) with short lectures and exercises on communication theory and best practices. These mediating processes result in student artifacts (work-in-progress reports, final reports, student self-reflections) serving as student-generated evidence of the learning progress. These processes and artifacts reveal learners' misconceptions about their proficiency levels, trigger motivation to improve, and, ultimately, promote enhancement in professional communication competencies.

The study utilizes a concurrent mixed methods research design for a comprehensive examination of the research question from multiple perspectives. It quantitatively establishes the effects (i.e., differences in student learning outcomes across the two classes) and provides a qualitative description of the underlying processes (i.e., varying awareness levels about misconceptions and the need for remediation) to *contextualize these effects*.

In line with prior research (Trevelyan, 2012; Wright, 2023), the findings confirm students' tendency to overestimate their communication proficiency. Consequently, they do not feel the need for improvement and are not as actively engaged in the learning process for communication skills. The findings further demonstrate the effectiveness of the inductive teaching methodology in adjusting students' perceptions of their proficiency in professional communication skills. Notably, the SCM students, exposed to inductive teaching methods, showed improved recognition of their communication limitations. Unlike the PM students experiencing deductive instructional methodologies, the SCM students calibrated their self-perceptions of competence, as demonstrated by the quantitative analysis results. SCM students also recognized the need and were motivated to develop their professional communication skills in asking questions and clarifying received information, creating clear messages, and improving personal interactions, as revealed by the qualitative data.

Therefore, based on the quantitative results and qualitative findings, the proposed inductive teaching methodology is effective for business disciplines to calibrate their overestimated competencies in communication skills and to motivate them for improvements. Targeted interventions aiming at enhancing professional communication competencies contribute to significant progress in SLOs and improve overall satisfaction levels, as reported by the SCM students in this study. Additionally, the proposed design allows for effective use of class time and can be successfully implemented within the typically rigorous, tight business curricula – another notable advantage of this methodology.

Limitations

While the research team strived to follow the best practices in the field and ensure the validity and reliability of the research design, some limitations could hinder the identified positive outcomes from being entirely attributed to the implemented inductive teaching interventions. First, the differences in individual teacher styles and levels of experience with inductive teaching methodologies may have influenced the results of the study. Implementation of the methodology by other instructors and researchers might require adjustments depending on their experiences.

Second, several aspects of the study might potentially impact the generalizability of the results: the researchers employed the convenience sampling approach utilizing the classes they were assigned to teach, and the overall sample size in the study was relatively small. Informing students about their participation in the research project could trigger awareness of the importance of the research and introduce social desirability bias, impacting their responses. Finally, the influences of other contextual factors on student progress, such as student background, cognitive and non-cognitive development, extra-curricular activities, and out-of-class environment should not be discounted.

Directions for Further Research

For future research, it seems beneficial to replicate the study at a larger scale and include a representative sample from multiple disciplines. Also, semi-structured interviews would be helpful for a deeper and more accurate exploration of the learning processes and analysis of the contextual factors that impact students' perceptions of their communication proficiency and learning progress.

While this study targeted learners' overconfidence in communication proficiency, some students may actually have low confidence in their abilities instead despite being quite proficient in communication. Testing the effectiveness of the proposed teaching methodology for these misconceptions seems promising.

An interesting observation in the study was that students from underrepresented groups (females, and students of color) desired to take leadership positions in the project. It might be a fruitful venue to explore the impact of inductive teaching on leadership and other professional skills as well.

Conclusion

The study findings suggest that the inductive teaching methodology shows promise in developing professional communication skills. The unique advantage of the methodology lies in the successful adjustment of students' overconfidence in their communication skills, thereby motivating them to improve. It also reveals specific areas for improvement such as an ability to create clear messages, asking clarifying questions, communicating in a timely manner, and preventing misunderstanding and miscommunication – vital qualities for business professionals. Implementation of the inductive teaching methodology for professional skills in the higher education business curricula has the potential to bridge the gap between employers' expectations for professional communication competencies and the proficiency levels of college graduates.

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Appendix A

Journaling Assignment

Description:

Each student is required to do journaling during the semester, reflecting on their professional development/ learning in the course. Students have to carefully read the course learning objectives, state their personal goals for the course, and reflect whether the class activities and assignments contributed to their learning, achieving their goals, and the course learning outcomes. Students should demonstrate critical thinking and express ideas related to their learning process and professional development. Reflection on their transformation process as professionals (or lack thereof) is important in the reflection.

Requirements:

1. Journal entries should be submitted 4 (four) times during the semester. There are due dates for the submission of journal entry in the course syllabus. All submissions go to the designated D2L Dropbox. Each submission has to be at least 0.5 pages but not more than 1.5 pages.
2. All entries have to be typed in a single (the same) Word document, Times New Roman 12, single space, 1” margins.
3. Provide student’s name and course number in the top left corner of the first page, page number at the bottom right corner of a page.
4. Provide dates for each entry in the document.

The final submission (complete document which contains all entries) will be graded. Grading rubric (attached) will be used to grade the assignment.

Important: Student’s journal content **will not be graded** based on student’s progress in the course and their achieving or not achieving the learning objectives. The goal is to provide meaningful and truthful reflection on your learning process and demonstrate critical thinking to reflect on why the learning process was successful or was not so.

Journal Grading Rubric:

	Weight	Excellent	Good	Fair	Poor
		100	80	70	60
Meeting Requirements	5%	All submission requirements are met	Most of the requirements are met	Some of the requirements are met	Requirements are not met
Volume	10%	3-4.5 pages	2-3 pages	1.5-2 pages	Less than 1.5 pages
Timeline	5%	Submission deadline is met	Late for a few hours, but less than one day.	One day late	More than one day late
Grammar and Spelling	5%	Journal is highly polished; no grammar or spelling errors	Journal is polished; maximum of two grammar or spelling errors	Journal is adequate; maximum of three grammar or spelling errors	Inadequate discussion; more than three spelling or grammar errors
Structure and Organization	35%	Writing demonstrates sophisticated clarity and conciseness, includes thorough details and relevant information, extremely well-organized	Writing is accomplished in terms of clarity and conciseness; includes sufficient details and relevant information; well-organized	Writing lacks clarity or conciseness; gives insufficient details; lacks organization	Writing is unfocused, lacks details and relevant information; poorly organized
Reflection	40%	Demonstrates meaningful connection of expressed ideas with the course learning outcomes; supports opinions with strong arguments and evidence; presents a balanced and critical view; interpretation is both reasonable and objective	Demonstrates connection of ideas with the course learning objectives; supports opinion with reasons and evidence; presents a fairly balanced view; interpretation is both reasonable and objective	Connection of content with the course learning objectives is weak; supports opinions with limited reasons and evidence	No connection with course learning objectives is identified. No reasoning and arguments are provided
Total					

Multicultural Education: Enhancing Business Education Students' Academic Success Using Banks' Model

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Abstract
The study examined how classroom diversity could be used to enhance business education students' academic success. The study considers the impact of multicultural education using Banks' model to enhance these students' academic success. Diversity is in different forms. As our global world and country become increasingly diversified with its attendant impact on school, campus, and classroom settings, it becomes imperative to examine ways of ensuring that students continue to enhance their academic success. Although there are challenges to both instructors and students alike in ensuring academic success in a diverse classroom setting, there are also benefits that enhance students' academic success, particularly business education students. Instructors also benefit from an enhanced understanding of their students to improve their teaching styles. The results of this study show that multicultural education helps business education students to function better in personal, social, and civil activities that are required for citizens in a diverse, democratic, and pluralistic society.

Keywords: Academic Success, Business Education, Business Students, Diversity, Banks Model

American education at all levels i.e., elementary, secondary, and tertiary (higher education) including colleges and universities, is increasingly becoming ethno-culturally diverse. Indeed, across the world, issues regarding diversity have been receiving more attention, challenging people to think in new ways (Bai et al., 2020; Banks, 2004; Banks, 2009; Banks & Banks, 2019; Castles, 2009; Ely & Thomas, 2020). The aging population in developed countries and the increasing population in developing and emerging countries of the world have further created a demographic divide and a demand for highly skilled and educated immigrants to meet the workforce and labor needs of developed economies. Indeed, the United States (U.S.) Census Bureau (2024) revealed that the U.S. is the only developed country out of the top 10 most populous countries in the world. In the U.S., ethnic minorities are projected to increase from one-third of the nation's population as of 2006 to about 50% in 2042 (Roberts, 2008). Due to global migration and globalization, racial, cultural, linguistic, and religious diversity, equity and inclusion continue to increase in countries across the world including the U.S. (Bai et al., 2020; Banks, 2009; Castles, 2009; Frey, 2020; Jensen et al., 2021; Soetan & Nguyen, 2018; 2023).

Diversity in the U.S. is increasingly reflected in the nation's schools, colleges, and universities as well. For example, Planty et al. (2007) stated that 43 percent of the students enrolled in grades one to 12 in public schools in the U.S. were students of color.

Korhonen (2023) stated that this figure has increased to 54.8 percent as of 2021. Also, in 2007, 20 percent of school age students spoke a language other than English at home (Planty et al., 2007) which implies that a significant percentage of the students in U.S. schools are English language learners. However, by 2030, about 40 percent of the students in the U.S. will speak English as a second language (Peebles, 2008).

These demographic and social diversity findings have important implications for teaching and learning and students' academic success. Therefore, increasing diversity within U.S. schools, colleges, and universities provides opportunities that could be explored and taken advantage of to enhance business education students' academic success. Diverse classrooms make it possible and easier to teach students from different cultures. These diverse classrooms provide an opportunity for instructors and students alike to enrich their knowledge, attitude, and skills in today's increasingly globalized and diversified world.

Purpose of the Study

The purpose of this study was to consider or examine how classroom diversity between and amongst students on one hand and instructors in business education on the other hand could be better managed for an effective teaching and learning experience for both instructors and students. The Banks' model of multicultural education was used to examine literature on classroom diversity.

Theoretical Framework

James A. Banks is an American educator and a specialist in social studies education, multicultural education, diversity, and citizenship. His scholarly and professional work led him to develop the five dimensions of multicultural education that are parts of the Banks' model of multicultural education (Banks, 1995a). This model consists of five dimensions: Content Integration (CI), Knowledge Construction (KC), Prejudice Reduction (PR), Equity Pedagogy (EP), and Empowering School Culture and Social Structure (ESC & SS).

Content Integration (CI)

This first dimension addresses the need to include the knowledge and perspectives of other cultures in curriculum development. Four approaches to CI are:

i. *Contributions approach:* Involves providing information or examples in class topics and discussions that involve other cultural groups or places i.e., inclusion of differences and diversity.

ii. *Additive approach:* Involves building on the contributions approach through the provision of additional course content.

iii. *Transformative approach:* Involves the assumption that the construction of knowledge is both value-driven and value laden. Therefore, to include knowledge from different, several, or multiple perspectives, a strategy must be in place to permit additional and alternative views and perspectives.

iv. *Social action approach:* Involves efforts made to provide students with the needed tools and resources that enable them to contribute to the decision-making process that can lead to social change.

Knowledge Construction (KC)

This second dimension encompasses the perspectives, presumptions, and assumptions that are considered in the process of designing, constructing, and validating knowledge produced in a particular discipline. At this level, students are encouraged to take a critical approach to issues and topics that are discussed in class and ask difficult questions regarding course content in order to both develop and enhance their critical thinking skills and competencies. Instructors have a responsibility to expose students to the different and various processes that are involved in knowledge production. Furthermore, instructors must ensure that students are aware and better informed about the considerations and perspectives that inform, influence, and contribute to the production of certain types of knowledge.

Prejudice Reduction (PR)

The third dimension, Prejudice Reduction (PR), attempts to change attitudes and beliefs that are rooted in sexism, racism, stereotyping, and other forms of bias and prejudice. This dimension also helps students to value and respect differences. PR is greatly enhanced through the provision of opportunities for students from different backgrounds to work together in groups and build respect for different perspectives in a culturally diverse group. It should be noted that the classroom setting, and environment also plays a huge role in PR.

Equity Pedagogy (EP)

Equity Pedagogy (EP), the fourth dimension, assumes that students have different learning styles that are influenced by their culture, background, peculiar experiences, environment, and world views. Instructors acknowledge the differences in students' learning styles and provide opportunities for them to

learn in different and meaningful ways. Instructors encourage students to think critically, since they can encourage critical thinking based on their knowledge of students' background, cultural influences, learning styles, and unique experiences.

Empowering School Culture and Social Structure (ESC & SS)
The final dimension, Empowering School Culture and Social Structures (ESC & SS), was initially developed for K-12 education, but it is also relevant to higher education. This dimension provides a framework for instructors to alter course materials and resources to accommodate different perspectives and develop appropriate instructional delivery styles and strategies that make for an all-inclusive learning culture in higher education. Indeed, ESC & SS is essential for students from diverse racial and cultural backgrounds to experience equitable and empowering learning environments in today's increasingly pluralistic and diverse world.

Research Questions

Banks' model of multicultural education provided theoretical orientations for forming two research questions for this study. The research questions addressed in this study are:

i) How can instructors manage classroom diversity in an increasingly diverse classroom to support business education students' academic success?

ii) What strategies can be applied to ensure deeper and better interactions and rapport between instructor and business education student diversity in the classroom?

Literature Review

Given the increasing diversity across all levels of education from elementary to higher education today, instructors need skills to better communicate with students from different cultures and backgrounds. This is very important, and the Banks' model has proved to be successful in providing the needed skills. For example, using the first dimension of the Banks' model, Content Integration, Akcaoglu and Arsal (2022), revealed that the model significantly improved the multicultural efficacy of instructors after training on multicultural education. Abacioglu et al., (2022) also found that instructors who received professional development in multicultural education, especially during their in-service years, had more positive attitudes and beliefs about multicultural ideologies and practices compared to instructors who did not.

Higher Education and Diversity

Business educators must understand the relevance of diversity in higher education because one of the purposes of higher education is to provide an enabling and supportive teaching and learning environment. They must embrace differences and diversity and integrate them into all areas of teaching and learning to develop inclusive education (Guo & Jamal, 2007). It is also important for higher education institutions to continue to commit resources to diversity and inclusiveness as a demonstration of their commitment given the increasing diversity that is taking place in our world today (Banks, 2009; Bowman et al., 2016; Hu and Kuh, 2003; Soetan, 2020).

Goal of multicultural education

A major goal of multicultural education is to provide students with the skills and knowledge that they need to be able to function in a diverse nation and world. Multicultural education also provides an opportunity to better educate under-achieving students and to ensure that no student is left behind academically. Helping these students revitalizes faith and trust in the promises of democracy, equality, and justice by building educational systems that reflect diverse cultural, ethnic, racial, and social contributions. Those educational systems provide better opportunities for every student and ultimately societal advancement and progress (Garcia, 2016; Feinberg, 1996; Kymlicka, 1995; Taylor, 1992).

Challenges of multicultural education: Classroom diversity

Both instructors and students face various challenges in a diverse classroom. Diversity comes in different forms and can be based on race, sexual orientation, disability, income background, and ethnicity. Literature reveals that minority students often feel isolated and unwelcome in predominantly white classrooms, and many experience discrimination and differential treatment (Costa et al., 2021; Cress & Sax, 1998; Goudeau & Croizet, 2016; Hurtado et al., 1998; Neugebauer et al., 2021; Rankin, 2003; Triventi, 2020; Sari & Yuce, 2020; Wenz & Hoenig, 2020). Also, when female students are in the minority in class, they may experience unwelcoming climates that can include sexist use of language, stereotypic or disparaging views of women, differential treatment from instructors and male students, and/or sexual harassment. Literature also reveals that the absence of previous positive experiences for minority students causes majority class members to feel anxious about interacting with minority students, and such anxiety can cause

majority students to respond with hostility or to avoid interactions with minority students (Salter & Persaud, 2003; Sands, 1998; Plant & Devine, 2003).

Benefits of multicultural education: Classroom diversity

The benefits of classroom diversity in enhancing the academic success of students are enormous (Lee, 2019; Smith et al., 1997). The benefits provide students with opportunities to confront racial and multicultural issues in the classroom and in extra-curricular activities. These opportunities encourage students to have meaningful engagements rather than casual and superficial interactions which lead to greater benefit from interacting with racially diverse peers. Indeed, literature reveals that scholars from minority groups have expanded scholarship and teaching in many academic disciplines by offering new perspectives, and raising new questions, challenges, and concerns. Female instructors and instructors of color more frequently employed active learning in the classroom, encouraged student input, and included perspectives of female students and minorities in their coursework (Antonio, 2002; Astin, 1993; Espenshade & Radford, 2009; Lee, 2019; Milem, 2003; Soetan & Nguyen, 2023; Turner, 2000).

Other benefits of multicultural education from literature are that it makes schooling, i.e., attending classes and lectures, more relevant for students from various backgrounds. Literature reveals that students are more successful academically when there is greater compatibility between their cultural backgrounds and school experiences such as class lectures and lessons (McCarty, 2002; Park et al., 2001). Finally, multicultural education addresses the challenges that confront many students from diverse cultural backgrounds who don't find class sessions inviting or exciting because they often feel unwelcomed and/or alienated (Gay, 2004).

Research Method

Based on the purpose of this research, a retrospective review of literature on multicultural education using the Banks' model was conducted. A substantial amount of time and focus was used to conduct literature reviews and to understand multicultural education and how it could be designed and implemented to engender business education students' academic success in the classroom. The process of my literature search is provided below in figure 1.

The literature that I reviewed was mostly qualitative papers with a few quantitative as well. A summary of the most important literature is provided in Table 1. The Banks' model of multicultural education was central to this review because it provides a framework to create and provide equal opportunities for every student regardless of their background, gender, or sexual orientation. The goals of the model were used as a guideline in the analysis of the literature that I reviewed. These goals include helping students to acquire the learning skills that they need to function successfully in a diverse world, providing students with the appropriate skills, attitudes, and knowledge that they need to function effectively in both mainstream and other ethnic cultures, and designing the school or campus environment to reflect diversity in the society. After the literature review was conducted, I evaluated the dimensions and developed an understanding of how multicultural education plays a role in enhancing business education students' academic success through classroom diversity. This evaluation allowed me to have a perspective of the past, current, and future implications through this approach.

In Table 1, I provide a research table with a summary of the most important literature in this study. The most important literature provided in the table highlighted the significance and relevance of the findings to the important topic of multicultural education. It also highlighted findings related to the Banks' model along with the dimensions of the model. The summary of the most important literature along with other literature in this study reveals the benefits and challenges of multicultural education, goal of multicultural education, and higher education and diversity.

Table 1 • Summary of the Most Important Literature in this Study

Source	Title of Article	Type of Article	Findings
Abacioglu et al (2022)	Professional development in multicultural education: What can we learn from the Australian context?	Article on multi-cultural education. Published in a peer review journal.	Instructors who received training on multicultural education during their in-service years were better informed in their beliefs and practices regarding multicultural education.
Abacioglu et al (2022)	The effect of multicultural education on preservice teachers' attitude and efficacy: Testing Banks' Content Integration dimension.	Article on multi-cultural education. Published in a peer review journal.	The study revealed that the Banks' model significantly improved the knowledge and practice of multicultural education after instructors underwent professional development and training on multicultural education.
Banks (2009)	The Routledge international companion to multicultural education.	A published book on multicultural education.	Minority students which may be based on gender, race, sexual orientation, income background, or religious belief often feel isolated and unwelcome and many of them also experience discrimination and differential treatment.

Source	Title of Article	Type of Article	Findings
Costa et al (2021)	Teachers' implicit attitudes toward ethnic minorities: A systematic review.	Article on ethnic minorities and diversity. Published in a peer review journal.	Minority students which may be based on gender, race, sexual orientation, income background, or religious belief often feel isolated and unwelcome and many of them also experience discrimination and differential treatment.
Guo and Jamal (2007)	Nurturing cultural diversity in higher education: A critical review of selected models.	Article on cultural diversity in higher education. Published in a peer review journal.	Three primary models of nurturing cultural diversity in higher education i.e., intercultural education model, multicultural education model, and the anti-racist education model were examined. Instructors and educators must integrate differences and diversity into curriculum to enhance inclusive education.
Lee (2019)	Bringing multiculturalism to the classroom: Voice of experience.	An online publication on multiculturalism in the classroom.	Classroom diversity provides benefits to students' academic success including opportunities for meaningful engagements rather than casual or superficial interactions.
Soetan (2020)	Impact of support areas on the perceived academic success of international students in community colleges in Canada.	Article on interna-tional students and cultural diversity in a higher education setting. Published in a peer review journal.	Classroom diversity provides benefits to students' academic success including opportunities for meaningful engagements rather than casual or superficial interactions.

Findings

The results of this study reveal that to answer the two research questions in this study, action activities and projects should be tuned to the cognitive and moral development levels of students (Banks, 1995a). Practicality and feasibility also emerged as important considerations. To enhance students' academic success in the classroom through multicultural education, students in elementary schools should be taught and encouraged to make a commitment to stop laughing at ethnic jokes that hurt or are offensive. Students in junior, middle, and secondary school levels can take action by reading books about other racial, ethnic, and sexual orientation groups such as LGBTQ. Furthermore, these students should be encouraged to participate in projects that are cross cultural and cross racial, because these projects provide enlightenment, education, and insight to others (Lee, 2019). When students engage in projects, they learn about the country and the world from the perspectives of diverse and different groups. As a result, they will be able to participate and function better in personal, social, and civil activities that are necessary for citizens in a diverse, democratic, and pluralistic society (Banks, 2009; Guo & Jamal, 2009). Finally, actions by instructors using the Banks' model will help in developing strategies and styles that ensure much improved, deeper, and better communication and understanding between business education instructors and students. This finding agrees with (Akcaoglu & Arsal, 2022; Abacioglu et al., 2022). The design and creation of a school or campus environment to reflect the diversity in society requires enhanced commitment from instructors and administrators to ensure that business education students function effectively and successfully both on campus and outside campus and upon their graduation based on the increasing diversity in our world today (Soetan, 2020).

Limitations to the Study

A major limitation to this study is in the eurocentric approach of the Banks' model of multicultural education. The model appears to perpetuate the analysis of multicultural education from the perspective of the majority culture. As such, it may not be realistically possible, if at all feasible, to integrate multicultural content and perspectives across all courses at every educational level, either at the elementary, secondary or tertiary levels. This, therefore, presents a challenge for instructors who may require significant professional training and development to overcome that challenge.

Conclusion

This study considered the role of business education instructors in achieving business education students' learning outcomes in a culturally diverse classroom. The study examined the need and necessity for instructors to develop all-inclusive and all-embracing teaching strategies to enhance these students' academic success in a diverse classroom setting using the Banks' model of multicultural education. The model considered the benefits and challenges of diversity, and identified ways to address those benefits and challenges. These strategies to optimize and/or maximize the benefits should acknowledge multiple sources of knowledge that are both available and valid in instructional delivery styles in a diverse classroom setting.

Diversity is a means of achieving educational and institutional goals. However, having a diverse classroom does not automatically provide a more welcoming and intellectually stimulating classroom (Fine & Handelsman, 2010). Despite the improvements that have been made in multicultural education, there is still room for improvement, particularly in today's increasingly diversified world. Therefore, the earlier the benefits of a diverse classroom in business education are taken advantage of, the faster and better the students will realize the enhanced academic success. Indeed, a consistent and continued study of the topic of classroom diversity in business education is both germane and imperative in an increasingly diverse campus and classroom setting that we have today, not only in the U.S., but across the world. Such a study serves to deepen our understanding of how students learn and interact with their colleagues and instructors to enhance their academic success.

This study considered several ways of enhancing business education students' academic success using the Banks' model of multicultural education including the role of business education instructors in achieving business education students' learning outcomes in a culturally diverse classroom, the need and necessity for instructors to develop an all-inclusive and all-embracing teaching strategies to enhance these students' academic success in a diverse classroom setting. It also examined the benefits and challenges of diversity and ways to address those benefits and challenges. However, it is recommended that further studies should consider addressing multicultural education from the perspective of a minority culture or a combination of both minority and majority culture rather than just the majority culture that the Banks' model focused on. Further studies can also explore the possibility

of how multicultural content and perspectives can be better and more easily integrated across all subjects and disciplines across all levels of education from elementary to higher education. Finally, it is suggested that further research may consider ways to increase business education students' academic success using other models of multicultural education apart from the Banks' model that this study focused on.

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