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Virtual and Augmented Reality: Utilization of These Innovative Technologies to Enhance Accounting Education and Training

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Simulations have been known to benefit learners by engaging students in realistic learning examples. Virtual reality (VR) has recently expanded its capabilities due to rapid technological advancements. Similarly, augmented reality (AR) has become common in various industries as technology has improved. Both VR and AR can be used to improve accounting education for technical training and soft skills. The primary purpose of this paper is to provide a broad overview of VR and AR, their applications in accounting education and training, implementation costs, as well as actionable examples of their potential use in collegiate accounting education and training.

Keywords: Virtual Reality, Augmented Reality, Accounting Education, Accounting Training, Professional Development, Simulations, Experiential Learning, Soft Skills
Disciplines of Interest: Accounting Education, Education Technology, Business Education, Instructional Design, Professional Training and Development

INTRODUCTION

The rise of advanced reality-enhancing technologies has changed the way people engage with the virtual world. Such advancements give learners the opportunity to engage in environments that appear to be real. As a result of these advancements, learners can be encouraged to actively participate in high-tech simulations that closely resemble real-life scenarios and are able to make mistakes in a safe environment [Kouijzer, Kip, Bouman, and Kelders, 2023; Kshetri and Dwivedi, 2024]. These simulations provide ways for students to

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practice and get more comfortable with solving unstructured problems [Riley, Cadotte, Bonney, and MacGuire, 2013; Taylor, Barnard, McGregor, and Rafuse, 2023] and help build confidence [Taylor et al., 2023]. The recognition of the benefits of simulations to educate people for positions in business [Bell, Kanar, and Kozlowski, 2008; Martin, 2000], and in accounting education [Bootsma, Jeffrey, and Perkins, 2021; Granitz and Kohli, 2021] is not new. Simulations bridge the gap between the classroom and practice by enabling students to learn by doing rather than only learning by listening or reading [Hackathorn, Solomon, Blankmeyer, Tennial, and Garczynski, 2011; Martin, 2000]. Effective simulations enable learners to gather enough facts to make their own decisions, make mistakes, and learn from their errors [Chernikova, Heitzmann, Stadler, Holzberger, Seidel, and Fischer, 2020; Jones, 1989].

With the sophisticated advancements of virtual reality (VR) and augmented reality (AR), simulations can be elevated to a new level. Today's VR programs are high-tech digital simulations that can fully immerse someone in a virtual world. Such simulations offer a mechanism to create a realistic hypothetical situation and enable users to interact in that scenario [Bell et al., 2008; Hartstein, Verkuyl, Zimney, Yockey, and Berg-Poppe, 2022; PwC, 2020a; Singh and Ahmad 2024].

AR stands somewhere between the real and virtual worlds, interjecting 3D images of virtual material into real life [Singh and Ahmad, 2024]. AR enhances and augments reality by superimposing digital information onto the real world to enrich an actual environment [Johnson, 2023; Tan, Chandukala, and Reddy, 2022]. AR helps learners understand difficult concepts and theories by offering them the ability to visualize the topics [Singh and Ahmad, 2024]. Research suggests that AR offers strong pedagogical benefits on critical thinking and problem-solving abilities in technical disciplines and can help students gain confidence by practicing in an environment more reflective of the natural world [Sharma, 2023; Singh and Ahmad, 2024].

The primary purpose of this paper is to provide a broad overview of VR and AR, discuss their applications and limitations, including costs, in accounting education and training and apply this information to actionable examples of their potential use in accounting education and training. The examples presented of how VR and AR have been used in practice are offered to help accounting educators better understand how these technologies are being used and how they can help learners bridge the gap between theory and practice.

BACKGROUND LITERATURE

Virtual Reality: Overview

VR is not a new concept and has been researched for many decades [Burdea and Coiffet, 2003]. VR can be thought of today as highly sophisticated simulations equipped with advanced technology. Simulations are typically

"defined as artificial environments that are carefully created to manage individuals' experiences of reality" [Bell et al., 2008, p. 1,417].

Simulations allow learners to learn complex tasks that mimic the real world in a safe environment [Loukas and Georgiou, 2011; Salas, Rosen, Held, and Weissmuller, 2009; Taylor et al., 2023].

In its most basic form, simulations do not even need computers and simply require role-playing to act out a hypothetical situation [Salas et al., 2009]. A higher-level simulation involves basic computers. This type of simulation, however, does not deliver the same kind of digital immersive experience made possible by today's modern VR interface.

VR creates a reproduction of a real or imagined environment that a user experiences through various senses, such as sight and sound, using a computer as the infrastructure for this experience. A key point about VR is that the user views and interacts with an artificial environment. For example, when looking through VR glasses, users do not see the actual environment but instead see the VR-created imaginary environment. VR employs digital technology that generates 3D simulated environments and mentally puts people in a place where they are not physically located [Bailenson, 2018]. Various tools are used to interact within the simulated environment to create what is often referred to as an immersive experience [Bale, Ghorpade, Hashim, Vaishnav, and Almaspoor, 2022; Burdea and Coiffet, 2003; Guo, Khan, Hsu, and Chen, 2024]. These sophisticated VR input tools include equipment such as gloves, headsets, helmets, glasses, goggles, wands, motion trackers, and body suits [Bale et al., 2022]. Individuals can interact in this imaginary, multidimensional environment, where the technology can detect an individual's input and immediately react to the individual's action. [Burdea and Coiffet, 2003; Guo et al., 2024].

Advances in technology enable VR to offer very engaging and emotional experiences by incorporating lively interactions with avatars, integrating realistic audio and visual effects and making it possible for avatars to easily complete actions such as walking up and down warehouse aisles, handling and inspecting merchandise inventory, and documenting damaged goods in a simulated environment [Lee, Choi, and Kim, 2025]. In another example, assume a VR simulation is introduced in a class to help auditing students learn how to effectively communicate with audit clients. In the simulation, the auditing student, posing as an auditor (i.e., avatar), talks in an angry tone to one of the virtual client's employees, and the virtual client complains to the virtual audit manager. The virtual auditor (i.e., student) is then reprimanded by the virtual audit manager for acting unprofessionally toward the client. This advanced technology heightens the sense of immersion in the VR world, making this situation more impactful, because users perceive that they are really part of the imaginary world they are observing. Immersion is a crucial component of an effective VR environment, making the distinction between the physical and virtual realms less apparent [Burdea and Coiffet, 2003; Guo et al., 2024].

VR simulations have been found to be more effective than traditional desktop simulations without VR [Kim, Mainardi, Jeong, Rybkowski, and Seo, 2025] and beneficial in the enhancement of learning [Ketron, Schatz, Sullwold, Sackett, and Goldschmidt, 2024]. In a VR environment, the learner experiences a more realistic environment, increasing the likelihood that the student learns from the experience, similar to experiential learning situations [Klingenberg, Bosse, Mayer, and Makransky, 2024].

Augmented Reality: Overview

Although VR users view an artificial environment, AR users can experience their live reality with additional virtual images, virtual sounds, or virtual text superimposed onto their view of the real world. For instance, a user could wear smart glasses connected to the internet, which enables augmented reality to insert information into the user's real environment [Arrowsmith, 2020]. Many people saw this first-hand during the 2024 Super Bowl Nickelodeon Cast that imposed slime, Sponge Bob, and other cartoonish digitization onto the football field for those watching the Super Bowl on a different channel (Nickelodeon, 2024). AR does not need to transform the entire environment or replicate a distant or fictional land in the way VR does. AR uses sensors or markers to understand the real environment. AR input tools include headwear such as transparent smart glasses, physical touch tablets [Sereno, Gosset, Besancon, and Isenberg, 2022], smartphones, and cameras [Sekhavat and Zarei, 2018]. With the use of various sensor tools, such as a satellite navigation system (GPS), gyroscope (a device that can determine when a moving object switches directions), and accelerometers (a sensor typically in smartphones that help gauge the speed of a moving object), AR programs can determine where a user is located and the direction that the user is facing [Johnson, 2023].

AR is being used more often than people realize in their daily lives. Table 1 highlights examples of how AR is used outside of the realm of accounting.

Next, we will discuss the key differences between AR and VR, along with the pedagogical benefits of choosing one platform over the other. We then explore the practical implications and costs in accounting education and practice.

Difference Between VR and AR

In its most simple form, AR is designed to supplement the real world, whereas VR creates a perception of the real world [Johnson, 2023]. VR users operate in a purely digital and simulated setting. In contrast, AR users operate in the real world, enhanced with digital (i.e., virtual) elements inserted into the AR environment [Tan et al., 2022]. For instance, in a VR setting, an audit

Table 1. Examples of Augmented Reality (AR) Application Outside Accounting

Use Case	Application Examples
Online shopping	Shoppers using sites like Wayfair and Warby Parker can use their smartphones to insert a digital picture of the item into their home to trial its placement.
Sports broadcasts	Major League Baseball game viewers can observe the "visual strike zone and pitch trail," [para. 4] which makes it more enjoyable for sports enthusiasts and easier for umpires to make calls (Wang, 2025).
Manufacturing	At Boeing, AR headwear has been used to guide its employees, by providing them with step-by-step directions, as they build the wing for an airplane. This enables the users to keep their hands and eyes on the parts instead of looking back and forth between typed directions and the plane [Porter and Heppelmann, 2017].
Meal preparation	Cooks can view recipes, timers, and cooking tips by looking into their AR glasses. Ingredients can even be ordered through use of the glasses [Kittch Inc., 2023].
Financial advising	Financial advisors can view trends in stock prices, augmented with 3-D images of the company's factories around the globe, or compare the information with a competitor's stock prices in real-time [Sokolov, 2023].

intern might access a simulation on a computer with VR headsets, controlling an avatar that simulates the user. The intern controls a VR device (e.g. wand or mouse) to move the avatar down an aisle in the warehouse, counting fictitious inventory. This virtual activity enables the intern to learn how to audit without being on a client-facing audit.

Alternatively, in an AR setting, the intern is physically walking down the aisle in a warehouse, wearing AR glasses or goggles, and counting actual inventory. The AR glasses might project a checklist on the boxes (e.g., "Is the box damaged?") to guide the intern during the actual audit. AR technology scans the physical surroundings, recognizes characteristics or objects in the environment, and superimposes virtual items. Examples of virtual items that can be imposed into the user's real world include text, sounds, 3D images, and animations. AR supplements the user's auditory and visual view of reality by merging virtual objects with the physical world in real time. The AR user can often manipulate virtual objects through physical movements or gestures, creating an interactive experience [Tan et al., 2022].

To summarize, the key difference between VR and AR is that a VR world is not real, but digitally created, whereas an AR world is real, with artificial

elements embedded into the real world. Readers should note that VR and AR can also be used together in what is often referred to as mixed reality.

Pedagogical Reasons for Choosing Between VR and AR in Accounting Education

From a pedagogical viewpoint, in a VR setting users are fully immersed in a simulated environment, whereas with AR, users are only partially immersed in an artificial environment. With VR, educators can take full control over the content of the educational experience. For example, with a financial statement analysis project comparing the performance of two companies, accounting professors might choose AR because they want students to review paper copies of historical data and news events in real time. Because financial statement data are easy to access and provide to students, there does not seem to be a need for VR. Alternatively, suppose the instructor wants students to analyze financial statements, consider certain types of hypothetical news events, and explain the news to a hypothetical client. In this situation, VR would be the better tool. In mixed reality, the student could conduct the financial statement analysis, use AR to receive news in real time, and use VR to practice communicating with a client.

Use of VR and AR Technologies in General Education, Accounting Practice, and Accounting Education

General Education

With recent rapid advancements in technology, VR and AR offer vast opportunities to provide more effective education to students and professionals by providing learners with a more realistic and interactive learning environment [e.g., Kouijzer et al., 2023; Kshetri and Dwivedi, 2024]. VR creates a safe environment in which users can learn, enabling them to make mistakes without serious repercussions [Ketron et al., 2024; Loukas and Georgiou, 2011]. For example, the New York University Grossman School of Medicine uses VR and AR to deliver more relevant learning experiences by providing more realistic, multidimensional images of various anatomical structures, such as the human heart. Traditional dissection of cadavers has been replaced with sophisticated technologies, including the use of VR and AR (NYU Langone Health). At Stanford Medicine, residents join each other in a classroom, put on VR headsets, and are greeted by an avatar in a white coat who takes the residents inside a patient's brain, demonstrating different parts of the organ, with the ultimate opportunity for the residents to advance as avatars through the steps of removing a tumor from the brain [Erickson, 2017]. VR has also been used to teach soft skills. For example, medical students have practiced communicating

with hospice patients using sophisticated VR simulations. For instance, to teach empathy, students assume the role of a patient who is notified that he is terminally ill. The simulation has triggered strong emotional responses from students. From this simulated experience, students learn how it feels to be the patient [McConnon, 2019].

At Hofstra University, business students can visit the Zarb School of Business Core Skills Lab with its dedicated VR room to engage in various VR programs to enforce and improve soft skills. Eye-tracking software and artificial intelligence (AI) are integrated into some VR programs, such as virtual presentations, to provide students with feedback on whether they are making appropriate eye contact or using too many filler words during the interview. Students can select which virtual environment they want to practice in, such as a virtual conference room, classroom, or lecture hall. For interviews, students can choose the type of interview they want to prepare for, such as a structured, nondirective, or behavioral interview.[1] The integration of AI-enhanced technologies that allow students to interact with virtual interviewers and receive answers and feedback is a forward-thinking approach; it can help students gain more confidence and practical experience in a controlled and supportive environment.

The next section of this paper provides examples of how VR and AR have been used in accounting practice, training, and education. In addition, ideas are provided for how VR and AR can be used in specific accounting courses and how academics, universities, and trainers must weigh the costs of such technologies against their perceived benefits.

Accounting Practice and Training

VR can be an effective tool to address skills, such as person-to-person interactions, in a remote environment. According to PwC [2022], VR provides a cost-effective way to deliver quality technical and soft skills education and allows it to be done at scale. Recent studies support the scaling of VR relative to live training. In a study of hospital training exercises, Farra, Gneuhs, Hodgson, Kawosa, Miller, Simon, Timm, and Hausfeld [2019] found that although an individual VR training session was more expensive than a live session, the VR sessions became almost 50 percent cheaper when the trainings were performed three times [Farra et al., 2019]. The cost per individual was $327.78 per participant initially in the VR session and $229.79 in the live session. However, as many VR costs are fixed, the price per participant fell to $115.43 per participant after two subsequent classes [Farra et al., 2019]. As the VR program is used more, its marginal cost falls, whereas the marginal cost of an in-person training session remains constant. A practical application of this cost aspect presents itself in soft skills.

Soft skills are essential in the accounting profession and, as the world becomes more digitized, can be viewed as the distinguishing factor when selecting between two individuals applying for the same position [Chabus,

2021]. There has been a significant increase in the demand for improvement in soft skills since the COVID-19 pandemic [Capranos and Magda, 2023]. This increase has been attributed to the fact that Generation Z did not interact with people in person during the pandemic, and consequently, their soft skills were not as developed as those of prior generations. As a result, the Big Four accounting firms have been proactive in offering professional development courses that address the lack of perceived soft skills [Confino, 2023; Foy, 2023]. A study by PwC [2020b] reports that employees in VR learning environments can learn up to three times faster than in a traditional environment, obtain confidence in their skills more quickly than in person, and are less distracted in a VR classroom than in a traditional classroom and, thus, more focused, leading to better learning results. PwC [2020b, p. 5] found that its "VR-trained employees were up to four times more focused during training than their e-learning peers and 1.5 times more focused than their classroom colleagues." For a large organization such as PwC, the costs are scalable to make the adoption of soft skills in a VR setting advantageous despite a higher up-front cost.

Although VR has found a place in soft skills and technical skill training, AR can also be used in the realm of accounting practice. For instance, a company's employees can use AR glasses, often referred to as smart glasses, to provide information to users, particularly in inventory counts. Porter and Heppelmann [2017] discuss how AR equipment provides users with "X-ray vision" [p. 49]. This capability can allow public auditors to see inventory in a warehouse that would not normally be easily viewed. For example, with the assistance of AR glasses, an auditor has the potential to observe that there are three boxes behind the front row of inventory stored on a high shelf in a warehouse and that ten units are in each box. Auditors will note that this inventory arrangement calls for dual-purpose testing to ensure that the client's procedures for controls over inventory are adequate and confirm that a physical inventory of the merchandise, conducted by the auditor with the aid of AR equipment, can be relied on. Just as drones use sensors and cameras to audit inventory, see through boxes, and collect data, smart glasses can also be used to control inventory [Appelbaum and Nehmer, 2017] and smart glasses already being employed in remote inventory counts by KPMG [Bishop, 2020]. Sensors, such as radio frequency identification technology (RFID) tags, can be used to assist with the control of the inventory and collection of data [Dai and Vasarhelyi, 2016; Krahel and Titera, 2015].

AR can also be used to comply with audit supervision standards. BDO USA [2020] discusses how AR inventory observations can be performed under the guidance of a more experienced team member using Microsoft's HoloLens 2 headwear device: An auditor can go to a warehouse to take inventory and share the observations with a remote BDO Digital Subject Matter Expert (SME). The SME can remotely view what the auditor observes at the

warehouse and provide guidance to the auditor as needed. The SME can take photos of the auditor's view and post live feedback (referred to as annotations or holograms) that the auditor can see from the headwear device. Data that are transmitted are stored using data security protocols and standards.

VR and AR are both being employed by auditors and accountants to enhance the quality of their work product. The same enhancements can be applied to accounting education.

Accounting Education

In addition to practice and training, VR appears to continue to have strong potential for accounting education, even if its use in accounting education is not new. By creating an environment that simulates reality, VR can improve learning by making it easier to remember what occurred because the learner experienced the learning first-hand [Astuti, Sugiyarto, and Ikhsan, 2020]. For example, a VR program called Second Life has been used in education and the accounting profession [Buckless, Krawczyk, and Showalter, 2012; 2014; Johnson and Middleton, 2008]. The accounting department at North Carolina State University started using Second Life to enhance the accounting education experience. This VR program enables users to engage in purchase and sale transactions by using virtual currency. For instance, users can rent office space for virtual people (i.e., avatars). Buckless et al. [2012, p. 71] find that Second Life provides learners with the opportunity "to be immersed in a real-world environment to gain hands-on experience with common accounting professional tasks" and enables learners to make errors without negative consequences as in the real world.

Buckless et al. [2014] describe students' experiences using Second Life in an advanced auditing course to provide more realistic learning experiences for graduate accounting students. The project required students to inspect inventory virtually as is already occurring at KPMG [Bishop, 2020]. Students were required to visit the audit client's warehouse, conduct a count of finished goods inventory, perform control testing and substantive tests of details, and document their work in work papers. They were also required to observe the inventory, such as how it was kept and stored. The virtual assignment was supplemented with the instructor serving as the warehouse manager, and students interviewed the hypothetical manager outside the Second Life program. Pre- and posttests suggest that students significantly improved their audit skills because of the virtual inventory program. Specifically, skills relating to inventory observations, client interviews, audit documentation, critical thinking, collaborative work skills, and applying theory to practice improved after completion of the virtual project. Sample comments from students are included in the Appendix.

Significant technological strides have occurred since Second Life was used in the study by Buckless et al. [2014], resulting in even more realistic simulations. As a result, new opportunities for using VR await accounting education. For example, to take advantage of today's advanced VR capabilities, Dr. Linda Kidwell at Nova Southeastern University collaborated with Foretell Reality, subsidiary of The Glimpse Group, Inc., a global immersive technology company, to use a VR program for its students to learn to take inventory. Accounting students use this program to act as virtual auditors, walking down aisles, opening and inspecting boxes, and performing inventory counts from the classroom. Inventory includes items that may have been damaged or affected by virtual flooding before the auditor arrives [L. Kidwell, personal communication, March 13, 2024].

Firms are employing AR and VR in their training programs and schools across the globe are doing the same. The opportunities are extensive. The following section provides additional examples of how VR and AR could be used in various accounting courses.

Managerial Accounting

In a managerial accounting course, VR can be used to create a simulated environment wherein management by exception (i.e., the investigation of significant variances) is used to examine variances. Managers often have limited time and must focus on what is essential to their business' success. An accountant can support management by uncovering significant variances between planned and actual costs. This concept can be experienced in a VR classroom, providing students with "real-life" experience. VR can promote a more active learning experience in the classroom by creating a virtual retail company, where each student poses as the management accountant and is required to identify what variance needs to be investigated and virtually meet with the virtual department managers to question them about the variances. For example, let us assume there is a significant purchase price variance for direct materials in a virtual pharmaceutical manufacturing company. The virtual accountant (i.e., student/avatar) would identify the virtual department(s) believed to be responsible for the variance, visit the different department(s), question the department(s), and receive feedback from the VR program about the questioning. For example, if an unfavorable purchase price variance results, the accountant should typically start by questioning the procurement department. However, assume the virtual accountant decides to first go to the production department to question why the purchase price is so high. The virtual program can be created so that the VP of Production responds in an annoyed tone, "We had nothing to do with the purchase of raw materials and suggest that you go bother someone else." Assume next that the program directs the student to the quality control department and that the student is given a similar unpleasant response. This simulation would

teach the student the importance of performing the upfront work to identify the appropriate steps to follow before investigating variances and the necessity of asking the right questions to the right personnel. Alternate scenarios can be developed to enable students to ask questions in various tones, prompting different responses depending on the way the question(s) are asked. Communication skills can thereby also be practiced by requiring the accounting student to interact virtually with avatar managers and provide feedback to the students.

Although this exercise could be implemented as a full-class role-play exercise with various students and/or instructors serving in the different roles and students walking from station to station (e.g., desk to desk) to converse with others acting as company employees, the benefits to VR would enhance the overall experience by creating the workplace environment in the headset and offering detailed feedback on tone and response with preset scripts. Many VR tools can analyze a person's feedback, voice level, tone, and eye contact in a way that other students, particularly in an introduction class, would likely not be able to do. This exercise would give students an early exposure to client and coworker relationships and how to properly engage in the workplace. It would also incorporate the soft skills component that firms are seeking to supplement the training that students are not perceived as obtaining in their undergraduate studies [Confino, 2023; Foy, 2023].

Auditing

Some seasoned auditors have been known to state that accountants with little or no experience "wouldn't know a good audit from a bad audit" [see Marcello, Ray, Carmichael, Peterson, Ramamoorti, Collemi, and Nearon, (2017), p. 21]. VR and AR are ways to bridge the experience gap and offer hands-on learning to students in a manner that allows them to gain experience and confidence in a low-risk, low-stakes environment [Singh and Ahmad, 2024; Sharma, 2023]. VR and AR now offer the opportunity to create a lifelike test environment for the auditing practice in the classroom. Accounting instructors can now realistically simulate an audit and evidence-gathering activities without having to perform an actual audit at a client site.

Other realistic accounting experiential learning activities can also be delivered to students. Before engaging with real clients, accounting students can now virtually audit a mock company or practice a case study augmented with AR that walks them through the best audit procedures for a given client. VR and AR provide ways to gain experience without having real experience.

Anecdotally, the authors have seen that students often struggle with understanding auditing when taking a college course because many students lack work experience and consequently have difficulty relating what they are learning to their lived experiences. Auditing makes sense to them in theory, but

they cannot connect it to their lived experiences. Professors often comment on how teaching auditing to students in a classroom is comparable to teaching someone how to play the piano without the student ever playing the piano. For instance, source documents are routinely referred to in an auditing class. However, many students have never seen commonly audited source documents, such as purchase orders, invoices, packing slips, canceled checks, or materials requisition forms. Although textbooks provide pictures of some source documents, not all college students read their textbooks in detail and some students only skim the books [Elletson, 2019; Ludlum and Teeman, 2020; Phillips and Phillips, 2007]. Furthermore, reading a textbook does not actively engage students in the learning process, and images are often skipped over. Audit simulations have already been used to enhance the learning process in the auditing class. Simulations in business courses, particularly auditing, are effective experiential learning activities [Levant, Coulmont, and Sanduet, 2016] and help bridge the gap between practice and theory [Bruton and Bradley, 1992; Ho, Oddo, and Sze, 2010; Saadullah and Elsayed, 2020].

Although a VR or AR approach would incur costs in addition to the cost of a textbook, it is difficult to create an entire audit ecosystem within a classroom. The creation of source documents, inventory organization, client interactions, and evidence documentation all being housed in one location (the VR or AR setting) in real time, as they are on an audit, is an actionable way to expose students to an audit. The VR and AR system would bring the words from textbooks, popular press articles, and lectures to life for the student in a way seeing invoices in a textbook or in a case cannot.

Expanding on the benefits in a VR setting, a real-life situation can be depicted that requires students to actively engage with the content. Students are often unfamiliar with business processes because they have limited experience working at a business. With VR, students can virtually experience various business processes to better prepare them for their first jobs in business. For instance, to familiarize a student with the procurement process and related source documents, the VR case can start with a student working virtually as a procurement agent or receiving clerk to virtually experience the process of ordering or receiving materials from the side of the client. As the procurement agent, the student could engage with a policy requiring three bids on equipment purchases costing more than $5,000. The procurement agent can be required to physically collect the bids from the ordering department, review the bids for appropriate details, create the purchase order, and sign the purchase order. The student has now experienced the procurement process. The same student can then switch roles and be required to work as the auditor of a company who is now testing purchase orders for appropriate signatures.

Financial Statement Analysis

In a financial statement analysis course, students can be required to analyze a public company with the goal of recommending to a hypothetical client whether stock from a company should be purchased. Students would be required to compute various financial statement analysis ratios and key figures. To emphasize the importance of not relying solely on historical information, AR can be used to interject current events in real time while students are analyzing the numbers. For example, assume a student wears AR smart glasses that are connected to business news updates and stock market reports, all in real time, while analyzing a company's ratios. Assume the news flash announces that the company is attempting to unionize. Alternatively, assume a student is analyzing a company that is already unionized, and a news flash is superimposed onto their ratios, stating that the company could not reach a deal during union contract negotiations and the union employees voted to strike. The professor can encourage the students to consider relevant news when making their final recommendation.

In balancing costs against the effectiveness of the exercise, this exercise may be an example where, if AR is only used in such a setting, the costs will not outweigh the benefits because the limited use would be more difficult to scale as was observed in Farra et al. [2019]. However, stretching the use of the systems to more classes and more scenarios would reduce the cost per student and lead to instructors finding more useful cases and ways to implement the programs.

Tax Research

A tax research course could use AR in a role-playing simulation tax audit case, with one student playing the role of the taxpayer being audited and another playing the role of the internal revenue agent. Both students would be given AR headgear, such as glasses or goggles, and they would have the ability to access tax laws from this headgear. In the beginning, the instructor would present the facts of the case, and each student would have to defend their position. The other students in the class would also have the same headgear and act as the jury evaluating which student gave the better argument for their position. The instructor would play the role of the judge and, based on the decision rendered by the jury, decide on what, if any, penalty should be rendered in the case.

This assignment presents another situation where the role-playing exercise could be conducted without AR. However, it would be more challenging for students to quickly access tax laws without the support of AR during the exercise. Although using AR in this specific scenario might not offer enough advantages

to justify the costs, it could still be advantageous if AR is integrated into a sufficient number of sections to maximize its cost effectiveness.

Costs and Implementation Challenges

We have highlighted the benefits of implementing AR and VR into the accounting curriculum, and like any business analysis, this analysis would be incomplete without a discussion of costs. Cost is likely to be the most significant barrier for colleges and universities seeking to apply AR and VR.[2] Although the hardware component costs have declined considerably in recent years, they still require up-front expenditures. Meta's Quest 3 VR headset currently retails for $299 at large retailers (see for example, Target.com and Amazon.com), whereas one of Apple's most advanced AR hardware offerings in production is estimated to cost at least $10,000 just to produce (Vice, 2024). To effectively apply many of the strategies we present in this paper, multiple headsets with the ability to sync would likely be necessary, pushing the hardware cost into the thousands.

Many departmental or college budgets do not contain flexibility to make such investments without outside funding. A study funded by the National Institutes of Health (NIH) found that the cost to implement a single VR-based training program for virtual interviews amounts to $25,482 [M. Smith, Graham, Sax, Spencer, Razzano, J. Smith, and Jordan, 2020]. Most of this cost went to labor costs for the design meetings, material preparation, and staff training [Smith et al., 2020]. These costs likely represent the upper bound because this program was specifically designed for a select subset of users and had to be fully customized. An accounting application could be prepared in a more off-the-shelf manner and created for use across programs. Jordan Gutt, Director of Operations of Foretell Reality, explains how technological advancements over the past decade have resulted in better-quality delivery in a more cost-efficient manner. VR hardware is now considered "standalone," incorporating all necessary components into a single head-mounted display, whereas in the past the hardware needed to be "tethered to a computer with a high-performance graphics card, enabling software developers to deploy their experience into a classroom setting with greater ease and scalability than was possible before" [Personal communication, March 14, 2024].

Despite the initial cost, like the cost analysis in Farra et al. [2019], it is easy to see how using this program across courses and across periods (e.g. semester, quarter, etc.) could easily come down to a relatively low fee per student when scaled. In just three courses, Farra et al. [2019] brought the cost of a VR session to half that of a live session. Ketron et al. [2024] provide fixed and variable cost information for the creation of a "VR coffee shop simulation" project implemented at the University of St. Thomas, in a dedicated space as part of the MS in Management program. The development of this project totaled approximately $201,000. A significant portion of the cost was the

technical build, amounting to $142,000. Meta-quest 3 headsets made up the most significant variable costs, totaling approximately $21,000. As a result, Ketron et al. [2024] expect future VR simulations to be significantly less expensive because most of the developmental work has already been done.

Costs could be further spread if the costs could be shared across departments or across the entire college. For instance, the accounting and finance departments could share costs for a financial statement analysis VR program, whereas an entire college of business would benefit from a soft skills program. A college of business could create a VR/AR lab, with an administrator who oversees the lab and students who assist with the operations of it. For example, the administrator would decide when this lab would be open, and student aids would be stationed in the lab to assist students with accessing a VR simulation. The college could raise money and name the lab after the donor. By doing this, students can solve VR/AR projects outside of class time.

However, even in a shared cost setting, the costs may still be too prohibitive for some programs. Given that limitation, we propose alternative funding structures for them. The two studies [Farra et al., 2019; Smith et al., 2020] mentioned herein that directly identified costs of VR and AR implementation were funded by governmental grants through the NIH. Recognizing that governmental grants are not guaranteed and require a lengthy application and vetting process, such grants may be a source of funds. In 2022 the University of North Carolina Greensboro received $1.8 million from the National Institutes of Standards and Technology (NIST) to develop AR interfaces for use by first responders [Shivaji and Keri, 2022]. In a separate grant, $9.7 million was awarded to another group of higher education institutions [NIST, 2021]. The opportunities clearly exist but would likely require coordination with the accounting department and the university's grants division.

Another option to obtain funding is seeking outside donations from public accounting firms or other businesses, an area in which the authors' business school has had success. Firms such as KPMG are already actively employing VR and AR in audits [Bishop, 2020]. Therefore, any training done at the college level has a direct benefit to the students' future employers. With states shifting away from a 150-hour to 120-hour requirement, the more hands-on training students have will save firms' training costs once the students are hired as employees. All avenues with existing accounting firm relationships should be explored because the most likely solution for many institutions will be a combination of funding avenues.

LIMITATIONS AND FUTURE RESEARCH

A few issues need to be considered when using VR and AR. Privacy is a significant issue [Kohnke, 2020; KPMG, 2022a] because any actions taken inside a virtual setting are trackable, including, but not limited to, what the

user decides to focus on in a VR environment, how long the student looks at something, and how users behave within that environment [KPMG, 2022a].

Also, VR and AR can result in problems such as eye strain, motion sickness, and physical injury [Kohnke, 2020; PwC, 2017]. These physical problems are especially relevant when using inferior, less costly VR equipment. In addition, equipment, such as goggles, headphones, and helmets, can be costly to implement [Kohnke, 2020; Odeleye, Loukas, Heartfield, Sakellari, Panaousis, and Spyridonis, 2023; PwC 2022; Sokolov, 2023]. For example, PwC [2022] reports that VR education is estimated to be more cost-effective than classroom or online learning when taught to larger groups. However, the initial cost of VR learning material can be almost 50 percent more than that of traditional classroom or online learning material. As a result, to achieve economies of scale, PwC [2022] states that it is important to have enough learners to be cost-effective.

VR and AR can be combined into one digital platform, blurring the differences between VR and AR. Although beyond the scope of this article, readers should note that in addition to VR and AR, accounting firms are starting to take advantage of the metaverse, which some refer to as a form of combined virtual and augmented reality [Gaetano, 2022]. The metaverse can be viewed as a merging of the physical and virtual worlds, allowing individuals to interact with each other in innovative ways [KPMG, 2022a, 2022b]. The Information Systems Auditing and Control Association (ISACA) describes gaming, work, education, entertainment, and commerce as some of the ways in which the metaverse will be used and foresees a work environment in the virtual world because of the metaverse. For example, the metaverse, as suggested by ISACA, may help overcome the obstacles of a remote audit by providing the appropriate environment for an auditor to effectively engage with their client and carry out the audit processes [Davis, 2022]. The metaverse opens new opportunities for accounting educators [see, for example, Qasim, El Refae, and Eletter, 2023]. Researchers are encouraged to explore how the metaverse can be used to enhance accounting education.

Furthermore, because the purpose of this article is to raise awareness of how VR and AR can be used to enhance accounting education, it is beyond the scope of this paper to discuss how the simulations would be designed or operationalized, including classroom dynamics and physical space. The authors recognize that a common goal of a classroom setting is to keep all students engaged and participating. If only a limited number of students are using AR or VR, it is incumbent on the instructor to find tasks or activities for the non-participating students. Although it is beyond the scope of the article to provide detailed logistics of how to implement VR and AR into classes, the authors believe that a layered approach to AR and VR would alleviate some concerns about class participation. In this approach, students using one of the accounting education cases we present could work in groups, each at different stages in

the activity, so that while one group is using the AR or VR program, others could be in planning or discussions. Classroom operational decisions will likely be dependent on the design of the AR or VR application, the amount of required hardware available, class size, and time commitment to the assignment. Additionally, if students are physically moving while solving a problem using VR and AR, enough space must be provided to enable the students to move easily and safely as users replicate a real situation, such as walking or swinging one's arm, a concept referred to as VR locomotion [Boletsis and Cedergren, 2019]. If a VR/AR lab is integrated into the business building and is equipped with multiple VR/AR stations, then VR/AR projects can be completed by students outside class time. This arrangement would result in the need for someone such as an administrator or faculty member to oversee the lab and staff it with one or more people, which would require some training. With adequate supervision, graduate assistants or student aides could be trained to assist students with logistics in the lab. We leave such operational applications to future researchers.

The authors encourage papers relating to the actual design and implementation of VR and AR simulations for accounting education. For example, this paper provides examples of how VR and AR can be used in specific accounting courses. It would be beneficial to design VR and AR simulations for accounting classes that incorporate these examples and assess the learning outcomes and student satisfaction in such classes. Also, research addressing how VR and AR could be used to improve online accounting education and comparing student satisfaction in an online accounting course that uses VR and AR versus one that does not would be informative.

CONCLUSION

VR and AR can be used to provide more interesting, effective, and practical learning. The promise of VR and AR finally matches the technology available. Assuming cost concerns can be addressed, failure to use such a powerful tool in accounting education and training may be viewed as a missed opportunity to engage learners and employees alike in hands-on learning in a low-risk, secure environment. Educators should seek practical ways to embrace the technology to connect theory to practice. Firms and corporations should embrace the technology to offer training in a low-risk and safe environment where the accountant is free to make mistakes and learn without harming revenues or the reputation of a client.

VR and AR do not come without their costs or risks. Hardware is costly, and designing entire programs from the ground up can push development and implementation costs into thousands of dollars. But many of the costs are scalable and can be applied to future classes of students, periods, and courses.

Given the benefits of experiential learning opportunities in accounting, VR and AR should be considered valuable tools—for firms and colleges alike—that allow learners to bridge the gap between what they learn in the classroom and what they will do in practice. Studies have shown that the best way to learn is by doing [Hackathorn et al., 2011; Martin, 2000]. As Xun Kuang, a Chinese philosopher from the third century, stated, "Tell me and I will forget; teach me and I may remember; involve me and I will learn" [as cited by PwC (2017), p. 20].

NOTES

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Appendix
Select Students Comments from Buckless, Krawczyk, and Showalter[2014], p. 402]
The opportunity to do a physical inventory count was very informative and provided 'hands on' experience that we would not otherwise get from an academic setting.
It presented a number of subtle issues that do not typically emerge in academic studies but which are more practical. It encouraged me to think outside of the academic sphere and more on how those concepts can be applied in a practical scenario.
The most beneficial portion of the project was the simulation of meeting with a client. I'm not sure I handled it as effectively as I would have hoped, but it was definitely a helpful, immersive experience that allowed us to make mistakes without quite the pressure of a real-world engagement.
For somebody that had no experience with an audit internship or relevant work experience, I found all of it to be very beneficial.
It was good to have to conduct our own three-way match [of the bills of lading, shipping documents, and invoices] and deal with client paperwork. I'm glad to have had the chance to see examples of those before joining the profession.
I am by no means a fan of Second Life, but being able to go in and actually take a count was good experience. I will feel more confident when I begin work. Also having an interview with a 'client' was good experience for those who have not been able to do that.

Measuring Readability: An Integrated Writing Assignment for Business Students Using Generative AI and the SEC Plain English Guidelines

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This paper proposes a writing assignment wherein students analyze and rewrite public Securities and Exchange Commission (SEC) documents using AI tools, resulting in plain English documents. Literature research identified skills valued by employers, including written communication, critical thinking, and digital/AI literacy skills. Students are introduced to AI readability tools and measures, the 2010 Plain Writing Act, SEC handbook, sample original SEC filings, and model rewritten samples. This process helps students develop skills in critical thinking, reading, writing, and digital literacy using AI tools to determine readability and clarity for investor use, while increasing familiarity with industry filings.

Keywords: AI, artificial intelligence, communication, critical thinking, digital literacy, generative artificial intelligence, integrative learning, plain writing, the Plain Writing Act of 2010, readability measures, SEC, Securities and Exchange Commission, writing
Disciplines of Interest: Finance, Accounting, Legal Studies, Communication

INTRODUCTION

The Carnegie Foundation explains integrative learning as connecting knowledge from multiple fields and sources, applying theory to practice using divergent and/or contradictory points of view, and helping students understand issues in context [Taylor Huber and Breen, 2007]. The goal of universities and colleges is to provide learning environments in which students graduate as

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well-rounded, educated individuals who add value and lead innovation in the workplace. Decades of feedback from employers call for college graduates who can think critically, who can communicate clearly in writing, and who are able to apply classroom theories and knowledge to real world applications per industry demand. These skills remain in demand today. In 2021 the American Association of Colleges and Universities (AAC&U) noted the importance of writing, finding that data-driven and technology-enabled jobs require 50 percent more writing and research skills and 40 percent more problem-solving skills [Flaherty, 2021]. In 2024, the National Association of Colleges and Employers (NACE) 2024 Job Outlook survey asked employers to identify the top characteristics and skills of job candidates. In response, employers identified critical thinking, communication, teamwork, problem-solving, written communication, and a strong work ethic [NACE, 2023, 6].

This paper proposes an integrated learning assignment wherein students improve their critical thinking, reading, writing, and digital literacy/AI skills while becoming familiar with SEC documents used by investors. Students are introduced to AI readability measures and tools along with the 2010 Plain Writing Act, the Securities and Exchange Commission (SEC) handbook, sample SEC filings, and models of rewritten samples in plain writing for review and discussion. The purpose of this assignment is for students to improve their writing and critical thinking skills by analyzing and rewriting public documents in plain writing, while gaining new skills in generative AI tool use. This assignment integrates historically technical documents with current technology for more readable documents while students practice skills that employers seek.

LITERATURE REVIEW

Written Communication and AI Generative Tools

Written communication, analytical, and technical skills remain at the top of employers' lists when evaluating job candidates. In the 2024 NACE Job Outlook 2024 survey, two-thirds of employers responded that they seek students who possess written and verbal communication skills along with technical skills [Gray, 2024]. The 2023 AAC&U employer survey found employers looking for skills that include written communication skills and digital literacy [Finley, 2023, 2]. After the public release of ChatGPT in November 2022, business use of generative AI (GenAI) is anticipated to grow over 37.3 percent between 2023 and 2030 [Haan, 2023]. Although 35 percent of businesses are concerned with employees having the technical skills to use AI effectively, over half of businesses believe that AI tools will improve the quality and creativity of texts while also increasing employee efficiency [Haan, 2023]. Gartner predicts that many jobs will not be replaced by GenAI but that jobs will be

redesigned to incorporate GenAI tools that will increase the impact on text from 10 percent in 2023 to 70 percent in 2025 [McRae Aykens, Lowmaster, and Shepp, 2024; Turner, 2024]. Based on this increased use of GenAI in the workplace, Gartner notes that this new technology requires new skills, and employees who have the skills to use AI tools will likely be higher-performing employees in comparison with those who lack AI skills [Cain, White, Greene, Trueman, Verma, and Schwartz, 2024]. Teaching students the skills necessary to use, understand, and appropriately and ethically apply GenAI tools will help them navigate and succeed in the AI business world.

According to a survey by Bernoff [2016], 81 percent of employers believed they wasted approximately 25.5 hours per week reading poorly written and organized material filled with jargon. Poor writing harms employers in lost time, money, productivity, and market share. Craig [2022] estimates that Bernoff's estimate of lost time in 2016 translated into $400 billion in lost dollars in 2021-2022. GenAI tools can help reduce this loss in productivity. Higher education institutions can improve students' writing with both AI tools and real-world examples. Craig [2022] suggests work-integrated learning in which courses incorporate real writing assignments from employers to help students become proficient writers and make strides in understanding relevant industry specific culture and norms.

Plain Writing: The Evolution in United States Government Documents

The drive for plain writing/plain language use in government and business documents has grown from the early 1900s through the present. K. A. Schriver [2017] reviewed the evolution of the use of, and requirement for, plain writing in government and business through a literature survey from 1940 through 2015. Schriver [2017] noted that business and government communication is usually in a style that is deliberate, with pragmatic goals of ". . .understanding, decision-making, learning, analyzing, following procedures, assessing risk, and taking action." This style, however, does not mean that government and business writing is clear or understandable to the public.

The Plain Writing Act of 2010 [U.S. Congress, 2010] sought to address this gap by requiring U.S. government documents and agency-generated documents to be written in plain language to allow the audience to understand immediately and not require constant re-reading relistening, or additional research. The Plain Writing Act [2010] defines plain writing as, "Writing that is clear, concise, well-organized, and follows other best practices appropriate to the subject or field and intended audience." In 2011, the Plain Language Action and Information Network (PLAIN) [Plain Language Action and Information Network] issued guidelines for submitting documents to the federal government and federal agencies [Federal Plain Language Guidelines]. Schriver [2017] notes the purpose of the Plain Writing Act of 2010 is to

require federal agencies to be more accountable to the public by communicating more effectively. Given the importance of plain writing to potential investors, and costs incurred by businesses when plain writing is not used, students in all fields would benefit from learning how to write in plain language prior to arriving in the workplace and benefit from learning generative AI tool skills that are, and will be, used in business.

Plain Writing in Publicly Filed Investment Documents and the SEC Response

The stock market crash of 1929, the Securities Act of 1933 [U.S. Congress, 1933] and the 1934 Securities and Exchange Act [U.S. Congress, 1934] were enacted, and the Securities and Exchange Commission (SEC) was created to protect investors in the stock market. The purpose of the Plain Writing Act of 2010 is to make it easy for the public to understand government documents, including those documents filed with the SEC. The SEC [1998] was ahead of the U.S. government in adopting plain language when it adopted its first plain writing handbook in 1998 with SEC Rule 421(b) [U.S. Securities and Exchange Commission, 1998a] requiring prospectus to be clear, concise, and understandable. SEC Rule 421(d) [U.S. Securities and Exchange Commission, 1998b] requires the entire prospectus, including organization, tables, covers, summary, and risk factors sections, to be in plain English. The six writing principles required by the Rule are: 1. Short sentences; 2. Definite, concrete, everyday language; 3. Active voice; 4. Tabular presentation or bullet lists for complex material, whenever possible; 5. No legal jargon or highly technical business terms; and 6. No multiple negatives. [U.S. Securities and Exchange Commission, 1998b].

The goal of documents filed with the SEC is for the reader to understand, apply, use, and trust the information when making informed investing decisions [Schriver, 2017]. Writers of documents filed with the SEC, or writers of documents generated by the SEC, can use AI-generated readability tools to ensure that documents are written in plain language that potential investors can trust they are making the best decision available to them at the time the document is read [Ricci and O'Sullivan-Gavin, 2022].

Artificial Intelligence Readability Tools

Artificial intelligence (AI) readability tools analyze written documents for ease of reading and for levels of readability based on commonly accepted education grades in the United States. There are many software programs that can analyze documents for ease of reading and level of understanding. Some readability tools are built into existing computer or telephone software. Other readability tools, such as Grammarly [Grammarly Inc.], are available for free or purchase as application downloads or software plugins and offer their own

versions of readability formulas derived from original formulas such as the Flesch Reading Ease Readability Formula ["Flesch Reading Ease Readability Formula"], the Flesch Kincaid Grade Level Readability Formula ["Flesch Kincaid Grade Level Readability Formula"], and the Gunning Fog Index Readability Formula ["Gunning Fog Index Readability Formula"]. Other popular readability programs include the SMOG Index ["SMOG Readability Formula"], the Automated Readability Index ["Automated Readability Index"], and the Linsear Write Formula used by the U.S. Air Force ["Linsear Write Formula"]. Today's AI-generated readability tools often go beyond word, syllable, and sentence-length counts and can check for spelling, grammar, tone, ease of reading, accessibility, grade level, clarity, and understandability.

Although AI readability tools can check for technical writing, generative AI has several drawbacks, including data bias/discrimination, inequity, data security, and privacy, legal and ethical issues, and questions of reliability and accuracy. When relying on these tools, writers must be aware of all these issues, but the issues of accuracy and reliability are major concerns when prompting generative AI tools to create text content. GenAI tools often create "hallucinations," or "... output that is nonsensical or altogether inaccurate." [IBM Data and AI Team] These results can be due to missing data sets or information missing from the GenAI tool's database. Students must learn not only how to correctly prompt a GenAI tool, but also how to assess GenAI output to discern whether the information is accurate and can be relied on.

THE INTEGRATED WRITING ASSIGNMENT

This innovative, integrated writing assignment has students analyze documents filed with the SEC to determine why those documents are unclear or unreadable, and to learn how AI-generated readability tools can improve those documents (See Appendix A for the assignment and sample rubric). The instructor reviews and discusses the purpose and requirements of the Plain Writing Act and the importance of clear writing in the business world for both employability and for decision-making. How to use current AI readability tools is reviewed, and the instructor explains how readability and reading level are determined based on the audience. Students then review three original SEC filings and apply the AI tools to determine the documents' original readability and reading levels. Using the identified AI tools, students will then rewrite the documents for readability and understandability at identified reading levels and explain their AI prompts and iterations. Students are provided with a grading rubric to help them understand instructor expectations and to receive instructor feedback. (See Appendix B for the assignment directions, grading rubric, three sample original SEC documents, and three sample documents rewritten with ChatGPT2).

Discussion

Writing clearly is a skill that improves upon repetition. In this assignment, students improve their writing skills as they revise documents that are poorly written and do not comply with the Plain Writing Act into documents that the student and the public can understand. Students also learn how to use AI-generated readability tools and interpret output for reliability and accuracy, thereby enhancing their AI/digital literacy skills. Business students, those interested in investing in the market in the future, or both, will gain valuable experience in analyzing complex documents for knowledge and application, while rewriting for understandability. Introducing students to existing SEC documents (e.g.: initial public offerings, quarterly reports, Form 10-K, Form 10-Q, Form 8-K, the proxy statement, etc.) will enable students to connect course materials to SEC filings while improving understanding and knowledge and improving critical skills in high demand in the workplace: critical thinking, reading, writing, and digital literacy for integrated problem-solving. Reading, analyzing, and rewriting these SEC documents will help students become familiar with how documents are written in the business world and further students' understanding and application of course content and implications for investment opportunities. Students will also be able to apply these skills in other courses where written assignments are required, in their personal lives, and ultimately when they are employed. [Krsmanovic, 2021]. This model assignment involving analysis, modeling, and student application can be integrated into any discipline where publicly filed documents can be accessed or other publicly presented information is available. Instructors can also divide students into groups to review and discuss chosen documents, use of AI-generated tools, and assignment outcomes and then come back together as a class to discuss common findings and questions, reinforcing the learning goals of the assignment. Instructors can also modify this assignment to meet various other instruction methods suggested by Angelo and Cross, Classroom Assessment Techniques: A Handbook for College Teachers [Angelo and Cross, 1993].

CONCLUSION

This integrated learning assignment engages students using modeling, reading, writing, critical thinking, and application of technology skills. Rewriting real world documents in plain language helps students improve their skills in reading, writing, analysis, applying learned concepts, and demonstrating knowledge gained. This assignment also closes the gap between classroom instruction and the application of relevant real-world business information and skills. With the anticipated growth of AI, it is imperative that higher education

instructors begin to investigate how to constructively add AI literacy into courses. The authors encourage instructors and researchers to examine our assignment design and delivery for application and relevancy while informing and encouraging ongoing development as an effective instructor. This assignment also furthers the discussion and analysis of effective teaching methods and improving student learning outcomes in critical thinking, reading, writing, and digital literacy skills.

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Appendix 1: Plain Writing Assignment: Analyze and rewrite an SEC document as per the Plain Writing Act using AI generated readability tools.

DESCRIPTION

Analyzing and rewriting SEC documents for plain writing and understanding using AI-generated readability programs.

GRADING

____% of grade**;** see Grading rubric

AUDIENCE

The public, investors, instructor

DATE DUE

Learning Outcome Objectives

1. to familiarize students with reading and understanding SEC filings and to help students make the connection between course material and business applications.
2. to introduce students to the Plain Writing Act of 2010, its application to SEC filings, and the need for clearly written understandable documents.
3. to introduce students to AI generated readability programs,
4. to help students improve:
    a. critical thinking skills,
    b. reading skills,
    c. written communication skills,
    d. AI technology skills/digital literacy skills, and
    e. ability to connect course material to real world applications.

Assignment Instructions

Instructor Note: Place in LMS prior to class meeting: Plain Writing Act of 2010; selected SEC assignment examples—original and rewritten; information and examples of generative AI readability tools; document samples list for students to choose from; links to The Plain Language Group, Checklist for Plain Language: https://www.theplainlanguagegroup.com/resources. Add additional documents per individual instructor [Center for Plain Language].

Students are to:

- ▶ Review course materials on Plain Writing, SEC samples—original and rewritten, and AI-generated readability tools.

- ▶ Download and review the selected sample documents for rewriting; choose one.

- ▶ Use the selected readability program to determine the ease of reading/understandability of the document. Note the readability score and the readability program used. What were three (3) main readability/understandability issues you identified after this analysis?

- ▶ Rewrite the document using an AI-generated tool (ChatGPT, Perplexity, or Claude, for example), to reflect plain language/writing. Your goal is to achieve a readability level of grade 9–11. (The authors chose Grade 11, given that U.S. high school students may legally leave school at 16 years of age).

Format

Submit your findings to the [LMS] assignment using the format below; include the original and rewritten documents. Remember to include the prompts you used in the AI generated tool and to hyperlink to all sources used:

Name and date prepared:
Original document Title:
Original document readability score and program used for analysis:
Analysis/findings – Original document – three (3) fundamental issues:
Rewritten document: rewrite the document to achieve 9–11 grade level reading:
Rewritten document readability score and program used for analysis:
Prompts used in AI-generated tool:
Analysis/findings – AI revised document – three (3) fundamental issues:
Conclusion: What did you learn? Explain in one full paragraph; include two (2) recommendations.

Plain Writing Assignment Sample Grading Rubric

Below is a sample grading rubric for this plain writing assignment. Instructors can use this rubric or create their own rubric, including using the guidelines provided at https://centerforplainlanguage.org/awards/clearmark/criteria, or create a rubric with the assistance of a GenAI platform.

Criteria	Needs Improvement	Competent	Excellent
	0–1	**2–3**	**4–5**
Document Identification	Missing	Incomplete Identification of Document	Full Identification of Document
Initial Readability Analysis: Program and level?	Missing	Partial	Complete
Analysis/findings	Missing	Partial	Complete
Rewritten / analysis: identification of AI tool and readability level of rewritten document. AI prompts provided. Spelling check? Grammar check?	Numerous errors distract from meaning of document (grammar, punctuation, usage, spelling); missing AI prompts; incomplete analysis.	Some errors do not distract the reader (grammar, punctuation, usage, spelling); some AI prompts are provided; partial analysis.	Grammar, punctuation, usage, and spelling enhance paper quality as to plain writing; all AI prompts provided; thorough analysis.
Conclusion—Recommendations—What learned?	Conclusion is missing or unclear; missing recommendations; missing What learned?	Conclusion is clear; most key issues in document writing style are summarized; some recommendations made; What learned? discussed.	Excellent conclusion: key issues summarized; provided recommendations; What learned? discussed.

Appendix 2: Sample Original and Revised Documents

Note: The largest sectors in the S&P 500 are technology, healthcare, and finance. Accordingly, the authors chose one company from each sector: Technology: Microsoft; Healthcare: JNJ; Financials: Visa. Assignment: Rewrite at grade 11 reading level.

Sample #1 Original Document: MICROSOFT 10K
(FRE = 17.7; FKGL = 17.2—determined using the Editor tool in Word)

Industry Trends

Our industry is dynamic and highly competitive, with frequent changes in both technologies and business models. Each industry shift is an opportunity to conceive new products, new technologies, or new ideas that can further transform the industry and our business. At

Microsoft, we push the boundaries of what is possible through a broad range of research and development activities that seek to identify and address the changing demands of customers and users, industry trends, and competitive forces.

Economic Conditions, Challenges, and Risks

The markets for software, devices, and cloud-based services are dynamic and highly competitive. Our competitors are developing new software and devices, while also deploying competing cloud-based services for consumers and businesses. The devices and form factors customers prefer evolve rapidly, influencing how users access services in the cloud and, in some cases, the user's choice of which suite of cloud-based services to use. Aggregate demand for our software, services, and devices is also correlated to global macroeconomic and geopolitical factors, which remain dynamic. We must continue to evolve and adapt over an extended time in pace with this changing environment.

The investments we are making in cloud and AI infrastructure and devices will continue to increase our operating costs and may decrease our operating margins. We continue to identify and evaluate opportunities to expand our datacenter locations and increase our server capacity to meet the evolving needs of our customers, particularly given the growing demand for AI services. Our datacenters depend on the availability of permitted and buildable land, predictable energy, networking supplies, and servers, including graphics processing units ("GPUs") and other components. Our devices are primarily manufactured by third-party contract manufacturers. For the majority of our products, we have the ability to use other manufacturers if a current vendor becomes unavailable or unable to meet our requirements. However, some of our products contain certain components for which there are very few qualified suppliers. Extended disruptions at these suppliers could impact our ability to manufacture devices on time to meet consumer demand [Microsoft, 2023].

Sample #1 Revised Original Document Using ChatGPTv2: MICROSOFT 10K (FRE = 65.4; FKGL = 8.4—determined using the Editor tool in Word)

Industry Trends

In our industry, things change fast, and there's a lot of competition. This means new technologies and ways of doing business are always popping up. But instead of seeing this as a problem, we see it as a chance to come up with cool new products, ideas, and technologies that can shake things up and make our business even better. At Microsoft, we're always pushing the limits of what's possible. We do tons of research and development to figure out what our customers want and how we can stay ahead of the competition.

Now, let's talk money. The markets for software, gadgets, and online services are always shifting, and there's a ton of competition out there. Other companies are always making new stuff, and they're also offering services similar to ours. What people like in gadgets and how they use online services changes quickly too. Plus, our sales are influenced by big things happening in the world, like the economy and politics. So, we've got to be ready to change and keep up with what's going on.

We're putting a lot of money into improving our online services and using artificial intelligence. This means our expenses are going up, and we might not make as much money as before. We're also working on expanding our data centers and making sure we have enough servers to handle all the new stuff people want to do with AI. But building these data centers depends on things like having enough land, energy, and supplies, which can sometimes be a challenge.

When it comes to making our gadgets, we mostly rely on other companies to do the manufacturing. If one of these companies can't make what we need, we can usually find someone else to do it. But for some parts of our gadgets, there aren't many options out there. If something goes wrong with one of these parts, it could slow down how fast we can make our gadgets and meet demand from customers.

Instructor Notes

document is unacceptably informal; substantially improved readability with lower reading level, but not necessarily improved understandability; uses unprofessional words like "stuff," "gadgets," phrases like "popping up," "a ton," "big things." It's not clear what the gadgets are.

Sample #1 Revised Original Document Using Claude 3.5 Sonnet: MICROSOFT 10K

(FRE = 18.3; FKGL = 15.6—determined using the Editor tool in Word)

The technology industry is fast-paced and fiercely competitive, with constant shifts in both technical innovations and business strategies. Each change in the industry presents an opportunity to develop new products, technologies, or concepts that can further revolutionize the sector and our company. At Microsoft, we strive to push the limits of innovation through diverse research and development initiatives aimed at anticipating and meeting evolving customer needs, industry trends, and competitive pressures.

Economic Conditions, Challenges, and Risks

The markets for software, devices, and cloud services are volatile and highly competitive. Our rivals continuously develop new software and hardware while also launching competing cloud services for both individual consumers and businesses. Customer preferences for devices and form factors change rapidly, influencing how they access cloud services and sometimes affecting their choice of cloud service providers. Overall demand for our products and services is also linked to global economic and geopolitical factors, which remain in flux. We must continuously adapt to this changing landscape over the long term.

Our investments in cloud infrastructure, artificial intelligence, and device development will continue to increase our operational expenses and may reduce our profit margins. We are constantly seeking and evaluating opportunities to expand our data center locations and increase server capacity to meet our customers' evolving needs, particularly given the growing demand for AI services. Our data centers rely on the availability of suitable land, reliable energy sources, networking infrastructure, and server components, including graphics processing units (GPUs). Most of our devices are manufactured by third-party contractors. For the majority of our products, we can switch to alternative manufacturers if a current supplier becomes unavailable or unable to meet our requirements. However, some of our products contain specific components with very few qualified suppliers. Extended disruptions at these suppliers could impact our ability to manufacture devices in time to meet consumer demand. https://claude.ai/chat/d8b34a22-1ec5-43de-a27e-5b996b423939

Instructor Notes

moderate improvement; higher grade level reading; not necessarily easier to understand; more format; professional tone; clear what product is; better outcome than ChatGPT2.0

Sample #2 Original Document: Johnson & Johnson (10K 2022)

(FRE = 16.5; FKGL = 16.3—determined using the Editor tool in Word)

ITEM 7. MANAGEMENT'S DISCUSSION AND ANALYSIS OF RESULTS OF OPERATIONS AND FINANCIAL CONDITION

Organization and Business Segments

Description of the Company and Business Segments

Johnson & Johnson and its subsidiaries (the Company) have approximately 141,700 employees worldwide engaged in the research and development, manufacture, and sale of a broad range of products in the healthcare field. The Company conducts business in virtually all countries of the world with the primary focus on products related to human health and well-being.

The Company is organized into three business segments: Consumer Health, Pharmaceutical and MedTech. The Consumer Health segment includes a broad range of products used in the Baby Care, Oral Care, Skin Health/Beauty, Over-the-Counter pharmaceutical, Women's Health, and Wound Care markets. These products are marketed to the general public and sold online (eCommerce) and to retail outlets and distributors throughout the world. The Pharmaceutical segment is focused on the following therapeutic areas, including Immunology, Infectious diseases, Neuroscience, Oncology, Pulmonary Hypertension, and Cardiovascular and Metabolic diseases. Products in this segment are distributed directly to retailers, wholesalers, distributors, hospitals, and healthcare professionals for prescription use. The MedTech segment includes a broad portfolio of products used in the Orthopaedic, Surgery, Interventional Solutions (cardiovascular and neurovascular), and Vision fields. These products are distributed to wholesalers, hospitals, and retailers, and used principally in the professional fields by physicians, nurses, hospitals, eye care professionals, and clinics.

The Executive Committee of Johnson & Johnson is the principal management group responsible for the strategic operations and allocation of the resources of the Company. This Committee oversees and coordinates the activities of the Consumer Health, Pharmaceutical and MedTech business segments.

In all of its product lines, the Company competes with other companies both locally and globally, throughout the world. Competition exists in all product lines without regard to the number and size of the competing companies involved. Competition in research, involving the development and the improvement of new and existing products and processes, is particularly significant. The development of new and innovative products, as well as protecting the underlying intellectual property of the Company's product portfolio, is important to the Company's success in all areas of its business. The competitive environment requires substantial investments in continuing research. In addition, the development and maintenance of customer demand for the Company's consumer products involves significant expenditures for advertising and promotion.

Management's Objectives

With "Our Credo" as the foundation, the Company's purpose is to blend heart, science, and ingenuity to profoundly change the trajectory of health for humanity. The Company is committed to bringing its full breadth and depth to ensure health for people today and for future generations. United around this common ambition, the Company is poised to fulfill its purpose and successfully meet the demands of the rapidly evolving markets in which it competes.

The Company is broadly based in human healthcare, and is committed to creating value by developing accessible, high quality, and innovative products and services. New products introduced within the past five years accounted for approximately 25 percent of 2022 sales. In 2022, $14.6 billion was invested in research and development reflecting management's commitment to create life-enhancing innovations and to create value through partnerships that will profoundly change the trajectory of health for humanity.

A critical driver of the Company's success is the diversity of its 141,700 employees worldwide. Employees are empowered and inspired to lead with Our Credo and purpose as guides. This allows every employee to use the Company's reach and size to advance the Company's purpose, and to also lead with agility and urgency. Leveraging the extensive resources across the enterprise enables the Company to innovate and execute with excellence. This ensures the Company can remain focused on addressing the unmet needs of society every day and invest for an enduring impact, ultimately delivering value to its patients, consumers and healthcare professionals, employees, communities, and shareholders [Johnson & Johnson, 2022].

Sample #2 – Revised Document Using ChatGPTv2: Johnson & Johnson 10K

(FRE = 61.5; FKGL = 8.7—determined using the Editor tool in Word)

ITEM 7. MANAGEMENT'S DISCUSSION AND ANALYSIS OF RESULTS OF OPERATIONS AND FINANCIAL CONDITION

Organization and Business Segments

Description of the Company and Business Segments

Johnson & Johnson and its branches (the Company) have around 141,700 workers all over the world. They're busy with making and selling lots of different healthcare products. The Company does business in nearly every country, mainly focusing on stuff that helps people stay healthy and feel good.

The Company is split into three parts: Consumer Health, Pharmaceutical, and MedTech. The Consumer Health part makes things like baby products, toothpaste, skincare stuff, and medicines you can buy without a prescription. They sell these things online and in stores all over the world. The Pharmaceutical part is all about making medicines for different health issues like infections, mental health, and heart problems. These medicines are mostly given with a doctor's prescription. The MedTech part makes things like tools for surgeries and vision care, which are used mostly by doctors and hospitals.

The big bosses of Johnson & Johnson, called the Executive Committee, are in charge of making big decisions about how the Company runs. They keep an eye on all the different parts of the Company and make sure they're working together well.

Johnson & Johnson has to compete with other companies everywhere. This means they have to work hard to make better products and come up with new ideas before their competitors do. They spend a lot of money on research to make sure they stay ahead. They also spend a bunch on advertising to make sure people know about their products.

The Company's main goal is to use science and compassion to make a big difference in people's health. They want to keep making new and better products that help people now and in the future. They spend a lot on research and team up with others to make this happen. They believe that having a diverse group of employees who believe in their goals is key to their success. Everyone in the Company is encouraged to work together to make sure they're doing their best to help people and make a positive impact.

Instructor Notes: easier to read but unprofessional, using "a bunch," "stuff," "big bosses," "all about," "a lot." Some meaning lost (given with a doctor's prescription). Very low-level reading.

Sample #2 – Revised Document Using Claude 3.5 Sonnet: Johnson & Johnson 10K

(FRE = 32.4; FKGL = 12.1—determined using the Editor tool in Word)

Johnson & Johnson Overview

Johnson & Johnson (J&J) is a global healthcare company with about 141,700 employees worldwide. They focus on researching, developing, manufacturing, and selling products related to human health and well-being in nearly every country.

The company is divided into three main segments:

1. Consumer Health: Produces everyday items for baby care, oral care, skin health, over-the-counter medicines, women's health, and wound care. These are sold online and in stores worldwide.
2. Pharmaceutical: Develops prescription drugs for areas like immunology, infectious diseases, neuroscience, cancer, lung problems, and heart and metabolic diseases. These are distributed to healthcare providers and pharmacies.
3. MedTech: Creates medical devices for orthopedics, surgery, heart and brain treatments, and vision care. These are sold to hospitals, clinics, and healthcare professionals.

J&J's Executive Committee oversees these segments and decides how to use company resources.

The company faces strong competition in all its markets, both locally and globally. Research and innovation are crucial, as developing new products and protecting intellectual property are key to success. This requires significant investment in ongoing research. For consumer products, advertising is also important to maintain customer interest.

Company Goals and Values

J&J's purpose is to use a combination of compassion, science, and innovation to significantly improve global health. They aim to provide healthcare for current and future generations.

The company strives to create value by developing accessible, high-quality, innovative products and services. In 2022, about 25 percent of their sales came from products introduced in the previous five years. They invested $14.6 billion in research and development that year.

J&J values the diversity of its global workforce. Employees are encouraged to follow the company's "Our Credo" values and overall purpose. This approach allows the company to use its size and reach to advance its goals while remaining flexible and responsive.

By using its extensive resources, J&J aims to innovate and perform excellently across all areas. They focus on addressing unmet societal needs and creating lasting positive impacts. Ultimately, their goal is to deliver value to patients, consumers, healthcare professionals, employees, communities, and shareholders.

Instructor Notes

Moderate improvement; formal, professional tone and terminology; not necessarily easier to understand

Sample #3 – Original Document: VISA (10K)

(FRE = 1.3; FKGL = 20.9—determined using the Editor tool in Word)

ITEM 9A. Controls and Procedures

Evaluation of Disclosure Controls and Procedures

We maintain a system of disclosure controls and procedures [as defined in the Rules 13a–15(e) and 15d–15(e) under the Securities Exchange Act of 1934, as amended (Exchange Act)] that is designed to ensure that information required to be disclosed in our Exchange Act reports is recorded, processed, summarized, and reported within the time periods specified in the SEC's rules and forms and that such information is accumulated and communicated to our management, including our Chief Executive Officer and Chief Financial Officer, as appropriate, to allow timely decisions regarding required disclosures.

Under the supervision and with the participation of our management, including our Chief Executive Officer and Chief Financial Officer, we conducted an evaluation of our disclosure controls and procedures. Based on this evaluation, our Chief Executive Officer and our Chief Financial Officer concluded that, as of September 30, 2023, our disclosure controls and procedures were effective at the reasonable assurance level.

Management's Report on Internal Control over Financial Reporting

Our management is responsible for establishing and maintaining adequate internal control over our financial reporting. Management assessed the effectiveness of our internal control over financial reporting as of September 30, 2023 using the criteria set forth in Internal Control—Integrated Framework issued by the Committee of Sponsoring Organizations of the Treadway Commission (2013 framework). Based on management's assessment, management has concluded that our internal control over financial reporting was effective as of September 30, 2023.

The effectiveness of our internal control over financial reporting as of September 30, 2023, has been audited by KPMG LLP, an independent registered public accounting firm, as stated in their report which is included in *Item 8* of this report.

Inherent Limitations on Effectiveness of Controls and Procedures and Internal Control over Financial Reporting

Our internal control over financial reporting is designed to provide reasonable, but not absolute, assurance regarding the reliability of financial reporting and the preparation of financial statements in accordance with U.S. generally accepted accounting principles. There are inherent limitations to the effectiveness of any system of internal control over financial reporting. These limitations include the possibility of human error, the circumvention or overriding of the system and reasonable resource constraints. Because of its inherent limitations, our internal control over financial reporting may not prevent or detect misstatements and instances of fraud. In addition, because we have designed our system of controls based on certain assumptions, which we believe are reasonable, about the likelihood of future events, our system of controls may not achieve its desired purpose under all possible future conditions. Accordingly, our disclosure controls and procedures provide reasonable assurance, but not absolute assurance, of achieving their objectives. Projections of any evaluation of effectiveness to future periods are subject to the risks discussed in *Part I, Item 1A—Risk Factors* of this report.

Changes in Internal Control over Financial Reporting

In preparation for management's report on internal control over financial reporting, we documented and tested the design and operating effectiveness of our internal control over financial reporting. There have been no changes in our internal controls over financial reporting that occurred during our fourth quarter of fiscal 2023 that have materially affected, or are reasonably likely to materially affect, our internal control over financial reporting [Visa, 2023].

Sample #3: Revised Document Using ChatGPTv2: VISA (10K)
(FRE = 39.2; FKGL = 12.9—determined using the Editor tool in Word)

ITEM 9A. Controls and Procedures

Checking How We Handle Information

We have a system in place called disclosure controls and procedures. This system makes sure that all the important information we need to share in our reports is recorded, processed, summarized, and reported on time, as required by the Securities Exchange Act of 1934. It's important that this information is shared with our management, including the Chief Executive Officer and Chief Financial Officer, so they can make decisions on what needs to be disclosed. Our management, along with the Chief Executive Officer and Chief Financial Officer, looked into how well our disclosure controls and procedures were working. They concluded that as of September 30, 2023, everything was going well.

Making Sure Our Financial Reporting is in Check Our management is responsible for making sure our financial reporting is accurate. They used a set of criteria to assess how well our internal control over financial reporting was doing as of September 30, 2023. Based on their assessment, they found that everything was effective. An independent accounting firm, KPMG LLP, also checked the effectiveness of our internal control over financial reporting, as mentioned in their report in Item 8. Limitations on How Well Our Controls Work While we aim for our controls to be reliable, there are some limitations. Human error, people finding ways around the system, and resource constraints can all affect how well our controls work. So, even though our controls provide reasonable assurance, they might not catch every mistake or case of fraud. Changes in How We Handle Financial Reporting We looked at

how we handle financial reporting to prepare for our management's report. During the last part of fiscal 2023, there were no big changes that would have a significant impact on how we handle financial reporting.

Instructor Notes
Clearer than ChatGPT 2.0 revised Microsoft and J&J statements; still overly broad; vague —"everything was going well" . . . "no big changes. . .."

Sample #3: Revised Document Using Claude 3.5 Sonnet: VISA (10K)
(FRE = 35.6; FKGL = 12.5—determined using the Editor tool in Word)

Financial Reporting Controls and Procedures

We have a system to control how we share important financial information. This system makes sure we record, process, summarize, and report required information on time, as specified by the Securities and Exchange Commission (SEC). It also ensures our management, including our CEO and CFO, can make timely decisions about what to disclose.

Our management, led by the CEO and CFO, evaluated this system. They concluded that as of September 30, 2023, our controls were working effectively and providing reasonable assurance.

Management's Responsibility for Financial Reporting

Our management is responsible for maintaining good internal control over our financial reporting. They assessed how well this control system worked as of September 30, 2023, using guidelines set by the Committee of Sponsoring Organizations of the Treadway Commission. Based on this assessment, management concluded that our internal control was effective.

An independent accounting firm, KPMG LLP, has audited and confirmed the effectiveness of our internal control. Their report is included in Item 8 of this document.

Limitations of Our Control Systems

While our internal control system is designed to provide reasonable assurance about the reliability of our financial reporting and statements, it's not perfect. There are inherent limitations, including:

1. Possibility of human error
2. People might bypass or override the system
3. Resource constraints

Because of these limitations, our system might not catch all mistakes or fraud. Also, because we designed our controls based on certain assumptions about future events, the system might not work as intended in all future situations.

Therefore, our control systems provide reasonable, but not absolute, assurance of achieving their goals. How well they'll work in the future is subject to risks discussed in Part I, Item 1A of this report.

Changes in Financial Reporting Control

We regularly document and test how well our internal control over financial reporting works. During the fourth quarter of our 2023 fiscal year, there were no significant changes to our internal control that would likely affect our financial reporting.

Instructor Notes
better result; easier to understand professional terms and formal writing.

Toward an Agentic Future of Grading: Development and Evaluation of an AI-Powered Grading Application

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Higher education continues to grapple with how to effectively and ethically integrate AI into teaching and learning practices. In this study, we created an AI application that grades student essay-type exam responses by mirroring human faculty, generating both a numerical score and explanatory feedback. We evaluated its performance by comparing its output to the grades assigned by three faculty members. Results indicate strong positive correlations and moderate-to-good inter-rater agreement. We discuss how these findings inform the ethical and pedagogical integration of AI in higher education, emphasizing its potential to augment human educators in fostering student learning.

Keywords: Artificial Intelligence (AI), Automated Grading, Large Language Models (LLMs), Higher Education, Pedagogy, Student Assessment
Disciplines of Interest: Education, Information Systems, Business Education

INTRODUCTION

We stand at a pivotal moment for artificial intelligence (AI) adoption across diverse sectors, with organizations rapidly transitioning from experimental pilots to widespread deployment of "agentic AI." A recent KPMG report indicates that over half (51 percent) of organizations are currently exploring AI agents—tools capable of working independently, adapting in real time, and scaling AI capabilities throughout the enterprise [KPMG, 2025]. This shift toward adopting innovative AI brings with it both the promise of efficiency and the responsibility of ensuring robust oversight to maintain trust and encourage adoption. These characteristics are particularly true in higher education, where

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AI has immense potential to enhance learning but also carries significant ethical and pedagogical considerations [Dwivedi, Kshetri, and Hughes, 2023].

A significant number of opportunities are being explored for new AI agents in education, from personalized learning platforms to automated administrative tasks. There is also a pressing need for tools that directly address the everyday challenges faced by both students and faculty. For students, one such challenge is the limited access to immediate, personalized feedback on their work, often constrained by the availability of instructors, which is especially a problem in large classes [Carless, 2015; Gibbs and Simpson, 2005]. For faculty members, devoting time to give detailed feedback on assignments and exams can be a significant undertaking. AI has the potential to reduce the workload for faculty members by providing quick, accurate feedback to students on qualitative assignments.

This paper focuses on a specific, time-consuming academic task that holds significant instructional value: grading student essays. Essays provide a unique opportunity for faculty to evaluate higher-order cognitive skills such as argumentation, synthesis, and critical thinking [Bloom, Engelhart, Furst, Hill, and Krathwohl, 1956]. When students are asked to articulate reasoning, craft coherent arguments, and engage critically with complex scenarios, they move beyond memorization and demonstrate a deeper level of learning [Biggs, 1999]. Unfortunately, the benefits of essay-type assessments come with a substantial cost in faculty time and effort [Brown and Knight, 1994]. Unlike multiple-choice formats that can be scored instantly, essays demand close reading, nuanced interpretation, and the provision of individualized feedback. In large classes, the amount of grading can become overwhelming, leading to delays that not only strain faculty resources but also hinder students' ability to learn effectively due to the delay in receiving feedback [Hattie and Timperley, 2007].

Recent advances in AI, natural language processing (NLP), and large language models (LLMs)—such as OpenAI's ChatGPT, Google's Gemini, and Anthropic's Claude, to name a few—offer new opportunities. Grounded in transformer architectures [Vaswani, Shazeer, Parmar, Uszkoreit, Jones, Gomez, Kaiser, and Polosukhin, 2017], LLMs have demonstrated unprecedented abilities to understand context and generate humanlike text, revealing potential for more sophisticated—and pedagogically aligned—approaches to automated essay evaluation [Ramesh and Sanampudi, 2022]. Their ability to process meaning beyond surface-level features and adapt to various writing styles suggests that they may overcome many of the limitations of earlier essay grading systems.

This study investigates the feasibility of using a tailored LLM-based application to assist with essay grading. Specifically, we address the following research question: Can an AI-powered system, tailored with prompts that

reflect specific faculty expectations and grading criteria, assign essay scores that are statistically comparable to those of human faculty?

The answer to this question has significant implications for both pedagogy and efficiency in higher education. For students, an AI grading tool could be adapted to provide instant, personalized feedback on drafts, effectively replicating the guidance offered during faculty office hours, but would be available 24/7. This swift receipt of feedback could give students access to a knowledgeable agent familiar with their instructor's expectations, enabling iterative improvement and a deeper understanding of assessment criteria [Nicol and Macfarlane-Dick, 2006]. For faculty, such an application offers a potential solution to mitigate the time-intensive nature of essay grading, particularly in large-enrollment courses [Carless, 2015]. Use of an AI grading tool could even allow them to change their methods of assessment by allowing for alternative assignment designs, because many faculty may refrain from assigning essay-type assessments due to the significant time commitment involved in traditional grading approaches [Gibbs, 1999]. By potentially reducing some of the grading burden, this technology could empower faculty to explore more diverse and engaging assessment formats, ultimately enriching the learning experience.

As mentioned, we aimed to test whether an AI application could generate essay feedback and scores that are similar to those a faculty member would assign. The rest of the paper is as follows: first we present some background on the history of how AI has been used in education and how newer AI applications using modern LLM technology are being used. Then, we present our method for collecting data by having faculty and an AI system grade essay exams to test for comparison. After comparing the results, we discuss the implications of our findings and how they can benefit higher education's move to adopt more AI systems.

BACKGROUND

Traditionally, essay grading has been a manual, labor-intensive process, with educators dedicating significant time to reading, evaluating, and providing feedback on student work, often with inherent challenges in maintaining consistency and mitigating potential bias [Taskiran and Goksel, 2022; Hussein, Hassan, and Nassef, 2019]. Assessing writing skills is often avoided in large-scale exams due to difficulties in ensuring valid and reliable scoring, alongside the time and resource intensiveness of the process [Meye, Jansen, Fleckenstein, Keller, and Köller, 2023]. In response to these challenges, early Automated Essay Scoring (AES) systems emerged, such as Project Essay Grade (PEG) [Page, 2003], the Educational Testing Service's e-rater [Attali and Burstein, 2006], and Pearson's Intelligent Essay Assessor (IEA) [Landauer et al., 2003]. These systems sought to replicate human scoring by extracting linguistic and

structural features from text and mapping them onto predetermined scoring rubrics [Ramineni and Williamson, 2013]. However, these systems often relied on shallow NLP techniques, focusing on surface-level textual elements such as word counts and syntactic complexity [Ifenthaler, 2023; Hussein et al., 2019].

Despite their initial promise, early AES systems faced significant limitations. Their setup, calibration, and domain-specific tuning required extensive effort [Taghipour and Ng, 2016], and they struggled with complex rhetorical strategies, nuanced argumentation, or less formulaic writing [Ramesh and Sanampudi, 2022]. Their reliance on easily quantifiable features sometimes incentivized test-takers to produce verbose but shallow content, effectively "gaming" the system [Perelman, 2014]. Furthermore, the rigidity of these systems and their dependence on predefined scoring rubrics could perpetuate biases and fail to adapt to new content areas or evolving educational standards. These systems also struggled with the lack of domain knowledge-based evaluation in essays [Ramesh and Sanampudi, 2022]. This inflexibility limited the broader applicability of early AES technology in diverse educational settings. Any shifts in disciplinary focus, student demographics, or curricular objectives often required a substantial recalibration or retraining of the model—a significant undertaking that further reduced their practicality for a wide range of educational contexts.

The emergence of large-scale LLMs has created an opportunity to overcome many of these historic shortcomings. These models, often based on the transformer architecture introduced by Vaswani et al. [2017], are capable of more context-sensitive understanding and can generate sophisticated textual analyses. Unlike traditional feature-based approaches, LLMs learn from extensive, heterogeneous corpora and can infer more subtle patterns of meaning, style, and even context [Dwivedi et al., 2023]. The transformer architecture, the underlying architecture of LLMs, are deep learning models designed for sequential data, combining the strengths of CNNs and recurrent neural networks (RNNs) [Mizumoto and Eguchi, 2023]. This breakthrough has led to the development of notable LLM-based systems, including OpenAI's ChatGPT, Google's Gemini, and Anthropic's Claude. These models have demonstrated remarkable capabilities in generating humanlike responses, complex reasoning, and even domain-specific knowledge [Manohar and Prasad, 2023].

The rise of transformer-based LLMs creates potential for more flexible and semantically rich essay evaluations, potentially bridging the gap between the mechanical scoring of earlier AES systems and the nuanced judgment of human graders. LLMs can often be adapted to new contexts simply by adjusting the prompting strategies, thereby reducing the time and labor needed for calibration. This change in modality enables faculty members to model the LLM-based grading to fit in the context of their class, enabling professors to customize their feedback, such as expected answers on an exam, without further intervention from technical staff. This adaptability, combined with the models' capacity to evaluate essay content more holistically, positions LLM-based grading as a promising next step in the evolution of AI-assisted educational assessment. For example, a single faculty member can provide the model

with a relevant prompt, rubrics, or sample answers that reflect their specific course objectives. By doing so, the LLM can tailor its assessment to the demands of a given class or assignment, improving accessibility for educators who lack the institutional resources or willingness to undertake complex training processes. The ability to use general-purpose models for this type of grading is only possible through recent innovations in generative AI such as ChatGPT. Because of this, there are relatively few research papers using these general-purpose models to automate grading. Our work leverages the model to also provide feedback to the students and summarize the students' responses for the teacher. Furthermore, our system makes use of the model's ability to retain prior conversation information to ensure that when grading, the model can recall other students' responses to the same question. Early research suggests their potential to transform educational practice, showing that LLMs can be used effectively for automated scoring [Mizumoto and Eguchi, 2023] and providing feedback in scientific journal evaluations [Liang et al., 2024].

METHODOLOGY

To explore the grading consistency between a custom-made AI application and faculty members when assessing essay exam responses, we used a quantitative, comparative research design. By comparing the grades assigned to the same set of essays, we aimed to determine whether there were significant differences between the evaluation patterns of the AI grader and the faculty evaluators. This design allowed for a systematic examination of grading alignment, providing insights into the feasibility and reliability of AI-assisted essay assessment in an academic setting.

Student Essays

Eleven undergraduate students enrolled in an upper-division, in-person Management Information Systems (MIS) course participated in this study. The students' participation was integrated into the regular course activities; each student's essay constituted a component of the standard course assessment, ensuring ecological validity. As the course was designed, each student was given five essay exam questions per test. We used students' answers from the two tests totaling to ten total essay questions. All eleven participants from the course took both exams, resulting in 110 essay exam responses. The essays were designed to test the student's higher-order thinking skills, critical analysis skills, and the application of MIS concepts. Each of the two exams included a mixture of objective and subjective essay questions—three objective and two subjective questions per exam. The essay questions given to the students are listed in Appendix 1 along with their classification as objective or subjective and reasoning behind the classification.

Faculty Graders

Three faculty members served as human graders in the study. All three faculty members were from the MIS department; each faculty member had extensive experience teaching MIS courses, including the course students were selected from in this study. To ensure anonymity and reduce potential bias, all essays were de-identified before grading. Any personal identifiers were removed, and each essay was assigned a unique alphanumeric code. This approach ensured that neither the AI application nor the faculty graders had knowledge of the students' identities.

Each faculty member independently graded the de-identified essays using the same grading rubric provided to the AI application (i.e., provide a recommended grade out of ten and a comment justifying recommended grade). The answers were given to each faculty member ordered by question. Answers to each question were evaluated as a group (i.e., eleven responses to question1 were evaluated, then question 2, etc.). Each faculty member independently graded the same set of essays without consulting one another and recorded their grades and comments in their own Microsoft Excel file. After all grading was complete, the faculty members shared their scores to minimize the risk of evaluator influence.

Some of the essay questions were course-specific and thus required clarifications based on in-class discussions. This supplementary information (e.g., lecture materials, key definitions, examples) was provided to the faculty graders beforehand to ensure they were aware of what students had been taught. For example, one student essay question asked: "What concerns about privacy do people have? Specifically, what are the four dimensions we discussed in class, and give examples of why someone might be concerned about each dimension." In this example, the faculty graders were given the relevant lecture notes so they could anticipate the specific dimensions and examples that students were expected to address.

AI Application Grading

A custom-made AI grader was developed to evaluate the same set of student essay responses reviewed by the faculty graders. Drawing on advancements in LLMs, the application was designed to replicate the grading process of human instructors by analyzing student responses based on detailed, instructor-specific criteria. The application operates with a preset prompt, then adds in a student's essay question and response. It used a customized prompt to generate a grade via a ChatGPT "completion." The foundation of the AI grader is built on a prompt containing highly specific instructions that guide the evaluation process, ensuring the AI adheres to the desired grading standards (e.g., in this instance, our application was instructed to provide grades on a scale of 0 to 10). Furthermore, the system is preloaded with a list of potential essay questions and

corresponding grading guidelines (i.e., faculty's expectations outlining the specific elements and concepts that faculty are looking for in each response).

Our AI-powered grading application used OpenAI's o1-mini model. The o1-mini is a model created by OpenAI that has been available in the API form since December 2024. We selected this model because it is a streamlined version of OpenAI's newest and most advanced model, specifically optimized for shorter prompts and faster processing. Given that our application's prompts consist primarily of grading instructions and student answers—without the need for an extended conversational context—the o1-mini model's smaller context window is ideal. This smaller context window allows for quicker response times in comparison with the larger, more general-purpose model while still providing high-quality analysis. Moreover, the o1-mini model offers a cost-effective solution for our application, because its efficiency translates to lower operational costs.

To mirror each faculty member's grading style, three custom prompts—one for each instructor—were created. These prompts were informed by the faculty's grading expectations, rubrics, and specific areas of focus each faculty member had previously identified, as mentioned earlier in this section. This approach highlights the limitation that the AI grader is not a one-size-fits-all solution. It is a tailored tool that reflects each instructor's unique grading approach and standards. By incorporating these faculty-specific elements into the prompts, the AI grader can more accurately emulate the judgment and preferences of individual instructors.

A Python script was used to iterate through each de-identified essay response one at a time. In each iteration, the script constructed the necessary prompt—complete with the grading instructions, key criteria, and examples—and then appended the student's essay at the end. This feature allowed the o1-mini model to process each essay under controlled, replicable conditions. The prompt instructed the model to generate a numerical score out of ten along with a brief explanatory comment, paralleling the faculty's grading approach. Because each faculty member's prompt was slightly different, each essay effectively received three distinct AI-generated evaluations, each tailored to the corresponding instructor's priorities and standards.

By integrating course-specific notes and guidelines directly into the prompt, the AI grader was able to focus on content mastery, argument coherence, and relevant examples—ensuring a grading process more attuned to the nuances of the MIS course. This setup made it possible to assess not only whether the AI grader's final scores aligned with human evaluations overall, but also whether the AI system could reflect the unique pedagogical preferences of individual faculty members in a single, adaptable framework.

Analysis

To examine how closely the AI-generated grades align with the grades assigned by each faculty member, we first calculated Pearson correlation coefficients (r) for each faculty–AI pair. This initial step measures the degree of

linear association between two sets of scores, ranging from −1 (perfect negative correlation) to +1 (perfect positive correlation), with 0 indicating no linear relationship. In our study, we anticipated strong positive correlations to indicate that, as a faculty member's score increases, the AI grader's score also increases in a similar fashion. Although correlation alone cannot fully capture the extent of agreement between two raters, it offers a straightforward initial measure of how consistently the AI's scoring patterns track with each faculty member's manual assessments. However, correlations alone do not fully capture absolute agreement—that is, whether the AI and professor are operating on the same scale and giving close or identical scores. High correlations can still occur if one rater has a systematically higher or lower mean or broader variability.

Second, to determine whether systematic differences existed in the average scores assigned, we conducted paired samples *t*-tests for each faculty–AI pair. This analysis directly tests whether the AI consistently assigned significantly higher or lower scores on average in comparison with the human grader it emulated.

Building on the correlation and *t*-test findings, we also chose to run Intraclass Correlation Coefficient (ICC) analyses to evaluate the reliability of the AI-generated grades in comparison with each faculty member's manual grades. The ICC accounts for both consistency and absolute agreement among raters [Fleiss and Cohen, 1973]. We adopted the ICC(3,1) model, as described by Shrout and Fleiss [1979], because our study involves a fixed set of two raters per condition: (1) a specific faculty member and (2) the AI grader that was tailored to that faculty member's rubric. This model is often referred to as the "two-way mixed-effects model with consistency," because it treats faculty as fixed raters and aims to assess how consistently each faculty member and the AI grader score the same essays. ICC values were interpreted using standard benchmarks: <0.50 (poor), 0.50–0.75 (moderate), 0.75–0.90 (good), and >0.90 (excellent agreement) [Fleiss and Cohen, 1973]. These ranges help determine how closely raters align, offering a more robust measure of reliability than correlation alone. By calculating one ICC for each faculty–AI pair, we can isolate the extent to which the AI grader replicates the unique scoring perspective of each individual instructor.

RESULTS

Correlation Matrix

Table 1 below shows our correlation matrix for manual faculty scores and the AI-generated scores across three different faculty members (F1, F2, and F3). Boldface text show the relationships between each faculty's manual grades and that same faculty's AI-generated grades. Because each professor's grading

Table 1. Correlation Matrix

	F1_Manual	F1o1mini	F2_Manual	F2o1mini	F3_Manual	F3o1mini
F1_Manual	1					
F1o1mini	**0.7436**	1				
F2_Manual	0.7570	0.7466	1			
F2o1mini	0.7436	1	**0.7466**	1		
F3_Manual	0.6776	0.5668	0.6896	0.5668	1	
F3o1mini	0.5860	0.7075	0.5967	0.7075	**0.7078**	1

approach reflected their unique pedagogical perspective, correlations between different professors' manual scores were not central to our investigation, because our primary focus was comparing each professor's own grading to the corresponding AI-generated scores.

The three faculty members all had strong, positive correlations between .71 and .75. Taken together, these results suggest that the custom AI application, when tailored to each faculty's grading approach, can yield scores that are substantially correlated with traditional manual assessments. Although strong correlations do not necessarily equate to perfect agreement, they indicate that the AI system is capturing many of the same evaluative factors deemed important by human graders.

Paired *t*-Test Comparing Faculty and AI Mean Scores

To address whether the AI application systematically assigned higher or lower scores in comparison with the faculty members that it was modeled after, a series of paired samples *t*-tests were conducted. Each test compared the mean score assigned by a faculty member to the mean score assigned by the corresponding AI model across all 110 essay responses.

The results, summarized in Table 2, reveal a nuanced pattern. For Faculty 1, the mean score assigned by the faculty member ($M = 7.44$) was significantly higher than the mean score assigned by the AI ($M = 6.68$), $t(109) = 4.87$, p-value $< .001$. Similarly, Faculty 3's mean score ($M = 7.39$) was significantly higher than that of the corresponding AI ($M = 6.44$), $t(109) = 5.55$, p-value $< .001$. These results indicate that for two of the three faculty members, the AI tended to assign lower scores on average in comparison with the human grader.

However, for Faculty 2, there was no statistically significant difference between the faculty member's mean score ($M = 6.69$) and the AI's mean score ($M = 6.68$), $t(109) = 0.05$, p-value $= .961$. This result suggests that, for this particular faculty member, the AI assigned scores at a similar average level.

Table 2. Paired *t*-Test Results Comparing Faculty and AI Mean Scores

Faculty–AI Pair	Faculty Mean (SD)	AI Mean (SD)	Mean Difference (Faculty–AI)	*t*-Statistic (df = 109)	*p*-Value (Two-Tailed)
F1 vs. AI1	7.44 (2.36)	6.68 (2.15)	0.76	4.87	<.001
F2 vs. AI2	6.69 (2.90)	6.68 (2.15)	0.01	0.05	.961
F3 vs. AI3	7.39 (2.53)	6.44 (2.02)	0.95	5.55	<.001

Note: AI = artificial intelligence; SD = standard deviation.

ICC

To address absolute agreement, we conducted a series of ICC analyses, which test for rater agreement on continuous variables [Shrout and Fleiss, 1979] and are shown in Table 3 below.

The ICC(3) results show that all three faculty–AI pairs fall within the moderate-to-good range (e.g., 0.68–0.74), suggesting a substantial degree of agreement between the human and AI rater for each instructor's unique grading approach. Our *p*-values indicate strong evidence that the ICC is significantly different from 0, meaning there is meaningful agreement between rates, and the 95 percent confidence interval provides a range in which the true ICC is likely to fall in the moderate-to-good range.

Taken together, these analyses reinforce our correlation findings and demonstrate that the AI grader—when customized to each faculty member's unique criteria—produces essay scores that are consistently aligned with manual faculty assessments. The fact that each faculty member's ICC result is statistically significant and shows moderate-to-near–good agreement demonstrates the AI grader can indeed replicate humanlike scoring patterns in a reliable manner.

Post Hoc Analysis: Determinants of Grade Divergence

We conducted a post hoc analysis to explore potential determinants of the divergence observed between grades assigned by faculty and the AI application tailored to emulate them. Understanding these factors can offer insights into

Table 3. Intraclass Correlation Coefficients (ICC)

Faculty	ICC	*p*-Value	CI 95%
F1	0.7405	$p < .001$	[0.64, 0.81]
F2	0.7141	$p < .001$	[0.61, 0.79]
F3	0.6897	$p < .001$	[0.58, 0.78]

the conditions under which the AI aligns most (or least) closely with human evaluators. We employed a multiple linear regression analysis on the 110 essay responses.

The dependent variable was constructed by calculating the difference between each faculty member's grade and the grade assigned by the AI mimicking that specific faculty member, then averaging these three difference scores for each essay. Independent variables included the essay word count, a dummy variable indicating the exam (Exam 1 vs. Exam 2), a dummy variable for question type (subjective vs. objective), and dummy variables representing each unique essay question (excluding two removed due to multicollinearity).

The results are shown in Table 4 below. The overall regression model was statistically significant ($F(10, 99) = 4.29$, p-value $< .001$), explaining approximately 23.2 percent of the variance in grade divergence (Adjusted $R^2 = 0.232$). Three predictors emerged as significant determinants. Essay word count was the strongest predictor (p-value $< .001$), indicating that as essay length increased, the divergence grew, with faculty tending to assign relatively higher grades in comparison with the AI. In addition, specific question characteristics played a role: Question 3 from Exam 1 (IsE1Q3) showed significantly higher divergence compared to the baseline (p-value $= .045$), whereas Question 4 from Exam 2 (IsE2Q4) exhibited significantly lower divergence in comparison with its baseline (p-value $= .0016$). It is noteworthy that, after controlling for

Table 4. Regression Analysis Predicting Faculty-AI Grade Divergence

Variable	B	SE	*t*	*p*-Value	95% CI
Intercept	−1.37	0.47	−2.93	0.004	[−2.30, −0.44]
Word Count	0.01	0.002	5.61	<.001	[0.007, 0.014]
Exam 2 (vs. Exam 1)	0.58	0.53	1.09	0.277	[−0.47, 1.63]
Subjective Question (vs. Obj.)	0.82	0.53	1.55	0.124	[−0.23, 1.88]
Exam 1, Q2 (vs. Q1)	1.01	0.54	1.88	0.063	[−0.06, 2.08]
Exam 1, Q3 (vs. Q1)	1.1	0.54	2.03	0.045	[0.03, 2.17]
Exam 1, Q5 (vs. Q1)	0.44	0.53	0.83	0.409	[−0.61, 1.49]
Exam 2, Q2 (vs. Q1*)	−0.51	0.75	−0.69	0.494	[−1.99, 0.97]
Exam 2, Q3 (vs. Q1*)	−0.42	0.75	−0.56	0.58	[−1.90, 1.07]
Exam 2, Q4 (vs. Q1*)	−1.73	0.53	−3.24	0.002	[−2.79, −0.67]
Exam 2, Q5 (vs. Q1*)	−0.31	0.75	−0.41	0.679	[−1.79, 1.17]

Note: B = Unstandardized coefficient; SE = Standard error; CI = Confidence interval. Dependent variable is the average difference between faculty grade and corresponding AI grade. Adj. $R^2 = .232$; $F(10, 99) = 4.29$, p-value $< .001$. *Reference category for Exam 2 questions is Exam 2, Question 1 (removed due to multicollinearity). Variable Inflation Factors (VIFs) for all predictors in the final model were below 5.1, with key predictors (Word Count, E1Q3, E2Q4) below 1.9.

word count and individual question effects, the broader variables for exam context and question subjectivity were not statistically significant predictors of divergence in this model.

DISCUSSION

Our analyses revealed a strong alignment between the human grades and their respective custom AI-powered grades. Correlation coefficients for each faculty–AI pair ranged from $r = 0.71$ to 0.75. In addition to these high correlations, the ICC values—spanning 0.69 to 0.74—fell within the moderate-to-good range, reinforcing that the AI grader and each instructor operated on a comparable grading scale rather than merely sharing a linear relationship. Adding nuance to this picture, paired *t*-tests revealed that for Faculty 1 and Faculty 3, the AI assigned significantly lower scores on average, indicating a tendency toward harsher grading in comparison with those specific instructors; however, for Faculty 2, the analysis indicated no significant directional bias in the average scores (p-value $= .961$). Taken together, these findings suggest that the AI grader not only captured many of the same evaluative signal's faculty deemed important but also applied them with a level of consistency that closely approximated human scoring patterns. These results directly address our primary research question: Can an AI system, when tailored to reflect a specific faculty's standards and course objectives, achieve essay scores *comparable* to those assigned by human graders? Based on both the correlation and ICC metrics, our data strongly support an affirmative answer.

Furthermore, the post hoc regression analysis exploring determinants of grade divergence yielded an interesting finding regarding essay length. The analysis revealed a statistically significant positive relationship between essay word count and the difference between faculty and AI scores, specifically indicating that faculty tended to assign relatively higher grades than the AI as essay length increased. Although the precise reason remains speculative—perhaps faculty implicitly value depth associated with length, whereas the AI penalizes redundancy more strictly—it highlights an area where human and AI evaluations differed systematically in our study. Unique characteristics of specific essay questions also influenced divergence, suggesting factors like subtle wording differences or how well prompting captured question requirements can impact AI alignment, necessitating follow-up studies to understand these effects fully. It is interesting to note that after accounting for these factors we found no significant difference in divergence based on whether questions were primarily objective or subjective, suggesting the AI, as prompted, handled both question types in a manner comparable to faculty in this instance.

These findings on divergence transition into broader considerations of fairness and bias, which are paramount for any grading tool. Historical AES

systems faced documented bias challenges, and although modern LLMs offer new capabilities, vigilance remains crucial. LLMs can inherit data biases, yet their behavior is also highly malleable through prompting. Our study offers a relevant perspective in that regard: the AI successfully adapted to mirror the distinct grading styles of individual faculty members, even when faculty differed amongst themselves. This adaptability underscores the potential—requiring careful design and rigorous testing—for prompts to be engineered to guide AI toward more equitable handling of diverse writing styles or proficiencies, possibly mitigating some human inconsistencies. However, the sensitivity of LLMs to subtle prompt changes means this aspect is complex. Ensuring responsible deployment necessitates ongoing research into developing and validating prompts that actively promote fairness and address potential systemic biases.

We want to emphasize that AI-generated scores are *similar* to what a faculty member would assign. It is imperative we state that this technology is not intended to fully replace human judgment in the grading process. Instructor oversight remains essential, and this application should be viewed as a tool to *augment* and *support* the grading process, not to replace it. One reason for this continued reliance on human faculty is the critical need to ensure fairness and ethical grading practices. Faculty are responsible for the grades they provide to students, and this responsibility should not be put into the hands of an AI system that provides *similar* output at best.

In practice, educators may choose to adopt a hybrid approach where there remains human oversight. This option would offer a balanced solution that leverages the strengths of both the LLM and the faculty member. For example, the AI system could pre-grade assignments, and faculty can review this evaluation before assigning the official grade. Chai et al. [2024] found that students perceived AI as more objective and less susceptible to biases, but they still valued the role of human educators in ensuring fairness and providing personalized feedback. By incorporating human review in the grading process, educators can address student concerns and promote trust in the use of AI in education.

Another promising application is leveraging an AI application like ours to categorize essays by difficulty or quality. In many grading scenarios, awarding top marks for well-written, fully correct responses is relatively straightforward. For example, if a student turns in an essay that is well written and structured, and the student's answer far exceeds the expectations for a good grade, faculty can often skim these and know the grade they'll give the student quickly, whereas partial-credit determinations for answers containing errors can be time-consuming and require deeper interpretation. An essay that is well below expectations requires ample concentration from the faculty to decide how much partial credit to give. Our data illustrate this potential time-saving mechanism: In a set of 110 essays, the AI rated eighteen as perfect (10/10). Upon

reviewing these items, the corresponding faculty member concurred with scores of 10/10 for thirteen of those essays and assigned only slightly lower scores (9/10 or 8/10) to the remaining five. This high agreement on the strongest responses implies that when the AI flags certain essays as "exceeding expectations," faculty can often verify them quickly without a lengthy review. As a result, instructors could focus their time on the more ambiguous or partially correct submissions—where their teacher's judgment is most needed—thus making more efficient use of their time while still maintaining overall grading integrity.

Rather than a tool for faculty, our application could also be repurposed as a tool for students to use. Distributing such a tool would allow students to essentially gain access to a virtual proxy, available on demand, of the professor's grading rubric and expectations. This 24/7 access would give students personalized and immediate feedback that emulates how their professor would grade them. Students could now submit practice essays and receive feedback aligned with the professor's standards, allowing them to refine their writing and argumentation before the actual assessment. Having virtual, unlimited, quick, and accurate feedback on demand is a luxury that was not previously available to them. This option could serve as an extremely valuable supplement for students to test their understanding of course material.

Looking ahead, these findings underscore the broader "agentic" future of AI in education. As learning management systems (LMSs) become increasingly integrated with advanced AI agents, the capacity to automate routine tasks—such as identifying top-performing essays—can enable more flexible and scalable teaching practices. Our study serves as a proof of concept for that potential, demonstrating that AI can replicate a substantial portion of faculty scoring decisions under controlled conditions. Yet, faculty cannot rely solely on these systems; our data also confirm that AI-based grading has limits, particularly when dealing with nuanced cases or partial-credit scenarios that require deeper understanding. Moving forward, the challenge will be to harness these agentic AI tools not as stand-alone solutions, but as supportive tools that complement human judgment, ensuring both efficiency and the depth of evaluation necessary for robust student learning outcomes.

CONCLUSION

In this study, we developed an AI-powered application capable of generating grades and feedback for student essay responses that align with those of human faculty. Our evaluation, involving three faculty members and 110 student essays, demonstrated strong correlations and moderate-to-good inter-rater agreement between the AI-generated scores and those assigned by instructors. These results highlight the potential of customized LLMs to effectively emulate key aspects of the human grading process, particularly when tailored to

reflect the specific expectations and criteria of individual faculty members. We view this effort as a stepping stone toward a more nuanced understanding of how AI can be integrated into educational settings to benefit both students and faculty. The moderate agreement we observed, although encouraging, is a reminder of the unique value of human judgment in education. We see two key takeaways from this work.

First, this application can empower students by providing them with an accessible, on-demand tool for receiving feedback and improving their work. A student preparing for an exam could, for the first time, be able to submit practice essays and receive immediate insights into how their professor might evaluate their response—essentially gaining access to a virtual proxy of their instructor's rubric, available anytime, anywhere. Second, as we move toward an "agentic" future where AI agents become more prevalent in LMSs, this research serves as a proof of concept of AI's capabilities. Our application demonstrates that with thoughtful design and faculty-specific customization, an AI agent can indeed perform a significant portion of the grading workload while maintaining reasonable fidelity to human scoring patterns. Importantly, our data also suggest that AI is best suited for identifying clear-cut cases (e.g., high-scoring essays), allowing faculty to dedicate more time and energy to providing the nuanced feedback that only human expertise can offer. This vision of human–AI collaboration, where technology complements rather than replaces the human element, is vital for ensuring that the integration of AI into higher education is both effective and ethical. This work contributes to the ongoing conversation about how to leverage the power of AI to create richer, more personalized, and more equitable learning experiences for all students.

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Appendix: Essay Questions, Classification, and Justification

Exam & Question #	Question Text	Classification	Justification
Exam 1, Q1	What is the difference in data, information, and knowledge? How are these concepts connected?	Objective	Asks for specific definitions and relationships covered directly in course material.
Exam 1, Q2	What is client-server architecture?	Objective	Asks for a definition of a specific technical concept.
Exam 1, Q3	Explain what Information Technology (IT) and Information Systems (IS) are.	Objective	Asks for definitions and explanations of core course concepts.
Exam 1, Q4	A large-sized agriculture company is considering using big data. . . Should they use big data? Why or why not? What should they consider. . .?	Subjective	Requires students to apply concepts to a scenario, weigh pros/cons, and justify a decision, allowing for varied, defensible answers.
Exam 1, Q5	A mid-sized IT consulting firm is looking to switch to cloud computing. . . What things would they likely consider?	Subjective	Asks students to apply knowledge to a specific business case and identify relevant considerations, which involves judgment and prioritization.
Exam 2, Q1	A Youtuber with lots of subscribers just posted a video stating that if I start taking metformin (a medicine for type 2 diabetes), then I'll be able to live longer because it slows the aging process down. Should I start taking this medicine? Why or why not? How can I know if this is true or not?	Subjective	Requires critical evaluation of information, justification of a personal health decision (hypothetical), and outlining verification steps.
Exam 2, Q2	What are the benefits of blockchain? Give three benefits and examples with how it can be more beneficial than alternatives.	Objective	While requiring examples, it primarily asks for recall and explanation of specific benefits of a technology.

Appendix. Continued

Exam & Question #	Question Text	Classification	Justification
Exam 2, Q3	What concerns about privacy do people have? Specifically, what are the four dimensions we discussed in class, and give examples?	Objective	Asks for specific dimensions covered in class and related examples, focusing on recall of taught material.
Exam 2, Q4	E-business has transformed the global economy. . . Discuss an example of one industry and talk about how e-business reshaped the economy.	Subjective	Requires students to select an industry, analyze impacts, and construct an argument, allowing for diverse examples and perspectives.
Exam 2, Q5	Why is a security team important? What are they protecting? How do they protect?	Objective	Asks for the fundamental roles, scope, and methods of a security team, based on defined concepts from the course.

Learning Spaces: Impact of Physical Design on Student Engagement and Learning

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It is widely assumed that appropriate classrooms result in many benefits, including higher student engagement in classroom activities, an improved learning experience, and a better overall university experience. In addition, it is assumed that an academic building with more open spaces, natural light, and good esthetics and colors also enhances students' experience and improves their impressions of the school. However, very few of these relationships have been empirically tested. This study examines the impact of the physical features of a building (classrooms, hallways, and other spaces) on student engagement and learning in higher education.

Keywords: Learning Spaces, Classroom Design, Classroom Learning, Student Engagement, Innovative Education
Disciplines of Interest: Education, Engineering Management, Building Science

INTRODUCTION

Universities and colleges periodically decide to or need to upgrade, enhance, or build new classrooms and other learning spaces, including entirely new buildings. Both designers and educators are becoming more aware of the importance of physical space for teaching, learning, and student engagement [Cleveland and Fisher, 2014]. "The physical design of classrooms . . . and other indoor environments can have a profound impact on student learning" and on student ratings of their instructor [Lei, 2010, p. 128]. In addition, physical design decisions are usually costly and long term, so it is important to understand which design features are best to include. In a controlled study, Hill and Epps [2010] found that students rate course enjoyment and classroom learning

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higher in upgraded classrooms. This study verifies their findings and also considers additional specific design features and their effect on various outcomes.

Understanding the role of physical classrooms and other spaces remains important despite the trend toward online and hybrid learning environments. Some students and instructors prefer online, but many prefer the in-person mode of teaching and learning. Campus spaces are still regarded as indispensable for learning [Leijon, Nordmo, Tieva, and Troelsen, 2022].

Both classrooms and other spaces are important in higher education (HE). The physical building is the most influential determinant for students in deciding which university to attend (e.g., Shamsudin; Aeshah Mohd Ali, Aina Mohd Ali, and Shahida Shabi, 2019; Okerson, 2016]. As such, it is not surprising that university decision-makers are paying greater attention to the physical attributes of their universities as they respond to student demands for better value for money [Temple, 2018]. One university in that study reported that their new buildings provided them with a "significant recruitment advantage."

Research into the impact of physical learning environments on learning outcomes in HE is still in an early stage of development; not much has been done [Cleveland and Fisher, 2014]. A small number of case studies and limited number of controlled studies have looked into this area, however, this research has focused primarily on classrooms. Temple [2008] noted a lack of studies on the relationship between spaces and interactions in teaching and learning. Ellis and Goodyear [2016] noted that space in HE was both under-researched and undertheorized; they suggested that there is a need for more studies that relate the qualities of the space to the qualities of the learning. Leijon et al. [2022] noted that although space cannot be isolated as the single cause of learning outcomes, it is an important component, and there is a need for more work on the complex relationship between learning spaces and student learning. This paper contributes to the literature by empirically testing the impact of physical attributes of classrooms and other spaces in the building to student-felt engagement and learning experience. The study is carried out in a Business School (with comparisons to other classrooms and buildings on campus), and most findings apply more broadly to other university and college settings as well.

The Goodman School of Business at Brock University has recently benefited from a 29,000 sq. ft. addition to its building and a complete renovation of the existing 50,000 sq. ft. business building. The additions to the building included six new classrooms, a large two-story atrium, employer interview rooms, a Bloomberg financial research lab, twenty-one new offices for faculty and staff, and other spaces, including hallways that provide more space for movement and seating, with cellphone and laptop charging available. In addition, nine classrooms in the existing building were completely renovated with new flooring, student desks and chairs, ceilings, lighting, and state-of-the-art technology. Furthermore, all other portions of the existing building, including 108 faculty and staff offices, the dean's suite, student spaces (e.g., a new space for student

club offices), hallways, etc., received new flooring, ceilings, lighting, color upgrades, and new furniture.

To investigate the effect of physical spaces on learning experience, in our research we empirically tested a theoretically driven model. The paper starts with a review of relevant literature, followed by theory and model development. Then we discuss the design process for the construction project and user evaluation of the finished building. That section is followed by an explanation of the methodology adopted, results from a post-occupancy study, and the data collection methods adopted in this study. We then present the analysis and discussion of findings of the main survey and structural model. Concluding remarks and implications of this study are also provided.

LITERATURE

There are a number of studies that facilitated model development for this research. LeGrow, Espin, Chui, Rose, Meldrum, Sharpe, and Gucciardi [2023] agreed with others that the physical design of spaces can impact learning. They found that HE students appreciate open, clean, bright spaces, describing them as "welcoming."

Morrone, Ouimet, Siering, and Arthur [2014] tested a unique classroom that had been set up like a café, with bright colors, high and low bistro-style tables, booths, sofas, and small coffee tables. It also had multiple projection screens that instructors and students could connect to with laptops. They found that the design improved collaboration, comfort, and the overall feel of the classroom. Improved student interactions were also found in another unique classroom that had swivel chairs for all students, fixed to the floor [Henshaw, Edwards, and Bagley, 2011]. The students could face the front or swivel to work in groups of various sizes. This design also facilitated instructor movement around the classroom and minimized transition time between modes of instruction. Both of these studies were done in courses where frequent student interaction was used as a primary pedagogical technique.

Another study done in a similar environment verified a number of important features for interactive classrooms in a more general sense, suggesting that important features include flexible seating, space for the instructor to move around, and provide an easy method for student teams to report out to the rest of the class [Folkins, Friberg, and Cesarini, 2015].

Brooks [2011, 2012] found that students in an active learning classroom (facilitated by technology) outperformed their peers who were in a more traditional classroom but also suggests that classroom design should be informed by the type of activity to be carried out. Perks, Orr, and Al-Omari [2016] reported on a significant change to a classroom that involved reducing the number of students, more whiteboard space, significant upgrade in technology,

and other enhancements. The initial reaction by students was positive, but once it had been used more than a semester, student surveys suggested their perceptions were back to the baseline before the improvements. It is possible that this was because some design features did not quite work out as expected; and even in the first semester after the enhancement, students were not enthusiastic about the dual screens. This study highlights the need to understand which physical features are important during the design stage.

Yang, Becerik-Gerber, and Mino [2013] noted that the largest determinants of student perceptions of the classroom and their ability to learn were spatial attributes (especially visibility and furniture) and ambient attributes (especially temperature and air quality). This survey analysis highlighted that students need to be able to see what they need for learning, the furniture needs to be comfortable and appropriate, and appropriate temperature and air quality make it easier to concentrate. Similar findings regarding the importance of various features were reported in a path analysis by Choi et al. [2013–2014]. Furnishings and viewing conditions had the highest load factors, with thermal conditions also scoring high. In a related study, Castilla, Llinares, Bravo, and Blanca [2017] determined that what students value the most is "functionality-layout" and [space that is] "cozy-pleasant." They then identified which design features contributed to those aspects, showing that personal workspace (i.e., furniture) and interior environmental conditions were both very important to improve student perceptions.

Veltri, Banning, and Davis [2006] looked at a number of classroom features including color, stating that appropriate color can increase learning productivity, reduce absenteeism, and help morale. Light colors are generally preferred due to their calming affect, although brighter colors may help keep students awake.

In addition to classroom features, this study also considers other aspects of building design. Okerson [2016] found that when students go for the campus visit before deciding which school to go to, the three most influential components, respectively, are the esthetics of the campus environment, the community feel and "general vibe" of the campus, and the personal interactions they experienced during the visit. Shamsudin et al. [2019] also found that the facilities are the largest determinant of a student's choice of university. It is interesting to note that Beckers, Van der Voordt, and Dewulf [2016] found esthetics may be less important for HE students as long as the spaces are functional and comfortable. These results suggest that universities need impressive-looking buildings for recruitment, but all study spaces do not necessarily need to be highly esthetically appealing. This information could help when deciding where to allocate investment when resources are scarce.

Ibrahim and Fadzil [2013] looked at informal spaces around campus and found that students value spaces that allow them to get their academic work done (alone or in groups) but also facilitate interaction and discussion with

colleagues. Students interact using social media but also value face-to-face interactions; hallways, atriums, lounges, study halls, etc., that have tables and/or seating all facilitate that type of interaction. Authors have found that informal settings are important for learning. Alstete and Beutell [2018] found that students like open spaces for these settings. They also suggest that a business school is more than a collection of classrooms, lounges, study spaces, and offices but is best thought of and used as a venue for collaboration, study, discussions, and the development of community. Temple [2018] reinforces the importance of design when suggesting that a key task for universities should be turning spaces into desirable places to be, because functional and comfortable places are where the best university work is done.

THEORY AND MODEL DEVELOPMENT

Many prior studies have focused on learning outcomes such as student grades or student perceptions of how the classroom affects their learning. Many of these have focused exclusively on the classroom. The current study focuses primarily on student engagement that is a result of a new building, including all spaces in the building. Students are asked about how the new building affects their feelings about the business school and the university and whether the new building helps them feel more connected to their school. Part of this inquiry involves delving into specific physical features within and outside the classrooms.

Classroom Features and Student Engagement

Prior research has demonstrated that many classroom features combine to create student impressions of the learning environment inside the classrooms. In this study, separate questions were asked about comfort of the chairs, comfort of chair position in comparison with desk/table; acoustics (dampening of distracting noises and ability to hear what they are supposed to); effectiveness of teaching technology; placement of screens, whiteboards and podium; air freshness; temperature, overall esthetics; work area of the desktop; quality of desks and tables, location of electrical outlets; quantity of electrical outlets; colors; and lighting. Each of these elements is discussed briefly below.

Hill and Epps [2010] showed that students enjoyed coming to class more in an upgraded room that had fixed tables with cushioned chairs, in comparison with classrooms with one-armed movable desks. Others have found that flexible furniture is best for learning (e.g., Veltri et al., 2006; Folkins et al., 2015]. The new classrooms in the Goodman School of Business are of two main types: tiered classrooms with fixed U-shaped tables and movable chairs, and flat classrooms with movable tables and chairs (i.e., flexible).

Lei [2010] found in a literature review that acoustical treatment was very important in classrooms. Acoustical sound engineering has advanced rapidly in recent years, and the new classrooms have an excellent balance between sound

absorption for unneeded noise and sound projection for the instructor. This balance was obtained in most classrooms by installing acoustical panels on the back and side walls, with acoustical ceiling tiles along the sides and back of the classroom but having a section of drywall ceiling above the instructor and out about halfway into the classroom so the speaker's voice bounces off that and projects to the back (the drywall portion is "acoustically lively").

Most of the new classrooms have either forty-five or seventy-one student seats and have two ceiling mounted projectors with two retractable screens, a ceiling mounted document camera, a whiteboard across the entire front (behind the screens), and a central podium that has hookups for a laptop, access to the classroom computer and is height-adjustable (for accessibility and for instructors of different heights). Initially, an attempt was made to design a movable podium to accommodate instructors who did not want a podium at all, but the design posed enough challenges (including safety, accessibility, and maintenance issues) that this was not possible. As such, the podium is fixed but the size was minimized to allow more space for movement.

When the classrooms were first used, there were some temperature and air freshness issues. Troubleshooting found that most of these problems were because old and new ventilation systems had been combined and designers had not anticipated all of the impacts. These issues were resolved quickly.

Regarding esthetics, the rooms were designed to have a "business" look with lots of wood accents and lighter colors. There was wide informal agreement that the tables and chairs were of high quality.

Student desks are typical of more recent classroom design; they share longer desktops. These tend to be preferred over the older-style single-desk options, because there is more desk space per student. This space includes power outlets on the desktops for each student.

Multiple studies have shown that flexible lighting makes the classroom more comfortable and thus better for learning (e.g., Hill and Epps, 2010; Folkins et al., 2015]. These studies suggested it was good to have multiple zones that could be turned on or off. All classrooms in the building take this a step further, with multiple lighting zones—each of which is 100 percent dimmable. Most classrooms have five lighting zones, providing large flexibility. This innovation is in stark contrast to the old classrooms, which had only two options: one very bright, and one that was suitable for projecting a computer but was so dark that students had trouble seeing their notes and trouble staying awake.

Later when results are reviewed, insights regarding individual features are discussed. These features were included together to form a hypothesis about student engagement. The first hypothesis follows directly from the literature:

H1a: Classroom Features Are Positively Associated with Student Engagement in Classroom Activities

During the design stage, some stakeholders from outside the business school pushed for flexible classrooms with movable tables and chairs. These

classrooms may be preferred for some (or many) courses on campus, but many business instructors prefer the fixed, tiered, U shape that has become common in many business schools because it facilitates student discussion and debate for the entire class together. A survey of faculty was done; approximately 20 percent of business instructors said they preferred flexible classrooms, the rest preferred U-shaped classrooms. As such, two of the larger classrooms and the three smaller classrooms were designed and built as flexible, whereas the remaining ten large classrooms are fixed U-shape (i.e., fixed, tiered desks with individual movable chairs). In addition, students attend classes in other buildings on campus, some of which are flexible, some of which face the front, and some of which have fixed tables. Students were asked separately about U-shaped versus front-facing and flexible versus fixed classrooms.

A prior study found that more students preferred a "curved semi-circle row style classroom" than other designs [Alstete and Beutell, 2018]. As far as we can tell, there aren't any other studies that have compared U-shape to front-facing classrooms. Based on student and instructor experiences in business courses, it is suggested that:

H1b: U-Shaped Seating Layouts Are More Positively Associated with Student Engagement in Classroom Activities than Front-Facing Seating

Some of the literature has found that flexible seating and tables is better, discussed above (e.g., Veltri et al., 2006; Folkins et al., 2015), and as such the following was tested:

H1c: Flexible Classrooms (Both Tables and Chairs Movable) Are More Positively Associated with Student Engagement in Classroom Activities than Layouts with Fixed Tables (That Have Either Fixed or Movable Chairs)

Classroom Features and Learning

Using the same information regarding classroom features discussed above, the link between new classrooms and student perceptions of both their own learning and course delivery is considered. Many have tested this relationship using student surveys (e.g., Castilla et al., 2017; Choi et al., 2013-2014; Hill and Epps, 2010; Morrone et al., 2014; Perks et al., 2016), and we tested this as well.

H2a: Student Perceptions of Classroom Features Are Positively Associated with Perceptions of Course Delivery and Learning Experience

Another relationship that comes out of the literature above is whether higher engagement (H1a) results in better learning.

H2b: Higher Student Engagement is Positively Associated with Course Delivery and Learning Experience

Student impressions of the school as a whole are important, and schools are very interested in graduates that have positive impressions. As such, the impact of learning experience on overall experience in the school is tested.

H2c: Better Course Delivery and Classroom Experience is Positively Associated with Overall Experience in the School

Building Features and Student Experience

The large, two-story atrium has become the focal point for the School, and many people feel it is the best feature and even the "crown jewel" of the building. It features acoustical wood paneling (giving it a warm feeling), as well as two walls that are entirely glass (giving it an open, bright feeling). Most of the time the furniture is set up to accommodate both relaxing and studying; there are regular-height and higher tables, both with appropriate chairs; there are small sofas; a plinth with wood seating; and power for charging laptops and cell phones. All the furniture can be moved or removed to accommodate presentations, ceremonies, job fairs, etc.

Students were asked about many specific features in the atrium, including number of seating places, comfort of seating, quality of tables and work surfaces, location of outlets, quantity of charging outlets, natural lighting, artificial lighting, flooring, audiovisual characteristics, temperature, air freshness, and acoustics. It is hypothesized that positive impressions of these aspects will result in positive experiences in the atrium and also be directly related to positive feelings about the business school.

As far as we can determine, these non-classroom space relationships have not been tested before. They are important because they affect learning and students' impressions of the school they study and learn in [Ibrahim and Fadzil, 2013; Alstete and Beutell, 2018]. Students will sometimes choose a university based on how it looks and how the physical spaces feel when they tour the campus (e.g., Shamsudin et al., 2019; Okerson, 2016). Having a modern building helps convey the impression that the school is up to date in terms of teaching, learning, and technology [Temple 2018].

H3a: Atrium Features Are Positively Associated with Students' Atrium Experience

H3b: Atrium Experience Will Enhance Overall Student Experience in the Program

Another non-classroom aspect not found in the literature is the relationship of new hallways to students' experience in the school. As with associations and enhancements regarding the atrium noted in H3a and H3b, we posit that

hallways can affect students' impressions. The hallways are completely renovated, and some new hallways were added. They feature acoustical wood paneling, better lighting, more natural lighting, seating with charging outlets, and better wayfinding signage than previously.

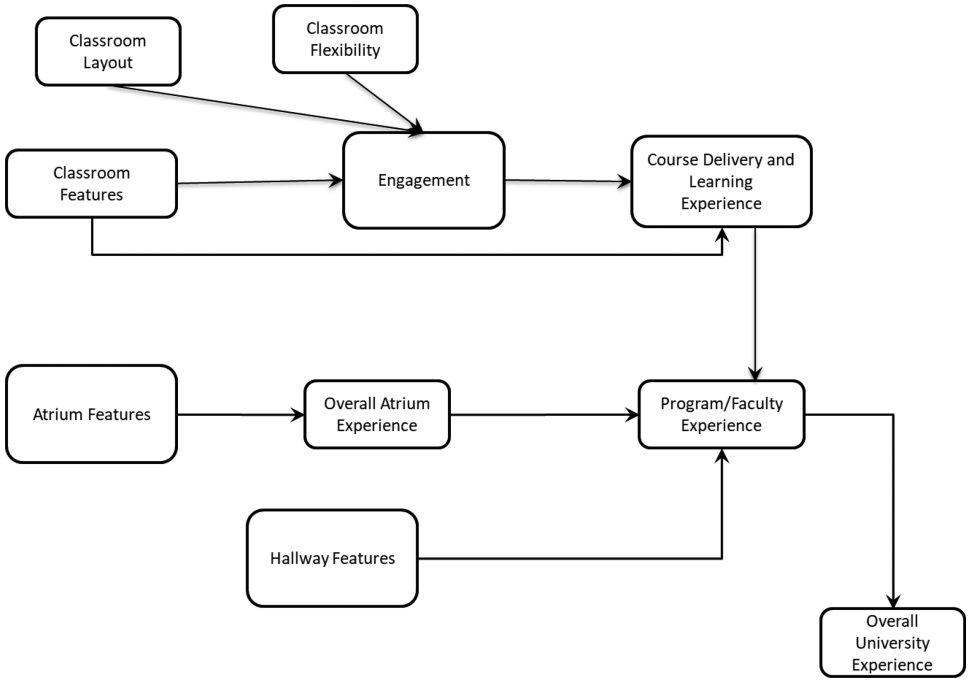
H3c: Hallway Features Are Positively Associated with Students' Experience in the Program

Finally, the affect of students' experience in the school on their impressions of the entire university is considered. Indeed, students and the business community tend to refer to the name of the university more often than they do the name of the business school. Therefore, new and upgraded buildings for a single school can impact the impressions for the whole university.

H3d: A Positive Experience in the Program is Associated with a Positive Experience at the University

Figure 1 presents the research model.

Figure 1. Research Model



Project Design and Evaluation of Completed Building

As noted above, this research is facilitated by a large addition and complete renovation of the Goodman School of Business, providing well-designed new learning spaces for undergraduate and graduate business students that could be compared to the prior building and to other spaces on campus.

The design process involved significant consultation with faculty and staff as well as consultation with students and other stakeholders within the university. One of the challenges was determining how to design certain aspects when stakeholders had diverging and/or opposite requests. Decisions were made based on information from focus groups, formal meetings, informal meetings, and surveys of faculty and staff opinions. Also, sometimes other things helped or dictated design features (e.g., cost, building code, university policy (such as accessibility requirements), or the physical limitations of the building or classroom). The whole process was significantly enhanced because a business faculty member was the project lead for the design and construction—the faculty member was able to catch many assumptions and design choices that were not in the best interest of academic faculty, staff, and students. As such, the final design was excellent in terms of meeting user preferences. This is in line with one of the conclusions of Leijon et al. [2022] in their comprehensive literature review: "If there is one conclusion to highlight, it must be to involve all users at an early stage in the process" (p. 10). As with all complex construction, design adjustments also occurred throughout the construction period. The project was finished on schedule and on budget.

After construction was completed, two surveys were completed. A post-occupancy evaluation (POE) was conducted asking faculty and staff about their experiences during construction and in the new spaces. This evaluation was carried out immediately after construction, and the findings helped inform the larger survey. For the main portion of this research, a student survey of undergraduate and MBA students was conducted during the following fall and winter semesters, and it forms the basis for the path analysis in this paper. At that point, there were students who had been on campus before construction began, had lived through the construction, and were enjoying the new building. In addition, there were students who had only experienced part of the construction and the new building. Students who had been there throughout construction were asked about their level of engagement and learning in the new versus prior classrooms, and all students were asked to compare the new classrooms to others on campus.

RESEARCH METHODOLOGY

Measurement Instrument Preparation and Data Collection Process

The proposed research model (Figure 1) was tested empirically via data collected through survey questionnaires. Survey-based investigations are preferred

in the assessment of learning environments in comparison with direct observations because students are the only ones who can provide their perceptions of learning environments [Yang et al., 2013] and a survey method may provide a larger sample of respondents, providing more generalizable assertions. There are several studies in the learning environment research that have used surveys; thus instruments for classroom attributes and various learning outcomes such as classroom engagement are available [Lei 2010; Yang et al., 2013] and could be adapted.

POE and Results

A POE was carried out to understand faculty, staff, and some students' perceptions. The POE toolkit is a common practice in evaluating quality architecture; it includes a systematic questionnaire related to how the building performed in key areas [Cleveland and Fisher 2014; Harun, Hamid, Talib, and Rahim, 2011]. This survey also included some open-ended comment questions. It was designed and administered by an external consultant [HJS Solutions, 2019] in collaboration with stakeholders from the university's facilities management department and the business school. The overall goal of the POE survey was to understand any concerns with the initial use of all parts of the building so that they could be addressed while the construction company was still on site finishing the last details (often called deficiencies).

Participants invited were all faculty and staff who currently work in the business school, fourth year business undergraduate students, and all business graduate students. Survey results were collected anonymously. It was not designed with the above hypothesis in mind but provides some useful supporting information. Respondents were asked about various aspects of design and conditions during construction.

Although scores on all aspects were quite positive, respondents noted a few issues with the classrooms. The following list identifies the most common complaints and shows how they were addressed soon after they were identified:

Temperature

Toward the end of and after construction, some classrooms were very inconsistent in temperature. One respondent said, "Classroom 405 is an icebox or an oven." This temperature fluctuation was initially because not all air circulation was active because construction was still continuing, but even after construction was complete, further adjustments were necessary to better combine the ventilation systems in the prior and new portions of the building. This issue was taken care of quickly, to everyone's satisfaction.

Lighting Control

Installing multiple dimmable lighting zones in the classrooms was extremely helpful to accommodate multiple teaching situations but required a fairly complex control panel. This panel was not entirely user-friendly for instructors. As such, instructions were developed, framed, and posted beside each control panel.

Noise

Despite acoustical design features, some classrooms experienced excessive noise from the hallway. A number of solutions were considered, and some were experimented with before decisions were made on a final solution. In the end, more acoustical paneling was installed in the hallways that needed it, more soundproof gasket tape was added around the doors, and automatic door bottoms were installed that sealed down to the floor when the door was closed but lifted when the door was moved to open.

Whiteboards

Instructors complained that the whiteboards could not be erased. Upon investigation, it was found that the whiteboard supplier had not followed the specifications regarding the chemical composition of the whiteboards, and therefore the supplier had to replace all the whiteboards in the building.

Electrical Outlets

Students were happy with the quantity of outlets, but some commented that they got in the way because they protruded from the desk, which was not something that could be adjusted; fortunately, the majority of responses were primarily positive.

Overall, respondents were very pleased with the new classrooms. With an average score of 4.03 out of 5, 83 percent of respondents agree or strongly agree that "teaching and learning are enhanced with the new and renovated spaces in the Business School."

It is important to note that all of the issues listed above were addressed by the fall before the final data collection was carried out, and the students completing the survey for the main portion of the current research were commenting on the classrooms after these "worst" issues were resolved. This timing was good for the purposes of this survey, because at that point the building was working in the way it had been intended.

Respondents were also asked for their impressions about the Atrium and other public spaces including hallways. Scores and comments were overall very positive (e.g. "The Atrium is beautiful," "Lovely space"), with a few issues identified:

Atrium Blind Controller

The glass walls in the atrium face south and west. Therefore, on sunny days it gets bright and sometimes quite hot. Initially the handheld remote controls for the two-story blinds were locked up, so occupants could not adjust them. This issue was addressed by fastening a controller to the wall.

Tables and Electrical Outlets

The electrical outlets were located around the periphery of the atrium, and students often moved the tables to get close to them. To reduce the movement, the default table positions were modified. In addition, education of occupants was carried out so they understood the safety issues of stretching charging cords across open spaces.

When asked about the overall building design, scores were very high, with some comments noting "Love the building design," and "Building looks great, very functional and meets needs," and very few negative comments were received.

Student Survey Instrument

Prior literature and the POE were used to inform the main survey instrument. Given that scales for some aspects of the physical spaces such as atrium and hallway features used in this survey were not necessarily validated in the preexisting literature, additional content and construct validation was carried out using a multistage iterative procedure. The scales for classroom features were adopted from the POE survey. Classroom features such as lighting, temperature, air quality, acoustics, etc., are validated from prior studies [Lei, 2010; Yang et al., 2013]. Students were asked to rate their satisfaction with these factors on a 7-point Likert scale (extremely dissatisfied to extremely satisfied). Prior studies have suggested that classroom layout and furniture placement (e.g., flexible classrooms) promote student engagement (e.g., Lei, 2010). Thus, two specific questions on the classroom layout and the movability of furniture were included to relate the classroom layout to learning outcomes.

Classroom engagement was captured using six questions to see how classroom layout and features facilitated and enhanced physical movement, classroom participation, and classroom activities using a 7-point Likert scale (strongly agree/strongly disagree). Course delivery and learning experience was also captured using a 7-point Likert scale (strongly agree/strongly disagree) using self-reported measures. Although a secondary measure of course grades could be linked to the surveys, that would require respondent identification, which can hinder honest responses. Thus, self-reported measures were chosen to encourage more honest responses.

In addition to the classroom experience, the study also sought to capture the impact of facility design on students' overall experiences in the school and the university as whole. Thus, atrium and hallway features were used in the survey; these features were based on findings from the POE survey.

The instrument was pretested by several faculty members and graduate students. Feedback was solicited regarding the content validity and the clarity of the wording for each item. Subsequently, a pilot survey was conducted to ensure the reliability of the scales and the general mechanics of the survey questionnaire, particularly with regard to survey instructions, completion time, and appropriate wording in the survey. A total of fifteen respondents participated in the pilot test. Cronbach's alpha for the various scales in the survey showed adequate reliability, with all scales having reliability above 0.7. The measurement scale used for this study is presented in Appendix Table A1.

In preparation of the survey instrument, several procedural remedies were incorporated to avoid or reduce common method bias. Craighead et al., [2011] and Podsakoff et al., [2003] provide the following recommendations:

1. *Increasing validity by using concise and clear questions; removing ambiguity of terms used; removing vagueness of questions.* In this study this was achieved through the multi-iterative pretest with the panel. To remove the ambiguity, the participants were also given clear instructions.
2. *Protecting respondent anonymity and reducing evaluation apprehension:* In this study the variables were chosen such that they were informative but at the same time did not require any sensitive data. For example, for learning experience, a self-reported measure was chosen rather than a secondary course grade–type measurement, which would have required respondents to identify themselves. Thus, participants could answer the questionnaire without requiring any special identification or clearance. All precautionary measures were adopted in the survey process to ensure the confidentiality of data.
3. *Counterbalancing item order:* For this study the measurement items were randomized in blocks. This randomization can easily be done in online survey software.
4. *Use of different scale anchors where possible.* As can be seen in the appendix, the constructs used different scale anchors.
5. *Use of attention check questions.* Several simple random attention check questions that had nothing to do with the study context were incorporated.
6. *Use of a marker variable for additional post-hoc analysis.* The additional variable "consciousness" was incorporated to serve as a marker variable as needed.

Sample

This survey was carried out in several sections of courses at all levels of undergraduate and graduate programs in the business school. These classes were spread out in several buildings across the campus, some in the new building as well as some classes in other buildings.

After cleaning the data for incomplete or obviously erroneous input, the sample consisted of 701 responses, with 466 (66.5 percent) undergraduate and 235 (33.5 percent) graduate students. Of these, 418 (60 percent) were male, and 218 (40 percent) were female.

ANALYSIS

SmartPLS 3 was used as the primary statistical tool to analyze the measurement and structural models because it is well suited to handle large models with latent constructs, and more important, is adept at handling formative constructs. Per the norm, preliminary analysis of the data was carried out, followed by testing the measurement model, followed by testing the structural model using the hypothesized relationships.

Measurement Model

Appendix A1 provides a description of all items in the survey. To assess reflective (first-order) constructs in the measurement model, construct reliability, convergent validity, and discriminant validity were examined. As recommended by Hair, Risher, Sarstedt, and Ringle [2019], the first step in reflective measurement model assessment involves examining the indicator loadings. Appendix A2 shows the loadings for all survey items included in the model. Items without sufficient loading were removed from further analysis (denoted in Appendix A1). Although the instrument was informed by prior research as well as the POE survey carried out before the final data collection, certain factors that were deemed important did not load in the larger final data collection (e.g., acoustic quality of the classroom, temperature, availability of electrical outlets).

The second step is assessing internal consistency reliability [Hair et al., 2019]. Reliability can be assessed using Cronbach's alpha and composite reliability [Cronbach, 1971; Fornell and Larcker, 1981]. A composite reliability of 0.70 or greater [Nunally, 1978] and a Cronbach's alpha of 0.70 [Chin, 1998] are considered acceptable for research. Cronbach's alpha produces lower values than composite reliability, and more specifically, Cronbach's alpha is a less precise measure of reliability, because the items are unweighted [Hair et al., 2019]. In contrast, with composite reliability, the items are weighted based on

the construct indicators' individual loadings and, hence, this reliability is higher than that of Cronbach's alpha. Although Cronbach's alpha may be too conservative, the composite reliability may be too liberal, and the construct's true reliability is typically viewed as being within these two extreme values. As an alternative, Dijkstra and Henseler [2015] proposed Rho_A as an approximately exact measure of construct reliability, which usually lies between Cronbach's alpha and the composite reliability. As presented in Appendix A3, composite reliability of 0.70 or greater [Nunally, 1978] was observed for all constructs. In addition, Cronbach's alpha was above the threshold of 0.70 [Chin, 1998] for all. Rho_A was also observed to be above the acceptable value of 0.70 and is between Cronbach's alpha and the composite reliability.

In the next step, convergent validity and discriminant validity were examined. Convergent validity assesses consistency across multiple items, whereas discriminant validity examines the extent to which different constructs diverge from one another. To test the convergent validity and discriminant validity, average variance explained (AVE), latent construct correlations, and indicator loadings can be examined. Convergent validity exists when the indicators load much higher on their hypothesized factor than on other factors (i.e., own loadings are higher than cross-loadings). Items should load high (>0.70) on their respective constructs, and no item should load higher on constructs other than the one it was intended to measure [Chin, 1998]. (This is shown in Appendix A2.) Additionally, AVE is calculated by using the square of the loading of each indicator on a construct and computing the mean value. An acceptable AVE of 0.50 or higher indicates that the construct explains at least 50 percent of the variance of its items [Fornell and Larcker, 1981]. All AVEs (Appendix A3) are well above 0.50, suggesting that the principal constructs capture much higher construct-related variance than error variance.

To assess discriminant validity, which is the extent to which a construct is empirically distinct from other constructs in the structural model, the square roots of the AVEs for each latent variable should be higher than any of the correlations between that latent variable and other latent variables [Fornell and Larcker, 1981; Gefen, Straub, and Boudreau, 2000]. As shown in Appendix Table A4, the square root of the AVE of all constructs (presented in bold in diagonal gray cells) was found to be much larger than all other cross-correlations. The correlations among all constructs are all well below the 0.90 threshold, suggesting that all constructs are distinct from each other.

In addition to the precautionary approaches used to reduce the chances of common method bias creeping in the data, the following statistical tests were performed to assess the potential effects of common-method variance in the results. First, the correlation matrix was examined for highly correlated factors. The common method bias exists when there exist extremely high correlations ($r > .9$) [Pavlou et al., 2007]. Table A4 shows that correlation is not very high meeting this criterion. Second, a variance inflation factor (VIF) test was carried

out. The occurrence of a VIF greater than 3.3 can be considered an indicator of pathological collinearity—suggestive of common method bias. If all VIFs in the inner model are equal to or lower than 3.3, as can be seen from Appendix Table A5, the model can be considered free from common method bias [Kock, 2015]. Third, an analysis with a marker variable "consciousness" was conducted. The structural model was tested with and without the marker variable and did not show any significant differences in the coefficients, direction of the path, or the significance levels for all the main paths tested in this model. These tests collectively indicate that common method bias was not a substantial issue for this data.

Structural Model Results

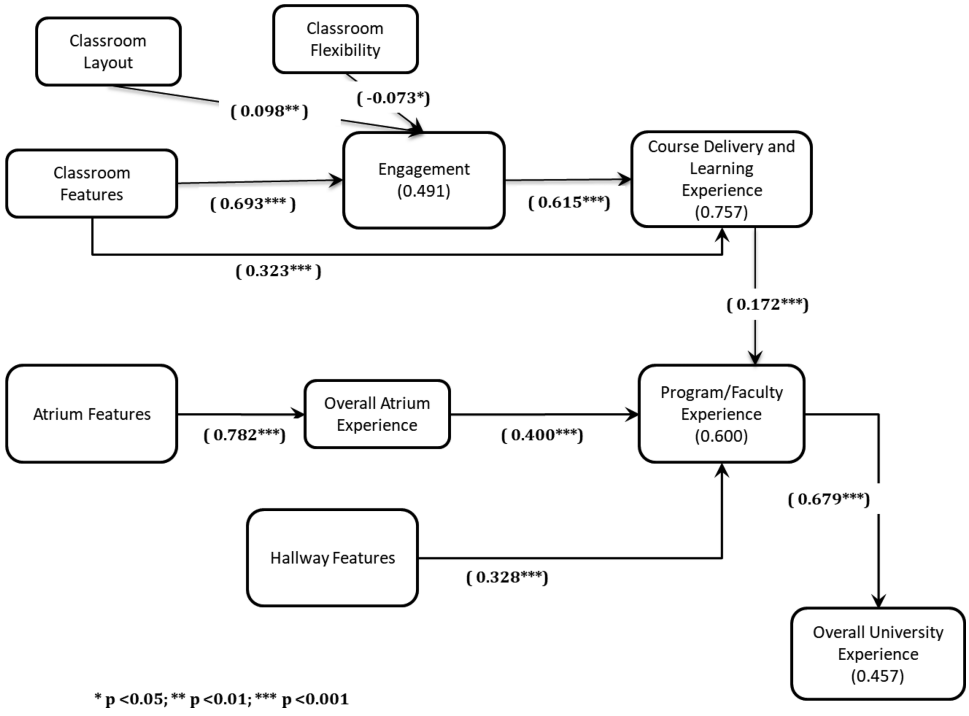
Upon confirmation that the measurement model met satisfactory conditions, for hypotheses testing, the structural model was examined using bootstrapping (1,000 resamples) to determine the significance of the path coefficients. These results are shown in Table 1 and Figure 2.

The proposed model explains 49 percent of the variance in student engagement due to classroom features and layout. Student engagement and classroom features explain 76 percent of the variance in course delivery and

Table 1. Structural Model Results

Hypothesis		Path Coefficient	Significance (*p*-Value)
H1A	Classroom Features (CFS) → Engagement	0.695	0.000
H1B	Classroom Layout → Engagement	0.098	0.0035
H1C	Classroom Flexibility → Engagement	−0.073	0.0399
H2A	Classroom Features (CFS) → Course Delivery and Learning Experience	0.323	0.000
H2B	Engagement → Course Delivery and Learning Experience	0.615	0.000
H2C	Course Delivery and Learning Experience → Overall School Experience	0.172	0.000
H3A	Atrium Features → Overall Atrium Experience	0.782	0.000
H3B	Overall Atrium Experience → Overall School Experience	0.400	0.000
H3C	Hallway Features → Overall School Experience	0.328	0.000
H3D	Overall School Experience → Overall Univ Experience	0.679	0.000

Figure 2. Research Model Results



learning experience of students. Classroom experience, atrium experience, and hallway experience together explain 60 percent of the variance of program and school experience felt by students, which in turn explains 46 percent of the variance in overall university experience felt by students.

Classroom features were found to have a significant effect on student-perceived engagement in the course (0.693; p-value < 0.001), confirming hypothesis H1a. Classroom features were found to have an additional effect on overall class experience felt by students in course delivery and learning experience (0.323; p-value < 0.001), confirming H2a. In line with expectations, the U-shaped classroom layout is preferred for student engagement when compared with front-facing classrooms (0.098; p-value < 0.01), confirming H1b. However, contrary to expectations, flexible arrangement of furniture was found to have a slightly negative effect on the student felt engagement (H1c: -0.073; p-value < 0.05). Student engagement was found to have significant effect on the overall classroom course delivery and learning experience (0.615, p-value < 0.001) confirming hypothesis H2b.

The effect of classroom layout and flexibility of the furniture movement was further tested with analysis of variance (ANOVA) tests. Mean engagement

score of various classroom layouts (front-facing, U-shaped, and other) were found to have a statistically significant difference among the groups (F stat: 28.12; $p < 0.0001$),with the highest average score for the U-shaped classrooms. Similarly, an ANOVA test was carried out for the mean engagement score for classroom flexibility [options were: (1) tables and chairs both movable, (2) only chairs movable while tables fixed, and (3) and both chairs and tables fixed], which also indicated that there was a statistically significant difference among the groups (F stat: 15.12; $p < 0.0001$) with the highest score occurring for the classrooms where chairs were movable but tables were fixed).

This classroom experience was tested to see its effect on the students' perceived experience in the program and faculty/school. The data showed a significant effect of classroom experience on the student experience in the school (H2c: 0.172; p-value < 0.001).

Considering other physical areas in the building, atrium features enhanced the atrium experience (H3a: 0.782; p-value < 0.001), which in turn enhanced the student experience in the school and program significantly (H3b: 0.400; p-value < 0.001). Hallway features are also significantly related to student experience in the program (H3c: 0.328; p-value < 0.001).

In testing hypothesis H3d, it was found that student experience in the school has a significant positive effect on the overall university experience felt by the students (0.679; p-value < 0.001).

DISCUSSION

Many of these quantitative results align with prior research that found that physical facilities such as classrooms and other spaces in the building affect learning experiences [Cleveland and Fisher, 2014; Lei, 2010]. Findings indicate that a substantial portion of variance in student experiences is related to the building characteristics, such as classroom features, atrium features, and hallway features. Thus, this study shows the significant impact physical spaces have on student engagement, student learning, program and school experience, and university experience. Although most prior studies and discussions have provided logical or theoretical explanations and/or were anticipatory, this study is one among a few that quantitatively verify the effect of the physical characteristics of learning spaces.

It may be surprising how much of the variance in course delivery and learning experience is explained by the model (75.7 percent). It is important to note that part of this comes directly from the physical features, but much more comes from student engagement—which may be expected. Thus, engagement is an important intermediary variable that is necessary to help explain the effect of the physical space on course delivery and learning experience. Still, some may doubt that a model that is entirely based on physical classroom

features can explain such a large portion. We suggest that this may indeed be accurate, given that even the best instructor would have difficulty teaching if the physical classroom were very poor (e.g., not all students able to see the front, students not able hear everything that is said, the room is very hot or very cold, etc.). Consider that even the worst classrooms in HE have at least basic functionality to enhance learning; therefore when asking students about superior classrooms, we have shown that they do indeed have a significant effect on course delivery and learning experience.

When considering what affects student engagement, classroom features were found to have significant effect (i.e., quality of the desks and chairs, lighting, effective teaching technologies, etc.; see Appendix A1 for the list of all the features that loaded). Veltri et al. [2006] and Lei [2010] discuss classroom features. The quality of desks and chairs is an important consideration. Uncomfortable seating may shift student focus. The ability to use desks and chairs comfortably allows students to focus better, even for longer three-hour lectures. Similarly, appropriate lighting is critical. With the diversity in the classroom activities and presentation styles used in the classroom, user-friendly controls that allow adaptation to the presentation style are also critical. Visual environment can influence an individual's ability to perceive visual stimuli and influence mental attitude toward learning [Veltri et al., 2006]. In addition, classroom technologies have become essential in today's classroom. Today's classrooms integrate multiple presentation modes, including projecting a computer screen, Wi-Fi shared device screens, overhead cameras, and more. However, the audiovisual functioning of these technologies as well as placement of the projection screens is essential to enhance the learning experience. Previous studies have found that students rate course enjoyment and classroom learning higher in upgraded classrooms [Hill and Epps, 2010]. In this study, all classroom features were vastly superior to the prior classrooms.

Classroom layout also had a significant impact on engagement (U-shaped versus front-facing, fixed versus flexible). Many pedagogical resources suggest that an instructor can maximize student engagement by changing the physical setup of chairs, tables, and presentations in the classroom. This notion is based on instructional communication theory [McCorskey and McVetta, 1978]. The theory suggests that seating arrangements can impact how the instructors communicate with students and how students interact with one another. These interactions affect student engagement. The setup of the classroom space can shape instructor pedagogy, choice of activities, and student engagement. There are many different classroom seating arrangements possible, such as front-facing, roundtable, horseshoe or U-shape, grouped or paired seatings. The layout should enhance the nature of the course delivery, as suggested by Brooks [2011, 2012].

In the Goodman School of Business most classes have U-shaped layouts, and students prefer these over other layouts. At the same time, most business faculty

members also prefer U-shaped classrooms; this preference may or may not be unique to business schools, but it is apparent that a U-shape facilitates class-wide discussion and debate—which is common in business classes. This is in line with Alstete and Beutell [2018], who identified that students favor curved semicircle-style classrooms.

In a related but separate finding, it may be surprising that flexible classrooms are not preferred; they had a slightly negative effect on the student felt engagement. This is in contrast to many other studies that have found flexible or active-learning classrooms to be best for smaller group interaction (e.g., Morrone et al., 2014; Brooks, 2001, 2012; Lei, 2010; Harvey and Kenyon, 2013). We feel this is a function of at least two factors in this study. First, the new U-shaped classrooms are really very comfortable and esthetically pleasing. The flexible classrooms have the same features, colors, and technology but are usually less organized; tables and chairs get moved around and sometimes left a little helter-skelter; the place a student sits in one class may not be available the next class, and at times the table arrangement can be an impediment to movement. In addition, the flexible classrooms are not tiered, which reduces sight lines for students toward the back. Second, the tiering of the U-shape not only facilitates sight lines but are also better for class-wide discussions than the flexible classrooms.

Now considering the combined impact of both classroom features and layout on engagement, in the sample data the impact of classroom features was much stronger than the impact of layout, signifying that the features are more important than the layout. This is an interesting finding, suggesting that layout is less important than other features. The combination of aspects such as esthetics, technology, comfort, sight lines, and acoustics are together more important than layout.

In our study, some respondents were taking classes in the new building, whereas some respondents were taking classes held in other older buildings on the campus. Thus, additional analysis was carried out to examine whether there was any difference between these two groups. Using two respondent groups: (1) the new building group and (2) other campus building group, analysis reveals that for all the main model paths, the coefficients and direction of the paths were similar for both the groups with no statistically significant differences among the two groups. This finding suggests that the results were not artifacts of the new building, but rather they denote the effect that physical spaces can have on engagement and learning in general.

LeGrow et al. [2023] point out that spaces on a campus play a role in shaping students' personal and professional identities. This study touched on this relationship by testing the strength of students' positive experience as a result of the physical building. Figure 2 shows that the course delivery and learning experience significantly contributes to student experience in the program. However, the student experience in the program is also affected by their

experience of other physical spaces, such as the atrium and the hallways. With the understanding that these spaces also significantly enhance student experience, and with significant user input in the new building design, significant thought was put into creating an inviting atrium that will give students space to sit, relax, visit, or work on their own or in groups. This study found that the atrium features enhanced the atrium experience, which in turn enhanced the student experience in the program significantly. Similarly, hallway features enhanced the students' experience in the program (although, not surprisingly, this was weaker than the impact the atrium had). Finally, the student experience in the program significantly enhanced the overall university experience felt by the students.

Thus, it has been shown that a physical building and its spaces have a significant impact on student engagement, student learning, faculty and program experience, and university experience.

Limitations and Opportunities for Future Research

There are several opportunities for future research resulting from the findings and limitations of this study. First, this study uses a cross-sectional survey data collection method; this methodology provides student views at a point in time. Future studies can consider using a longitudinal investigation to understand students' experience over time using a within-subject design. If the opportunity presents itself, studies can also examine building projects through a pre- and post-method analysis.

The study used self-reported perceptions to capture learning experience. While some have argued that students may not be the best evaluators of their own learning (e.g., Beckers et al. [2016]; in contrast, Rovai, Wighting, Baker, and Grooms [2009, p. 9] argue that in cases where disparate courses are being taught, such as in this study, "using grades as the sole measure of learning can be problematic, particularly when measuring learning outcomes across disparate courses and content areas, so a self-report instrument has advantages for such research." Nonetheless, it would be helpful to evaluate the findings using other measurement tools (e.g., grades, focus groups) to triangulate the findings.

It would be beneficial to carry out similar studies in other schools, and/or carry out the study in multiple schools to see what the similarities and differences are to validate and enhance these findings.

CONCLUSION

This study focuses on the impact of a physical building and its learning spaces on student engagement and learning. It is one of the first to test these relationships empirically with a structural model. The study benefited from a

well-designed building that included substantial new space and a complete renovation of existing space. Thus, respondents were able to validly compare the new space to the prior building and to other spaces on campus. This research is one of very few that have quantitatively tested these relationships. It demonstrates that classroom features have a positive impact on course delivery and learning experience, which then have a positive impact on students' experience in the program and with faculty. Other building features also positively affect student experiences interacting with the faculty, which then positively affect student experience at the university. In contrast to many other studies, students do not prefer flexible classrooms in this study; as explained, this may be a result of the particular features of the classrooms in this building. It is hoped this study can motivate other empirical research that will study specific design details further.

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APPENDIX

Table A1. Survey Instrument

Classroom Features	**Please rate your satisfaction with the following aspects of the classroom this course is in: (Extremely satisfied – Extremely dissatisfied)**	
	Chairs - Comfort/ergonomics of chair	CFS1
	Acoustics (dampening of distracting noises)	CFS10*
	Effectiveness of teaching technology (audio-visual)	CFS11
	Placement of screens, whiteboards, podium, etc.	CFS12
	Air freshness	CFS13*
	Temperature	CFS14*
	Overall esthetics (does the classroom look nice?)	CFS15
	Comfort of chair position compared to desk/table	CFS2
	Work area on the desktop	CFS3*
	Quality of desks and tables	CFS4
	Location of electrical outlets	CFS5*
	Quantity of electrical outlets	CFS6*
	Colors (walls, floor, furniture, etc.)	CFS7
	Lighting	CFS8
	Acoustics (ability to hear what you are supposed to)	CFS9
Classroom Flexibility	Furniture arrangement: (Both tables chair Moving 3; Tables Permanent Chair moving 2; Both tables chair permanent 1)	TC Movable BM3,cm2,bP1
Classroom Layout	Seating arrangement (front −1; U −2, Other 3)	ClassLayout (f1,u2,o3)
Engagement	**In terms of the classroom activity and engagement, please indicate your experiences as a result of the classroom layout. The classroom layout facilitated: (Strongly Disagree . . . . Strongly Agree)**	
	General physical movement	Eng1*

Table A1. Continued

	Participation / Class Contribution	Eng2
	The classroom layout helped me:	
	Focus on classroom activities	Eng3
	Be interested in the classroom activities	Eng4
	Work with other students when teamwork was done in class	Eng5
	Be engaged in the classroom activities	Eng6
Classroom Experience: Course Delivery and Learning Experience	**Please indicate overall experience you had in your classroom (Strongly Disagree . . . . Strongly Agree)**	
	good	Overall ClassExp1
	enhanced my learning	Overall ClassExp2
	enhanced teaching delivery.	Overall ClassExp3
	course delivery effective.	Overall ClassExp4
Atrium Features	**Indicate your overall feelings about the FOB Atrium: (Extremely satisfied – Extremely dissatisfied)**	
	Number of seating places in the Atrium	Atrium1
	Temperature	Atrium10*
	Air freshness	Atrium11*
	Overall esthetics (does the Atrium look nice?)	Atrium12
	Acoustics (is the noise level comfortable when you are in the Atrium)	Atrium13
	Comfort/ergonomics of seating	Atrium2
	Quality of tables and work surfaces	Atrium3
	Location of electrical and USB outlets	Atrium4*
	Quantity of electrical and USB outlets	Atrium5*
	Natural lighting	Atrium6*

Table A1. Continued

	Artificial (electric) lighting	Atrium7
	Floor material	Atrium8
	Audio/Visual technology (video wall, etc)	Atrium9
Atrium Experience	**Indicate your overall feelings about the FOB Atrium:** **(Strongly Disagree . . . . Strongly Agree)**	
	Overall I like being in the Atrium	OverallAtrium1
	It feels good to be in the Atrium	OverallAtrium2
	The Atrium is a good place to study	OverallAtrium3
	The Atrium is a good place to relax	OverallAtrium4
	The Atrium is a comfortable space to be in	OverallAtrium5
Hallway Features	**Indicate your level of satisfaction with FOB hallways/ corridors** **(Extremely satisfied – Extremely dissatisfied)**	
	Number of seating places in the hallways	Hallway1
	Comfort/ergonomics of seating	Hallway2
	Location of electrical and USB outlets	Hallway3
	Quantity of electrical and USB outlets	Hallway4
	Natural lighting	Hallway5
	Artificial (electric) lighting	Hallway6
	Overall esthetics of hallways	Hallway7
	Acoustics (is the noise level comfortable when you are in the hallways)	Hallway8
	Overall satisfaction with the hallways	Hallway9
	Indicate your overall experience and opinions about the following **(Strongly Disagree . . . . Strongly Agree)**	

Table A1. Continued

Overall Faculty/Program Experience	The overall academic experience is enhanced with the new FOB building	OverallExp1
	It feels good to be part of a faculty with a new building.	OverallExp2
	I am likely to spend more time on campus because of the spaces in the new FOB building	OverallExp3
	I feel attached to Faculty of Business.	OverallExp4
Overall University Experience	In general, I like – University.	OverallExp5
	I feel attached to – University.	OverallExp6
Consciousness	Pay attention to details.	
	Make plans and stick to them.	

Note: Items indicated with * were removed from final analysis due to inadequate loadings. The surveys used "FOB" as a short form for "Faculty of Business."

Table A2. Measurement Model—Loadings and Cross-Loadings

	1_Class Features (CFS)	1_Class Flexibility	1_Class Layout	1_Engagement	2_CrseDel Learning Exp	3_Atrium Features	3_Overall Atrium Exp	4_Hallway Features	5_Overall FOB Experience	6_Overa-ll UnivExp
CFS1	**0.70**	0.28	0.18	0.48	0.54	0.40	0.35	0.40	0.40	0.36
CFS11	**0.79**	0.13	0.04	0.53	0.59	0.47	0.38	0.42	0.44	0.33
CFS12	**0.73**	0.05	−0.01	0.53	0.55	0.41	0.32	0.36	0.32	0.25
CFS15	**0.83**	0.08	0.07	0.63	0.66	0.44	0.36	0.40	0.36	0.35
CFS2	**0.71**	0.24	0.23	0.49	0.52	0.37	0.33	0.34	0.37	0.33
CFS4	**0.75**	0.15	0.09	0.51	0.56	0.41	0.33	0.40	0.38	0.33
CFS7	**0.80**	0.14	0.08	0.52	0.53	0.46	0.37	0.43	0.38	0.34
CFS8	**0.78**	0.11	0.03	0.48	0.50	0.42	0.32	0.35	0.32	0.25
CFS9	**0.73**	0.05	0.12	0.51	0.52	0.39	0.26	0.31	0.28	0.24
ClassFlex	0.18	**1.00**	0.30	0.08	0.08	0.17	0.11	0.15	0.19	0.11
ClassLayout	0.13	0.30	**1.00**	0.15	0.12	0.03	−0.03	−0.05	0.10	0.05
Engage2	0.57	0.11	0.08	**0.80**	0.65	0.44	0.36	0.42	0.39	0.33
Engage3	0.63	0.04	0.11	**0.90**	0.76	0.44	0.42	0.43	0.41	0.35
Engage4	0.64	0.05	0.14	**0.90**	0.77	0.44	0.41	0.43	0.44	0.38
Engage5	0.47	0.07	0.19	**0.72**	0.56	0.36	0.35	0.35	0.41	0.39
Engage6	0.61	0.09	0.12	**0.91**	0.76	0.43	0.37	0.42	0.42	0.39
OverallClass Exp1	0.72	0.04	0.10	0.78	**0.89**	0.48	0.41	0.47	0.45	0.41
OverallClass Exp2	0.64	0.10	0.15	0.78	**0.92**	0.43	0.39	0.44	0.49	0.41
OverallClass Exp3	0.66	0.08	0.12	0.75	**0.92**	0.40	0.36	0.41	0.44	0.37

Table A2. Continued

	1_Class Features (CFS)	1_Class Flexibility	1_Class Layout	1_Engagement	2_CrseDel Learning Exp	3_Atrium Features	3_Overall Atrium Exp	4_Hallway Features	5_Overall FOB Experience	6_Overa-ll UnivExp
OverallClass Exp4	0.67	0.07	0.07	0.72	**0.91**	0.42	0.37	0.40	0.42	0.33
AtriumF1	0.41	0.05	−0.09	0.38	0.33	**0.72**	0.58	0.55	0.44	0.40
AtriumF12	0.40	0.12	0.10	0.34	0.32	**0.75**	0.59	0.52	0.51	0.36
AtriumF13	0.40	0.12	0.00	0.34	0.31	**0.75**	0.62	0.58	0.52	0.40
AtriumF2	0.42	0.10	−0.03	0.43	0.40	**0.79**	0.66	0.56	0.52	0.39
AtriumF3	0.46	0.16	0.00	0.44	0.42	**0.78**	0.65	0.56	0.56	0.43
AtriumF7	0.47	0.16	0.06	0.36	0.39	**0.81**	0.59	0.60	0.55	0.41
AtriumF8	0.45	0.17	0.07	0.38	0.38	**0.79**	0.57	0.62	0.58	0.41
AtriumF9	0.43	0.16	0.07	0.38	0.38	**0.80**	0.57	0.59	0.56	0.43
Overall Atrium1	0.39	0.12	−0.02	0.36	0.34	0.72	**0.89**	0.59	0.60	0.45
Overall Atrium2	0.38	0.13	0.00	0.39	0.36	0.72	**0.91**	0.61	0.64	0.49
Overall Atrium3	0.32	0.02	−0.12	0.32	0.32	0.55	**0.76**	0.50	0.47	0.42
Overall Atrium4	0.40	0.11	−0.01	0.41	0.39	0.66	**0.85**	0.58	0.60	0.48
Overall Atrium5	0.44	0.08	0.00	0.43	0.41	0.72	**0.90**	0.64	0.64	0.50
Hallway1	0.38	0.11	−0.01	0.37	0.37	0.55	0.51	**0.79**	0.49	0.32
Hallway2	0.41	0.10	−0.05	0.44	0.42	0.61	0.60	**0.81**	0.57	0.43

Table A2. Continued

	1_Class Features (CFS)	1_Class Flexibility	1_Class Layout	1_Engagement	2_CrseDel Learning Exp	3_Atrium Features	3_Overall Atrium Exp	4_Hallway Features	5_Overall FOB Experience	6_Overa-ll UnivExp
Hallway3	0.36	0.07	−0.05	0.35	0.35	0.52	0.50	**0.81**	0.49	0.36
Hallway4	0.38	0.08	−0.06	0.35	0.37	0.54	0.50	**0.80**	0.49	0.36
Hallway5	0.41	0.14	−0.05	0.36	0.34	0.56	0.51	**0.77**	0.54	0.39
Hallway6	0.46	0.16	0.01	0.39	0.39	0.68	0.56	**0.80**	0.60	0.45
Hallway7	0.39	0.15	−0.04	0.38	0.37	0.62	0.55	**0.82**	0.58	0.46
Hallway8	0.39	0.16	−0.02	0.40	0.37	0.62	0.56	**0.81**	0.57	0.43
Hallway9	0.46	0.13	−0.06	0.45	0.44	0.65	0.62	**0.88**	0.62	0.49
OverallUniv Exp1	0.48	0.16	0.10	0.47	0.50	0.67	0.62	0.61	**0.84**	0.53
OverallUniv Exp2	0.41	0.15	0.08	0.38	0.39	0.59	0.57	0.55	**0.80**	0.50
OverallUniv Exp3	0.32	0.08	0.00	0.37	0.36	0.50	0.56	0.56	**0.81**	0.54
OverallUniv Exp4	0.40	0.22	0.12	0.39	0.41	0.53	0.54	0.55	**0.86**	0.69
OverallUniv Exp5	0.40	0.08	0.03	0.42	0.40	0.51	0.54	0.49	0.64	**0.95**
OverallUniv Exp6	0.38	0.14	0.07	0.40	0.40	0.48	0.49	0.49	0.66	**0.95**

Table A3. Measurement Model—Reliability Test

	Model Constructs	Cronbach's Alpha	Rho_A	Composite Reliability	Average Variance Extracted (AVE)
1	1_ClassFeatures (CFS)	0.905	0.908	0.923	0.573
2	1_ClassFlexibility	1.000	1.000	1.000	1.000
3	1_Engagement	0.901	0.913	0.928	0.723
4	1_ClassLayout	1.000	1.000	1.000	1.000
5	2_CrseDelLearningExp	0.930	0.931	0.950	0.827
6	3_AtriumFeatures	0.904	0.905	0.923	0.600
7	3_OverallAtriumExp	0.914	0.923	0.935	0.744
8	4_HallwayFeatures	0.934	0.937	0.946	0.659
9	5_OverallFOBExperience	0.850	0.854	0.899	0.689
10	6_OverallUnivExperience	0.899	0.900	0.952	0.909

Table A4. Measurement Model—Latent Variable Correlation

	1	2	3	4	5	6	7	8	9	10
1_ClassFeatures (CFS)	**0.757**									
1_ClassFlexibility	0.181	**1.00**								
1_Engagement	0.692	0.082	**0.850**							
1_ClassLayout	0.125	0.299	0.145	**1.00**						
2_CrseDelLearningExp	0.740	0.080	0.835	0.121	**0.910**					
3_AtriumFeatures	0.561	0.165	0.495	0.029	0.476	**0.774**				
3_OverallAtriumExp	0.451	0.107	0.448	−0.032	0.423	0.786	**0.863**			
4_HallwayFeatures	0.507	0.150	0.486	−0.049	0.476	0.740	0.679	**0.812**		
5_OvFOBExperience	0.483	0.190	0.483	0.095	0.498	0.682	0.688	0.683	**0.830**	
6_OvUniExperience	0.413	0.113	0.434	0.050	0.423	0.519	0.542	0.514	0.684	**0.953**

Table A5. Inner Variance Inflation Factor (VIF) Values

	1	2	3	4	5	6	7	8	9	10
1_ClassFeatures (CFS)			1.0397		1.9210					
1_ClassFlexibility			1.1239							
1_Engagement					1.9210					
1_ClassLayout			1.1046							
2_CrseDelLearningExp									1.3265	
3_AtriumFeatures							1.0000			
3_OverallAtriumExp									1.9046	
4_HallwayFeatures									2.0307	
5_OvFOBExperience										1.0156
6_OvUniExperience										

Can Retained Learning of Lower-Level SES Students Surpass the General Student Significance Found in Using Simulation or Combined TBL/PjBL Modalities?

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Guided by the tenets of constructivist learning theory combined with an analysis of thirteen years of collected primary cohort data (from a standard Principles of Marketing course, 2006–2019), authors posit that lower-level socioeconomic status students could have better learning outcomes than the general student body when specific higher-order, active-learning modalities are added to traditional pedagogy. This revelation occurred when using the higher-order modalities, namely simulation or combined team-based learning (TBL)/project-based learning (PjBL), for all cohorts over the data collection period. These findings present a unique contribution. Business educators are often encouraged to design courses with a simulation component or a combined TBL/PjBL program because it will lead to greater engagement and learning for all students, but our research suggests that the gains may be even more pronounced for those students in disadvantaged socioeconomic segments.

Keywords: Active Learning, Demographics, Team-based Learning (TBL), Problem-based Learning (PBL), Simulations, Project-based Learning (PjBL), Experiential and Cooperative Learning, and Community Service
Disciplines of Interest: Behavioral Economics, Psychology, Sociology, Demography, Marketing, Management

INTRODUCTION

For this work, using guidance from, and building with the suggested framework of, constructivist learning theory, statistical analysis was conducted using random pre- and posttest student scores collected from 2006 to 2019 in a

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recurring Principles of Marketing course at a southeastern university. Our study objective was to determine whether the improved learning outcomes reported in an earlier analysis [von Freymann, J., and Cuffe, B., 2020] when adding higher-order learning modalities were consistent across students in different subgroups relating to socioeconomic status (SES), and Major. For this statistical analysis, more information was gleaned from the university records regarding student demographic and socioeconomic data for additional study.

In the combined cohort data sets, a control group that did not use project-based learning PjBL or team-based learning (PjBL/TBL) was set up in 2006. The control group used a combination of traditional active-learning lectures and casework. After that, other higher-order forms of such active learning were added to the effort to make up three different additional groups that were presented as a non-TBL simulation, TBL/problem-based learning (PBL), and TBL/PjBL. The primary objective of the prior analysis was to determine, through statistical analysis of the database, the significance with the combined cohorts for learning retention via use of these higher-order active-learning modalities.

The literature revealed that other researchers had added demographic considerations to their analysis of higher-order modalities, with significance shown specifically in using PjBL with low-performing student populations [Cervantes, Hemmer, and Kouzekanani, 2015]. Significance was also shown by others when considering just ethnicity and economic status [Han, Capraro, and Capraro, 2015]. Separately, significance was also attained by adding TBL programs that considered several specific demographic characteristics [SES, race/ethnicity, gender, and age] [Hettler, 2015].

Given these recent directions in improving student learning and retention, one might wonder whether significance might also be found in considering demographic, sociocultural, and economic data, and other metrics in the database for this paper's extended study, as worthwhile added analyses of its existing database. In the context of constructivist learning theory, paying special attention to such minority and/or economically challenged, low-level SES groups (combined with the new opportunities derived from experiential building concepts) should now be more worthwhile endeavors.

Considering the historical progression in active learning and its various higher orders of application as posited by constructivist learning theory, this paper will attempt to add to the body of emerging SES considerations in active learning, as suggested in the literature [Freeman, Eddy, McDonough, Smith, Okoroafor, Jordt, and Wenderoth, 2014], by addressing the following question:

Will analysis of student metrics when implementing higher-order active-learning modalities depict homogeneous improvements across all of the various defined groups within the SES, GPA, and Major demographics?

LITERATURE REVIEW

Constructivist Learning Theory

Constructivist learning theory (one of three primary learning theories) focuses on individual learners and how they build new understanding and meaning from applied experiences to construct new knowledge as their new learned and retained reality [McLeod, 2024; Cooperstein and Kocevar-Weidinger, 2004; see also Good and Brophy, 1994].

Simply put, constructivism as a student learning theory is "a process of constructing knowledge based on experience" [Jumaat, Tasir, Halim, and Ashari, 2017, 7904]. The student learning experience is then built upon the classroom concepts under study and their relevant, hands-on, and rigorously applied application [Jumaat, et al., 2017].

This new knowledge then frames and influences a cognitive process in adapting future exposures to expand new knowledge. This is an active process for students, realized with new meaning through activities like hands-on experiments and/or real-world problem-solving, pushing and expanding new knowledge from short-term to long-term memory [Arends, 1998]. This observable and measurable newly retained learning process surpasses past passive classroom practices, such as lectures alone, where content may or may not go beyond working memory [Khalil and Elkhider, 2016; see also Elliot, Kratochwill, Littlefield Cook, and Travers, 2000; Arends, 1998].

Active Learning

Given the constructivist learning theory definition, how does active learning fit as a model for application? Since the late 1990s, researchers have identified active learning as an appropriate extension of the constructivist learning theory. Why? Because it fits the constructivist framework, where students can actively participate and learn how to build on their experiences, retaining that learning, and expanding their education in and out of the classroom (Anthony, 1996; Cooperstein and Kocevar-Weidinger, 2004; McLeod, 2024). And the active-learning process becomes much more than just in-class participation or hands-on activity. It is a multipart inductive process.

Perhaps better called "constructivist or discovery learning, [as it] moves from experience to learning and not the other way around" [Cooperstein and Kocevar-Weidinger, 2004, 141]. In this process, six engagement levels of active learning have been identified from the first level with in-class active forms of simple student questions, exchange, and discourse to higher-order problem- and project-based modalities and TBL as formalized key aspects of the process that included student collaborative and cooperative interactivity [Kuh, Kinzie, Schuh, and Whitt, 2005; Kuh, 2008].

Constructivist Learning Theory and the Higher-Order Modalities of Active Learning

Fortunately, encouraging findings have emerged since 1990 using the flipped classroom concept [Rotellar and Cain, 2016] and higher-order PjBL modalities in upper-level classes. This resulted in more positive student attitudes once completed in comparison with traditional case work, followed by possible improved critical thinking skills and problem-solving [Johnson, Johnson, and Smith, 1991; Hmelo-Silver, 2004; Dunlop, 2005; Strobel and van Barneveld, 2009; Stowe, von Freymann, and Schwartz, 2011; Perrault and Albert, 2018]. Consequently, specific higher-order active-learning modalities were noted as effective extensions of cooperative learning.

PBL Defined

As framed by constructivist learning theory, PBL is seen as a higher-order active-learning modality that is focused on the student being able to conduct research on a specific problem, apply theory and practice with the knowledge gained, coupled with the resulting enhanced demonstrated skills, to present a workable solution as an individual or group to the specific problem under study [Savery, 2006]. More importantly, as noted in research, students preferred the PBL approach with instructors and practitioners who were more engaged in the learning process as posited by theory [Torp and Sage, 2002].

PjBL Defined

PjBL was built from the theory and process of assigning real-world, time-projected student projects to accomplish set performance objectives and expectations for greater individual and/or collective learning [Smith and Dodds, 1997]. Remembering that constructivism as a learning theory is "a process of constructing knowledge based from experience" [Jumaat, et al., 2017], a more recent definition of PjBL presents it as a robust constructivist student learning model that "entails the construction of knowledge with multiple perspectives, within a social activity, and allows for self-awareness of learning and knowing while being context dependent" [Tamim and Grant, 2013, 73; see also Duffy and Cunningham, 1996]. Another paper posits that PjBL must be at the core of the activity, task-focused, investigative of resources, with scaffolding, collaboration, and opportunities for internal reflection, retained learning, and sharing [Grant, 2002].

Simulation Defined

Simulations for product marketing courses in higher education began to be offered beginning in 2010 by the major course text providers such as McGraw-

Hill and Pearson and are available today in many other special course applications from other publishers. The simulations work, for example, with *Practice Marketing* from McGraw-Hill Education, by using the major concepts in their *Principles of Marketing* text and having students act as brand managers simulating how they would process and apply the given major concepts in eighteen or more chapters to producing, pricing, promoting, placing, and selling a backpack.

More recently, the higher-order significance of active learning was presented in one study using a thirteen-year database where PBL, simulation, or community social service /PjBL (CSS/PjBL) combined with TBL were selectively added to Principles of Marketing courses from 2006 to 2019 [von Freymann and Cuffe, 2020]. Given prior considerations [Kuh et al., 2005; Kuh, 2008], CSS/PjBL combined with TBL suggested greater significance across all student cohorts than other modalities under study [von Freymann and Cuffe, 2020].

PBL and PjBL as Higher-Order Modalities Based on Cooperative Constructs

Cooperative constructs (the multiple steps that include collaboration suggested by Kuh, et al., [2005]) that are used in higher-order active-learning modalities (which included student team cooperation) were extolled by Kuh et al. [2005] and others [Johnson, Johnson, and Smith, 1991; Felder and Brent, 2007] with examples of student interaction in various kinds of projects such as community service as possibly the highest order of interactive learning [Kuh, 2008]. In time, PBL and PjBL were seen as alternative extensions of the cooperative construct, with students working in teams (at least two in the group) on specific assigned problems or projects. Later, some researchers posited that engaging students in real-world situations would yield the desired learning outcomes using the PjBL paradigm. It was suggested that PjBL (in reflecting the tenets of constructivist learning theory) would draw students in to address and apply the core concepts represented in the given project. They concluded that constructivism presents the frame and PjBL presents the process with a proven method to help students build knowledge from their experiences [Jumaat et al., 2017]. This finding would suggest that PjBL is the better alternative for retained learning of all the concepts under study rather than PBL, which usually focuses only on a single assigned real-life problem that would change for each class [DeFillippi, 2001].

Additionally, student-selected team projects, using PjBL-framed community service, were posited to be a better selection of the two higher modalities, not only did the projects expand the scope of real-world, analysis but allowed students to select their own project with increased retained learning over PBL [Panitz, 1996; Kuh et al., 2005; Stowe et al., 2011; von Freymann and Cuffe, 2020]. Over time, some problems and learning inconsistencies appeared to

exist when using PBL projects in which students were required to follow instructor-formulated problems and not given the freedom to select their own project [Kirschner, Sweller, and Clark, 2006].

Results from additional research suggested that more benefits would be gleaned with PjBL community service project for students, the community, and the sponsoring university over PBL-focused work on a single real-world problem [Govekar and Rishi, 2007; Grant, Malloy, Murphy, Foreman, and Robinson, 2010; see also Schwab, Greenwood, and Dustin, 2014].

TBL And Its Greater Value When Combined With PjBL

TBL is now seen as "an active learning and small group instructional strategy that provides students with opportunities to apply conceptual knowledge through a sequence of activities that includes individual work, teamwork, and immediate feedback" [Parmelee, Michaelsen, Cook, and Hudes, 2012, 275]. Conforming to constructivist learning theory guidelines [Hrynchak and Batty, 2012], TBL has emerged as a better learning process than traditional pedagogy and as a viable alternative to PBL [Burgess, van Diggele, Roberts, and Mellis, 2020]. Educators in most higher education disciplines now believe that TBL offers greater student involvement and broader retained learning due to its multiple levels of active-learning opportunities [Burgess et al., 2020; Carrie, Mulla, Patterson, Kilkolly-Proffit, Brookes, Sima, and Agee, 2016].

As such, the TBL process can be a simple, in-class, concept-focused learning activity that ultimately leads up to a higher-order active-learning experience with a focus on group collaboration and cooperation. First designed and applied in the 1980s by Larry Michaelsen and moving into prominence in higher education, especially in medical colleges [Burgess et al., 2020] to current times, TBL is an accepted, more universal, higher education didactic method than the long-standing lecture approach to learning [Michaelson, Watson, Cragin, and Fink, 1982; Michaelson, Knight, and Fink, 2002; Haidet, Kubitz, and McCormack, 2014]. Hrynchak and Batty [2012] posit that TBL reflects the principles of constructivist learning theory, using team cooperation and collaboration to build frameworks critical to students learning. TBL is an important addition to teaching and learning in health care, where students' understanding and functioning in team-based applications are critical [Hrynchak and Batty, 2012]. And when added to lower-level active-learning activities such as class participation and casework, TBL combined with PjBL community service presented suggested significance over the lecture/casework paradigm for greater retained learning [Kuh et al., 2005].

Some examples of TBL significance: Starting with a researchers' review of literature, it identified the possible need for improvements in undergraduate education and took on a team-based integration study using three different marketing classes. Student opinions presented an overall response skew in fifteen

of the sixteen assessment questions toward *strongly agree* in evaluating the personal learning value to them of integrated TBL/PjBL projects [Bobbitt, Inks, Kemp, and Mayo, 2000]. It is "not surprising that TBL produces a wide range of positive outcomes" [Michaelsen and Sweet, 2011, 50] as presented over the thirty years since published studies first began suggesting improvements in student test scores, engagement, knowledge retention, attitudes, and satisfaction in TBL [Michaelsen and Sweet, 2011].

In other selected TBL research papers published since 2012, a case study using TBL for the first time in a postgraduate marketing class detailed a more effective teaching process where students experienced higher-order learning experiences [Chad, 2012]. A meta-analysis of TBL literature to date posited that the review revealed evidence that TBL provided encouraging higher education performance outcomes in knowledge retention and student engagement [Haidet et al., 2014].

In a meta-analysis of thirty TBL-based studies (where seventeen of the thirty conformed to meta-analysis criteria), results in the effects of TBL on content learning outcomes suggested improvement in student grades, testing, and in-class engagement, with smaller group sizes positively affecting significance [Swanson, McCulley, Osman, Scammacca-Lewis, and Solis, 2017]. In an emergency medicine clerkship study to determine TBL advantages in knowledge improvement and retention (versus didactic/case discussion), it was suggested that adding TBL as part of a blended learning environment could improve student performance based on increased knowledge, possibly leading to long-term learning retention [Cevik, El Zubeir, Abu-Zidan, and Shaban, 2019].

Although little has been written with statistical support regarding the combined greater effect of TBL and PBL on retained learning, a paper published in 2022 suggested TBL cumulative significance (using multivariate regression analysis) through each of three identified TBL phases of learning: preparation, readiness assurance, and application [Hrynchak and Batty, 2012; Roossien, Boerboom, Spaai, and de Vos, 2022]. And another paper has suggested significance in a similar combination (PjBL/TBL) using a thirteen-year study of one recurring entry level class (Principles of Marketing), presenting higher impact than a standard didactive (lecture/casework) approach through TBL/PjBL classes or non–TBL/PjBL simulation (von Freymann and Cuffe, 2020).

Demographic Aspects, Lower-Level SES Student Considerations, and Their Relationships to Active Learning and Its Higher-Order Modalities

Study and understanding of demographic aspects that may affect an organization's offering of its goods, services, and/or ideas have long been a critical

mainstay of the marketing process. This importance is especially true in recent years, with the emphasis on product/market fit assessments in launching and maintaining successful product management and sales growth [Osterwalder, Pigneur, Bernarda, and Smith, 2014. see also Beck, 2022; Pahwa, 2022].

However, higher education's best teaching practices (including active learning and its higher-order modalities) are far slower to include such considerations in offering their educational services, even in tuition-based degree programs. So, an organization may wonder why marketing professors and other business educators do not take a page from practitioner successes in adopting and using an adaptive version of product/market fit (course content adaptations as student services' needs-wants fulfillments)—which may be more dependent on and directed by demographic considerations. As a result, adding such considerations to a diverse spectrum of graduates could better prepare them to be more productive and valued in contributing to the organization's goals.

Fortunately, some recent studies suggesting significance have appeared in the last few years. As a result, some faculty course planners have started to find demographic considerations worthy of review and inclusion for their content pedagogy and applications using active learning, especially with higher-order modalities in TBL, PBL, and PjBL student programs [Han, Capraro, and Capraro, 2015; Hettler, 2015; Cervantes et al., 2015; Creghan and Adair-Creghan, 2015; Hood et al., 2020; Theobald et al., 2020; Duke, Halvorsen, Strachan, Kim, and Konstantopoulos, 2021].

It would seem that a more appropriate focus would come in consideration of SES groups and their effect on education performance as put forward by the American Psychological Association, "Socio-economic status (SES) encompasses not just income but also educational attainment, financial security, and subjective perceptions of social status and social class. Socio-economic status can encompass quality of life attributes as well as the opportunities and privileges afforded to people within society" [APA, n.d., 3]. The APA sees SES as applicable to the social and behavioral sciences, where situations such as low income or, much worse, poverty are not just single factors. SES is more realistically characterized along with other psychosocial and physical mental stressors. Additionally, APA members see SES as a consistently reliable predictor of a multitude of outcomes in a person's lifetime, especially in physical and mental health. Given these observations, they see SES as applicable to all aspects of behavioral and social science, specifically in research, practice, and education. SES goes beyond just income to include education level, financial well-being, and personal perceptions of social status and class [APA, n.d.].

In seeking additional research on the impact of SES and students in higher education, a meta-analysis was conducted of thirty-five papers that presented significance in relation to SES, higher education, and students' social integration.

More specifically, their applied Student-Adaption-To-College questionnaire had the greatest effect (p-value $< .001$) in measuring this relationship. Given this broad-based significance, the recommendation was made for using social integration multidimensional measures in future research relating to the social class–social integration relationship [Rubin, 2012]. A follow-on complementary paper, bringing together work from multiple authors in sociology and psychology, posited that researchers must go beyond traditional demographics and include SES student levels (low to high) along with personal subjective definitions and traditional objective measures [Rubin, Denson, Kilpatrick, Matthews, Stehlik, and Zyngier, 2014].

More recent research revealed multiple research papers addressing low-SES psychological barriers for students in higher education (four specific areas: emotional, identity management, self-perception, and motivation), the university role in producing/reproducing these psychological barriers, and the performance gaps between low- and high-SES students [Jury, Smeding, Stephens, Nelson, Aelenei, and Darnon, 2017], with three suggestions for psychological intervention to possibly increase student academic achievement and the quality of low-SES student experience in the college setting. The three psychological interventions discussed are improvements in self-affirmation, difference-education, and goal-reframing [Jury et al., 2017].

As part of the SES inclusion, the issue with first-generation college students was studied again in terms of support for the hypothesis of added value of active-learning modalities in narrowing achievement gaps in STEM programs and increasing academic confidence in abilities. However, it was noted that it may come at the expense of initiating higher anxiety in minority students. Feedback was also collected by expanding the study to include physiology and anatomy classes at the community college level. Significance from analysis of data collection at the end of the semester suggested that "academic self-efficacy decreased in non-white first-generation students whereas other students showed little change" [Hood et al., 2020, 1]. It was suggested that educators need to address minority students' emotional state if introducing active-learning components [Hood et al., 2020].

Researchers, using an urban Texas middle school that was predominately composed of minority and low-income students, decided to see if using PjBL in the curriculum could energize students to continue their education rather than drop out due to boredom (primary student-identified problem). Using a PjBL/non-PjBL model, testing outcomes in reading and mathematics for students in the PjBL groups performed significantly better than the non-PjBL participants. Recommendations were made that faculty adopt a PjBL-rich curriculum driven by real-world problems to solve. As such, researchers concluded that preparing learners in such a way would help students graduate with "skills such as collaboration, creativity, teamwork, problem-solving, and decision-making" [Cervantes et al., 2015, 64].

PjBL (versus PBL) comes into consideration again in a study looking at the youngest of students in a low-SES secondary school setting and the higher-order active-leaning application and its effect on their motivation and learning. Testing was focused on social studies and informational reading where achievement gains reach 63 percent over prior periods for social studies and 23 percent for informational reading with PjBL applied to the curriculum versus non-PjBL controls [Duke et al., 2021].

TWO HYPOTHESES FOR CONSIDERATION

In 2020, along with their educational efforts, researchers with years of actual business experience published the results of a thirteen-year study that applied to in-course, higher-order active-learning strategies, in a recurring Principles of Marketing course [von Freymann and Cuffe, 2020]. That paper presented consistent, significant findings relating to mixed SES student cohorts' retained learning. In comparison with the control group, which used the lecture/case work approach, this learning came from applying combined TBL/PjBL and simulation higher-order active-learning approaches to various individual or group class projects over the period studied.

Although that work contributed to the literature in support of higher-order cohort pedagogy, it has also led these researchers to consider a host of related, deeper questions regarding the higher value of using combined TBL/PjBL and simulation approaches with lower-level SES subcohorts in the same thirteen-year database. Because conventional wisdom suggests that college students, in general, may have a variety of different (preferred) learning styles, is there justification for combined TBL/PjBL or simulation-based applications in classes like the Principles of Marketing course? It would certainly seem so, if homogeneous improvement could be demonstrated across gender, ethnicity, SES, major, and academic strength?

Given the review of the literature and the possible significances to be considered, these two null hypotheses are presented:

1. **H01**: There is no significant difference in retained learning outcomes for TBL/PjBL classes versus simulation classes, and

2. **H02**: There are no significant differences between average learning outcomes for students in the defined groups for any of the five specific association demographic categories in this study. Given the available data, five demographic factors were considered:

A. gender
B. major
C. ethnicity
D. GPA groups
E. SES, based on Pell grant eligibility

FINDINGS

Comparison of TBL/PjBL versus Simulation Classes (Posttest Performance for retained learning)

t-Test: Two-Sample Assuming Equal Variances

	TBL/PjBL	Simulation
Mean	18.57142857	16.74193548
Variance	12.34843206	16.71919619
Observations	42	62
Pooled variance	14.96232041	
Hypothesized		
Mean Difference	0	
Degrees of freedom (df)	102	
t Stat	2.366655898	
P(*T*<=*t*) one-tail	0.009918739413	
t Critical one-tail	1.6599299761	
P(*T*<=*t*) *two-tail*	*0.01983747883*	
t Critical two-tail	1.983495259	

We can conclude from this posttest performance that students in TBL/PjBL categories significantly outperformed the students in the simulation cohorts in terms of retained learning.

What follows is a summary of results from analyses involving the five lower-level student SES factors (listed above) and their relationship to pre- and posttest performances as recorded over thirteen years (2005–2018) in the Principles of Marketing course. University data were made available matching students for sociocultural specificity of gender, university major, GPA groups, ethnicity, income, and other socioeconomic groups.

GENDER

Female students at Wingate generally have higher GPAs than male students. This begs certain questions:

Question 1

Can we conclude that female posttest scores for MARK 301 (Principles of Marketing) are in fact significantly higher on average than male posttest scores? The answer is no, not quite. Female students averaged about 15.46, and male students averaged approximately 14.61 across all four learning groups. Females have generally done better, but not significantly so. (The *t*-test table located at Cell E219 produced a *p*-value of .08696.)

Deeper questions follow regarding student performance and the four learning groups. Initially, we were motivated to ask whether gender and posttest performance are *independent* factors for MARK 301 students? (Are the distributions of posttest scores significantly different for females and males?)

The Contingency Table analysis (Cells M217 to S236) indicate that there is *no significant* difference in the distributions of posttest scores for female and male students (the distributions of posttest scores are independent of gender based on the *p*-value of .4461.) Perhaps more so than posttest scores, the effectiveness of the active-learning approaches can be measured by investigating the *improvement* from pretest to posttest.

Question 2

Can we conclude that females improved more on average from pretest to posttest in MARK 301 than Males did? The answer is no, not quite. Female students improved on averaged by about 6.81 and male students averaged an improvement of 5.92 across all four learning groups. (The *t*-test table located at Cell E219 produced a *p*-value of .06252.)

Next, we look at a complete factorial comparison for all levels of both gender and learning group. The output from G252 to Z286 describes posttest performance for all eight combinations. And the output from G290 to Z324 assesses improvement from pretest to posttest for the same eight factor combinations.

In analyzing posttest scores, there was *no significant interaction* (p-value = .5473) between gender and learning group. With random sampling in play, females did outperform males significantly (p-value = .0074) and students in Groups 3 and 4 outperformed students in Groups 1 and 2 (p-value = .000000000554.)

In analyzing improvement, there was again *no significant interaction* (p-value = .6756) between gender and learning group. With random sampling in play, females once again improved significantly more than males (p-value = .0264), but there were no significant differences in mean improvement by students representing any pairs of the four learning groups (p-value = .4901).

MAJOR

Question 1

Are there any significant differences in mean posttest scores for pairs (there are 28 pairs) of majors? The answer is yes (p-value = .000846.) A Tukey test was performed to identify those pairs that differ significantly. The threshold of 3.443 was calculated, so we can conclude that posttest means for accounting, finance, marketing, and other majors are all significantly greater than the mean posttest scores for students majoring in communications. (Not all that surprising.) Does anything similar apply for improvement from pretest to posttest?

Question 2

Are there any significant differences in mean improvement for pairs of these majors? This time the answer is no, not quite (p-value = .10,025). Examining the improvement means (not surprised that the communications major was the lowest but noticed a very strong mean for marketing) led to another question.

Question 3

Can we conclude that the mean improvement for marketing majors is significantly greater than the mean improvement for non-marketing majors? The mean improvement for marketing majors was 8.06, whereas the mean improvement for non-marketing majors was 5.98. This time the answer is yes (p-value = .004589). It is helpful to know that majors bring their A-game to the principles course.

Are we able to establish that major and posttest performance are *independent* factors for MARK 301 students? (Are the general distributions of posttest scores for seven majors significantly different?) The Contingency Table analysis (Cells S218 to Z254) indicates that there is *no significant difference* in the distributions of posttest scores for students with the different majors (the distributions of posttest scores are independent of major based on the p-value of .0851.)

Proceeding to a complete factorial comparison for three levels of major (reclassified to marketing, "business other," and outside business) and four levels of learning group. The output from G252 to Z286 describe posttest performance for all twelve combinations. And the output from G555 to Z590 assesses improvement from pretest to posttest for the same twelve factor combinations.

In analyzing posttest scores, there was *no significant interaction* (p-value = .5810) between major and learning group. Marketing majors in the

random sample averaged a posttest score of 16.92, "business other" majors had a sample mean of 15.08 and those majoring outside business, a 14.46 posttest score. These major differences in mean posttest scores fell just short of significance (p-value = .0591). For learning groups, however (p-value = .000000000554), some pairs did differ significantly. The Tukey's test indicates that students in Groups 3 and 4 outperformed students in Groups 1 and 2 on average.

Regarding improvement, again there was *no significant interaction* (p-value = .8338) between major and learning group. Marketing majors in the random sample improved on average by 8.17, "Business other" majors on average by 5.71, and those majoring outside business, by 5.63. These major differences in mean Improvement fell *just short of significance* (p-value = .0702), but the improvement for marketing students was again notably strong. There were no significant differences in mean improvement by students representing pairs of the learning groups (p-value = .4433.)

ETHNICITY

Question 1

Are there any significant differences in mean posttest scores for pairs (there are 10) of ethnicities? The answer is no (p-value = .199866.) Due to small sample sizes for some of the ethnicity levels no pairs differed significantly, but it is interesting to note that when combined, Hispanic and international students averaged 17.4375 on the posttest, whereas White, African American, and "Other" students averaged only 14.772.

Does anything similar apply for improvement from pretest to posttest for the ethnicity groups?

Question 2

Are there any significant differences in mean improvement for pairs of these ethnicities? This time the answer is yes (p-value = .010725).

A Tukey test was performed to identify those pairs that differ significantly. The threshold of 4.375 was calculated, so the only pair that exceeds the threshold is that the improvement mean for Hispanic students was significantly greater than the mean improvement for African American students. Again, Hispanic and international students averaged 9.625, quite a bit more than the White, African American, and "Other" students (6.0259.)

The Contingency Table analysis (Cells R242 to AE276) indicate that there is *no significant* difference in the distributions of posttest scores for students in the ethnicity groups (the distributions of posttest scores are independent of ethnicity based on the p-value of .3538.) The Contingency Table analysis (Cells

V381 to AI415) indicates that there is *no significant* difference in the distributions of improvement for students in the ethnicity groups (the distributions of posttest scores are independent of ethnicity based on the *p*-value of .1926.)

A two-Factor analysis of variance for all levels of ethnicity and all levels of learning group category is not possible because there are underrepresented ethnicities within several of the level combinations.

GPA GROUPS

Question 1

Are there any significant differences in mean posttest scores for pairs (there are 10 of them) of GPA groups? The answer is yes (with a *p*-value of .000178.) Tukey's test was performed to identify those pairs that differed significantly. The threshold of 2.613 was calculated, so students in MARK 301 with a cumulative GPA at or below 2.200 have posttest means that are significantly lower than those for students whose cumulative GPA are 2.800 or higher (a finding that is not all that shocking). Also, students with GPAs of at least 3.500 do significantly better on the posttest than students with GPAs between 2.201 and 2.799.

Question 2

Are there any significant differences in mean Improvement for pairs of these Ethnicities? Again, the answer is yes, although somewhat less convincingly (with a *p*-value = .035405). Here Tukey's test revealed a 2.536 threshold for significance. Therefore, the *only* significant difference was between students with GPAs at or below 2.200 and students with GPAs at or above 3.500. (Generally speaking, the better a student's cumulative GPA is, the more "improvement' from pretest to posttest can be expected.)

A two-factor comparison for posttest performance across levels of GPA group and learning group revealed *no significant interaction* (*p*-value = .8,80,018) between the two factors. GPA group posttest means were 12.188, 13.938, 15.25, 16, and 17.313 (note that posttest means trended in the expected direction.) These GPA group differences in mean posttest scores were *significant* (*p*-value = .001041). The calculated Tukey's test threshold was 3.400, so we can conclude that MARK 301 students with a cumulative GPA of 3.100 or higher did better on the posttest than students with cumulative GPAs at or below 2.200, irrespective of learning group.

For learning groups (*p*-value = .00000221), some pairs of posttest means also differed significantly. The Tukey's test threshold of 2.858 indicates that

students in Groups 3 and 4 outperformed students in Groups 1 and 2 on the posttest, on average.

Regarding the two-factor comparison for improvement, again there was *no significant interaction* (p-value = .8338) between major and learning group. Marketing majors in the random sample improved on average by 8.17, "business other" majors on average by 5.71 and those majoring outside business, by 5.63. These major differences in mean improvement fell *just short of significance* (p-value = .0702). But the improvement for marketing students was again notably strong. There were no significant differences in mean improvement by students representing pairs of the learning groups (p-value = .4433.)

STUDENT SES

The authors also undertook an independent analysis of SES groupings, realizing full well its interrelation with ethnicity. Students in the Principles of Marketing course were categorized into two groups, those who were eligible for Pell grant and those who were not. Here, two-tailed tests were conducted to determine: Was there any significant difference in mean posttest performance or in mean improvement from pretest to posttest for Pell-eligible and non–Pell-eligible students across the sampling period? Surprisingly, Pell-eligible students scored higher on the posttest on average than those who were not. Pell-eligible students averaged 17.583 and those who were not Pell-eligible had a mean of 14.434. (A p-value of .0000805 from the t-test established this significant difference.)

The difference in mean improvement fell slightly short of significance. Pell-eligible students improved by an average of 7.139 points, whereas the non–Pell-eligible students improved by an average of 6.127 points. (This led to a t-test p-value of .0932.)

So, the data suggest that students coming from the lower SES group may, in fact, benefit more than their counterparts from the implementation of active-learning strategies.

ACCEPTANCE/REJECTION OF THE NULL HYPOTHESES

HO1

Whereas there was a significant difference found in learning outcomes for TBL/PjBL classes versus simulation classes, the null hypothesis is rejected.

HO2a, b, c, d, and e: Whereas there was significance found in HO2c (ethnicity) and HO2e (SES) between general student cohort learning outcomes versus their specific associated demographic–socioeconomic student metrics regarding correlations to and application in higher-order modalities, those null

hypotheses are rejected. Whereas no significant differences were found in HO2a, b, and d, those nulls are accepted.

In summary, much has been written about the importance of pedagogical use of the constructivist theory in the classroom, as noted in the literature review, including acceptance and application of its active-learning components and especially with its higher-order modalities in simulation, PBL, and combined TBL/PjBL. This paper adds to those efforts with the results of its in-depth analyses and report of findings from the thirteen-year study where greater significance in retained learning was found when using specific higher-order modalities of active learning for lower-level SES student cohort activities versus traditional active-learning methods.

CONCLUSIONS

The primary objective of this paper was to assess whether greater significance could be found in learning retention of lower-level SES student cohorts versus all class members. Data for this study had been collected over a thirteen-year period from principles of marketing classes at a southern university. In those classes, higher-order active-learning modalities of PBL, simulation, and PjBL/TBL were employed in separate cohorts as defined by each class.

Research was initiated, first using a literature review, to determine whether lower-level SES students presented higher retained learning results than the rest of the general higher education student population, where all used some form of higher-order active-learning modalities. It is noteworthy that several studies presented such success using these modalities. And they also stressed the need to consider expanding application of these modalities to improve retained learning and to build student self-achievement, awareness, and appreciation in this underserved segment [Theobald et al., 2020; Han, Capraro, and Capraro, 2015].

As a result of the findings with this first step review, more sophisticated, in-depth, statistical analyses were initiated. These analyses were conducted in comparison with the general cohort learning retention significance found in a prior paper using the same thirteen-year inclusive database [von Freymann and Cuffe, 2020].

Based on a directional review of the literature and findings gleaned from the thirteen-year class database, higher-order active-learning approaches, as shown in an earlier paper, appear to yield generally more positive results (than the control group) in retained learning for all tested students in the Principles of Marketing classes [von Freymann and Cuffe, 2020]. However, in this study, higher-order simulation and TBL/PjBL approaches were shown to be significantly better for retained learning than simulations. It was found that focusing on lower-level student SES demographic factors, namely considerations for

ethnicity and family income, is important to maximize higher gains in concept mastery.

RECOMMENDATIONS

Given the significant results presented in this paper and those in the literature review, instructors in higher education are encouraged to try including some form of higher-order active learning in their appropriate classes. Perhaps some form of testing can be considered if such modalities have not been tried in the past. Although lower-level SES student challenges have been recognized and called out, educators need to use the constructivist theory "... process of constructing knowledge based on experience" [Jumaat, Tasir, Halim, Ashari, 7904, 2017] and its higher-order modalities to help this cohort of students succeed through retained learning for real-world application—and in so doing, substantially improve these lower-SES students' appreciation of their own self-worth.

When their education is complete (and they are at their first full-time job), all of us would want them to shout out, "This stuff really helps!" It would be gratifying to hear from students a year or more after their graduation with a thank you for what was learned *and retained*.

Here is a suggested basic framework for using simulation or the TBL/PjBL combination in certain marketing, management, and other related business classes such as behavioral and applied economics and sociology:

1. If a professor does not have experience with simulation or TBL/PjBL, it is strongly recommended to check the literature for guidance and confirmation that these forms of higher-order active-learning are a good addition for his or her students. For those interested in using simulation and seeing its benefits to student learning, refer to the plethora of peer-reviewed higher education literature starting with Cadotte [2022] for guidance and others as needed.
2. Higher education professors who teach business classes and who still use the basic active-learning model (of reviewing chapter lectures paired with in-class active student response, along with student discussions of supportive chapter business cases) might want to consider the flipped classroom (as described at the Center for Teaching and Learning at the University of Texas at https://ctl.utexas.edu/instructional-strategies/flipped-classroom) along with its introduction to generative artificial intelligence (AI) and its place in the classroom. However, in introductory business classes such as Principles of Marketing, Management, and the like, professors can continue using the old standard model and just add simulation as an experiential learning enhancement for retained learning.

3. For those who want to consider using the combined higher-order active-learning TBL/PjBL model, we suggest beginning with the literature review provided in this paper as a worthwhile place to start and consider adding a test class before adding any higher-order modality to Introductory Marketing and Management courses as well as all other classes. Although there may be many possibilities for students in selecting their projects, and whether or not they are able to get the businesspeople involved or not, our analyses confirmed that the projects that worked best were those that focused on community service (as recommended by Kuh et al., 2005; Kuh, 2008) in either nonprofits such as local food pantries and churches or for-profits funded by the community. It then became easier for each group to select a target for their community project, regardless of whether recipients were involved or not.

Some of the benefits of taking this direction may seem obvious, with specially earned recognition coming to the students and their university or college for such worthwhile efforts and plans. The benefits should extend far beyond the classroom for what is provided to the service recipient with long-lasting recognition and appreciation from the community. For more details on why the community service project is best, see Kuh et al., [2005], who first recommended this approach and recognized these benefits, and Kuh, 2008 who expanded on them. See also von Freymann and Cuffe, 2020, 35, for six reasons to choose community service projects; see also Wee, Kek, and Kelley, 2003 and Williams and Linn, 2002.

4. For simulation or TBL/PjBL assignments: Based on experiences from the thirteen-year data capture, it was determined that Principles of Marketing classes work better (as noted above) for some students if individual simulation projects are assigned. Although they will not be as beneficial from an experiential learning standpoint as has been suggested in this paper, simulation is easier to implement and it still helps individual students to build confidence and develop teamwork skills.

We also found that using PBL was rather challenging to effectively implement, because although the projects were devised from real-world specific operational business problems by university-associated practitioners, they were often too narrowly set, and did not answer the need to work through the whole marketing process experience. Even at this level, TBL/PjBL worked better if developed, designed, and implemented by each student team with professorial guidance.

5. Instructors should devise measurement methods for data collection from the start of class to record and compare lower-level SES student achievements versus non–lower-level SES student achievements and determine

whether significance can be shown between the two groups at all measurable steps and consider publishing the results.

6. Suggested higher-order modality inclusion and preparation process:
   A. Given in-class application and experience, decide which higher-order active-learning modality will be used. (Once the project is completed, encourage students to incorporate this in-class internship process and their results as part of their education experience in their resumes.)
   B. When decided, be sure to include in the syllabus the details of what is expected, how to put it into writing, and define how each part will be graded.
   C. For the simulation, students will be required to submit their own responses to each of the specifically organized and presented components as devised by the chosen online simulation publisher. It is critically important to explain how each online segment will work and how it will be graded. Instructors should emphasize the importance of watching the publisher-provided videos and reviewing the PowerPoint slides. Students will have two to three attempts to achieve their best possible grade.
7. For the TBL/PjBL assignment, students will be required to run the approved projects in groups and in tandem with an individual student's experiential learning of the core concepts. It is best if a four-student blended group (based on highest to lowest GPAs) can be randomly chosen and directed to choose a community service project for professorial approval. Project directions and components must be supported by a properly notated literature review. The better results will often be realized if the selected nonprofit will agree to be part of the process for input and end-of-the-semester review (though this is not required).
8. To begin the class semester, explain and use constructivist theory as a guide to help students in the first week of classes to focus on what they might know, or can vicariously relate to, as their base experience in learning the course core concepts as they are revealed throughout the semester.
   A. For a class that will use simulation, it is strongly recommend that students form study groups of at least two to no more than four students, and professors should ask them to share their experiences within their new group and submit assignments as a group. Adjust the components of a group grade by listing the submissions that must be submitted by each individual such as his or her analysis of four to six supporting academic articles for midterm grades.
   B. For the class that will use TBL/PjBL, a group formation is required from the first week for assimilation and sharing with the class. Make sure each group has a unique service identified and not a duplicate of any other group.

9. To start the process of experiential learning before assignment, professors are encouraged to review papers like "The 10 Commandments of Experiential Learning" for their own guidance in directing their students (Roberts and Welton, 2022). If not being used already, use the flipped classroom approach, if possible, for basic active learning and improved retention. Typically, it takes the first two weeks of classes to build understanding for students to comprehend and start to apply experiential learning. Ensure that they are also reading the appropriate chapters in the text—and that the marketing process is explained, visualized, and added to their initial understanding and application.
    A. For each modality (whether the responsibility falls upon a single student or a group), a plan and process with all the critical marketing and communications parts for a tangible product sale or a service performance must be identified. If they do not understand this process, take another week to build the learning platform. Otherwise, the rest of the course could possibly end up being meaningless and unmemorable for them. (As an aside: some simulation programs allow group responses to all the simulation assignments.)
    B. Next, help students build new understanding by doing the parts of the process guided by their experiences to construct new knowledge as their new learned (and retained) reality [McLeod, 2024; Cooperstein and Kocevar-Weidinger, 2004]; see also Good and Brophy, 1994]. This reality then becomes "a process of constructing knowledge based on experience" [Jumaat, Tasir, Halim, Ashari, 2017,7904].
10. Be sure to present the marketing process framework beginning with target audience identification, including the personal needs and wants of that defined audience as customers, clients, users, or patients; specification of how the team would reach the potential audience using various forms of communications (IMC); explanation of how they would get goods or services to the audience; identification of how they would price the tangible/intangible goods or services; specification of how they would produce the products or services; explication of how they would develop a budget projecting sales and profit goals for goods or monies needed to offer the services; and clarification of how would they build a support staff for operational implementation.

Using assigned readings to build on process understanding, student teams need to continue throughout the semester to expand their experiential knowledge of the marketing process. This is where the professor will need to determine the next best steps in helping students understand and apply marketing strategies as if they were the managers in charge of making, distributing, and selling their products; or as if they were acting as free service providers, focusing on how to get and manage donors, clients, and volunteers.

LIMITATIONS

This study used data from only one course at one university and therefore some aspects should not be automatically applied to other courses at other institutions, without further testing. In addition, this study was limited to the data collected and group activity observations related to selected students' performance outcomes and their simulation and problem-and project-based learning at a southern university from January 2006 through May 2018 in sections of one ongoing class offering. It is further limited by its small sample sizes in some groups and between all groups and the interrelations of their ethnicity and socioeconomic statuses.

DELIMITATIONS

This study is delimited by the professor teaching these classes and the cross-sectional selection of students from the Principles of Marketing classes selected there for study, and the students' pre- and post-course testing assessments.

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Centralization Versus Decentralization: Delineation of General Advantages and Contingency Factors

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Articulations of the subject of centralization versus decentralization in Management textbooks are unsystematic and incomplete. This paper provides a structured description of the advantages of centralization and decentralization and contingency factors making these advantages more salient in particular circumstances. Centralization advantages involve a holistic view, impartiality in decisions, consistency, and efficiency, whereas decentralization promotes effectiveness, higher motivation, faster learning, and reduced workloads for senior management. Contingency factors include organizational environment, size, resource scarcity, motivation, skills, and decision types. The presented structured approach provides managers with tools for applications of these concepts in complicated organizational reality.

Keywords: Centralization, Decentralization, Contingency factors
Disciplines of Interest: Management, Organizational Behavior

INTRODUCTION

Determination of the proper level of decentralization or centralization is one of the most consequential decisions made by managers in any organization. De/centralization is a significant component of organizational structure, impacting numerous aspects of a company's performance. Which factors should managers consider when deciding whether to centralize or decentralize further or, in contrast, maintain the existing level of centralization or decentralization?

Such a decision ought to be based on (1) the advantages of centralization; (2) advantages of decentralization, and (3) contingency factors that define the situation in which a company finds itself that make advantages of decentralization or centralization more salient. It should be noted that the articulation of these

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subjects in textbooks on management and organizational behavior is unsystematic and far from comprehensive. Even in the prominent sources, the pros and cons of centralization and decentralization are presented only partially and are overwhelmingly tilting toward advantages of decentralization. Textbooks point out the general trend toward decentralization in modern organizations because of the need for higher flexibility and responsiveness [Daft and Marcic, 2023; Robbins and Coulter, 2021, Robbins and Judge, 2022; Williams, 2021]. Although statements regarding the need for a balanced approach between two opposites are made, the advantages of centralization are essentially omitted or sometimes mischaracterized. For instance, Lussier [2023] maintains that efficiency is the advantage of decentralization, whereas reduced duplication of work is the advantage of centralization. There is a clear logical contradiction between the two assertions, and in fact efficiency is generally associated with centralization rather than with decentralization [Campbell, Kunisch, and Müller-Stewens, 2011; Joseph, Klingebiel, and Wilson, 2016; Robinson, Caver, Meier, and O'Toole, 2007]. Some textbooks do not address contingency factors [DuBrin, 2024; Gomez-Mejia and Balkin, 2012; Robbins and Judge, 2022; Schermerhorn, 2020), whereas others include either a short or contradictory list of these factors. For instance, Daft [2008, 2016] and Daft and Marcic [2023] maintain that decentralization is preferable in times of uncertainty and change, whereas during crises, more centralization is warranted. However, examples provided in different editions for supporting decentralization in times of change and uncertainty are related to disasters, such as Hurricane Katrina and the attacks that occurred on September 11. Drastic events like those clearly constitute major crises and emergencies, apparently pointing to the need for centralization. In a list of situational factors provided by Robbins and Coulter [2021], centralization is associated erroneously with larger rather than with smaller organizational size, whereas geographical dispersion, which represents one of the metrics of organizational size, is associated with decentralization, constituting an apparent contradiction. Neither textbook provides comprehensive lists of the strengths and weaknesses of decentralization versus centralization *and* contingency factors that make these strengths and weaknesses more salient.

Consequently, students, as future managers, do not obtain a sufficient theoretical foundation with regard to the criteria for moving in the direction of either centralization or decentralization. This reflective paper endeavors to fill this gap in teaching organizational structure. It provides would-be managers with tools that might allow them to make informed decisions regarding practical application of these concepts and to navigate in complicated organizational realities; these tools will therefore be helpful for both students and instructors in the areas of management and organizational behavior.

CONCEPTS OF CENTRALIZATION AND DECENTRALIZATION

An organization is centralized when decisions are made at the top of its hierarchy, i.e., by senior management. In contrast, an organization is decentralized when decisions are made at lower levels of the hierarchy (chain of command), and there is some form of delegation of authority. Two terms—decentralization and delegation—are very similar, but not identical. Delegation of authority can be temporary and be reversed after a period of time. Decentralization can be defined as institutionalized delegation that is protected in policies and procedures and other mechanisms; it cannot be easily reversed by the whim of a new boss.

No relatively large organization is fully centralized. Absolute centralization can happen only in small businesses, where an owner makes all the decisions and instructs employees on what their tasks are and when and how to carry them out. Likewise, it is extremely rare that an organization is completely decentralized. Usually, there is some degree of each approach in any organization. Still an organization can be closer to either end of centralized-decentralized continuum depending on the degree of involvement of higher-ups in daily organizational decision-making.

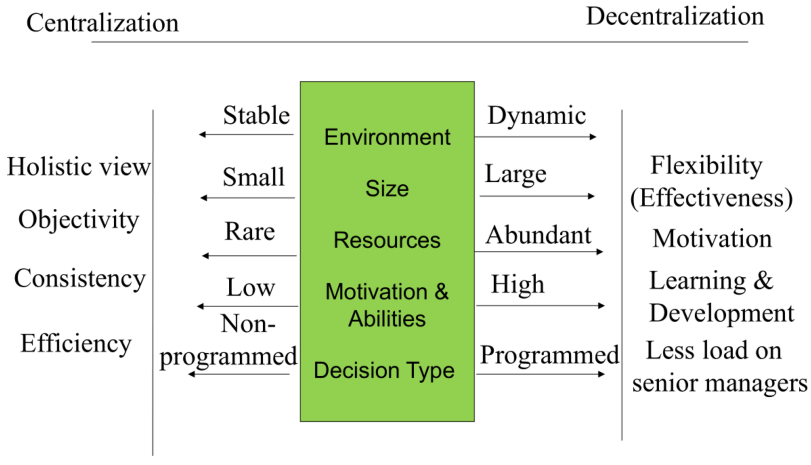
A company can move from one point on the centralization–decentralization spectrum to another over time. Also, within an organization, some departments are usually more centralized (e.g., Finance and Accounting departments); others are more decentralized (e.g., R&D and Marketing Research departments). Where a given company ought to be on this continuum is one of the critical determinations that a manager has to make. Should the organization centralize more, move in the direction of decentralization, or, instead, maintain the status quo? On what basis can managers make such a decision rationally? To do so, they ought to take into account two types of criteria:

(A) The general advantages of both centralization and decentralization. Because these are opposite systems, the advantages of one are intimately related to the disadvantages of the other, as will be demonstrated further.

(B) The situational or contingency factors of the circumstances in which the organization finds itself. These factors make certain disadvantages and advantages more salient and others less so. The overall model is presented in Schema 1:

It is noteworthy that centralization and decentralization constitute independent variables in the first category (e.g., centralization leads to higher efficiency, decentralization to higher flexibility and motivation), whereas they are dependent variables in the second category (e.g., centralization is predicated on a stable environment, decentralization is predicated on a dynamic environment).

Schema 1. General advantages of de/centralization and impact of contingency factors



General Advantages of the Two Approaches

An explanation of the two approaches should start with their general advantages. The advantages of centralization are shown on the far-left side of the schema; they include a holistic view, objectivity/impartiality of decisions, better coordination of functions and activities, and probably the most critical, efficiency. It should be noted that these advantages – and the same is true of the benefits of decentralization – are by no means absolute but rather correlative or bounded; this point is addressed in more detail below.

The description of these positive traits is as follows:

Holistic View

Adopting a holistic view means seeing the whole picture rather than focusing on minor details. It is logical to suggest that when senior managers make decisions, they look not at each "tree," but rather at the "forest," or system, in its totality. Akin to a commander in a battle, a manager does not see every trench or every squad. The manager instead can assess priorities and interactions between components within a system, possible disproportions that should be fixed, and the general direction in which the "battle" is going. In contrast, when decentralized decisions are made by local managers or employees, those managers can better see specific details but not always the real place and connection of these details within the whole picture.

Objectivity and Impartiality of Decisions

Because a senior manager is responsible for the success of the whole organization, rather than of a certain unit, just as a military commander is responsible for the winning of the entire battle, it is reasonable to assert that centralized decisions are generally more impartial than decentralized decisions. Thus, centralization allows the preservation of balance between different activities and functions in the system [Carlisle, 1974]. Resources are supposed to be used in activities where they will bring the highest output for the whole company. If, for instance, a certain investment brings higher return in Department A than in Department B, the money should be invested in Department A. Conversely, in a decentralized organization, a decision-maker has a personal stake in the success of particular unit or department such as Marketing, Operations, or Human Resources. Of course, senior managers are humans with their own flaws, biases, and personal preferences, all of which can distort the rationality of their decisions. However, because they are evaluated and rewarded based on the performance of the entire system, they are less prone to have special interests in particular units or departments than lower-level managers and employees. In contrast, decentralized decisions are impacted by a *combination* of personal biases and organizational factors such as vested interests of decision-makers and structure of reinforcements directed at rewarding a unit's achievements rather than organizational achievements.

Coordination and consistency of activities. The coordination and consistency of activities is one of the advantages of centralized management that is most typically argued-for [Carlisle, 1974, Nickerson and Zenger, 2002; Pollitt, 2005]. Indeed, it is easier to integrate operations in a coordinated and uniform fashion from one central point. In contrast, a decentralized company sometimes demonstrates a hodgepodge of inconsistent and even incompatible approaches and methods.

Efficiency. Efficiency is the last, but definitely not the least important, advantage of centralization. When decisions are made in a centralized way, resources are concentrated in the hands of senior managers. Concentration of financial, human, and other resources prevents duplication and waste and permits economies of scale through consolidation of activities [Campbell et al., 2011; Nickerson and Zenger, 2002; Pollitt, 2005]. Centralization reduces time-consuming political behavior and related conflicts [Altamimi et al., 2023; Andrews, Boyne, Law, and Walker, 2009; Robinson et al., 2007] and prevents delays resulting from a lack of synchronization between different departments [Joseph et al., 2016]. One salient example of the advantage of centralization is functional organizational structure, which, although not particularly flexible, allows a company to avoid duplication and waste and, thus, be more efficient [Daft, 2021]. By contrast, a more decentralized divisional structure allows

duplication, and as a result, is less efficient. It can be argued that when managers decide on further centralization, their primary motivation is cost reduction and higher efficiency. It is important to reiterate that this advantage of centralization is limited. Overcentralization can lead to bureaucracy, "red tape," long chains of approvals, and, consequently, to waste and inefficiency [Campbell et al., 2011]. The suggested advantages of the two systems are not absolute; they function not as laws of nature, such as the law of gravity, but rather as statistical laws of higher probability and correlation.

Advantages of decentralization are shown on the far-right side of the schema, and they include flexibility (effectiveness), higher motivation, quicker learning and development of skills, and reduction of the workload of senior managers.

Flexibility. The flexibility of a decentralized approach allows for quick resolution of problems on the ground, adjustment of decisions to local conditions [Campbell et al., 2011; Miles and Snow, 1978], and innovation [Leiponen and Helfat, 2011; Nickerson and Zenger, 2002; Pollitt, 2005]. Flexibility leads to effectiveness ("doing the right thing")—the ability to adapt to quick changes and customize responses to provide an apt product for a customer in a particular situation. The other side of the previous example on departmentalization is that divisional structure, as opposed to functional structure, despite being less efficient, tends to be more flexible and adaptable to changes [Daft, 2021].

Motivation. Motivation of employees is another significant advantage of decentralization [Altamimi et al., 2023; Pollitt, 2005; Whitehurst, 2015]. People usually prefer to make their own decisions rather than being constantly told what to do and feeling like a cog in a big bureaucratic machine [Pollitt, 2005]. Motivational models such as the Hackman and Oldham [1974] job characteristics model strongly support this connection by emphasizing autonomy in decision-making. According to this model, increasing the autonomy, responsibility, job enrichment, and empowerment of employees, if done properly, has the potential to raise the motivation of organization members.

Learning and development of skills. Learning and development of skills via experience and active doing takes place faster when a decentralized approach is applied [Carlisle, 1974; Miles and Snow, 1978; Whitehurst, 2015]. When people on the ground make their own decisions, they make their own mistakes and learn from them. The learning curve in a decentralized organization is steeper than in a centralized one. Motivation and development of skills, though different variables, mutually reinforce each other: more knowledgeable workers usually are more invested in their work, whereas more motivated workers put more effort into enhancing their job-related knowledge. Development of skills includes both technical and managerial skills. The last point is important for the creation of a pool of future middle-level and senior managers. It is reasonable to suggest that when a top manager retires or moves on, there is a

"reservoir" of talented and experienced people in decentralized company that can take the former manager's place. In contrast, centralized systems have a serious problem in such circumstances. When a manager with a centralized approach who has been making autocratic decisions throughout his or her career leaves an organization, it is less likely that anyone can fully replace that manager.

Reduction of workload of top managers. The reduction of top managers' workload in a decentralized organization [Daft, 2021; Pollitt, 2005] takes place because top managers do not need to be involved in tactical and operational decisions made by their subordinates. Delegation of these decisions relieves leaders of unnecessary burdens and gives them more time for the central task that they are supposed to carry out: formulating and executing strategy and creating the vision and mission of a company. Even the brightest individuals have limited capacity to collect and process information [Altamimi et al., 2023]. In a centralized organization, senior managers are involved in numerous minor decisions, which increases their workload and forces them to "swim" in a stream of myriad events rather than proactively managing them.

Contingency Factors Determining Appropriate Level of Decentralization and Centralization

In sum, both centralization and decentralization have their benefits, and neither one is generally superior to the other. Knowledge of the pros and cons of both methods does not yet allow managers to decide on the proper level of centralization or decentralization. An understanding of the general advantages and disadvantages of the two approaches is necessary but insufficient for exactly that reason—they are too general. For instance, what is more critical, efficiency or flexibility? Which factors bear more weight, better coordination or higher motivation and skills? There is no general answer to these questions; therefore, analysis based only on these criteria is inconclusive. Organizations and managers find themselves in specific situations that require adaptation and preclude "one size fits all" solutions. A contingency approach is the opposite of "one best way" thinking. It is also a more comprehensive and realistic paradigm, postulating that for an organization to succeed, there should be a fit between situational factors and organizational structure [Carlisle, 1974; Donaldson, 2001; Drazin and Van de Ven, 1985]. Mismatch between contingency variables and structure leads to subpar performance and, potentially, to organizational failure. Situational or contextual factors determine which advantages of either system are more important and which are less critical in specific circumstances. Among the contingency factors that will be analyzed below are external environment, organizational size, scarcity versus abundance of resources, motivation and abilities of employees and lower-level managers, and types of decisions.

External Environment

1. An organization's external environment can be either stable and certain, or, to the contrary, dynamic and uncertain. The difference is based on the pace of change: in a stable environment changes are relatively slow, whereas in a dynamic, turbulent one, the pace of change is high. According to the classical model of Burns and Stalker [1961], there are two "pure" organizational types: mechanistic and organic. The first is characterized by a high level of centralization, high formalization, strict specialization, etc. An organic organization, on the other hand, is characterized by decentralization, loose division of labor, and low formalization. According to Burns and Stalker, mechanistic organizations fit a stable environment, whereas organic ones fit a dynamic environment. Therefore, centralization as a component of mechanistic structure suits stable environments, and decentralization as a component of organic structure suits dynamic ones. The rationale for this is quite straightforward: in a dynamic environment, a company should respond quickly to changes and be more flexible, and as a result, more decentralized. In contrast, in stable circumstances the need for flexibility and responsiveness diminishes, whereas efficiency is paramount, and higher centralization is desirable. Because the external environment for most organizations has been growing more unstable and turbulent, the general trend in modern business is toward decentralization.

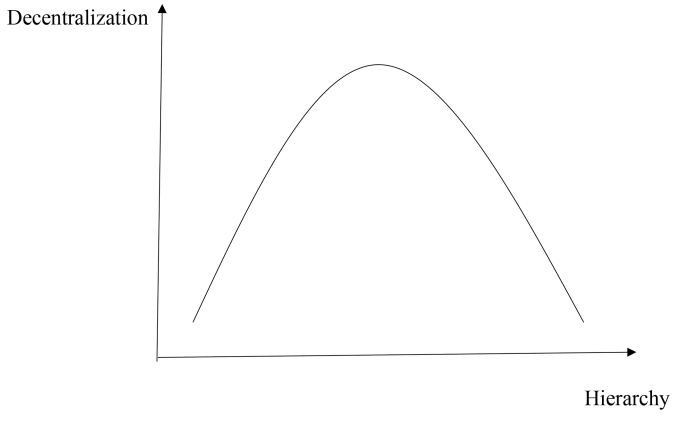
Size

1. The size of an organization is usually measured by the number of people employed by it. Alternative metrics can be geographic dispersion and volume of sales. A start-up company employs a small number of people, is flatter (less hierarchical), and has a simple structure. It does not yet have functional departments such as Marketing or Finance. Because the size is small and quite manageable, a manager, who is usually also an owner, can stay in control by making most decisions across different functions, such as operations, marketing, procurement, etc. Decisions are made "on the fly," without much documentation, standardization of procedures, or bureaucracy. Such a company is quite organic, to use Burns and Stalker's term, except for one feature: it is highly centralized. When an organization grows, it needs to create functional departments. The top manager should delegate authority to department managers—i.e., should decentralize decision-making. If a company is highly successful and continues to grow, it might warrant the creation of divisions—self-contained, autonomous units specialized on certain products, geographic areas, or types of customers. Thus, the company becomes decentralized even further. As

noted earlier, a senior manager in such a scenario, even one who possesses high-level managerial skills, is not capable of making all the numerous operational and tactical decisions anymore. Therefore, as a rule, the larger the size, the more decentralized an organization should be [Daft, 2021; Donaldson, 2001; Hage and Aiken, 1967].

An important point is worth noting here. Organizational growth is accompanied by the creation of units, departments, divisions, etc., with pertinent managerial levels. That entails a growing hierarchy (longer chain of command). Up to a certain point, decentralization and hierarchy are positively correlated and go hand in hand. Big organizations are naturally more hierarchical and more decentralized than small ones. There is a common mistake in popular literature and among students to equate hierarchy with centralization. These are two different structural characteristics, and equating them should be avoided. At the same time, beyond a certain threshold, hierarchy, if not checked, tends to grow uncontrollably and become dysfunctional. An organization becomes overly bureaucratic and rigid. In tall hierarchies, low layers feel detached from senior leaders and powerless; there is lack of autonomy and empowerment. Such a structure should be flattened and made more adaptive so that it does not become an "organizational dinosaur" [Lawler and Galbraith, 1994]. In sum, the connection between decentralization and hierarchy is not unequivocal; the curvilinear relationship between these two dimensions is shown in Figure 1.

Figure 1. Curvilinear Relationship Between Hierarchy and Decentralization



Available Resources

2. Available resources as a factor of decentralization and centralization are generally not considered in textbooks. These resources might be either abundant or scarce. It is logical to suggest that when resources are scarce, managers need to use a centralized approach because efficiency under these circumstances is paramount. Duplication of activities and waste would be devastating for the organization. Management in such circumstances should concentrate limited resources under their control to ensure that no part of an organization is deprived of them and that each part is able to sustain itself. The recent COVID-19 pandemic demonstrates vividly that in times of crisis and emergency, when resources are scarce, the government should ration vital resources such as ventilators or masks and allocate them in a coordinated, centralized way [Greene, 2020]. Another such case is management of water resources in places where there is a shortage of water, such as in California [State Water Resources Control Board, State of California, 2023]. In times of drought, the government uses water rationing, which constitutes a centralized method of distribution. On the other hand, when resources are abundant, although autonomy requires more managerial, technological, and financial resources [Young and Tavares, 2004], an organization can loosen restrictions and decentralize decisions because effectiveness then counts for more than efficiency.

Motivation and Abilities (Skills)

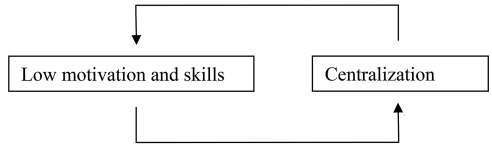
3. Motivation and abilities (skills) are two rather different factors, but their impact on decentralization and centralization is similar; hence, they can be articulated together. If those at the lower levels of hierarchy are well trained and experienced and possess high motivation and abilities, they are capable of making their own decisions. Therefore, a company should be more decentralized [Carlisle, 1974]. In contrast, those with little experience and low motivation should be told what to do and controlled closely, which implies a high level of centralization.

As one can see, in the schema presented above, motivation and skills appear twice: as advantages of decentralization on the right side and as contingency factors in the center. In the former case they constitute dependent variables—decentralization leads to higher motivation and to development of skills; in the latter case they are independent variables—the higher motivation and skills are, the more decentralized a company should be. It might seem that we are engaged here in circular logic and tautology. However, the "circle" in question here is not a logical fallacy but rather a difficult challenge in organizational environments that managers encounter, a self-reinforcing cycle which can be either virtuous (beneficial) or vicious (damaging). In such a self-

reinforcing cycle, there is no clear dependent or independent variable; each depends on the other.

The following example illustrates the vicious cycle. Imagine that employees in an organization possess low levels of motivation and scarcity of skills due to high turnover and lack of training. In such a case, managers would be correct in using a centralized approach and telling them when and how to carry out their duties. Such a pattern of management does not lead to quick learning, so skills remain low. Motivation remains low as well, because job content is rather poor, and unskilled employees are probably not highly paid. This self-reinforcing cycle is shown in Schema 2:

Schema 2. Self-reinforcing cycle of low motivation/skills and centralization



This status is tolerable while the environment is stable and size is relatively small. Suppose now that the external environment becomes less stable, and the size of the company grows. Such a development puts pressure on management to move toward decentralization, but the low quality of the labor force does not allow this, and the company is therefore somewhat stuck. Empowerment of employees who are not qualified is likely to create negative results. How to resolve this conundrum and overcome such a vicious cycle? It can be argued that the solution is to work on both ends of the cycle simultaneously: to provide a certain amount of training supplemented by a pay-for-performance type of compensation and at the same time give employees some (initially quite limited) authority, and then repeat the cycle, i.e., train them further and empower and compensate them more, and so on.

Decentralization puts considerable weight on effectiveness; thus, training itself should be effective as well. Decentralization ought to avoid using general presentations and "killing by PPT." Instead, training should use a combination of lectures and simulations reflecting specific work situations, blending both external and internal coaches, and instant application of newly learned material. In addition, training should embrace effective practices used by successful learning organizations, such as aligning learning practices with strategic priorities, generating personalized and flexible learning pathways that cater to the unique needs of individual employees [Collings and McMackin, 2021]. In that way, an organization can create a virtuous cycle of continuous improvement in

which motivation and skills, on the one hand, and decentralization, on the other, positively reinforce each other.

Types of Decisions

1. Types of decisions (or their significance) [Carlisle, 1974] are the last contingency variables in the presented model. The most widely used classification of decisions divides them into programmed versus nonprogrammed decisions [Daft and Marcic, 2023]. Programmed decisions are more routine and based on precedent or standing procedure. Nonprogrammed decisions are novel and more complicated, and they involve greater uncertainty. In a case where managers realize that a company needs more decentralization, the first type of decisions that should be delegated to subordinates is programmed decisions [Meirovich, 2015]. When a senior manager makes a programmed, routine decision, the manager should ask, "Can this decision be delegated to somebody lower in the hierarchy while I concentrate on nonprogrammed strategic decisions?" This is not to say that nonprogrammed decisions should be a prerogative of top managers only. Modern learning organizations are characterized by a high level of participation of rank-and-file employees, especially through teamwork and continuous improvement activities. Rather, the point is that the ratio between the two types of decisions should be different for senior managers and the rest of the personnel in a company.

The level of centralization or decentralization in an organization would be the result of a combination of presented contingency factors. It is less probable that all these factors would point in the same direction. A more realistic scenario is one in which some of these factors point to centralization and others to decentralization. One such scenario was addressed earlier: the size is large, whereas motivation and abilities are low. It is quite an intriguing question whether low motivation and skills represent a constraint that would block decentralization from being increased, despite the requirements stemming from larger size, or whether the actual level of decentralization would be the resultant force of independent contingency variables. Therefore, this question constitutes a fruitful venue for future research.

CONCLUSION

The presented model addresses the subject of centralization and decentralization in a structured and systematic way. It delineates general advantages and drawbacks of centralization and decentralization as well as contingency factors that make these advantages and disadvantages salient, depending on the

specific organizational context. In the discussed schema decentralization and centralization constitute both independent and dependent variables. In the general characteristics portion of the model, they represent independent variables leading to different outcomes, such as effectiveness versus efficiency. In contrast, in the contingency portion of the model, decentralization or centralization constitutes a dependent variable, which is affected by situational factors such as size, environment, skills of employees, etc.

The outline of general characteristics of centralization and decentralization, along with the identification of situational factors, offers clarity and guidance for future managers. The distinction between general features of the two methods on the one hand and contingency factors on the other is a considerable advantage of the presented model over descriptions provided in management textbooks, where such differentiation is lacking, and two categories of criteria are addressed in a mixed fashion. Due to the dearth of clear rationale, managerial texts do not equip would-be managers with the necessary insights to make educated decisions regarding the appropriate level of centralization or decentralization based on the specific circumstances facing organizations. The more sophisticated approach outlined here is a valuable tool for immediate users—faculty teaching management and organizational behavior courses—as well as for end users such as graduate and undergraduate students seeking to grasp and practically apply these concepts.

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Tech Layoff Letters: How Do They Stack Up?

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This paper describes an interactive exercise designed for an introductory management class. The goal of having an interactive exercise is to help the students engage with the content from a different perspective that results in effective accomplishment of learning objectives. The exercise explores a series of emailed letters that announced technology companies' layoffs. Some of these letters are more carefully crafted than others. The exercise will help identify best practices for composing layoffs letters, legal considerations, and issues of organizational justice. The exercise can be used in face-to-face as well as synchronous and asynchronous online classes.

Keywords: Layoffs, Organizational Justice, Human Resources, Communication
Disciplines of Interest: Management, Human Resources, Strategy

INTRODUCTION

Layoffs are defined as job losses resulting from profitability issues, mergers and acquisitions, changes in strategy, and other reasons [Hemingway and Conte, 2003]. These job losses are involuntary and, typically, permanent. They are often not the fault of the employees but are caused by attempts by the organization to achieve higher competitiveness [Mujtaba and Senathip, 2020]. When not handled properly, layoffs can have detrimental effects on motivation and the morale of the remaining staff [Mujtaba and Senathip, 2020; Nagpal, 2023]. Therefore, the savings or strategic changes leading to the reduction in force might not produce the results wanted from a layoff.

Management textbooks usually focus on best practices for individual dismissals and not on issues surrounding layoffs. The exercise described in this article fills that void by addressing human resources best practices, legal repercussions and requirements, and the impact on perceptions of organizational justice when it comes to communicating layoff decisions. Finding ways for management to seem compassionate and fair during a layoff is a complex process. Nevertheless, there are best practices that help promote a sense of

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organizational justice, help avoid legal entanglements, and create an environment that is positive for those who find themselves surviving the layoff. This is the key information that students will take away from the exercise.

At its core, the activity asks the students to review and analyze a series of letters published by technology companies during 2023. During that year, between 262,000 and 428,000 technology employees were laid off [layoffs.fyi, 2024; Trueup, 2024, respectively]. Good layoff processes follow a series of steps that can make them more compassionate [Tennant, 2022]. The letters provided to the students vary with respect to how many of these steps are followed, providing ample ground for discussion. For this exercise, students first read and analyze the different layoff letters individually, preparing a written assessment. Then (in small groups), they share their insights with each other. Finally, in a class-wide debrief, the students share and continue to learn from each other, with strong facilitative input from the instructor about best practices to follow in times of layoffs.

This exercise hinges on five real-world layoff letters. The fact that these are actual letters published by companies makes the information more relevant to the students than fictional examples, showing how managers can positively or negatively affect how companies communicate about layoffs. The letters range from good to poor examples of best practices. The key elements of this exercise are to involve the students with an activity that will make learning more engaging and produce better retention of the information.

There are three parts to the activity: individual preparation work for class; small group activities in class; and, finally, a class-wide debrief. The exercise is designed for use in a face-to-face class but, with small modifications, the exercise would be effective as an assignment for asynchronous and synchronous online classes. Because the letters are strategic in nature and usually signed by the CEO, the exercise can be a relevant exercise at all levels of higher education. The authors have used this exercise in both face-to-face and asynchronous online introductory management classes with positive student responses.

In this paper, we first examine the benefits of using active learning exercises in class. The article then presents a synthesis of best practices suggested in the literature about communication, legal, and organizational justice issues involved in layoffs. We conclude with describing the activity, suggesting uses beyond an introductory management class and sharing the authors' experiences deploying the exercise.

LITERATURE REVIEW

Active Learning

This section reviews relevant literature on active learning and group work as pedagogical strategies shown to enhance student engagement, deepen learning, and highlight the relevance of course content.

Active learning, also referred to as experiential learning, occurs when students engage with meaningful experiences as part of the instructional process [Kolb, 1984]. Active learning includes participation, interaction, and application [Kong, 2021]. Learning is enhanced when students interact with their environment, their peers, professors, and the subject matter to resolve conflicts, integrate concepts, and construct knowledge [Michel, Cater, and Varela, 2009]. Stock, Cola, and Kolb [2024] found that experiential learning is characterized by active participation, sensory engagement, deep involvement, alert attention, and being fully present in the exercise. By incorporating active learning techniques, educators deliver productive classroom experiences that better prepare students for real-world careers [Hackathorn et al., 2011].

The evaluation of active learning activities versus passive lectures has shown mixed results in different studies, the key to synthetize the information is to look at what kind of outcomes are being measured [Hackathorn et al., 2011]. Much of the existing research emphasizes student satisfaction over cognitive outcomes, which provides information about students' preferences of active versus passive learning. Also, the wide variety of activities classified as active learning complicates efforts to assess its effectiveness systematically. Although some studies show that active learning has been identified as a positive predictor of course performance and learning motivation [Andres, 2017], evidence suggests that the differences between active and passive learning may be minimal in terms of general cognitive outcomes but superior in terms of course learning objectives [Michel et al., 2009]. Singh and Rao [2024] conclude that active learning enhances the various aspects of learning (i.e., cognitive, affective, and psychomotor) that help in the understanding of abstract concepts. Learners are encouraged to think logically, identify solutions, and take appropriate action in relevant situations [Kong, 2021].

Active learning often incorporates elements of problem-based, participative and cooperative learning, which, when implemented effectively, can optimize student learning [Michel et al., 2009] and overcome course difficulty [Andres, 2017]. Empirical studies indicate that in-class activities tend to result in higher student performance in comparison with lectures, demonstrations, or discussions, with lecture-based approaches yielding the lowest overall scores [Hackathorn et al., 2011]. Pedagogical tools that encourage student engagement have been linked to deeper thinking and improved encoding, storage, and retrieval of knowledge [Hackathorn et al., 2011]. Case studies illustrate the effectiveness of experiential learning in cultivating practical skills and promoting student engagement [Alabi, 2024]. In summary, for the key results instructors look for, learning objective's comprehension and student engagement, active learning methods have proved superior to passive methods.

Class discussions and group work further support learning through a cumulative process in which students build on their own knowledge, as well as that of their peers and instructors, through dialogue [Andres, 2017]. In both

synchronous and asynchronous discussions, students actively exchange information, thereby constructing knowledge collaboratively. Research shows that students are more attentive, engaged, and motivated during discussions, which also foster deeper learning by requiring students to understand and respond to peers' contributions, rather than passively absorbing information [Hackathorn et al., 2011].

Although discussions facilitate engagement, in-class activities provide more direct opportunities for active participation and deep learning [Alabi, 2024]. These activities involve students working individually or collaboratively to solve problems, allowing them to practice using course material to enable understanding and foster personal growth [Hackathorn et al., 2011; Malik and Behera, 2024]. Examples of such activities include game-based exam reviews, reflective journaling, and drafting professional documents such as layoff letters. Ultimately, active learning empowers learners to develop critical thinking skills and engage in their learning—unlocking the full potential of education to inspire the learners and being about positive change in individuals [Malik and Behera, 2024].

Best Practices for Layoff Letters

This section reviews relevant literature on the key elements of a well-executed layoff letter, its legal impacts, and fairness experience.

Layoffs are defined as job loss of a number of employees resulting from profitability issues, mergers and acquisitions, and changes in strategy, among other reasons [Hemingway and Conte, 2003]. These job losses are involuntary and, typically, permanent. They are a result of changes in the organization to achieve higher competitiveness [Mujtaba and Senathip, 2020] but are not necessarily the fault of the employees.

Factors in Decision-Making

When planning for a layoff, a key first step is to identify what the layoffs are supposed to achieve. Then, create a plan that is equitable and can be quickly implemented [Bilotta, Cheng, Ng, Corrington, Watson, King, and Hebl, 2020]. Businesses have always needed to justify their actions. It is even more important that layoffs by tech organizations are communicated in the best way possible because of the wider media scrutiny and because their products are such a big part of our lives [Sucher and Westner, 2022].

Communicating the Decision

Company-wide communications of the layoffs should have clear, concise explanations of reasons for the layoffs that are easily understood with consistent

justifications. [Bilotta, et al., 2020; Pfell, Setterberg, and O'Rourke, 2003]. The communications should demonstrate a commitment to respectfulness and compassion, recognizing that layoffs not only have an effect on those who lose their jobs but also on the remaining employees and image of the company [Tennant, 2022]. Companies want to avoid making headlines, being reviled on social media, and seen as heartless [Janicek, 2023].

The letters should include explanations of what is being done for the laid-off employees and a look ahead to planned changes in the company [Tennant, 2022]. They should also contain clear explanations of what comes next, such as what the process will be and when individuals will receive the news. The letters must also make a case for staying with the company, because survivors of layoffs might feel like they are at risk of another layoff and look for employment elsewhere [Sucher and Westner, 2022]. The communications of layoffs should express that their contributions were appreciated [Bilotta et al., 2020]. It is important to not make the employee feel that they are the guilty party because that will create resentment and distrust [Pfell et al., 2003].

Of course, the most respectful way to notify people that they have been fired is in one-on-one conversations [Mujtaba and Senathip, 2020], ideally with their direct manager [Pfell et al., 2003]. This approach would give employees the opportunity to ask questions [Bilotta et al., 2020]. However, the large numbers included in the tech layoffs make one-on-one notifications a lengthy, arduous process, creating more stress for the employees. Online formats provide an alternative avenue [Brewster, 2005].

Legal Implications

Effective management requires managing legal risk, and relieving people of their duties creates exposure to lawsuits. Companies need to be worried about three legal claims associated with perceived unjust layoffs: "disparate treatment," discrimination, and "disparate impact" discrimination [King and Hemenway, 2021]. It is unlawful for employers to base employment decisions on protected characteristics such as race, ethnicity, sex, religion, age, and ability, among others [Civil Rights Act of 1964, 1964; Americans with Disabilities Act of 1990, 1990; Age Discrimination in Employment Act of 1967, 1967]—whether done intentionally or unintentionally.

Disparate treatment claims arise when an individual believes they have suffered a negative employment action directly because they are black, white, male, female, atheist, etc. [E.E.O.C. v. Sears, Roebuck & Co., 1988]. To be successful with a disparate treatment claim, an employee must show that the discriminatory action was intentional, which is why relying on subjective criteria in making layoff decisions may put the company at higher legal risk [King and Hemenway, 2021]. For instance, if a company relies on managers' evaluations of employees' past performance and future potential to determine layoffs,

a Black former employee may be able to show that the company retained White employees with worse performance records. With only a subjective evaluation in hand, the former employee's case for intentional discrimination is much stronger than if the company had used a selection method based on objective factors.

Disparate impact discrimination, on the other hand, does not need to be intentionally discriminatory. Disparate impact discrimination occurs when a nondiscriminatory policy or practice ends up harming too many people in a protected class (race, sex, ethnicity, etc.) [Griggs v. Duke Power Co., 1971]. For example, if a company decides to lay off all employees hired in the last five years, this seemingly neutral and objective criterion could disproportionately impact minorities if the company had significantly increased its diversity during that period. If a disparate impact claim were filed, the court would question the company about whether there was a way to achieve the goal without the adverse discriminatory effect [Ricci v. DeStefano, 2009].

Companies must also consider the requirements of the Older Workers Benefit Protection Act (OWBPA), whose purpose is to protect workers age 40 or older, who may be more vulnerable to unfair layoffs. The Older Workers Benefit Protection Act [1990] prohibits employers from (1) targeting covered workers when undertaking staff reductions; (2) failing to follow certain procedures when asking covered workers to waive their right to bring an age discrimination claim under the Age Discrimination in Employment Act; and (3) using an employee's age as the basis for denying certain benefits [Older Workers Benefit Protection Act, 1990].

In response to the great impact and potential injustices of layoffs, Congress enacted the Worker Adjustment and Retraining Notification (WARN) Act [1988]. The WARN Act mandates that private companies with more than 100 employees provide sixty days' notice for layoffs affecting fifty or more employees at a single site. The Act seeks to mitigate the disruptive effects of mass layoffs on workers and communities, allowing time for adjustment, job searches, and retraining opportunities. WARN notices must specify whether layoffs are temporary or permanent, though they need not include reasons for the layoffs. Noncompliance can entitle workers to back pay and benefits [Worker Adjustment and Retraining Notification (WARN) Act, 1988].

Publicly traded companies must also report layoffs to the Securities and Exchange Commission via Form 8-K within four days of the decision, although disclosure to employees may precede public filing. Form 8-K requires detailed information about the layoff decision, including the date, circumstances, completion date and associated costs [Securities Exchange Act of 1934, 1934].

When looking at the legal risks associated with announcing layoffs, companies must keep in mind the many audiences with whom they must communicate. These include employees, of course, but also government regulators,

potential judges, investors, and the public. WARN notices and Form 8-K filings exist to ensure transparency and thoughtfulness in layoff decisions; this is crucial for reducing legal risks. However, filings often lack detail, and providing employees with only this information does not foster a sense of organizational and procedural justice [Hemingway and Conte, 2003]. Although most employers provide more information to their employees about the layoff decision-making process and implementation than is contained in public filings, companies must be cautious. Inconsistent communication can increase the risk of legal claims. If employees feel they were misled or not adequately informed about the layoff process, they may be more likely to pursue legal action [Richter, König, Geiger, Schieren, Lothschütz, and Zobel, 2018].

Organizational Justice

In a layoff, the employees are asked to trust that the organization (as an employer) is being fair and that there is logic behind the layoff decision [Sucher and Westner, 2022]. If their trust is violated, it is extremely difficult to recover it. The perception that the process is a fair one is critical.

Organizational justice is usually divided into two types: distributive justice (focused on outcomes to the individuals affected and how the experience balances out with the investment they have made in the organization) and procedural justice (focused on the decision process and its implementation) [Thibaut and Walker, 1975; Bilotta et al., 2020]. The way a layoff is communicated, how it is executed and who gets laid off can create a sense of unfairness. These issues can have detrimental effects not only for the people in the organization but also for the image of the organization to the outside world [Hemingway and Conte, 2003].

The study by Hemingway and Conte [2003] study showed that, in general, people do not perceive layoffs as fair. The study showed that the main issues involved procedural justice rather than distributive justice. The result of their experiment showed that a neutral policy, size of the severance package, and consistency in the implementation most explain the perception of fairness. Colquitt, Conlon, Wesson, Porter, and Ng [2001] also confirm that structural facets of procedural justice are the most important predictors of the perception of fairness. When employees perceive that layoffs are fair, they cope better with the job loss [Bilotta et al., 2020]. Furthermore, the surviving employees are more likely to think well of the company and the image of the company is less tarnished.

Surviving the Layoff

The employees who will be staying must also be taken into account. Lack of perceived fairness can affect revenue and profit due to lower commitment

and productivity [Mujtaba and Senathip, 2020; Nagpal, 2023]. Furthermore, if it is not taken into account, motivation can be affected as well as intention to leave [Mujtaba, 2013]. Surviving employees become risk-averse [Noe, Hollenbeck, Gerhart, and Wright, 2018] and experience "survivor's guilt" [Nagpal, 2023]. All of this, with the addition that the same amount of work needs to be done with fewer people, results in stress and all of its negative consequences [Acevedo, 2017]. It is no surprise that most layoffs fail to meet the expected improvements [Sucher and Gupta, 2018].

OVERVIEW OF THE EXERCISE

The exercise begins with individual work, where the students read all five layoff letters and submit an assignment with their reflections on them. The next step follows with group work; students gather into groups of four or five students in class and discuss their findings. There is a handout to help guide that discussion. The last step is a class-wide debrief carefully guided by the instructor to highlight the relationship the students' insights have with the best practices, and if some of the key elements do not surface in the discussion, the instructor should be sure to raise them. Differences in interpretation among individuals and groups provide an opportunity to discuss how the same information can be perceived differently and the challenge that human resources departments and managers face when crafting a good letter. We provide our own ratings of the example letters using the literature that will help the instructor guide the debrief.

When we have led the exercise, the students are engaged in part because the letters run such a wide spectrum of content and, with that, we see a wide range of reactions from students. *Some students prefer shorter or longer letters, some want lots of details, others prefer less detail, and some want the severance package information up front, whereas others are willing to wait until they know where they will stand in the layoff*. Having the students discuss the letters with each other results in key insights for these future managers about different perceptions and the challenge in reaching the entire audience. In the final debrief, we show the students how their results follow best practices, which empowers students and helps them develop key managerial skills.

Our learning objectives are as follows:

After working on this exercise, the students will be able to:

- Identify the key best practices for a layoff letter, including issues around legality, audience, fairness, and what is being done for the people being laid off.
- Understand the connection between the contents of a layoff letter and the perception of organizational justice.

Specifics of Running the Exercise

Step 1: Individual Work: Analyzing Termination Announcements

The letters are posted in a learning management system (e.g., Canvas, Blackboard) and used to answer the assignment questions shown in Table 1 individually and before the class session. Appendix A includes the texts of the letters.

The questions address lists of substantive similarities and differences in the letters not related to length, font, or spacing. The students are also required to list things done well and poorly in at least one letter and identify which of the letters illustrate best examples. This assignment is due before the start of class to ensure that the students come prepared to discuss the letters.

Step 2: Group Work Analyzing Responses

During class, students answer a different set of questions found in Table 2 in small groups meant to delve more deeply into the issues related to the letters and branding.

At the beginning of class, self-selected teams of four to five students are given the worksheet shown in Table 2. These questions ask for students' ideas about how the decisions were made, the reasons given for the rightsizing, which letters were most supportive of those laid off, which information could

Table 1. Individual Work

Instructions: Read the attached letters announcing terminations/layoffs. Then, prepare your answers to the following questions. Submit your answers at the start of Thursday's class. Be sure to identify to which company/companies you are referring in each answer. We will discuss your answers and more in groups.
1. List 2–3 substantive similarities in the content of at least two letters.
2. List 2–3 substantive (& maybe surprising) differences in the letters—not length, font, or spacing.
3. List 2–3 things that were done well in at least one letter.
4. List 2–3 things that were done poorly in at least one letter.
5. Circle or check the 1–2 letter(s) that illustrate best example(s) of such termination/-lay off notifications if any qualify. Be ready to justify your answer to your group members. ___Twitter ___ Pagerduty ___ Peloton ___Meta ___Spotify
6. Explain 2–3 reasons why exit interviews with those terminated/laid off would be appropriate or not.

Table 2. Small Group Discussion

1a. How were these decisions made at 2–3 of the companies?
Pagerduty:_____ _____
Peloton: _____ _____
Meta:_____ _____
Twitter:_____ _____
Spotify:_____ _____
b. Give 1–2 reasons why it might be relevant (or not) for employees to know how the decision was made.
2. What were the main reasons for rightsizing in 2–3 of the letters?
Pagerduty:_____ _____
Peloton: _____ _____
Meta:_____ _____
Twitter:_____ _____
Spotify:_____ _____
3. Which 2–3 letters seemed most supportive of those terminated? Explain 1–2 reasons why for each.
Pagerduty
Peloton:
Meta
Twitter
Spotify
4. In addition to the above discussed topics, list 2–3 things that were done *well* in at least one letter. *Mention the company(s).*
5. In addition to the above discussed topics, list 2–3 things that could have been deleted from the letters sent to the survivors (remaining employees) and/or those terminated. *Mention the companies.*
6. How do 2–3 of the above (and other aspects of the letters) influence perceptions of decision and company?
7. Select the letter that provides the best sense of a fair process and explain why.
8. List 5–7 main topics that should be included in letters announcing terminations/layoffs.

be deleted from the letters, and how these issues (and other aspects of the letters) influence perceptions of the decisions and organizations. The need to come to agreement when working as a team helps introduce the point of the complexity of writing these documents, because people reading the same text will have different reactions to it. This step takes about ten to fifteen minutes.

Step 3: General Debrief

The debrief takes about thirty minutes to go over the different answers in each team and discuss the differences between the teams' responses. The goal of the individual and group work is to help students realize that their perceptions are not everyone's perceptions and that people might value things in different ways. The goal of the debrief is to share best practices, engage the letters from different points of view, and examine issues of organizational justice.

The instructor should highlight how the students' results match best practices, and when things are missed by all teams the instructor needs to make sure to bring them up and call attention to the diversity of opinion present in the individual and group work. To aid the instructor, we have created Table 3 with our own ratings of how closely the letters match the best practices discussed in the literature review. We have also included Table 4, where we include some important points that should be included in the discussion and that might help start conversations if the students are a little quiet as an aid to the instructor.

Table 3. Ratings from 1 to 5, with 1 Being Poor and 5 Excellent

Best Practice	Meta	Peloton	PagerDuty	Spotify	Twitter
Recognizes the effect and needs of those staying and leaving	5	1	2	3	1
Clear explanation of why	5	2	1	2	1
Explanation of what is being done for those who are fired	5	N/A	3	3	2
Explains what is going to change in the company	3	4	3	3	1
Clear explanation of the process that will follow	3	N/A	4	3	2
Makes a case to stay	3	3	3	2	N/A
Opportunity to ask questions	5	N/A	5	5	N/A
Seems compassionate	5	1	2	3	1

Table 4. Highlights from Each Letter

Meta: Makes a point to address workers that are on a work visa, for these workers a layoff brings additional uncertainty as for many their visas are linked to having employment in the U.S.
Peloton: Only includes one sentence here or there where it says that people will lose their jobs but absolutely no detail.
Pagerduty: A quote for MLK, Jr. seems out of place.
Spotify: Does not create a clear picture of what is changing other than moving the organizational structure.
Twitter: Seems to say they do not trust their employees and are expecting them to steal from them but those rules assures that legal risk is reduced. Shows that they value legal protections over what could be perceived as handholding and explaining details.

After going over the questions on the small group discussion sheet, the instructor should discuss organizational justice and describe the two types: distributive and procedural. These topics are described in the literature review above. Then the instructor should ask the students the following questions:

- Which one of the two dimensions seems more relevant for a layoff?
- Which letter gives you a better sense of fairness?
- What leads you to that conclusion?

The instructor can complete this phase of the discussion by describing the results from literature. For example, the instructor could mention that layoffs are not seen as fair in general [Hemingway and Conte, 2003] and that the structural facet of organizational justice is the most relevant in layoffs for creating a sense of fairness [Colquitt et al., 2001]. More details can be found in the theory section of this paper.

If there is time, the instructor should mention that the class has been looking at the letters from the point of view of the people being laid off. It could be interesting to take on the role of the manager composing the letter addressing how their concerns are different from those of the recipients of the letters. For example, managers should focus on how to make sure that those surviving the layoff believe there is a well-reasoned path for the company to prevent future layoffs. The instructor should also bring up the legal considerations discussed in the literature review as most students do not know the legal requirements involved in layoffs. Then a discussion of the legal exposure in each of the five letters is needed. We have provided Table 5 with our own rating of legal risk for each of the letters as an aid to the instructor.

Table 5. Legal Risks

Best Practice	Meta	Peloton	PagerDuty	Spotify	Twitter
Balances legal risk	3	5	5	5	4.5

At this point, the exercise has focused on the recipients of the letters and the authors of the letters. To further reinforce the complexity of layoff letters, the instructor should bring up the other stakeholders who will be reading the letters: employees staying with the company, potential and current investors, and customers. A good question to ask in this section pertains to how different letters address these audiences. This question will lead to a discussion that paints the letters in a different light, such as discussions about pricing and future models that make more sense to be included because of the additional audiences.

POTENTIAL MODIFICATIONS

We see these letters as a resource. They can be used in different ways for different classes.

In a synchronous management online class, the exercise can be replicated with the use of breakout rooms. In an asynchronous management class, students can be assigned to read and review all five layoff letters, identify which ones are better, and provide insights into what should and should not be included in layoff letters, similar to Table 1 and Table 2. This can be an assignment or a discussion post. The discussion post has the benefit of sharing the results with the class, and it can create opportunities for the students to see that not everyone reacts similarly to these letters. The post or assignment can be followed up with the best practices information either by responding to posts, providing feedback on the assignment, or creating a mini lecture on the topic.

Another variation is to provide the students with a blank Table 3 and have them score the letters individually and then as a team.

In a Human Resources (HR) class, the same structure can be used but with further emphasis on the legal aspects of layoffs. The key legal document to reference is the WARN Act because it is the only one that provides guidelines for layoffs. It is important to mention potential issues of discrimination. We elaborate on those points in our literature review.

In an Organizational Behavior (OB) class, the letters can be used to look at emotional reactions, how the letters affect the organization's culture, and communication.

In a Strategy class, the focus can be on whether the announced changes make strategic sense and whether they correctly balance short-term and long-

term goals. The students could be asked to analyze the proposed strategies in each of the letters (except the Twitter letter, which has none) looking for feasibility, appropriateness, and, importantly, whether the strategies can be accomplished with fewer people in the organization. This is an interesting analysis because so many layoffs fail to meet the expected improvements; firms find that they actually need a certain number of people to do the necessary work [Sucher and Gupta, 2018]. The assignment can be done in small groups where each team focuses on one letter and researches the environment and how the proposed strategy matches with it. Another interesting activity in a strategy class can be reviewing different waves of layoffs for the same companies and analyzing how the letters and explanations change over each round in terms of justification and proposed changes.

GRADING THE ACTIVITY

We grade the activity as participation credit. There is also an opportunity to grade the preparatory work, but the engagement shown by the students when conducting the exercise allows us to feel comfortable that participation credit is sufficient.

Potential Challenges

An instructor might encounter challenges in conducting the exercise. As always, the key challenge is how to ensure that the students do the preparation work that is essential for the exercise. Grading the preparatory work is one way to ensure the work is completed. In our experience, classes vary on how much incentive is needed for them to prepare for the exercise.

Another challenge is that the students might have preconceived ideas about the different companies that might color their opinions of the letters. Some of the companies are better known than others. This issue can be alleviated by having the students research the companies to get more context into the companies. This step might be useful to include in the instructions in the individual section of the exercise.

International students might struggle with the language of the letters because several may include complex descriptions of future strategies, which might limit their understanding. Some suggestions can include looking for a tutor who would help them review the letters. In addition, the language struggles also may be alleviated during the small team section of the exercise because the teammates might provide further clarity. At the same time, having international students read the letters might help identify cultural differences in how these letters are perceived and whether the sense of organizational justice differs across cultures.

Some students might not feel up to the task of criticizing letters from such big companies. They might doubt their ability to make critical observations. To manage this possibility, the instructor might point out that they can look at the letter as one they would receive at their jobs and that most people would not know the best practices of writing layoff letters when they receive them.

Using the exercise as a discussion post in an asynchronous class loses some of its power because the discussions are never as rich as they are in an in-person class. We have overcome this challenge only in small ways, by providing our own responses to posts and/or an email to the class with key points, but there is definitely a loss. Instructors might have found ways to make discussion posts more dynamic, but we have not done so thus far.

OUTCOMES

We have not measured results of our exercise in a systematic manner, but we have discussed the students' experiences with them and evaluated the output of the different phases of the exercise. In all instances, the exercise successfully gave the students a sense of what it takes to write a good layoff letter and how these letters are perceived by the person receiving them. The students reacted positively to material that was real, timely, and something they had seen in their social media. The students' work shows understanding of the different points that are important in layoff letters. The students remember the exercise and are able to recognize best practices on their own and refine that information through the group work and debrief.

DISCUSSION

Our active learning exercise engages the student in a different way than a lecture would. It leverages the students' own reflexivity, the team learning opportunity, and engagement with the professor—all dimensions that enhance learning, as found by Michel et al. [2009]. Students engaged in this exercise seemed to appreciate a change from a typical lecture and seemed to retain the information better.

Michel et al. [2009] point out that active learning improves the attainment of the learning objectives. Our students have the opportunity to go into detail on the different dimensions of an effective layoff letter from many different angles. The discussion of organizational justice usually does not come up organically. However, once the instructor introduces the relevant concepts, the students easily make the connections to their experience reading and critiquing the letters.

CONCLUSION

In the tradition of experiential exercises where students engage with the material rather than passively receive the information, our exercise provides an

opportunity to learn best practices for HR and management in the context of layoff letters. The exercise presented here in detail focuses on the introductory management class audience. We provide some modifications for other classes. At the core, we think these letters are resources that can be used in different ways.

An interesting angle to our exercise is that, according to the literature, there are objective elements that need to be included and personalized in layoff letters, and writers must be mindful of all the different audiences the letters will have. These requirements provide an anchor for the instructor to guide the discussion, helping the students connect their insights with what has been shown to be effective.

The key benefit of our work is that the exercise provides the students with the opportunity to look at real-world examples of a key element of good HR and management practices and to engage with the material at the individual, group, and class-wide levels.

Further research can explore using information from companies with multiple rounds of layoffs and exploring how the letters change as time passes. Different industries could be compared and evaluated, so that students might analyze whether the type of industry makes a difference in how they are written. Another approach could be to compare announcements of mergers and acquisitions that usually precede layoffs and the layoff letters that are sent afterward.

Students' positive reactions to the exercise described in this article give us confidence that the active engagement is producing improved results in terms of achieving learning objectives.

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APPENDIX A. DETAILS FOR LETTERS

CEO Jennifer Tejada sent the following email to PagerDuty employees on January 24, 2023. [Tejada, 2023].

Dutonians,

Part of our mission at PagerDuty is to help businesses "anticipate the unexpected in an unpredictable world." Over the last year, the macro environment shifted rapidly, with growth contracting in Q1 and Q2 yet expanding in Q3. Inflation and geopolitical concerns caused the US Federal Reserve to hike interest rates, while the jobs market overall remained strong and the unemployment rate remained low. Macro signals remain mixed and uncertain as we head into a new fiscal year.

Our $38 billion TAM of over 75 million potential users remains large, our Operations Cloud platform mission critical for our customers, and our competitive advantages deep, but we are not immune to macro volatility, nor can we predict when the economy will improve.

While demand for our products and services remains stable and our strategy to help our customers transform their operations remains relevant and intact, it is taking longer to convert than prior years. Macro uncertainty and volatility has led our customers – businesses across segments and regions – to scrutinize and slow investments in order to preserve business outcomes and protect shareholder returns, while improving their **operational resilience.**

For the last two years we have undertaken proactive initiatives to scale efficiently, accelerating this program last summer by standardizing our go-to-market motion globally, reducing layers, improving spans of control, reducing discretionary spend and standing up teams in cost-effective, high-talent locations.

The reality of today's volatile economy requires additional transformation.

Despite executing well over the last eight quarters, sustaining high growth and dramatically improving operating margins, there is more to do to secure PagerDuty's future. To weather today's economic uncertainty and succeed over the long term, we must generate more cash flow and increase our operating margins in the near term. Doing so enables us to sustainably fund the priorities and commitments our customers count on us for: resilience and security at scale, and an easy-to-use, low-cost-to-own, high-ROI Operations Cloud.

Today's Actions

After considering a range of approaches for strengthening the company as we move forward, we are further refining our operating model as we work to increase our capacity while improving our cost structure, focusing our efforts, and improving our return on investments.

Additional refinements we are implementing today include:

- Eliminating roughly 7% of roles globally, the vast majority of which are in North America, primarily in our go-to-market and G&A organizations;
- Reducing discretionary spend;
- Negotiating more favorable commercial agreements with key vendors;
- Rationalizing our real estate footprint to reflect the realities of our distributed-by-design hybrid work model.

Like most technology companies, our most significant investment is our workforce. These decisions were carefully considered and are necessary to set PagerDuty up for long term success, especially in the context of ongoing uncertainty. That said, these changes are also very difficult. They will be painful for those Dutonians impacted, their loved ones and their teammates, because every PagerDuty employee is an important, valuable part of our community.

As these changes impact the heart of our organization, our people, we worked to ensure fair and equitable, principled decisions by focusing on a value-centered and business-based set of principles. Decisions were predicated on business rationale that included, for example, protecting investments in top product development priorities like our new Incident Workflows, self service and product-led growth (PLG), and continued AIOps and Automation enhancements, improving spans of control and streamlining management layers, expanding teams and roles in Santiago and Lisbon, and addressing our enterprise opportunity with a hybrid strategic and high-velocity GTM motion that continues to improve our productivity.

I regard Dutonians as more than employees; they are accomplished, deeply talented individuals who #BringThemselves and drive the innovation and culture behind our products and services to deliver experiences that delight our customers. I appreciate each and every Dutonian's contribution to PagerDuty. It is my expectation that we show all of our colleagues the grace, respect, and dignity they have earned. As someone who has worked in this industry for decades, I have experienced this before and it is never easy, and I also know from experience that while we may not work together in the short term, our relationships and this community live beyond our tenure at PagerDuty.

Honoring and Supporting Our People

We are committed to supporting impacted Dutonians through this transition. In doing so, we ensured our colleagues receive severance with an average of 11 weeks pay, with additional severance based on tenure (or we followed local laws as required). Impacted employees, who are currently enrolled in our plans, are being offered extended healthcare coverage for themselves and dependents for a minimum of three to four months (depending on carrier requirements by location), and all employees will be provided career transition support from Randstad RiseSmart. **All notifications for impacted employees are expected to be completed today and tomorrow.**

We are confident that these changes sufficiently improve our operational resilience such that we do not anticipate further actions outside of the regular course of business.

Looking Forward to the Future

I'm excited to appoint Jeremy Kmet **SVP, North America Sales**, to **Senior Vice President of Global Field Operations, effective February 1, 2023** reporting to me. Jeremy assumes expanded responsibility for our global Sales, Partner and Sales Strategy & Operations organization. **Jill Brennan, Natalie Fair, Josh Thacker, Julia Fare, Tim Chinchen and their teams will report to Jeremy beginning February 1.** For customer and business continuity, and efficiency, we are not backfilling the SVP, Americas role at this time.

We are well positioned to succeed with Jeremy leading our go-to-market (GTM) organization, going from strength to strength. As our most tenured and highest performing GTM leader, he is credited with designing and scaling the land-and-expand motion – especially in the upper mid-market and enterprise segments – underpinning PagerDuty's efficient growth and setting our performance pace, especially in the past two years as we accelerated our growth and profitability.

With this promotion, Jeremy's role expands from the Americas, approximately 75 percent of annual recurring revenue, to our global sales theaters, channels and operations teams. Jeremy has deep domain experience, customer relationships and product expertise. He brings a breadth of expertise – from selling to the world's largest enterprises to building a high-velocity mid-market motion here at PagerDuty. Given his track record and demonstrated deep commitment to our customers, our people, and our values, our board of directors and our leadership team have great confidence in Jeremy to lead the Global Field Operations organization.

Dave Justice, Chief Revenue Officer, is leaving PagerDuty to pursue other opportunities after the completion of FY23. Dave has been a valued partner to me and the executive team over the last three years. We thank him for his leadership in championing our customers, and for his many contributions to PagerDuty. Please join me in wishing Dave all the best in his future endeavors.

This leadership transition creates an opportunity for us to evolve our customer experience in ways that encourage a faster Operations Cloud adoption and value realization, through both product-led and sales-led growth. The strength of the partnership between our customer support, success and services team and sales teams creates a foundation for us to build on, more tightly integrating the voice of the customer into product design and experience, **blazing the product-led "Path to Platform" for our Operations Cloud** by connecting these teams with our product teams.

With that goal in mind, we are realigning the Customer Success Group (CSG) organization with the Product Development team. **Manjula Talreja, our Chief Customer Officer, will report to Sean Scott our Chief Product Development**

Officer. Manjula will stay closely aligned across the company as a part of both the GTM Leadership and Executive Leadership Teams, and continue to extend the teams' impact on our business by more tightly integrating the voice of the customer into product design and experience.

I am excited to connect Customer Success to our product strategy, and likewise drive a deeper connection between product management and our customers' platform engagement and post-sale experience. The organizational design of Sales, CSG and the rest of the company beyond the changes noted above remains in place. We are confident we have the right team and a strong platform to achieve our bold mission.

Taking additional steps to improve our own operational resilience will shore up our ability to achieve our long-term goals – achieving $1B in revenue, sustaining profitable growth and working towards the rule of 40 – by expanding our leadership in digital operations through adoption of the Operations Cloud which benefits our customers, our shareholders and all our stakeholders.

We are reinforcing our strengths, ensuring capacity to increase innovation and growth, and delivering on our commitment to operate as a profitable, durable growth company, with a platform and team our customers trust and can depend on for years to come. We expect to finish the year strong – in fact, we have reaffirmed our guidance for FY23 today – and those results, combined with the refinements outlined above, put PagerDuty in a position of strength to successfully execute on our platform strategy regardless of what the market and the macroenvironment bring.

None of this would be possible without you, our leadership, and our board — thank you for your grit and resilience, your commitment to our customers and your support of our values and people. I am reminded in moments like this, of something Martin Luther King said, that "the ultimate measure of a [leader] is not where [they] stand in the moments of comfort and convenience, but where [they] stand in times of challenge and controversy." PagerDuty is a leader that stands behind its customers, its values, and our vision — for an equitable world where we transform critical work so all teams can delight their customers and build trust.

What's Next

Please join us later today for a Town Hall at 1:30 pm PST/4:30 pm EST where we'll discuss these changes further and have an opportunity for Q&A. Once all notifications are completed (targeting end of day Wednesday PST), you will receive an email from your ELT member outlining any specific changes within your functional area.

Jenn

Meta email [Zuckerberg, 2022]

November 9, 2022

Mark Zuckerberg just shared the following with Meta employees:

Today I'm sharing some of the most difficult changes we've made in Meta's history. I've decided to reduce the size of our team by about 13 percent and let more than 11,000 of our talented employees go. We are also taking a number of additional steps to become a leaner and more efficient company by cutting discretionary spending and extending our hiring freeze through Q1.

I want to take accountability for these decisions and for how we got here. I know this is tough for everyone, and I'm especially sorry to those impacted.

How Did We Get Here?

At the start of Covid, the world rapidly moved online and the surge of e-commerce led to outsized revenue growth. Many people predicted this would be a permanent acceleration that would continue even after the pandemic ended. I did too, so I made the decision to significantly increase our investments. Unfortunately, this did not play out the way I expected. Not only has online commerce returned to prior trends, but the macroeconomic downturn, increased competition, and ads signal loss have caused our revenue to be much lower than I'd expected. I got this wrong, and I take responsibility for that.

In this new environment, we need to become more capital efficient. We've shifted more of our resources onto a smaller number of high priority growth areas — like our AI discovery engine, our ads and business platforms, and our long-term vision for the metaverse. We've cut costs across our business, including scaling back budgets, reducing perks, and shrinking our real estate footprint. We're restructuring teams to increase our efficiency. But these measures alone won't bring our expenses in line with our revenue growth, so I've also made the hard decision to let people go.

How Will This Work?

There is no good way to do a layoff, but we hope to get all the relevant information to you as quickly as possible and then do whatever we can to support you through this.

Everyone will get an email soon letting you know what this layoff means for you. After that, every affected employee will have the opportunity to speak with someone to get their questions answered and join information sessions.

Some of the details in the US include:

- **Severance**. We will pay 16 weeks of base pay plus two additional weeks for every year of service, with no cap.
- **PTO**. We'll pay for all remaining PTO time.

- **RSU vesting**. Everyone impacted will receive their November 15, 2022 vesting.
- **Health insurance**. We'll cover the cost of healthcare for people and their families for six months.
- **Career services**. We'll provide three months of career support with an external vendor, including early access to unpublished job leads.
- **Immigration support**. I know this is especially difficult if you're here on a visa. There's a notice period before termination and some visa grace periods, which means everyone will have time to make plans and work through their immigration status. We have dedicated immigration specialists to help guide you based on what you and your family need.

Outside the US, support will be similar, and we'll follow up soon with separate processes that take into account local employment laws.

We made the decision to remove access to most Meta systems for people leaving today given the amount of access to sensitive information. But we're keeping email addresses active throughout the day so everyone can say farewell.

While we're making reductions in every organization across both Family of Apps and Reality Labs, some teams will be affected more than others. Recruiting will be disproportionately affected since we're planning to hire fewer people next year. We're also restructuring our business teams more substantially. This is not a reflection of the great work these groups have done, but what we need going forward. The leaders of each group will schedule time to discuss what this means for your team over the next couple of days.

The teammates who will be leaving us are talented and passionate, and have made an important impact on our company and community. Each of you have helped make Meta a success, and I'm grateful for it. I'm sure you'll go on to do great work at other places.

What Other Changes Are we Making?

I view layoffs as a last resort, so we decided to rein in other sources of cost before letting teammates go. Overall, this will add up to a meaningful cultural shift in how we operate. For example, as we shrink our real estate footprint, we're transitioning to desk sharing for people who already spend most of their time outside the office. We'll roll out more cost-cutting changes like this in the coming months.

We're also extending our hiring freeze through Q1 with a small number of exceptions. I'm going to watch our business performance, operational efficiency, and other macroeconomic factors to determine whether and how much we should resume hiring at that point. This will give us the ability to control our cost structure in the event of a continued economic downturn. It will also put us on a path to achieve a more efficient cost structure than we outlined to investors recently.

I'm currently in the middle of a thorough review of our infrastructure spending. As we build our AI infrastructure, we're focused on becoming even more efficient with our capacity. Our infrastructure will continue to be an important advantage for Meta, and I believe we can achieve this while spending less.

Fundamentally, we're making all these changes for two reasons: our revenue outlook is lower than we expected at the beginning of this year, and we want to make sure we're operating efficiently across both Family of Apps and Reality Labs.

How Do we Move Forward?

This is a sad moment, and there's no way around that. To those who are leaving, I want to thank you again for everything you've put into this place. We would not be where we are today without your hard work, and I'm grateful for your contributions.

To those who are staying, I know this is a difficult time for you too. Not only are we saying goodbye to people we've worked closely with, but many of you also feel uncertainty about the future. I want you to know that we're making these decisions to make sure our future is strong.

I believe we are deeply underestimated as a company today. Billions of people use our services to connect, and our communities keep growing. Our core business is among the most profitable ever built with huge potential ahead. And we're leading in developing the technology to define the future of social connection and the next computing platform. We do historically important work. I'm confident that if we work efficiently, we'll come out of this downturn stronger and more resilient than ever.

We'll share more on how we'll operate as a streamlined organization to achieve our priorities in the weeks ahead. For now, I'll say one more time how thankful I am to those of you who are leaving for everything you've done to advance our mission.

Mark

Peloton email [McCarthy, 2022]

Team

I'm writing to update all of you on Peloton's ongoing transformation. The past few months we've made considerable progress on our journey. We continue to define and lead the global Connected Fitness category, even as we work to make Peloton more efficient, cost effective, innovative, and to best position ourselves for the future. Thank you for your hard work.

We have a clear strategy to drive the long-term, sustainable future of this company. Job one is generating free cash flow by right-sizing our inventory commitments and converting many of our fixed costs to variable costs because that cost structure better aligns with the seasonal revenue of our business. Second, we are

also focused on innovation across our hardware and software to strengthen our Member experience. And, finally, we're focused on growth and expanding the way consumers can experience the magic of Peloton.

We are making several additional changes to the business to improve our performance.

Maintaining Our Premium Brand Positioning

For several months we've been running the business to maximize cash flow. In April, we lowered prices on our original Bike, Bike+ and Tread to make the entry point for new Members more accessible and to accelerate the sale of inventory to generate much needed cash flow. At the time, we were still in the early days of our $800 million restructuring plan. We were under considerable cash flow pressure, and we were in the process of (but had not yet completed) securing a $750 million bank loan.

Because of our success managing our inventory and supply chain issues, and because of the bank financing, we have the opportunity to adopt a more nuanced pricing strategy targeting "value" and Premium members alike by increasing prices on our Bike+ and Tread models – which contain distinctive, superior design elements, while keeping the price of the Bike v1 and Guide the same.

Specifically, in the U.S., our new price structure will be as follows:

- *Bike+ will increase by $500 to $2,495*
- *Tread will increase by $800 to $3,495*

You can see the full pricing menu for all products across all markets here.

This pricing change achieves three objectives – we maintain an attractive entry point for new Members; we continue to sell down excess Bike v1 inventory, creating a financial tailwind on investments already made; and we maintain our position as the undisputed premium brand in the Connected Fitness category.

Optimizing Our Operations and Workforce

We continue to make strategic changes to our operations and workforce. Following last month's exit from owned-manufacturing in Taiwan, we are now restructuring our final mile delivery capabilities by expanding our work with our third party logistics (3PLs) providers. As a result, we are eliminating our North American Field Ops warehouses, resulting in a significant reduction in our delivery workforce teams.

Unfortunately, this means a number of team members will be departing the company. We know changes of this nature are never easy.

The shift of our final mile delivery to 3PLs will reduce our per-product delivery cost by up to 50 percent *and will enable us to meet our delivery commitments in the most cost-efficient way possible. I also want to highlight that we have been actively working with our 3PLs to dramatically improve the member experience,*

and we are seeing positive momentum in those CSAT scores. This has been a challenge. We won't fix it overnight, but we have no choice but to make it work, so we're leaning into it and proactively managing our 3PL relationships. We are confident in the plan we've put in place, and we're encouraged by the progress we're making.

After re-examining the resources required to provide our Members best-in-class support, we have also decided to reduce fixed costs by eliminating a significant number of roles on the in-house North America Member Support Team. In-bound Member support volume has been lower than forecasted, and like other parts of the business, we are going to expand our work with our third party partners. These expanded partnerships mean we can ensure we have the ability to scale up and down as volume fluctuates while still continuing to provide the level of service our Members have come to expect.

These are hard choices because we are impacting people's lives. These changes are essential if Peloton is ever going to become cash flow positive. Cash is oxygen. Cash is life. We simply must become self-sustaining on a cash flow basis.

I want to take this opportunity to express my gratitude to those delivery team and Member support colleagues who have been impacted by this decision.

Investing in Talent to Innovate and Grow

In the past you have heard me say we cannot cost cut our way to success. We have to make our revenues stop shrinking and start growing again. We do that with investments in marketing and R&D to drive innovative products. We must also develop new features and functionality for existing CF platforms that delight Members and drive word-of-mouth which drives organic growth. And, we double-down on our existing strengths, particularly our world-class, Instructor-led content that motivates and inspires Members daily.

While we're reducing our workforce in certain areas of the business, we continue to fill roles on key teams to drive the business forward. This includes further commitment to recruiting top talent in key areas of need such as our software engineering team. I share this so you won't think we're driving with our foot on the gas and the brake at the same time. Success is about making the right investments to drive growth while managing to a cost structure the business can afford.

I've also long believed hands-on, shoulder-to-shoulder collaboration is essential for fast, efficient teamwork and innovation. To that end, we'll be asking all office-based employees to return to their office three days per week starting on Tuesday, September 6th. We know some of you will need more time to sort out related details, and we are asking that you do so, working with your manager, with a deadline of Monday, November 14th for all of us to be back in the office (if your PeloTeam designation is office-based) every Tuesday, Wednesday, and Thursday. You also are welcome to come in more often, if you'd like, and take full advantage of the office amenities and gym.

As of November 14th, return to office for office-based workers (not you if you were hired to be remote) will be mandatory. There are many successful businesses, like Airbnb and Spotify, who have chosen to operate remotely. There are also many successful companies who have opted to collaborate in the office in person, like Nike and Google. The culture you choose to work in should be compatible with your personal preference. For those of you who don't want to return to the office, we respect your choice. We hope you will choose to stay, but we understand not everyone will.

Balancing e-Commerce and Retail

Lastly, we need to rebalance our e-Commerce and retail mix to drive efficiencies, which means we will reduce our retail presence across North America. This decision will result in a significant and aggressive reduction of Peloton's retail footprint. Data tells us that in a post-COVID economy, consumers want a mix of virtual and in-person engagement with the brands they love, meaning a hybrid model of e-commerce as well as limited physical retail touchpoints. We have to meet our prospective Members where they are.

We will provide future updates on which retail operations will be impacted by this decision in the coming months. We do not anticipate closing retail locations in calendar 2022, but the timing is uncertain as we begin negotiations to exit our store leases.

Forward Focus

In closing, I want to reiterate that I know some of this news is difficult to hear as it has a real impact on people's lives who believe in the mission and our ability to manage the business for success.

Today's news reminds us it was never more important that we be successful in managing our turnaround. That's the reason we're making the hard choices to shift our cost structure from fixed to variable and to right size our spending in retail stores. As we face economic uncertainty in the global macroeconomic outlook, we will continue to analyze our workforce and expenditures. Change is constant, and we need to embrace it and make it one of our super powers.

Overall, I continue to be optimistic about the future of Peloton. That doesn't mean there won't be challenges ahead. There will be, and there will be unforeseen setbacks. That's the nature of turnarounds. But I'm confident we can overcome the challenges because we've come so far in just the last four months, which feeds my optimism about our ability to engineer our long-term success. No one's gonna give it to us, least of all our competitors. We're going to have to step up and make it happen. The future of connected fitness is Peloton's to own.

Me to you. You to me. You to each other. And all of us to our members.

—Barry

Spotify email [Ek, 2023]

By: Daniel Ek
January 23, 2023
*Earlier today, CEO **Daniel Ek** shared the following note about the company's organizational changes with all Spotify employees.*

Team,

As we say in our Band Manifesto, change is the only constant. For this reason, I continue to reiterate that speed is the most defensible strategy a business can have. But speed alone is not enough. We must also operate with efficiency. It's these two things together that will fuel our long-term success. With this in mind, I have some important news to share today.

While we have made great progress in improving speed in the last few years, we haven't focused as much on improving efficiency. We still spend far too much time syncing on slightly different strategies, which slows us down. And in a challenging economic environment, efficiency takes on greater importance. So, in an effort to drive more efficiency, control costs, and speed up decision-making, I have decided to restructure our organization.

To start, we are fundamentally changing how we operate at the top. To do this, I will be centralizing the majority of our engineering and product work under **Gustav** as Chief Product Officer and the business areas under **Alex** as Chief Business Officer. I'm happy to say that Gustav and Alex, who have been with Spotify for a long time and have done great work, will be leading these teams as co-presidents, effectively helping me run the company day-to-day. They'll tell you more about what this means in the coming days, but I'm confident that with their leadership, we'll be able to achieve great things for Spotify.

Personally, these changes will allow me to get back to the part where I do my best work—spending more time working on the future of Spotify—and I can't wait to share more about all the things we have coming.

As a part of this change, **Dawn Ostroff** has decided to depart Spotify. Dawn has made a tremendous mark not only on Spotify, but on the audio industry overall. Because of her efforts, Spotify grew our podcast content by 40x, drove significant innovation in the medium and became the leading music and podcast service in many markets. These investments in audio offered new opportunities for music and podcast creators and also drove new interest in the potential of Spotify's audio advertising. Thanks to her work, Spotify was able to innovate on the ads format itself and more than double the revenue of our advertising business to €1.5 billion. We are enormously grateful for the pivotal role she has played and wish her much success. In the near term, Dawn will assume the role of senior advisor to help facilitate this transition. Alex will take on the responsibility for the content, advertising and licensing work going forward and you'll hear more from him on that.

The Need to Become More Efficient

That brings me to the second update. As part of this effort, and to bring our costs more in line, we've made the difficult but necessary decision to reduce our number of employees.

Over the next several hours, one-on-one conversations will take place with all impacted employees. And while I believe this decision is right for Spotify, I understand that with our historic focus on growth, many of you will view this as a shift in our culture. But as we evolve and grow as a business, so must our way of working while still staying true to our core values.

To offer some perspective on why we are making this decision, in 2022, the growth of Spotify's OPEX outpaced our revenue growth by 2X. That would have been unsustainable long-term in any climate, but with a challenging macro environment, it would be even more difficult to close the gap. As you are well aware, over the last few months we've made a considerable effort to rein-in costs, but it simply hasn't been enough. So while it is clear this path is the right one for Spotify, it doesn't make it any easier—especially as we think about the many contributions these colleagues have made.

Like many other leaders, I hoped to sustain the strong tailwinds from the pandemic and believed that our broad global business and lower risk to the impact of a slowdown in ads would insulate us. In hindsight, I was too ambitious in investing ahead of our revenue growth. And for this reason, today, we are reducing our employee base by about 6 percent across the company. I take full accountability for the moves that got us here today.

My focus now is on ensuring that every employee is treated fairly as they depart. While **Katarina** will provide more detail on all of the specifics around the ways we are committed to supporting these talented bandmates, the following will apply to all impacted employees:

- *Severance pay:* We will start with a baseline for all employees with the average employee receiving approximately 5 months of severance. This will be calculated based on local notice period requirements and employee tenure.
- *PTO:* All accrued and unused vacation will be paid out to any departing employee.
- *Healthcare:* We will continue to cover healthcare for employees during their severance period.
- *Immigration support:* For employees whose immigration status is connected with their employment, HRBPs are working with each impacted individual in concert with our mobility team.
- *Career Support:* All employees will be eligible for outplacement services for 2 months.

What's Next

In almost all respects, we accomplished what we set out to do in 2022 and our overall business continues to perform nicely. But 2023 marks a new chapter. It's my belief that because of these tough decisions, we will be better positioned for the future. We have ambitious goals and nothing has changed in our commitment to achieving them.

We've come a long way in our efforts to build a comprehensive platform for creators of all levels, but there's still much to be done. To truly become the go-to destination for creators, we need to keep improving our tools and technology, explore new ways to help creators engage with their audiences, grow their careers, and monetize their work.

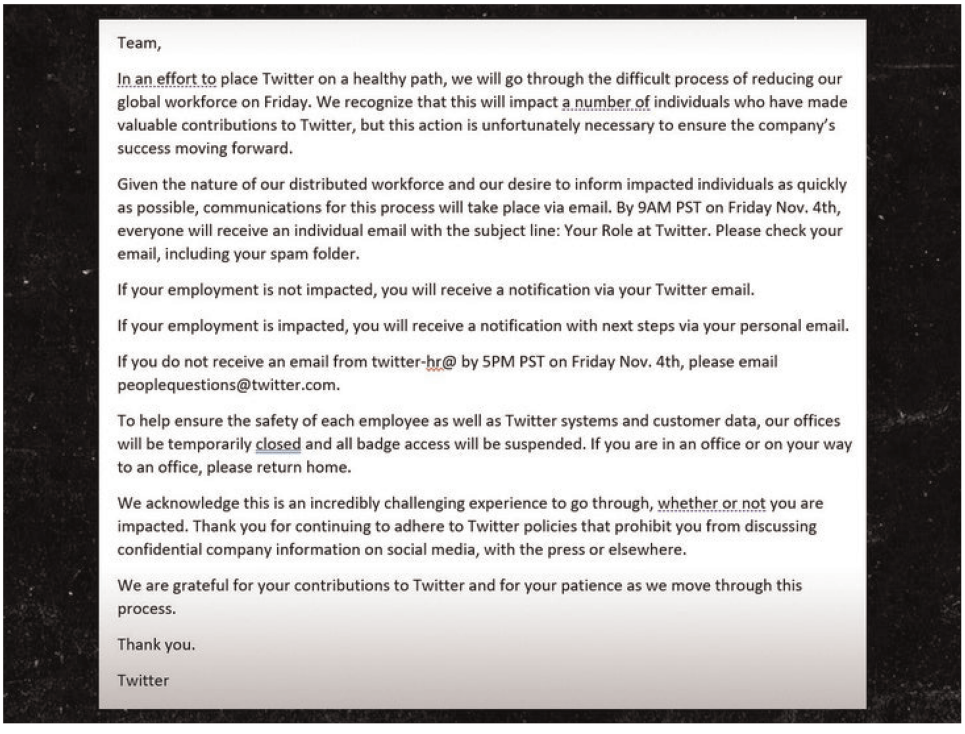
In fact, looking at our roadmap, with the changes we are making and what we have planned to share at our upcoming Stream On event, I'm confident that 2023 will be a year where consumers and creators will see a steady stream of innovations unlike anything we have introduced in the last several years. I will share more about these exciting developments in the coming weeks.

Finally, I hope you will join me tomorrow for Unplugged.

And again, for those of you who are leaving, I thank you for everything you've done for Spotify and wish you every future success.

—Daniel

Twitter email [Twitter, 2022]



Team,

In an effort to place Twitter on a healthy path, we will go through the difficult process of reducing our global workforce on Friday. We recognize that this will impact a number of individuals who have made valuable contributions to Twitter, but this action is unfortunately necessary to ensure the company's success moving forward.

Given the nature of our distributed workforce and our desire to inform impacted individuals as quickly as possible, communications for this process will take place via email. By 9AM PST on Friday Nov. 4th, everyone will receive an individual email with the subject line: Your Role at Twitter. Please check your email, including your spam folder.

If your employment is not impacted, you will receive a notification via your Twitter email.

If your employment is impacted, you will receive a notification with next steps via your personal email.

If you do not receive an email from twitter-hr@ by 5PM PST on Friday Nov. 4th, please email peoplequestions@twitter.com.

To help ensure the safety of each employee as well as Twitter systems and customer data, our offices will be temporarily closed and all badge access will be suspended. If you are in an office or on your way to an office, please return home.

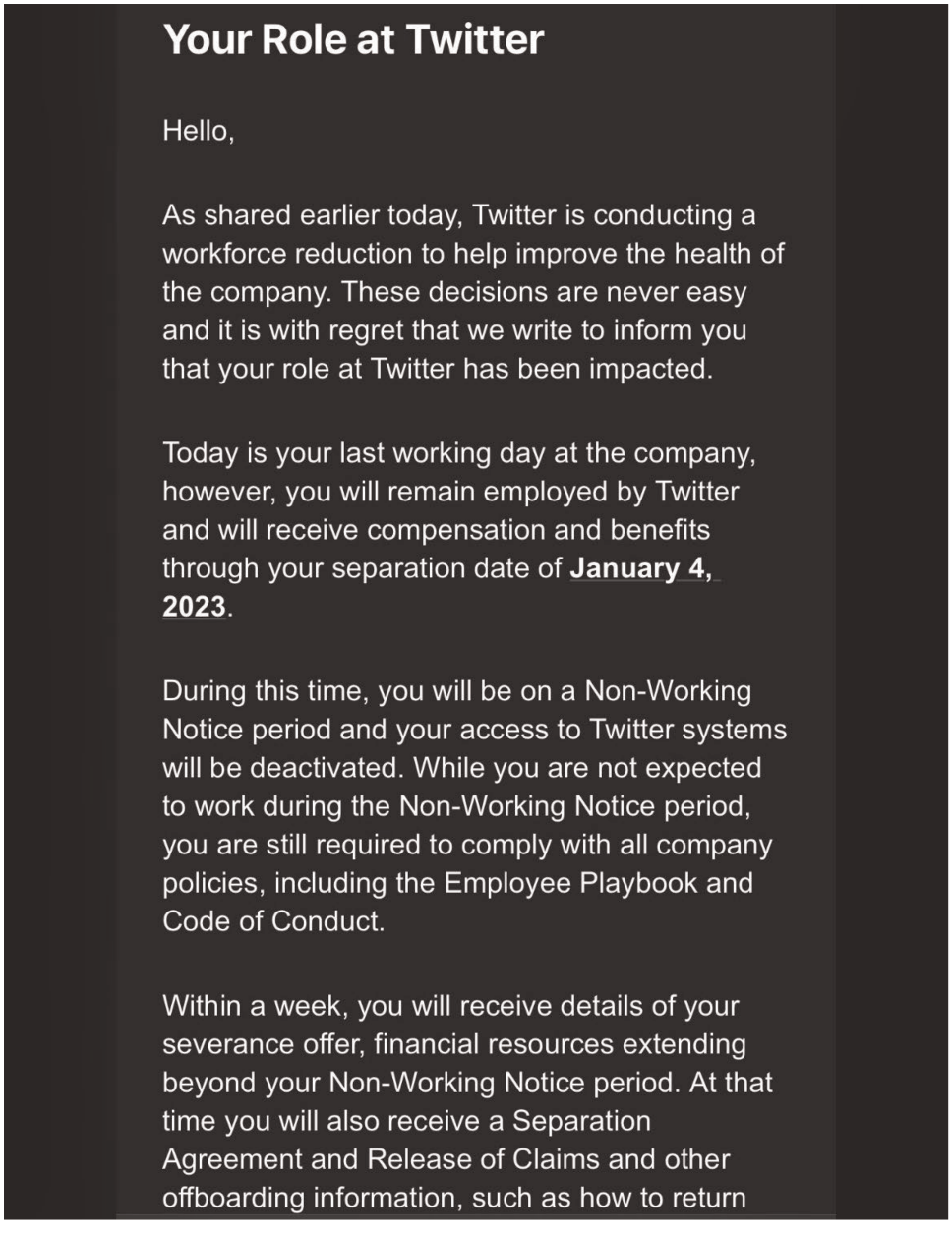
We acknowledge this is an incredibly challenging experience to go through, whether or not you are impacted. Thank you for continuing to adhere to Twitter policies that prohibit you from discussing confidential company information on social media, with the press or elsewhere.

We are grateful for your contributions to Twitter and for your patience as we move through this process.

Thank you.

Twitter

Email to fired employees [Twitter, 2023].



Your Role at Twitter

Hello,

As shared earlier today, Twitter is conducting a workforce reduction to help improve the health of the company. These decisions are never easy and it is with regret that we write to inform you that your role at Twitter has been impacted.

Today is your last working day at the company, however, you will remain employed by Twitter and will receive compensation and benefits through your separation date of **January 4, 2023**.

During this time, you will be on a Non-Working Notice period and your access to Twitter systems will be deactivated. While you are not expected to work during the Non-Working Notice period, you are still required to comply with all company policies, including the Employee Playbook and Code of Conduct.

Within a week, you will receive details of your severance offer, financial resources extending beyond your Non-Working Notice period. At that time you will also receive a Separation Agreement and Release of Claims and other offboarding information, such as how to return

will be deactivated. While you are not expected to work during the Non-Working Notice period, you are still required to comply with all company policies, including the Employee Playbook and Code of Conduct.

Within a week, you will receive details of your severance offer, financial resources extending beyond your Non-Working Notice period. At that time you will also receive a Separation Agreement and Release of Claims and other offboarding information, such as how to return your Twitter materials (computer, badge, etc.).

Attached is an FAQ which aims to address a number of questions you may have. If your questions are not answered in the FAQ, you can reach out via **peoplequestions@twitter.com**.

We remain grateful for all that you have done for Twitter throughout your tenure and wish you only the best in your next chapter.

Thank you.

Twitter

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Attachments

1. WARN Notice

2. Team@ note

3. FAQs

Email to contractors [Twitter, 2023].

As you may be aware of, Twitter has conducted a reprioritization and saving exercise in an effort to better focus during this period of resource constraints.

Please allow this communication to serve as notice on behalf of your employer on record that your assignment at Twitter has ended as part of the reprioritization and savings exercise.

In order to maintain Twitter confidential information and for security reasons, your system and badge access will be shut off immediately.

Your last day at Twitter will be Monday, November 14th. You will not be expected to perform any services on November 14th. You will receive your final pay from November 7th through November 14th. Please ensure that any time cards and expenses that are outstanding are submitted into Magnit VMS immediately.

As a reminder, you have signed a Non-Disclosure Agreement; please remember that all intellectual property information associated with your assignment, business practices, or your specific project is strictly confidential during and after your Contract.

If you have any questions, please reach out to your employer Surya Systems, Inc.

Thank you for your service to Twitter,

Magnit Team

Journal of the Academy of Business Education

Call for Papers

The Journal of the Academy of Business Education is a multi-disciplinary journal seeking the following topic areas of papers. Solid empirical research is preferred over descriptive papers.

- Educational research
- Pedagogy
- Curriculum
- Cases
- Multi-disciplinary
- Ethics and Moral Values

Requirements

There are a few strict layout requirements for submitting a manuscript for review. The following guidelines are recommended in preparing your manuscript for submission:

1) Manuscripts should be typed, double-spaced and in an easy to read font such as Times Roman (12 point) or Courier (10 point);
2) Cover page should include paper title, authors names and affiliations and phone number and email address of manuscript contact person. Authors names should not appear in the manuscript;
3) First page of manuscript should begin with paper title, followed by an abstract of no more than 100 words, then followed by the first section of the paper that should be called "INTRODUCTION";
4) Sections - There should be no more than three levels of headings in body of paper:
Level One headings should be left justified and all caps;
Level Two headings should begin each word with capital letter and left justified;
Level Three headings same as Level Two, but italicized.
5) End Notes - Use end notes only, not foot notes. Number them consecutively throughout the manuscript with superscripted Arabic numerals (dont use foot note feature of software). Place all end notes together at end of manuscript before the REFERENCES section;
6) Equations - Number all equations consecutively and place number in parentheses at the right margin of equation. If you use equation editor, place equation number outside of equation box;
7) Tables - Except for very small tables, tables should be placed at end of manuscript. Make every effort to avoid "landscape" orientations. Tables should have centered headings as:
Table 1: Title of Table
Note in body of paper approximately where table or figure should be placed, as:

Place Table 1 about here

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8) Figures - All figures should be headed as in the tables described above, except use the word "Figure" in place of "Table." Figures and charts must be clear and readable in black and white format; Tables and figures should be contained in the same Word document as the paper. A separate title page is not necessary.

9) References - References should appear alphabetically by authors last name at end of paper. Citations in body of paper should be in [brackets]. Only include references actually cited in paper. Examples:

Smith, R.J. "Learning by Doing: Teaching Can Be Fun," Journal of Business Education, 22 (Spring, 1994), 77-81.
Jones, R.R., Carol King and Sidney Slack. "Team Teaching Via the Internet," Journal of Educational Design, 7 (No. 2, 1993), 123-144.
In the body of the paper show citations like this [Smith, 1994] or [Jones et al., 1993].

10) Paper submissions should be e-mailed as a MS Word document to Benjamin Akins at the following address: JABESubmission@ggc.edu. There is no fee for manuscripts submitted to JABE by ABE members. Only one author needs to be an ABE Member. All fees must be paid using the credit card options as noted on the Membership Application Tab.

Website payment at https://www.abeweb.org/application.

Contact

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