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Significant Learning Experience Defined by Student Perceptions: A Four-Year Examination

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Abstract: This qualitative study is an attempt to collect data describing college students' descriptions of significant learning experiences during college. The data collected comes from two separate samples across four years. Through open-ended comments provided at the end of the National Survey of Student Engagement and thematic analysis, interesting information emerged about how students define significant learning experiences. Students defined learning experiences in two environments, inside the classroom, and outside the classroom. They also expanded on the notion of significant learning coming in the form of self-discovery and relationships formed during the experiences in college. Four years later, similar themes emerged such as real-world application, community, support, learning about self, and diversity. These findings suggest significant learning is similar across time and is centralized around a few particular elements.

Keywords: significant learning, student perception, assessment, support, community, self-discovery

Forecasts of decreasing enrollment, increased tuition costs, rising student debt, and alternatives to 4-year undergraduate degrees have created an urgency among colleges and universities to demonstrate their value to prospective students and employers (Drozdowski, 2022). Institutions competing to attract and serve a diverse student population are compelled to employ a diverse range of pedagogical approaches to meet the diverse learning needs of that market (Higbee & Goff, 2008). Long gone is the sole reliance on the traditional lecture-based model of learning in higher education (Schmidt, Wagener, Smeets, Keemink, & van der Molen, 2015). In doing so many have anatomized their curricular designs to better identify, articulate, and measure the most desirable teaching and engagement strategies for student achievement and success.

From this movement have emerged several distinct and widely adopted instructional models, expanding the learning environment beyond the classroom, and reconsidering the responsibility for successful learning outcomes to be shared among the student, the teacher, and the institution itself. An *informal* or *self-directed* approach incorporates this recognition of shared responsibility and requires the students' awareness of self-generated management, cognitive responsibility, and motivational dimensions to achieve learning outcomes (Garrison, 2016; Brockett & Hiemstra, 1991; Martin & Hokanson, 2022). *Active learning* incorporates meaningful activities during the classroom and may include *collaborative learning* (students working together in groups) and *cooperative learning*, which uses the same structured group work to achieve a common goal while individually evaluating participants (Prince, 2004; Cho, Melloch, & Levesque-Bristol, 2021). *Concept-point-recovery* (CPR) is a teaching

technique in which tests and quizzes, typically post-lecture evaluative measures, are integrated into classroom activities as a supportive and less-stressful learning tool to point out errors and misconceptions, as well as providing students the opportunity to demonstrate an improved understanding and, subsequently, their grades (Lee, Cho, Melloch, & Levesque-Bristol, 2021). Another high-impact teaching practice prioritizes *service learning*, an experiential activity incorporating volunteerism and community service to enhance and facilitate learning in the educational process (Rooks & Rael, 2013; Furco, 1996). The *global learning* approach takes education outside the classroom to another level, placing a premium on a global perspective to enhance the college experience (Butler & Reinke, 2020).

Selecting and incorporating the most appropriate learning strategies is only half the battle; effective curricular development necessitates identifying valid measures of those strategies to assess their impact. For each approach, a shared measure of learning successes (or failures) must be considered. *Significant learning* is a broad definition interpreted by many and at times questioned if it can even be assessed (Stolz, 2017). To begin, the description of significant needs definition as well as the understanding of learning. Each of the terms, *significant* and *learning*, have varied interpretations and meanings depending on whom you ask. What perceptions do students have of learning on college campuses? A considerable amount of literature suggests significant learning is interpreted by the process and the results (Fink, 2013). The process entails how the students perceived the instructor and the engagement and energy of the class. The results include how learning in class affects their overall career and life in the long run. The anatomy of a learning situation follows the process of a memorable experience, enjoyed experience, the connection of the experience to real life, and the overall anatomy of the experience itself (Fink, 2013; Stolz, 2017; Levine, Fallahi, Nicoll-Senft, Tessier, Watson, & Wood, 2008).

Another consideration for how students define significant learning is artificial intelligence. Recent studies underscore the transformative impact of artificial intelligence on the learning process. AI technologies, such as machine learning algorithms and natural language processing, are increasingly employed to personalize educational experiences but also streamline the learning process and potentially jeopardize the role of the instructor. For instance, AI-powered adaptive learning systems can tailor content delivery to individual student needs, enhancing engagement and learning outcomes (Sullivan, Kelly, & McLaughlan, 2023). But it can also encourage plagiarism, using misinformation, replacing students' critical thinking, hindering writing ability, and others. While AI holds promise in improving educational efficacy and accessibility, ongoing research also emphasizes the importance of ethical considerations, such as privacy concerns and algorithmic biases, in its implementation. However, there is an opportunity to explore AI and its positive and negative influence on significant learning. The "hurricane of generative artificial intelligence has blown in with little warning, leveraging its force can provide new learning opportunities for higher education" (Campbell & Cox, 2024, p. 107). How does AI use by students influence how they view significant learning?

Student definitions of significant learning most likely vary based on context, situation, and student experience, but all involve students undergoing positive, substantial, and lasting influences on their personal and professional lives (Partido, Chartier, & Jewell, 2020). Students want to talk about significant social issues that affect them and those around them through collective and individual reflection (Navarrete, Montero, & Cantero, 2020). The consistency in the literature suggests that personal history and background may influence what practices may be considered successful. There is a need to understand student perceptions of learning experiences. Previous studies mapped out particular skills associated with significant learning (Lee & Lee, 2022).

However, more research needs to be done to understand the interpretations of significant learning *outside* of the classroom. Do students perceive learning as something that can truly happen outside the classroom? Fink (2013) argues the learning of self, the examination of feelings, and learning

how to be a better learner are all significant learning experiences but don't necessarily have a place in the typical classroom environment. Learning does not happen solely in the classroom and within the borders of a college campus (Irani, Wilson, Slough, & Rieger, 2014). What better way to explore this notion than by asking the intended audience of learning, students? This study is an attempt to explore those potentials by asking those who experience significant learning to identify and define the makeup of significant learning. The intent is to merely examine how one sees the process of significant learning during a college career. Significant learning can happen in many forms and places.

Course evaluations, teaching evaluations, assessments of program effectiveness, and a variety of measurements attempt to capture if learning happens. The issue with these mechanisms is the lack of attributes generated by students as to what is the definition of significant learning. Good teaching leads to learning. Institutional support leads to learning. Clear course objectives do the same. But before we understand how we get to different accomplishments of learning, the main question is, what is it and how do students define it? "Learning should be seen as a qualitative change in a person's way of seeing, experiencing, understanding, conceptualizing something in the real world–rather than as a quantitative change in the amount of knowledge someone possesses. It is logically impossible for learning defined in this way to be content- and con-text-free." (Marton & Ramsden, 1988, p. 271). Others identify change, process, evolution, and understanding of new information. Regardless of how it is defined, student perception of what causes those changes needs to be examined. As well as understand the evolution of what those changes look like over time.

The final intent of this qualitative analysis is to compare and contrast student perceptions of significant learning over a period of time. There is a need to not only visit the perceptions across time but to revisit the definition of significant learning pre- and post-Covid-19 pandemic. Students have been asked for their definition of the explanation of significant learning in previous research (Brackenbury, 2012; Levine, Fallahi, Nicoll-Senft, Tessier, Watson, & Wood, 2008). It is imperative to revisit that exploration of student-defined significant learning.

Methods

Methodology

Significant learning is broad and complicated to define. The goal of this research study is simply to find the answer to one research question:

RQ1: How do college students define significant learning experiences?

Through a grounded theory approach (Charmaz, 2006; Tracy, 2012) this research process intends to find a theme in responses to what a student defines as significant. Grounded theory helps provide the discovery of the conditions that define a particular action or event. More importantly, grounded theory is a flexible, yet guided approach, to finding theory in the data itself (Charmaz, 2006; Glaser & Strauss, 1967). Understanding a perception of an experience through grounded theory is best achieved through narrative inquiry. The narrative inquiry asks for the experiences, interpretations, and definitions of participants (Corbin & Strauss, 2015; Lincoln and Guba, 1985) through open-ended and broad questioning. More specifically conceptual interviews help "explore the meaning and conceptual dimensions of central terms, as well as their position and links within a conceptual network" (Brinkman & Kvale, 2015, p. 176-177). The individual responses and narratives will help to define and centralize a common theme of what it means to experience significant learning. Through this conceptual model and grounded theory approach a more expansive definition of how students perceive significant learning can be provided. The true constructivist approach understands that

knowledge and meaning are developed through different social lenses. Grounded theory is an approach to help identify those differences.

Data Collection

The data was collected in two different time frames. In the spring of 2018 and the spring of 2022, a small midwestern university administered the National Survey of Student Engagement. This survey annually collects information at hundreds of four-year colleges and universities about the first-year and senior students' participation in programs and activities that institutions provide for their learning and personal development. The results provide an estimate of how undergraduates spend their time and what they gain from attending college (NSSE, 2023). The survey collects data from first-year and senior students. The survey asks several questions about student engagement but for this study, the research team used only one open-ended prompt: "Please describe the most significant learning experience you have had so far at this institution". In 2018, 259 first-year students and 246 senior students completed the survey. In 2022, 304 first-year students and 215 senior students completed the survey. After data was collected, the open-ended responses to the one prompt were separated from the rest of the survey responses into one data set. The responses were thematized in 2018 and set aside to reexamine after the four-year cycle. After the 2022 survey, the same process was completed. The process is explained further below.

One data analysis decision was to not address differences between first-year students/senior students, declared majors/undeclared, nor did it explore variations in responses based on factors like ethnicity, socioeconomic status, or first/continuing generation college status. The decision to treat students as a unified, unidentified group aimed to present a broad perspective on student experiences and behaviors. This approach allows for generalized conclusions that apply broadly across different student backgrounds and circumstances, avoiding the complexities that detailed subgroup analyses would entail. It also maintains a focus on overarching themes or trends within the student population as a whole, aligning with the study's scope and objectives. However, this would be an important follow-up study and extension of this generalized conclusion.

Data Analysis

After reviewing the survey answers, the research team began an inductive coding process using constant comparative analysis (Braun & Clarke, 2006; Charmaz, 2006). Glasser and Strauss (1967) define this process as the continual creation of analytic distinctions allowing for comparisons and contradictions in themes created. Open coding was performed to identify particular themes and concepts that are evident in the responses. The open coding process was completed after two rounds of reading the survey responses and theoretical saturation was met. Theoretical saturation occurs when no new themes can be identified, and themes generated continue to support already created themes (Corbin & Strauss, 2015; Bowen, 2008). After generating a broad selection of thematic categories, the team moved on to the axial coding process which helps to understand the interconnection of these themes. The team was able to accomplish this through the process of eliminating duplicate or similar responses. Through the interpretation of the meaning and the condensation of meaning, the authors allowed for the creation of centralized meaning created by the participants (Brinkman & Kvale, 2015). Once, the themes were coded and analyzed: four main themes were found for 2018 and five themes for 2022.

Preliminary Findings

The results presented in this section provide four themes in 2018 and five themes in 2022 that students reported as significant learning experiences during the college process. There is expansion and detail on each in this section and then an overview of the general meaning in the following section is provided.

2018 Findings

Classroom Elements

This theme was the most common of all the themes emerging from the student responses. Students would focus on particular classes or majors such as a core course in their major or the public speaking course they took at the beginning of their college career. They would emphasize this course stood out because of the learning they had or the instructor they had. They discussed particular elements of the classroom such as communication with others and the opportunity to have their voice heard. Finally, they overviewed the real-life application that they appreciated. The students recalled classes such as their public speaking class or their senior capstone class. The class itself was the embodiment of a significant learning experience. Some went on to describe the elements of the class and how it pertained to their careers and lives. They also explained the activities in the class such as enjoying discussion-based classes as the preferred method of engaging with the materials and their peers. They continually emphasized the importance of understanding the material but getting a chance in class to truly explore how the content applied to them. At times students singled out particular learning environments that were not conducive to significant learning such as lecture-based delivery and unengaging presentation. A considerable amount of responses in this category seemed to speak to the previously discussed literature on significant learning. Students would highlight particular classes by saying "my communication class", "my major class", or "my class on a certain topic". Others talked about particular events that happened in the class such as "this particular activity that allowed us to inventory our weaknesses". Another talked about "getting to talk with peers informally. Other participants often talked about any course found "in my major". All in all, students describing particular aspects of the classroom as a significant learning experience generated a theme.

Outside Classroom

This theme focused on the ability to learn outside of the class. Students thought significant learning happened when they weren't cooped up in a classroom and had the opportunity to situationally control outcomes. They liked the opportunities student organizations and extracurricular activities provided which allowed them to apply and refine skills in leadership roles. One student said, "while my classes have taught me a lot over my four years as a student, my experiences outside of the classroom have been the most formative." This was reinforced by the notion that leadership roles were not the only thing that helped them accomplish significant learning. Students reported the organizations themselves regardless of what role they had helped them achieve learning. They felt that they belonged and could truly apply the tenets of real-world learning in fraternities, sororities, or even organizing campus events. Very few students specifically named individual organizations but made broad statements about how these ideas were truly significant learning experiences. They also emphasized the notion that being social had a large influence on learning, something they also acknowledge rarely happened in the classroom. Opposed to the first theme, participants talked about "social" events offered on campus as significant learning opportunities. Others talked about their involvement in "sorority" or "fraternity" events. Others simply talked about "extracurricular" events. One student

emphasized how "their leadership roles allowed for more powerful learning than any classroom". Another said that "learning only happened outside of the classroom." Some of these quotes helped emphasize the importance of learning outside of the class.

Self-Discovery

This had to be the more significant finding in this study. The students took it upon themselves to discuss things outside of a type-defined learning experience. They talked about finding themselves in college as a true learning experience. They talked about learning how to manage time and being on their own without the constant supervision that they felt when in high school from their family. This idea of self-directed discipline was something that they didn't feel was happening before college. The students expanded on the knowledge of the discipline that had to be created on their own without the guidance of their parents. They weren't learning from others or learning in classrooms, they were learning from themselves. They had to find innovative ways that had not been a part of their daily routine to survive. One particular quote that stood out stated: "I think one of my most significant learning experiences so far at this university has been being on my own. It was a little scary at first but now I feel acclimated! I feel as though I'm more responsible and in control of my own life. I look forward to continuing to learn about the real job world and adult life and enjoying the rest of my college experience." They emphasized the need to find direction such as what it means to be an adult and someone who had to make their own decisions. They appreciate the introspective learning they had to accomplish to be successful in college and life. Students who were able to find themselves through the process of college was a large theme generated by participant responses. Terms seen throughout the coding process included "self-direction", "self-management", and "finding things they didn't know about themselves before college". One participant summed up the entire theme by saying, "I think one of my most significant learning experiences so far at this university has been being on my own. It was a little scary at first but now I feel acclimated! I feel as though I'm more responsible and in control of my own life. I look forward to continuing to learn about the real job world and adult life and enjoying the rest of my college experience." Students want to find themselves in a new light when they come to college.

Relationships

The final theme identified focused on the people that they met and how the people themselves made up a significant learning experience. Students discussed the peers they talked to in class and met during campus events. But the differentiation from the outside class theme identified earlier was the emphasis on the individual. They talked about conversations that were eye-opening and had a significant impact on who they are now as a person. One student commented, "Learning to make connections with people that were previously out of my social circle via speech class" in response to the most significant learning experience so far at this campus. Students developed new social circles that they would have never considered before and attributed them to true learning because they became different people because of that. Several comments focused on how social connections created experiences that made them think differently. Sometimes they even expanded on the nature of classroom experiences which didn't necessarily foster that outcome by themselves. Without social interaction and engaging conversations in a diverse classroom setting, no learning would have happened. They made several emphatic statements that underlined the key to learning from other people, not books or classes. Participants talked about "relationships", "friends", and "experiences with others" as having a perceived greater impact than the classroom curriculum. One participant stressed that "Learning to make connections with people that were previously out of my social circle via speech class."

2022 Findings

Real World Application

Similar to the 2018 responses, students crave a learning experience that gets them out into the world to showcase their skills and talents. Several respondents used the phrase "real-world experience" as a valuable and significant learning experience. They elaborated on particular experiences specific to their major and their field of study. One participant talked about "taking coursework that I have learned from previous years and applying it to real-world situations to maximize my preparedness for my career". Students don't want to stop short of the experience of being just in the classroom. Another interesting phrase echoed throughout the survey comments about "experiential learning assignments" and "field experience" being significant learning experiences. Experiential learning is something we have seen throughout higher education taking place as terminology in our curriculum because of higher impact practices (AACU, 2023). A student emphasizes that a significant learning experience should help "make me comfortable in my future job decisions". All of the student comments emphasized a desire for the application of learning in the real world. No matter what particular element of the course, the assignment, the location, and other aspects, students want to see the real-world implications.

Community

Often, learning is attributed to the classroom, but the students felt compelled in this survey to focus on things outside of course content. They stressed the need for community or learning about the community to experience significant learning. One student stated, "the biggest lesson for me was learning what it meant to be part of a community". Many use the term, "classroom community" as an important precursor to learning being able to take place in the classroom. They didn't feel they could learn until a sense of community was created in some way. Some emphasized "it didn't happen in the classroom" and stressed that learning happened when with "friends", with "clubs", or in "study groups". This repeated emphasis on social groups shows that significant learning can be interpreted in a lot of different ways. This theme however was crystallized with the negative comments about the "lack of community". One student said, "every time I walk around on campus I feel like an uninvited guest and never feel comfortable". Comments like these appeared several times throughout the data analysis. Another participant echoed this sentiment saying, "Honestly I don't know, I commute so I don't feel involved on campus. I try to make friends and I have a couple, but other people have other friends they have met through dorms and groups, so they are less interested in becoming friends with me." The lack of community seemed to inhibit the respondents from being able to experience significant learning.

Support

A third theme focused on the idea of support and the need to feel supported before learning happens. This theme was similar to the community but had unique elements to make support and community different. One student stated "they started here at [one institution], went to [another institution], and came back. I learned how much the professors here care about their students and how much they want us to succeed." This then echoed throughout numerous comments about care, support, and belonging in the university experience. Another student said, "the most significant learning experience I have had so far here is that you can't do everything alone." Several students talked about the need to have "care from professors". Without this "care," students felt lost and not able to learn. Significant

learning happens when "professors are very caring, and they made sure that you understand the materials that were given to you". Students needed the "professors [who] kept pushing me forward, and with their help, I was able to pull myself out of the hole I was in during the first semester". Finally, another student said, "an institution is where people are there to support you, and they want you to do your best."

Learning about Self

A university experience is sometimes about figuring out the day-to-day operations and the process of navigating the next steps of life. The participants suggested this is part of the significant learning they experienced. One student said, "I learned that I have particular limitations I have to keep in mind to avoid being self-destructive. Now I have a better idea of how much work I can manage sustainably." Understanding these limitations comes in a variety of forms and would look different for each student. The limitations and how to navigate those limitations were very significant learning experiences. Another student said, "where you are in control of your destiny and have to learn to manage multiple different areas of your life (academic, social, extracurricular, financial) at the same time". Trying to figure out who you are as a student and what that experience entails is complicated. One participant said any experience that "helped me know myself and understand myself better". One common phrase used throughout the survey responses was the aspect of "learning about myself". Whether this was about how to function in college, how to figure out what they wanted to do with their career, how to socialize, or just how to manage their time. For many, this idea of "being on your own" was a very significant learning experience and they found value when they found answers to who they are.

Learning About the Diverse World

The final theme talked about how the students viewed significant learning as an experience of learning about the world in new ways. The students didn't necessarily talk directly about diversity or particular buzzwords, but they talked about the idea of new perspectives. One student said, "I've learned how to appreciate and see points of view that I didn't before, think critically about what I'm experiencing, and developed a stronger sense of self." This concept of different world views or perspectives seemed to repeat often. Several students used the phrase being around "people to learn about different cultures" which initiates learning. Some students took a different approach to the encouragement of diverse perspectives and talked about how the learning environment enabled the conversations. One student said significant learning happened when "professors that would praise and encourage increased diversity and acceptance". Some keywords that came up to generate this theme were "diversity", "new perspectives", and "different viewpoints". The "Diversity" of those perspectives resonated with many students to report this as a significant learning experience. One striking comment came from a student stating /Similarities/New perspectives on the world. One student stated, "I learned overall that no matter where we come from, what or whom we like when it comes to education, we start at the same place". Another participant said, "I would say a significant experience would be talking with others in class discussions because it exposes me to different thoughts and perspectives." All of these responses emphasized a desire and need to talk with those with diverse perspectives.

Discussion

After two separate data analysis phases, themes generated by two different student populations separated by four years showed a significant similarity in how students define significant learning. Figure 1 compares the themes generated each year and shows how they align.

Table 1. Comparison of Themes.

2018 Themes	2022 Themes
A. Classroom Elements B. Outside Classroom	Real World Application (A, B)
	Community (A, B)
C. Self-Discovery	Learning About Self (C)
D. Relationships	Support (D)
	Learning About the Diverse World

The main question from this study is, why does this matter? For a variety of reasons, this data analysis provides a few interesting things. Students define significant learning as:

1. Almost identical to pre-covid
2. Happening inside and outside the classroom
3. Sometimes not about content
4. Helping them discover themselves in a variety of ways
5. Care, Support, and Community as a precursor to learning

Pre/Post-Covid

A large portion of our academic and pedagogical review for the past few years has been focused on efforts to return to normal or how COVID-19 influenced our teaching. Using this small data sample shows that significant learning is still relatively the same among our students. Students notice significant learning after certain things or events.

Inside and Outside

Learning is not confined to the classroom. Learning is not always happening when clearly defined learning objectives are present. Learning is not always going to happen just when a teacher is there. Students talked about the experience being something that happened in a variety of different ways and situations on a college campus. Finding ways to help foster significant learning among students is something that can happen in any way and every way.

Not About Content

Yes, learning is often about what you learn. However, participants in this study did not stop at content. They talked about the environment created, how they learned, what helped led to learning, and how

that learning was best accomplished. It is important to note the approach to learning and even the informal opportunities provided to students helped signal significant learning.

Find Themselves

The college experience involves a lot of firsts for students. When asked this question as both a first-year and senior student was about finding themselves. Experiencing life on their own, how to time manage, how to talk to others, and just figuring out their limitations was a significant learning experience. How do universities help navigate the exploration of finding themselves? This is a powerful finding from asking students to define a significant learning experience. How many course objectives are "demonstrate the ability to find themselves"? Is that our responsibility?

Care, Support, and Community

Students don't care how much instructors know until they know how much you care. The respondents stressed in two data collection cycles that they need to feel that they belong before they can learn. When they felt the care and support from their peers and instructors they signaled significant learning.

Trustworthiness & Limitations

Reliability, validity, and trustworthiness can all take different forms when justifying one's work. In this study, the seven stages of validation were attempted (Brinkman & Kvale, 2015). The thematization of responses took an objective examination of survey responses checking against other potential answers. Finally, reporting the information involved providing a direct response to the question at hand. Future studies need to expand on the data provided in this study to accomplish true triangulation.

Conclusion & Implications

The significance of the findings in this study is the fact that learning was not defined simply as a process or as a result of the typical college classroom. Often, the default answer was to talk about classroom activities or leadership roles outside of class. This spoke to the previous literature that encourages engaging classroom material and real-life application. Outside the classroom allows for that true application. This is important to consider when examining what learning truly is. However, the idea that people and self can be the true definition of what it means to experience significant learning is novel in the idea that learning does not need a teacher or a classroom even in the college environment. Learning means finding themselves and finding others to help them understand complicated ideas. When asked what a significant learning experience is, students took it upon themselves to paint a picture of a much broader interpretation of how and when learning happens. It is significant to understand that the classroom and the elements of the classroom still hold a significant place in the minds of students. They still desire a learning experience in class that expands their mind but also allows for exploration. However, students made it evident that they want people and introspective learning experiences. They want the opportunity to discover themselves and others on a college campus. If colleges allow for these opportunities and spaces, significant learning will happen according to the responses of the individuals who participated in this survey. Significant learning, just as stated at the beginning of this article, is complex, complicated, and somewhat arbitrary. This makes for the opportunities for significant learning to happen almost everywhere at any time. The integration of AI into education undoubtedly alters how students pursue meaningful learning.

Another important consideration to make in relation to significant learning is the influence of Artificial Intelligence and generative text. While AI can enhance accessibility to vast amounts of information and streamline learning processes, its influence on students' quest for deeper understanding is complicated and just starting to be researched. Students may face a dual challenge: balancing the acquisition of competencies with the temptation to merely skim the surface of knowledge for immediate application. AI's ability to provide quick answers and automated solutions might inadvertently promote superficial learning unless actively countered by educators fostering some of the themes provided in this study. The future landscape of education hinges on cultivating a balance where students harness AI for efficiency while valuing and striving for profound comprehension and application of knowledge. This study supports the idea that learning happens outside of assignments, readings, and places where AI can dominate the work. How could AI be leveraged to help students find the themes generated in this study of finding real-world applications, finding themselves, being cared about, and others? More studies need to explore how these significant learning themes will interact with student use of AI.

Significant learning is different for each individual. Trying to simplify and categorize the interpretations of how we define such an abstract idea is difficult. However, this brief study provides a connection of ideas that learning does not simply happen in the classroom. Students highlight particular aspects inside and outside the classroom that have significantly influenced their learning in college. However, they go on to identify two particular aspects that don't necessarily translate to learning as an event. Learning was defined as a relationship formed and an internal awareness developed. The process of learning was not just the mere fact of learning as a process but the product of being able to realize how to adjust to time management constraints.

References

AACU (2023). High Impact Practices. https://www.aacu.org/trending-topics/high-impact

Bowen, G. A. (2008). Naturalistic inquiry and the saturation concept: a research note. *Qualitative Research*, *8*(1), 137-152.

Brackenbury. (2012). A qualitative examination of connections between learner-centered teaching and past significant learning experiences. *The Journal of Scholarship of Teaching and Learning*, *12*(4), 12–28.

Braun, V. and Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3* (2), 77-101.

Brinkman, S., & Kvale, S. (2015). *Interviews: Learning the craft of qualitative research interviewing.* Thousand Oaks, CA: Sage.

Butler, S. M., & Reinke, A. (2020, May). Global Perspectives in the Core: Student Attitudes and Instructor PerformancePerformance. *International Journal for the Scholarship of International Journal for the Scholarship of Teaching and LearningTeaching and Lear, 14*(1).

Brockett, R. G., & Hiemstra, R. (1991). *Self-direction in adult learning: Perspectives on theory, research, and practice.* London: Routledge.

Campbell, L. O., & Cox, T. D. (2024). Facilitating the research writing process with generative artificial intelligence. *Journal of the Scholarship of Teaching and Learning, 24*(2). https://doi.org/10.14434/josotl.v24i2.36580

Charmaz, K. (2006). *Constructing grounded theory: A practical guide through qualitative analysis*. Thousand Oaks, CA: Sage.

Cho, H. J., Melloch, M. R., & Levesque-Bristol, C. (2021). Enhanced student perceptions of learning and performance using concept-point-recovery teaching sessions: a mixed-method approach. *International Journal of STEM Education*, 1-17.

Corbin. J., & Strauss, A. (2015). *Basics of qualitative research: Techniques and procedures for developing grounded theory*. Thousand Oaks, CA: Sage.
Drozdowski, M. J. (2022, June 27). *7 Challenges Threatening the Future of Higher Education*. Best Colleges. https://www.bestcolleges.com/news/analysis/7-challenges-threatening-future-of-higher-education/
Fink, L. D. (2013). *Creating significant learning experiences: An integrated approach to designing college courses*. Hoboken, NJ: John Wiley & Sons.
Furco, A. (1996). Service-Learning: A Balanced Approach to Experiential Education. *Expanding Boundaries: Serving and Learning* (pp. 2-6). Washington, D.C.: The Corporation for National Service.
Garrison, D. R. (2016, September 16). Self-Directed Learning: Toward a Comprehensive Model. *Adult Education Quarterly, 48*(1), 18-33.
Higbee, J. L., & Goff, E. (2008). *Implementing Universal Design in Higher Education.* Minneapolis, MN: University of Minnesota.
Irani, T. A., Wilson, S. B., Slough, D. L., & Rieger, M. (2014). Graduate student experiences on and off-campus: Social connectedness and perceived isolation. *International Journal of E-Learning & Distance Education, 28*(1), 1-16
Lee, & Lee, S. J. (2022). Korean university students' significant learning experiences and associated generic skills: A qualitative essay review. *Frontiers in Education (Lausanne)*, *7*. https://doi.org/10.3389/feduc.2022.886375
Lee, C., Cho, H. J., Melloch, M. R., & Levesque-Bristol, C. (2021). What worked for the engineering students to learn? Students' learning experiences through concept-point-recovery. *European Journal of Engineering Education*.
Levine, L. E., Fallahi, C. R., Nicoll-Senft, J. M., Tessier, J. T., Watson, C. L., & Wood, R. M. (2008). Creating significant learning experiences across disciplines. *College Teaching*, *56*(4), 247-254.
Lincoln, Y.S. and Guba, E.G. (1985) *Naturalistic Inquiry*. Newbury Park, CA: Sage Publications.
Martin, D., & Hokanson, B. (2022). Informal Learning: The Design and Development of an Exhibition. *International Journal of Designs for Learning, 13*(2), 100-108.
Marton F, & Ramsden P. (1988). What does it take to improve learning? In P. Ramsden (Ed.), *Improving Learning New Perspectives,* (pp. 268-286). Nichols Publishing Company.
Navarrete, V., A., Montero, E., & Cantero, D. (2020). Significant learning in catholic religious education: the case of Temuco (Chile). *British Journal of Religious Education*, *42*(1), 90–102. https://doi.org/10.1080/01416200.2019.1628005
NSSE. https://nsse.indiana.edu/nsse/
Partido, B., Chartier, E., & Jewell, J. (2020). Evaluation of an e-book assignment using Fink's Taxonomy of Significant Learning among undergraduate dental hygiene students. *Journal of Dental Education*, *84*(10), 1074–1083. https://doi.org/10.1002/jdd.12247
Prince, M. (2004, July). Does Active Learning Work? A Review of the Research. *Journal of Engineering Education*, 223-231.
Rooks, R. N., & Rael, C. T. (2013). Enhancing curriculum through service learning in the social determinants of health course. *Journal of the Scholarship of Teaching and Learning, 13*(2), 84-100.
Schmidt, H. G., Wagener, S. L., Smeets, G. A., Keemink, L. M., & van der Molen, H. T. (2015). On the Use and Misuse of Lectures in Higher Education. *Health Professions Education*, 12-18.
Stolz, S. A. (2017). Can educationally significant learning be assessed? *Educational Philosophy and Theory*, *49*(4), 379-390.

Sullivan, M., Kelly, A., & McLaughlan, P. (2023). ChatGPT in higher education: Considerations for academic integrity and student learning. *Journal of Applied Learning & Teaching, 6*(1), 1-10. https://doi.org/10.37074/jalt.2023.6.1.17 https://doi.org/10.37074/jalt.2023.6.1.17

Tracy, S. J. (2012). *Qualitative research methods: Collecting evidence, crafting analysis, communicating impact*. Hoboken, NJ: John Wiley & Sons.

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High-Impact Practices (HIPs) Spectrum: Introducing the High-Engagement Experiences (HEEs) Taxonomy

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Abstract: High-Engagement Experiences, or HEEs, are introduced as part of a new classification taxonomy: The High-Impact Practices (HIPs) Spectrum. The introduction of the HIPs Spectrum is relevant because it expands educators' definition of HIPs from binary to a more nuanced continuum, which lays the foundation for future research on HIPs and HEEs that can translate into practical implications for curriculum and student success. We propose a quantitative scale for measuring and classifying courses along the HIPs Spectrum, which ranges from 'Neither HEE nor HIP,' to 'HEE,' to 'HIP' based upon Kuh and colleagues' (2013) widely used Universal Elements of HIPs. This scale is part of a course classification system that is foundational for a comprehensive assessment process to measure the impact of the HIPs Spectrum on student success (i.e., course completion rates, grades, retention). We demonstrate this rating system using a School of Business at a midwestern regional comprehensive university in the United States. The assessment process and initial results are shared and discussed–including the disbursement of the HIPs Spectrum classifications across majors. We discuss the impact on faculty and students, limitations, contributions, and future research. The assessment process delineated can be used as a model for other colleges and universities.

Keywords: high-impact practices, high-engagement experiences, student success, regional comprehensive university, high-impact practices spectrum

Higher education has increasingly become more stratified, with some arguing that it closes equity gaps (Torche, 2011) and others arguing that it perpetuates social and economic inequality (Malcom-Piqueux & Bensimon, 2017). Faculty and staff working in institutions of higher education are actively seeking creative solutions to address issues of access, inclusion, equity, and quality. To close equity gaps, higher education institutions must assure access to all eager learners, regardless of socioeconomic background, and support equal success for all enrolled learners. Public regional comprehensive universities in the United States may be best suited to provide solutions to these challenges, as they fundamentally exist to serve local populations. They are also generally more affordable than private or flagship universities, and their lean budgets and limited endowments necessitate a culture of innovation to survive in today's higher education landscape and to genuinely support the students they serve. The 400 public regional comprehensive universities in the United States show a clear path for first-generation families to improve their

economic standing and are on the frontlines of expanding access to quality education for those who need it most (Sandeen, 2020), given that first-generation students' likelihood of departure in their first year is 71% higher than their counterparts (Ishitani, 2003). Meanwhile, growing class sizes necessitated by budget constraints make it challenging to incorporate engaging pedagogy (Lund Dean & Wright, 2017).

High-impact practice (HIP) courses use hands-on learning and teaching practices supported by research to strongly impact student learning. With lean budgets and limited staffing, regional comprehensive institutions may find it difficult to offer a substantial number of quality HIP courses, much less dedicate the time and resources to developing a plan to assess and improve their current offerings. However, research shows the link between HIPs participation and student success (Swaner & Brownell, 2009; Kilgo et al., 2015), and that benefits may be even greater for historically underserved students (Kuh, 2008; Price, 2021), many of whom enroll at regional comprehensive universities. The assessment process described here at a School of Business in a midwestern public regional comprehensive university strives to alleviate this process development burden on other institutions by delineating a straightforward, quantitative method for assessing high-impact practices along a spectrum. The introduction of a HIPs Spectrum and the high-engagement experience (HEE) taxonomy, as shown in Figure 1, recognizes medium-intensity courses that contain elements of HIPs. Allowing a 'grey area' between HIP and non-HIP courses makes it easier for universities with limited resources to assess courses and provide differing levels of engaging learning experiences for students in light of faculty workload concerns (Montgomery, 2019; Birkhead & Stanton, 2011; Faulconer, 2021; Free et al., 2015; Paul, 2012). Literature sets a precedent for creating classification frameworks around student experiences in high-impact practices (Hu & McCormick, 2012; Lee et al., 2021), and our taxonomy uses faculty and administration feedback about quality elements to classify courses, rather than relying on student self-report data in specific HIPs that are only identified by course title.

High-Impact Practices Spectrum

Traditional Taxonomy: Courses either are or are not HIPs

New Taxonomy: Courses fall along a spectrum of HIP element density, with ranges for categories

Figure 1. Visual representation of traditional HIPs taxonomy compared to new HIPs Spectrum taxonomy

The primary purpose of this project is to assess all undergraduate courses taught in a School of Business and categorize each one as HIP, HEE, or Neither. We discuss the development and implementation of the assessment process, along with the introduction of the HIPs Spectrum. We provide initial results and course examples, and further discuss limitations and future avenues of research to apply the assessment results in support of student success. This paper contributes

to higher education in multiple ways. First, we provide educators with an example process they can model for their own assessment. Second, we introduce a new taxonomy for the classification of courses along a continuum, the HIPs Spectrum with the HEE mid-tier designation. Third, we introduce a scale to measure courses along the HIPs Spectrum. Finally, we identify avenues for future research and practical applications in an expanded field of HIPs, including the HEEs.

HIPs Defined

In the 2008 Association of American Colleges and Universities (AAC&U) report, which helped to motivate the HIPs movement in higher education, Kuh (2008, p. 9-11) defined HIPs as "active learning practices" shown to contribute to student success, particularly for "historically underserved students." Kuh (2008) goes on to identify *first-year seminars and experiences*, *common intellectual experiences*, *learning communities*, *writing-intensive courses*, *collaborative assignments and projects*, *undergraduate research*, *diversity/global learning*, *service learning*, *community-based learning*, *internships*, and *capstone courses and projects* as examples of high-impact practices (HIPs). Over a decade later in a 2021 webinar, the National Association of System Heads (NASH) defined HIPS as "engaged teaching practices that research demonstrates benefit college students from all backgrounds, but especially students of color and first-generation students" (NASH, 2021). As exemplified here, HIPs definitions generally include two fundamental elements, a *practice*, or a learning activity that engages students, and beneficial *impact* on student success resulting from participating in an activity.

Considering these two HIPs dimensions—practice and impact—there are a host of other terms alternatively used to describe an educational practice that contributes to students' success. For example, the Center for Community College Student Engagement published a list of thirteen promising practices which are defined as "educational practices for which there is emerging evidence of success: research from the field and from multiple colleges with multiple semesters of data showing improvement on an array of metrics, such as course completion, retention, and graduation" (2012, p. 3). The promising practices list includes *college orientation*, *accelerated courses or fast-track programs in developmental/remedial education, academic goal setting and planning, tutoring, supplemental instruction, assessment and placement, registration before classes begin, class attendance, and alert and intervention*; in addition to the HIPs practices also identified by the AAC&U including *first-year experience, learning communities, student success course, and experiential learning beyond the classroom* (Waiwaiole et al., 2016, p. 46; Hatch et al., 2016, p. 13). Not surprisingly, as research continues, the list of HIPs and promising practices continues to grow. For example, *mentoring* and *bridge programs* are shown to have an impact, and are now under consideration to be HIPs (Hatch et al., 2016, Cabrera et al., 2013) along with *ePortfolios, travel courses, honors projects, teaching assistantships, on-campus employment,* and *advising* (University of Wisconsin – Green Bay High-Impact Practices Working Group, 2021; Bowman & Culver, 2018; Keup et al., 2021; Watson et al., 2016). Other terms can also be interpreted as high-impact practices, for example, student engagement (Wilson et al., 2019), active learning, interactive courses, experiential learning, and effective teaching (Smith & Baik, 2021).

HIPs Universal Elements

Kuh et al. (2013, p.10) introduced key universal elements of HIPs including: *high levels of performance expectations; a significant time and effort investment over an extended period of time; faculty and peer interactions regarding substantive matters; experiences with diversity; frequent, timely and constructive feedback; periodic and structured opportunities to reflect and integrate learning; real world applications; and public demonstration of competence.* As Zilvinskis (2019) uses most of these elements as a foundation to measure the *quality of the student experience* within three HIPS courses of undergraduate research, internships, and senior capstone using student self-report surveys; we use these elements as a foundation to measure the *quality of the courses for classification purposes* using faculty and administration surveys. Again, these foundational elements are the basis from which we developed this assessment process. In

reviewing these elements, we wondered about courses in which those elements are only partially met. Our extensive literature search yielded only one term in the HIPs literature that addresses practices that meet some criteria of a HIP, but do not quite meet the full elements of a HIP. Although not found in published, peer-reviewed literature, the term "mini-HIPs" was found in limited academic use (Kinzie, 2018; Kim, 2019). Examples given to help define mini-HIPs included short term study abroad and research within a course (Kinzie, 2018). Therefore, we conclude there is a gap in the HIPs literature addressing courses that only partially meet the HIPs elements.

Development of a New Taxonomy: High-Engagement Experiences

We propose filling this gap in the literature by introducing the high-engagement experience (HEE), which is defined as a course that meets some of the criteria of a HIP, but not quite the full standards. To be clear, HEEs are not a substitute for HIPs, but an additional, complementary practice. HEEs expand upon the initial concept of mini-HIPs. We provide definition, clarity, and measurement tools for this new taxonomy. The development of HEEs as a new category comparable to HIPs was in conjunction with an effort to assess each course taught in a School of Business, as discussed in the methods section.

Throughout the development of this new taxonomy, we kept the following motivations in mind:

(1) We want our courses to be impactful and engaging for our students. Based on the literature, we theorize that including at least some of the eight elements of HIPs (Kuh, et al., 2017) in a course should lead them to be more engaging and meaningful for student learning than basic lecture courses, even if they do not qualify as a widely recognized HIP. From this perspective, one can expect that students might still benefit from the accumulation of courses containing HIP components or may at a minimum have an improved impression of their educational experience. Testing this assumption requires a clear delineation for evaluating courses.

(2) HIPs require significant faculty effort and often require small class sizes, raising costs to the college. There are feasible limitations to the number of HIPs courses that any college or department can sustainably implement.

(3) Recognizing HIP elements along a spectrum rather than binary HIP/non-HIP course labeling could be beneficial for faculty workload, considering how difficult it is to balance teaching, research, and service. It could also help to better train and recognize faculty who implement HIP elements into their courses.

(4) Quantifying a HEE category of courses on the spectrum of high-impact practices will allow us to recognize these courses within the School of Business, compare them with student outcomes, and inform future curriculum and course offering decisions, as well as add to the field of research. Are HEEs leading to better course completion rates, grades, or retention rates? Until now, these kinds of courses have not been studied on their own, so we had no way to quantify their impact on student learning and success.

Methods for School of Business Assessment Process

Setting

Taxonomy development and assessment took place at the University of Wisconsin – Green Bay Cofrin School of Business (School of Business), a 4-year, regional comprehensive public university located in the upper Midwest area of the United States. The School of Business enrolls approximately 1,200 students across 6 majors and 8 minors (University of Wisconsin – Green Bay, 2021b). Across the university, 43.6% of undergraduates are first-generation students (University of Wisconsin – Green Bay, 2021a), and in the School of Business, 54% of undergraduate students

during Fall 2021 were first-generation students (University of Wisconsin – Green Bay, 2021b). In Fall 2020, 43% of incoming School of Business students were transfer students, 40% of incoming students came from within 30 miles of campus, and 30% of students were over the age of 25 (University of Wisconsin – Green Bay, 2021b). Our position as a regional comprehensive university solidifies the importance of improving our course impact and engagement to best benefit historically underserved students.

The School of Business is intentionally focused on high-impact practices, as demonstrated by including HIPs as an integral part of its strategic plan and mission statement: "Provide transformative undergraduate and graduate business degree programs that emphasize the use of high-impact practices (HIPs) to prepare learners to ethically and critically address complex issues and deliver innovative and socially responsible solutions" (University of Wisconsin – Green Bay, 2020). College leadership understands that these engaging, hands-on learning opportunities are crucial to staying relevant in the evolving landscape of higher education. The School of Business shows this dedication through the course assessment described below, as well as the creation of numerous extracurricular opportunities and the creation of a staff position to coordinate HIPs.

Developmental research on HIPs by Kuh (2008) suggests that each college student complete two HIPs by the time of graduation, but that one per year would be ideal. Based on this suggestion, the School of Business set a goal that each student who completes their bachelor's degree through the School of Business will take at least four HIP courses by graduation. That number is adjusted to three HIPs courses for transfer students who spend at least two years in the School of Business. To track progress towards this goal, we developed an assessment to categorize each course taught in the School of Business, and then examined how the course types map to the majors and relate to student success outcomes.

College-Wide Assessment Goals

In addition to being an integral part of the School of Business' strategic plan, goals of the HIPs assessment include:

(1) Accurately represent the rigor of School of Business courses in accreditation applications and reviews;
(2) Promote the School of Business to prospective students and external stakeholders;
(3) Identify courses requiring extra support or smaller class sizes (recognizing that teaching intensive, hands-on courses is pedagogically demanding);
(4) Track achievement towards a stated goal for each student with a major in the School of Business to complete at least 4 HIPs courses by graduation (or 3 HIPs courses for transfer students);
(5) Lay the foundation for adapting HIPs to better support historically underserved students;
(6) Create a model that can be adapted and replicated by other colleges at the university and other institutions.

These goals were discussed with the School of Business faculty and staff, and university leadership to gain the support necessary to secure high survey response rates, and for faculty to respect decisions that were informed by assessment results. Too often in higher education assessment, information is collected but never used (Kuh et al., 2015). Developing faculty buy-in was crucial in closing the assessment loop.

HIP and HEE Course Evaluation

In order to assess HIPs and HEEs, we created a quantitative scale, the HIPs Spectrum Course Classification Questionnaire (HSCCQ), guided by the eight universal elements of HIPs designated by Kuh et al. (2013) and affirmed in our state university system documentation on HIPs initiatives (Fischer et al., 2018). We adapted these elements for the HSCCQ based on the more quantifiable

wording of Hansen et al. (2015). Although our assessment was developed before Lee et al. (2021) published operational definitions for each of the universal elements, upon later reflection we found that the explanations included in our survey for each element do complement these definitions. Our taxonomy differs from those by Fischer et al. (2018) and Lee et al. (2021) by having a more objective, tangible rating system based on frequency of HIP universal elements in a course throughout a 15-week semester. This decision was made deliberately to increase consistency in definition interpretation, knowing that various instructors would be self-evaluating their courses. We fine-tuned the definitions and examples included in the survey over a two-year period to further improve consistency in interpretation. The universal elements of HIPs courses are high expectations, student time commitment, faculty and peer interaction, diversity, constructive feedback, and real world applications. Displays of competence and structured reflection are additional universal elements of HIPs, which we absorbed into definitions for the other elements to reduce repetition.

Instructors were given approximately three weeks during the first half of the semester to fill out the 10-15-minute survey for each of their courses, with multiple reminders. For each element of a HIP, courses could earn 3 points for incorporating the element 'every week or nearly every week,' 2 points for 'about half the weeks,' and 0 points for 'minimally/never' or 'not applicable,' with a maximum of 18 points available for each course. An additional 3 points were available to Undergraduate Research Programs, Service-Learning Programs, and First-Year Seminars so long as the course met the listed learning goals. Each element on the survey also had a space for describing the activities or projects in the course that fulfilled a HIP element.

After the deadline, the lead assessor quantified each survey answer according to the point system described above, totaled the score for each course, and labeled it as 'HIP,' 'HEE,' or 'Neither' depending on the number of points. To strengthen the rigor of the process, the ratings were triangulated, first verifying faculty self-reported survey answers with syllabi and then with the Department Chairperson. The written explanations of each element and the frequency score were compared with the course syllabi and adjusted when necessary for consistency. For example, we found that many instructors interpreted Interaction with Diversity differently, so we checked instructor comments against the syllabus and aligned point values to reflect the assessment definition.

Courses meeting or surpassing the quantitative cutoff of 15 points were labeled as a HIP class. As expected, courses such as Capstones, First Year Seminars, Internships, and a handful of others easily met this threshold (Kuh et al., 2017), providing confidence in our approach. Courses that focused on content delivery through readings, lectures, and quizzes generally scored less than 10 points, giving them a category of Neither. The middle ground courses scoring 10 to 14 points, were designated as HEEs. Often these courses featured a medium-sized group project, multiple guest speakers, or opportunities for structured reflection.

Once each course was labeled within a category, the lead assessor verified with department Chairs that they aligned with Chairs' understanding of each course. After making minor adjustments based on Chair feedback, participating instructors were sent the list of courses and category labels, along with instructions to file an appeal. If an instructor disagreed with the category that their course was labeled, they had an opportunity to appeal its classification. Most disputes were reconciled easily. One of the most common disputes was the result of two instructors using different teaching methods for a course and, therefore, landing in different categories. If instructors could not agree on similar teaching methods after talking, all sections of the course were labeled the same as the less-intensive section. Another common dispute was over survey interpretation, such as when instructors misinterpreted the definition of the diversity element. In the first year of the survey, many instructors rated their courses highly for diversity because of class discussions, claiming that students are diverse and, therefore, interact with diversity by default. However, since class discussions are a part of peer-to-peer interactions, we clarified - both in immediate conversations to adjust rating scores and in future iterations of the survey - that class

discussions about non-diversity topics were not sufficient to count towards intentional exploration of diversity.

After instructors finished the appeals process, a final list of course categories was compiled for the semester. The assessment was repeated for four semesters. In future semesters, courses will only need to be assessed if they are new or have had major curriculum changes. The first author is also working with a university task force to develop a similar type of assessment across the university's other colleges.

Results

Currently, all 87 undergraduate courses taught in the School of Business have been assessed. Of those courses, 26 (30%) met the qualifications of a HIP, 36 (41%) met the qualifications of a HEE, and 25 (29%) were categorized as Neither HIP nor HEE. Table 1 shows the number of required and optional HIPs and HEEs within undergraduate majors in the School of Business. Each undergraduate major requires students to complete a set of classes covering different discipline areas of business, so many of the HIP and HEE courses reflected here overlap between the degree programs.

Comparatively, the disbursement of HIP and HEE courses across the disciplines had more variation. Table 2 shows how many HIP, HEE, and Neither courses are offered by the college, organized by course prefix.

Table 1. Number of HIP and HEE Courses by Undergraduate Degree Program.

Department	Undergraduate Major	Number of Required HIPs Courses	Number of Elective HIPs Courses	Number of Required HEE Courses	Number of Elective HEE Courses
Business Administration	BBA General Emphasis	3	18	2	25
	BBA Supply Chain Management Emphasis	4	2	9	4
	BBA Entrepreneurship Emphasis	5	12	8	10
	BBA Business Analytics Emphasis	5	3	7	1
Accounting & Finance	BBA Accounting	4	1	5	4
	BBA Finance	3	2	8	3
	BS Economics	1	0	1	7
Marketing & Management	BBA Management	6	2	8	1
	BBA Marketing	6	2	8	1
	BBA Human Resource Management	5	0	10	0

The courses listed are 3 or 4 credits each. This table does not include First Year Seminar, which is a required HIP General Education course for all majors, or Internship, which is an elective HIP course in all majors.

Table 2. Number of Courses in each Category by Prefix.

Prefix:	**HIP**	**HEE**	**Neither**	**TOTAL**
ACCTG	2	3	9	14
BUS ADM	5	5	3	13
ECON	0	4	4	8
ENTRP	2	2	0	4
FIN	2	6	4	12
HRM	2	4	3	9
MGMT	6	4	0	10
MKTG	6	3	1	10
SCM	0	5	1	6
TOTAL	25	36	25	86

Prefixes represent (in order): Accounting, Business Administration, Economics, Entrepreneurship, Finance, Human Resource Management, Management, Marketing, Supply Chain Management. This table does not include the HIP Internship course, which is offered in every prefix.

Example Courses

To demonstrate the types of courses that fall into the categories, the following are examples of a HIP and a HEE course.

HIP Course Example: Teams

Teams is an upper-level (junior/senior) course in the Management curriculum and is an example of a full HIP course. Students participate in a semester-long Problem-Solving Team Project that focuses on solving a problem within their community or a local business organization. Students are challenged to apply their cumulative knowledge to the real world. They are also learning about group composition, goals, processes, team behaviors, team leadership, team performance, and technological tools, while working on a team. The project has several milestones and students receive frequent feedback from the instructor. The student teams are challenged with rigorous assignments for team learning (e.g., team building, team contracts, brainstorming via technology, etc.). Throughout the course, they are asked to reflect upon their experiences in essays, which foster deeper learning. Weekly discussions ask the students to apply class concepts to real-world experiences. Table 3 shows this course's assessment scores.

HEE Course Example: Governmental and Nonprofit Accounting

Governmental and Nonprofit Accounting is an upper-level (junior/senior) course in the Accounting curriculum and is an example of a HEE course. The course focuses on learning how to read and interpret Annual Comprehensive Financial Reports (ACFRs) and to account for the individual transactions that, when combined, form the governmental entities' financial statements. ACFRs are equivalent to public sector financial statements but are significantly different.

Groups of two to four students choose a city in the United States to analyze the municipality's ACFR. Students often choose cities that they would like to reside in after graduation, adding a personal aspect to the project. These groups complete four separate assignments analyzing different components of the financial statements, cumulating in a final presentation of their findings. The instructor gives feedback after each assignment, and changes are required before the final presentation.

Student feedback on these assignments is fairly consistent: difficult but rewarding and satisfying to be learning interpretation techniques that can be applied in real-world settings. Often, students report they will review a municipality's ACFR to help them make a financially sound choice during relocation after graduation. Feedback provided by students demonstrates the importance of studying HEEs as courses that have impact, but do not quite meet the more stringent standards of a HIPs course. The students' use of their knowledge from this class project on municipal ACFRs in choosing a place to live after graduation is impactful and would be missed in the traditional binary classification of HIPs. The new taxonomy of the HIPs Spectrum allows us to classify and measure outcomes of these mid-level classes as a HEE. Table 3 shows this course's assessment scores.

Table 3. Assessment Scores of Example HIP and HEE Courses.

HIPs/HEEs Assessment Criteria	Teams	Governmental and Nonprofit Accounting
Time on Task	3	3
Faculty & Peer Interaction	3	3
Interaction with Diversity	0	0
Frequent, Timely, and Constructive Feedback	3	2
Connections Between Learning Context and Real-World Settings	3	3
Occur in Context of Coherent, Academically Challenging Curriculum	3	2
Total Score	**15** (Scores of 15-18 qualify as HIP)	**13** (Scores of 10-14 qualify as HEE)

Scoring guide: 3=Every week or nearly every week; 2=About half the weeks; 0=Minimally or Never

Discussion

There are many ways this assessment process and new taxonomy can contribute to a greater understanding through the educational system.

First, completing this assessment process has allowed our School of Business to confirm that as of Spring 2022 we have met our goal of each graduate completing at least 4 HIPs courses during their course of study in all but one of our majors and emphasis areas. Each of the School of Business majors include a First Year Seminar (FYS) and Capstone course as two of the required HIPs courses; and this assessment process has led to the systematic identification of the remaining qualifying HIPs courses. Some majors proved to be heavier in their offering of required HIPs courses, such as Marketing and Management which require seven HIPs courses each when

including FYS; while other majors simply met the goal of requiring four HIPs courses, such as general Business Administration and Finance. This could be explained by the differences in discipline areas, as researchers have found that soft, people-focused disciplines tend to have deeper approaches to learning, whereas hard or applied disciplines more often use surface level or lecture teaching methods (Nelson Laird, et al., 2008). The number of required HEEs in each major was split into two ranges: those with two or fewer required HEEs (Business Administration General, Accounting, and Economics) and those with five to ten required HEEs (Supply Chain Management, Entrepreneurship, Business Analytics, Accounting, Finance, Management, Marketing, and Human Resource Management). In the future, we can use this understanding of how HIPs and HEEs are distributed across majors as a factor to consider in curriculum planning.

Second, the taxonomy could be integrated into the course registration system, allowing students to consider the HIPs Spectrum of course intensity (HIP, HEE, Neither) when assembling their academic plan and schedule, giving students the chance to make more informed decisions when selecting classes. Adding a field in the course registration system that identifies a course as a HIP or HEE would allow students and advisors to manage course loads more effectively, particularly for elective course options. It would expand the understanding of course rigor beyond our current credit load system. Anecdotal student feedback collected from student organization leaders and student workers about this additional classification information was overwhelmingly positive in our School of Business and is now a goal at our university more broadly.

Third, many studies on HIPs choose courses to study based on Kuh's (2017) list of commonly accepted HIPs (e.g., First Year Seminars, Writing Intensive Courses, Internships, Capstone Courses, Undergraduate Research, and Study Abroad) (Price, 2021; Finley & McNair, 2013; Kilgo et al., 2015; Johnson & Stage, 2018). We are adding to the field of research by assessing courses based on elements and activities, not merely course titles. Using faculty and administration feedback sets us apart and allows us to ensure that the types of courses commonly accepted as HIPs by their title alone are truly being taught as a HIP. This method also discovers other courses that have a comparable level of impact but a more unique course title or structure, such as the Teams course described earlier in this manuscript, which would have been overlooked as a HIPs course using more traditional classification methods.

Future Research

HIPs research has been heavily documented over the past two decades since HIPs were defined (Kuh et al. 2008), but it is still a new field with much to explore. "Despite ten years of promising developments, there is much more to learn and do given that these are still early days in scaling and ensuring the quality of HIPs" (Kuh et al., 2017, p. 15). The same type of research conducted on HIPs could be employed to understand the need for HEE courses as well. Further research on the application and classification of HEEs with HIPs in all types of higher education settings should be explored.

Future research can extend the HIPs Spectrum with HEEs into other regional comprehensive universities to replicate and verify the work being completed at the School of Business. Today, there are more than 4 million students in over 400 institutions of higher education in the United States attending regional comprehensive universities (Sandeen, 2020; Orphan & Broom, 2021). This vast population will allow for the rich conversation needed to broaden the depth of knowledge regarding the HIPs Spectrum. Extending this new taxonomy to other types of higher education institutions, such as community colleges, public research universities, private universities, and international universities will give further insight into the impact of the classification of courses as well.

Impact on Faculty

Academia recognizes that it is more rigorous to design and implement a HIP or HEE element due to the additional workload it places on a faculty member (Montgomery, 2019; Birkhead & Stanton, 2011; Faulconer, 2021; Free et al., 2015; Paul, 2012, White, 2018). However, no research has been found that indicates an optimum number of HIPs courses for a faculty member to teach. The School of Business resides in a regional comprehensive university and faculty teach three to four courses per 15-week term with a goal of limiting course preps to two per term. Faculty position responsibilities are split between instruction, research, and service. It is acknowledged that a faculty member cannot teach all HIP or HEE courses and successfully fulfill the required amount of research and service expected of a scholarly academic tenure-track or tenured faculty position. Future research is needed to determine the ideal number of HIP and HEE courses that a faculty member should teach to maximize job requirements and fulfill student needs.

Impact on Students

Current HIPs research focuses on the impact on students (Johnson & Stage, 2018; Kilgo et al., 2015; Kuh et al., 2008). With the introduction of HEEs to the academic community, we propose that future areas of research should include the optimal number or combination of HIPs and HEEs, differential effects of HIPs/HEEs on underrepresented minority students (URM) and non-underrepresented minority students (non-URM), measurement of students' self-esteem and confidence growth over time correlated to number of HIPs/HEEs taken, and the impact of HIPs/HEEs on neuro-diverse student populations.

As with faculty, students can also experience workload burnout, and care must be taken to not overload students with too many HIPs and/or HEEs (Faulconer, 2021). Understanding the optimal number of HIP or HEE courses for a student to experience during a semester or through their collegiate career would be important for higher education institutions to consider when planning discipline curriculum and degree requirements.

Much research has studied underrepresented minority students' (URM) and non-underrepresented minority students' (non-URM) involvement in HIPs, but results have been contradictory (Sweat et al., 2013; Paulson, 2012; Zilvinskis, 2019). "HIPs participation is inequitable, with first-generation, transfer students, and African- American and Latino students least likely to have such experiences" (Kuh, et al., 2017, p. 9). Research focusing on both HIPs and HEEs may perhaps produce more consistent results, allowing for greater understanding of the impact of these courses on URM students and expanding the developing conversation on the effect of HIPs on them (Williams et al., 2022). Using the assessment toolkit produced by the AAC&U (Finley & McNair, 2013), paired with the current study's HSCCQ will allow for consistent methodology.

In the realm of regional comprehensive universities, transfer students can make up a good portion of the student population. More research is needed to understand how many HIP and HEE courses transfer students complete by graduation. Further discussion and assessment development are needed to assure transfer students receive the same opportunities.

Lastly, we suggest researching the impact of HIPs and HEEs on neurodiverse student populations. Both faculty and students would benefit from knowing the types of modification(s) (if any) to HIP and HEE courses needed to support the education of neurodivergent students. Continuing with the suggestion above concerning the optimum number of HIP and HEE courses for all students, does this need to be modified in any way for neurodivergent students?

Limitations

The current assessment faced limitations. HIPs categorization was based primarily on self-report data from instructors. We implemented triangulation, including comparing the faculty self-reported answers with syllabi and discussing categorizations with department Chairs. However, it was evident especially during the first semester that some instructors had different interpretations of certain survey items than the researchers, leading to the need to manually adjust scores for consistency and a clarification of definitions during the survey repetition.

Instructors were asked to assess their courses as they are currently being taught within that semester. As the School of Business has gone through deliberate curriculum updates since its formation in 2016, this limits the generalizability of data across time. For example, a course that was assessed in Fall 2020 as a HIP may not have been taught as a HIP in Fall 2018. The authors will take steps to control for curriculum changes in future longitudinal data analysis.

Teaching methods may also vary from instructor to instructor. To limit bias towards high achieving instructors who teach with more HIPs elements, we reduced each course to the lowest common denominator. For example, consider a class in which three sections are taught concurrently by three different instructors. Two instructors' scores categorized the course as a HEE, but one instructor's teaching methods categorized it as a HIP. For our assessment, the course would be labeled as a HEE. Complicated categorizations such as this may need to be revisited each semester until a solid pattern appears.

Finally, assessment of courses during the 2020-21 academic year was challenging due to the COVID-19 pandemic. Many courses changed formats (from in-person to hybrid or online) which influenced the types of activities instructors could do with their classes. Student learning outcomes such as GPA and retention rates may have also been affected by the global health emergency. HIPs assessment and analysis will need to continue to fully understand how the pandemic affected the School of Business.

Conclusion

In conclusion, we introduce a new classification, the HEE, which falls in the middle of the continuum of the proposed HIPs Spectrum. Additionally, we develop and share our assessment process for others to model or adapt for their own use. This process includes the introduction of the HIPs Spectrum Course Classification Questionnaire (HSCCQ), a scale for course classification based upon Kuh et al. (2013) and the introduction of the HIPs Spectrum (HIPs, HEEs, Neither). Our initial findings of course classifications confirm that we meet our goal of four HIPs classes per major in all but one undergraduate program. Again, this process can be adapted by other institutions for their own HIPs Spectrum assessment. This lays the foundation for future research to explore student outcomes in relation to the HIPs Spectrum.

References

Birkhead, W. S., & Stanton, G. E. (2011). Columbus State University's approach to undergraduate research in biology. *Council on Undergraduate Research Quarterly*, *32*(1), 20-22.

Bowman, N.A., & Culver, K. (2018). When do honors programs make the grade? Conditional effects on college satisfaction, achievement, retention, and graduation. *Research in Higher Education, 59*(3), 249–272. https://doi.org/10.1007/s11162-017-9466-y

Cabrera, N.L., Miner, D.D. & Milem, J.F. (2013). Can a summer bridge program impact first-year persistence and performance? A case study of the new start summer program. *Research in Higher Education, 54*(5), 481–498. https://doi.org/10.1007/s11162-013-9286-7

Center for Community College Student Engagement. (2012). A *matter of degrees: Promising practices for community college student success (A first look)*. Austin, TX: The University of Texas at

Austin, Community College Leadership Program. https://www.ccsse.org/docs/Matter_of_Degrees.pdf
Faulconer, E. (2021). eService-learning: A decade of research in undergraduate online service–learning. *American Journal of Distance Education*, *35*(2), 100-117. https://doi.org/10.1080/08923647.2020.1849941
Finley, A., & McNair, T. (2013). *Assessing underserved students' engagement in high-impact practices.* Washington, DC: Association of American Colleges and Universities.
Fischer, A. E., Immel, K. R., Wilkum, K., & Lee, L. R. (2021). A taxonomy for developing undergraduate research experiences as high-impact practices. *Journal of the Scholarship of Teaching and Learning*, *21*(1), 84-106. https://doi.org/10.14434/josotl.v21i1.30564
Free, R., Griffith, S., & Spellman, B. (2015). Faculty workload issues connected to undergraduate research. *New Directions for Higher Education*, *2015*(169), 51-60. https://doi.org/10.1002/he.20122
Hansen, M. J., Baker, S. S., & Johnson, K. E. (2014, October 19). *Implementing and assessing high impact practices* [Conference presentation]. 2014 Assessment Institute, Indianapolis, IN, United States. https://irds.iupui.edu/_documents/reports-presentations/conference-presentations/assessment-institute/2014%20-%20Implementing%20and%20Assessing%20High%20Impact%20Practices.pdf
Hatch, D. K., Crisp, G., & Wesley, K. (2016). What's in a name? The challenge and utility of defining promising and high-impact practices. *New Directions for Community Colleges*, *2016*(175), 9-17. https://doi.org/10.1002/cc.20208
Hu, S., & McCormick, A. C. (2012). An engagement-based student typology and its relationship to college outcomes. *Research in Higher Education*, *53*(7), 738-754. https://doi.org/10.1007/s11162-012-9254-7
Ishitani, T. T. (2003). A longitudinal approach to assessing attrition behavior among first-generation students: Time-varying effects of pre-college characteristics. *Research in Higher Education*, *44*(4), 433-449. https://doi.org/10.1023/A:1024284932709
Johnson, S. R., & Stage, F. K. (2018). Academic engagement and student success: Do high-impact practices mean higher graduation rates? *The Journal of Higher Education*, *89*(5), 753-781. https://doi.org/10.1080/00221546.2018.1441107
Keup, J., Young, D. G., & Fountain, C. (2021). *Advising as the next promising practice.* [Conference presentation]. 40th Annual Conference on the First-Year Experience, Virtual.
Kilgo, C., Ezell Sheets, J., & Pascarella, E. (2015). The link between high-impact practices and student learning: Some longitudinal evidence. *Higher Education*, *69*(4), 509-525. https://doi.org/10.1007/s10734-014-9788-z
Kim, K. (2019). *Mini HIP interventions in upper-level psychology courses* [Conference presentation]. University of Wisconsin System Office of Professional & Instructional Development Spring Conference on Teaching & Learning, Madison, WI.
Kinzie, J. (2018). *High-impact practices to promote student learning and success: Considerations for effectiveness, quality, and equity*. https://uca.edu/ncad/files/2018/07/NCAD-HIPs-to-Promote-Learning-Consideration-for-Effectiveness-Quality-Equity-2018.pdf
Kuh, G. D. (2008). *High-impact educational practices: What they are, who has access to them, and why they matter*. Association of American Colleges and Universities.
Kuh, G. D., Cruce, T. M., Shoup, R., Kinzie, J., & Gonyea, R. M. (2008). Unmasking the effects of student engagement on first-year college grades and persistence. *The Journal of Higher Education*, *79*(5), 540-563. https://doi.org/10.1353/jhe.0.0019
Kuh, G. D., Ikenberry, S. O., Jankowski, N. A., Cain, T. R., Ewell, P. T., Hutchings, P., & Kinzie, J. (2015). *Using evidence of student learning to improve higher education*. Jossey-Bass.
Kuh, G. D., O'Donnell, K., & Reed, S. (2013). *Ensuring quality and taking high-impact practices to scale*. Washington, D. C.: Association of American Colleges and Universities.
Kuh, G., O'Donnell, K., & Schneider, C. G. (2017). HIPs at Ten. *Change*, *49*(5), 8-16.

https://doi.org/10.1080/00091383.2017.1366805
Lee, L., Wilkum, K., Immel, K. R., & Fischer, A. E. (2021). A taxonomy for designing and evaluating high-impact practice experiences. *College Teaching, 69*(4), 191-201. https://doi.org/10.1080/87567555.2020.1846487
Lund Dean, K., & Wright, S. (2017). Embedding engaged learning in high enrollment lecture-based classes. *Higher Education*, *74*(4), 651-668. https://doi.org/10.1007/s10734-016-0070-4
Malcom-Piqueux, L., & Bensimon, E. M. (2017). Taking equity-minded action to close equity gaps. *Peer Review*, *19*(2), 5-8. https://www.aacu.org/peerreview/2017/Spring/Malcom-Piqueux
Montgomery, S. E. (2019). Creating a HIP in the library: A high-impact practice case study. *College & Undergraduate Libraries*, *26*(2), 162-175. https://doi.org/10.1080/10691316.2019.1637319
NASH. (2021). *High impact practices: An educator's guide*. National Association of Systems Heads. http://hips.nashonline.org/
Nelson Laird, T. F., Shoup, R., Kuh, G. D., & Schwarz, M. J. (2008). The effects of discipline on deep approaches to student learning and college outcomes. *Research in Higher Education*, *49*(6), 469-494. https://doi.org/10.1007/s11162-008-9088-5
Orphan, C. M., & Broom, S. (2021). Life at the "people's universities": Organizational identification and commitment among regional comprehensive university faculty members in the USA. *Higher Education*, *82*(1), 181-201. https://doi.org/10.1007/s10734-020-00629-9
Paul, E. L. (2012). New directions for faculty workload models: Focusing on high impact learning practices. In E. L. Paul & N. H. Hensel (Eds.), *Faculty support and undergraduate research: Innovations in faculty role definition, workload, and reward* (pp. 133-145). Council of Undergraduate Research.
Paulson, K. (2012). Faculty perceptions of general education and the use of high-impact practices. *Peer Review*, *14*(3), 25-28.
Price, D. (2021, May 10). *Evidence from evaluation studies: NASH TS3 HIPs initiative.* [Webinar]. National Association of Higher Education Systems. https://nash.edu/
Sandeen, C. (2020). *Public regional comprehensives' time to shine.* https://universitybusiness.com/public-regional-comprehensives-time-to-shine/
Smith, C. D., & Baik, C. (2021). High-impact teaching practices in higher education: A best evidence review. *Studies in Higher Education*, *46*(8), 1696-1713. https://doi.org/10.1080/03075079.2019.1698539
Sweat, J., Jones, G., Han, S., & Wolfgram, S. (2013). How does high impact practice predict student engagement? A comparison of white and minority students. *International Journal for the Scholarship of Teaching and Learning*, *7*(2), 1-24. https://doi.org/10.20429/ijsotl.2013.070217
Swaner, L. E., & Brownell, J. E. (2009). Outcomes of high impact practices for underserved students: A review of the literature. Prepared for the Association of American Colleges and Universities (AAC&U) Project USA. http://www.aacu.org/inclusive_excellence/documents/DRAFTProjectUSALiteratureReview.pdf
Torche, F. (2011). Is a college degree still the great equalizer? Intergenerational mobility across levels of schooling in the United States. *American Journal of Sociology*, *117*(3), 763-807. https://doi.org/10.1086/661904
University of Wisconsin – Green Bay. (2020). Cofrin School of Business mission, vision, and values. Retrieved October 21, 2021. https://www.uwgb.edu/csb/about/mission
University of Wisconsin – Green Bay. (2021a). Fact book. Retrieved October 21, 2021. https://www.uwgb.edu/CMSAssets/ISE/factbook.asp

University of Wisconsin – Green Bay. (2021b). University of Wisconsin – Green Bay Cofrin School of Business student profile. Unpublished internal university document.

University of Wisconsin – Green Bay High-Impact Practices Working Group, (2021). Unpublished internal University document.

Waiwaiole, E. N., Bohlig, E. M., & Massey, K. J. (2016). Student success: Identifying high-impact practices. *New Directions for Community Colleges*, *2016*(175), 45-55. https://doi.org/10.1002/cc.20211

Watson, C. E., Kuh, G. D., Rhodes, T., Light, T. P., & Chen, H. L. (2016). ePortfolios–The eleventh high impact practice. *International Journal of ePortfolio*, *6*(2), 65-69.

White, A. (2018). Understanding the university and faculty investment in implementing high-impact educational practices. *Journal of the Scholarship of Teaching and Learning*, *18*(2), 118–135. https://doi.org/10.14434/josotl.v18i2.23143

Williams, K. L., Mobley, S. D., Campbell, E., & Jowers, R. (2022). Meeting at the margins: Culturally affirming practices at HBCUs for underserved populations. *Higher Education, 84*(5), 1067-1087. https://doi.org/10.1007/s10734-022-00816-w

Wilson, C., Broughan, C., & Marselle, M. (2019). A new framework for the design and evaluation of a learning institution's student engagement activities. *Studies in Higher Education*, *44*(11), 1931-1944. https://doi.org/10.1080/03075079.2018.1469123

Zilvinskis, J. (2019). Measuring quality in high-impact practices. *Higher Education*, *78*(4), 687-709. https://doi.org/10.1007/s10734-019-00365-9

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The Effect of Case-Based Instruction on Teacher Candidates' Culturally Responsive Knowledge: A Mixed-Methods Study

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Abstract: The rapid growth of culturally and linguistically diverse populations in K-12 schools has increased the need for preparing culturally responsive teachers. Yet, many pre-service teachers feel unprepared to work with diverse students. With the urgent need to connect educational theory to classroom practice, teacher preparation programs have turned to case-based instruction and worked examples to relay important content. In an explanatory sequential mixed-methods study, 95 pre-service teachers came into a lab to engage in a 4-week instructional sequence that examined two factors, namely, 1) case-based instruction (classroom cases vs. textbook) and 2) worked examples (expert worked examples vs. student exploration), on pre-service teachers' understanding of culturally responsive pedagogy. Results of a multilevel growth model show that pre-service teachers who learned from the case-based instruction performed higher than those in the textbook condition. Participants' rate of change was dependent upon viewing classroom cases but not an expert-worked example. Qualitative findings indicate that preparing culturally responsive teachers through case-based instruction could offer a more in-depth, rich, realistic, and inclusive experience associated with understanding multiple perspectives.

Keywords: culturally responsive practices, case-based instruction, teacher education

A goal of the U.S. Department of Education and state education agencies has been to reduce the achievement gap for students from culturally and linguistically diverse (CLD) backgrounds (McFarland et al., 2017). These efforts include initiatives, funding opportunities, and other incentives for states, school districts, and teachers to increase academic scores, lower dropout rates, and open access to higher education. Although the U.S. Department of Education has made sustained efforts, the disparity in academic achievement continues (McFarland et al., 2017). These differences in achievement and the rapid growth of CLD populations in K-12 schools have heightened the need for preparing culturally responsive teachers (Gay, 2018). Yet, many pre-service teachers feel unprepared to work with CLD students (Nieto, 2010l; King & Butler, 2015). With this urgency, teacher preparation programs have turned to case-based instruction (CBI) and expert examples as authentic, practicum-like experiences of the school environment.

Contrary to textbook instruction, CBI engages pre-service teachers by having them (a) review classroom cases and (b) generate analyses of instructional efficacy and alternative solutions, allowing for practice-oriented learning. Despite the intuitive notion that CBI supports a pragmatic foundation, little empirical evidence exists concerning this approach's effectiveness in relation to culturally

responsive pedagogy. Therefore, in this study, we use an explanatory sequential mixed methods design to evaluate the instructional effectiveness of CBI to increase elementary and secondary pre-service teachers' knowledge of working with CLD students. Additionally, as research on the mechanisms of CBI-supported learning is limited, we also examine the effectiveness of integrating an expert worked example, an elaborated analysis of problems presented in the case and/or textbook material by an expert, to see if this strategy would further enhance CBI effectiveness in comparison to other conditions.

Culturally Responsive Pedagogy in Teacher Education

When teachers engage in culturally responsive pedagogy (CRP), they draw on CLD students' experiences, cultural knowledge, frames of reference, and other essential components to make learning experiences as relevant and effective as possible (Gay, 2018). CRP provides a framework based on scholarship (e.g., Gay, 2018; Ladson-Billings, 2001) holding that "teachers knowing who they are as people, understanding the context in which they teach, and questioning their knowledge and assumptions are as important as the mastery of techniques for instructional effectiveness" (Gay & Kirkland, 2003, p. 181). CRP is an educational initiative in which acceptance, respect, and celebration of diverse cultural, ethnic, racial, and linguistic groups are vital to the development of society and an essential part of the human condition (Gay, 2018). Because CRP is a practice that encompasses all aspects of students' learning and teachers are the instructional facilitators, the foundational knowledge, and skills that teachers must possess are the same across ages, grade levels, subject areas, and student populations (Gay, 2018; Santamaria, 2009).

Studies show that culturally responsive teaching promotes k-12 student academic achievement and engagement, feelings of belonging, and a positive orientation toward others outside one's racial/cultural group (e.g., Byrd, 2016; Christianakis, 2011; Ensign, 2003). A synthesis by Aronson and Laughter (2016) shows that CRP increases student engagement and motivation across all content areas, as evidenced by achievement scores in mathematics, science, English/language arts, and history/social studies. Although evidence-based research connecting CRP and positive student outcomes has shown promise, the best way to support preservice teachers in developing this knowledge has yet to be thoroughly investigated.

Potential Mechanisms for Enhancing CRP in Teacher Education

Case-Based Instruction

In their review of CBI, Koehler et al. (2018) underscored several of its benefits. These benefits include: (a) engagement with experiences comparable to those pre-service teachers will have in their classrooms/schools; (b) interactions with complex problems in nonthreatening environments supportive of reflective learning; (c) opportunities for collaborative learning through exposure to diverse perspectives; and (d) opportunities to develop relevant problem-solving skills and self-directed learning behaviors, skills that are in high demand in the profession as full-time teachers. In other words, CBI helps future teachers learn how to interpret student behaviors "in rich, accurate, and complex ways" through analysis of the data of practice (Cochran-Smith et al., 2015, p. 117).

Empirically solid evidence across disciplines has demonstrated CBI's potential for enhancing pre-service teachers' critical thinking and pedagogical skills (e.g., Goeze et al., 2014; Gravett et al., 2017; Koehler et al., 2018) as well as improving student achievement and social well-being (Kane et al., 2011). Although emergent (e.g., Andrews, 2002; Cochran-Smith et al., 2015), CBI research on diversity and multicultural awareness remains limited, a significant gap that our study aimed to fill.

Additionally, research on the mechanisms of CBI that support pre-service teachers' learning is limited. Thus, expanding upon cross-disciplinary research (e.g., Crippen & Earl, 2004), we not only contrast CBI with a textbook condition, but we also examine the effectiveness of integrating expert worked examples of the cases and/or textbook material to see if these strategies would further enhance CBI effectiveness.

Expert Worked Examples

Expert worked examples, often employed in well-structured domains such as mathematics, are statements that provide the learner with an expert's solution to the problem for learners to study. These statements often include a problem statement, solution steps, and a final solution (Wittwer & Renkl, 2010). Empirical evidence suggests that learning from well-designed expert worked examples can benefit learners who need more prior knowledge in that area (Kalyuga et al., 2001; Schwaighofer et al., 2016; van Loon-Hillen et al., 2012), such as pre

Research on worked examples has demonstrated several benefits for learning. Notably, research suggests that integrating worked examples increases understanding of problem-solving procedures (Atkinson et al., 2000; Renkl, 2014) and supports novice learners in knowledge acquisition (Bokosmaty et al., 2015; Chen et al., 2015). These benefits manifest themselves when learners can focus their attention on how experts viewed and solved the problem, facilitating the construction of a schema for solving similar issues or cases in the future (Paas & Van Gog, 2006; Schworm & Renkl, 2006; van Loon-Hillen et al., 2012).

Rationale for Selecting CBI and Expert Worked Examples

In reviewing teacher preparation literature, Cochran-Smith et al. (2015) identified two approaches to changing teacher attitudes and practices related to enacting CRP. To change CRP attitudes, Cohran-Smith and colleagues suggest providing pre-service teachers with opportunities to explore their sociocultural identities and learn about diversity through direct interactions with people of diverse backgrounds. CBI and worked examples have the potential to combine the benefits of the approaches identified by Cochran-Smith et al. (2015) as effective in enhancing CRP attitudes and practices. Inviting pre-service teachers' analysis and reflection upon cases of practice, including identifying issues and biases, and designing practical solutions, exposes them to their own thinking and pre-conceptions. This work, in turn, provides an opportunity to consider ideas related to multicultural curricula and including through expert responses to various situations, much like in a real-life practicum.

Theory-practice connections may be particularly beneficial for pre-service educators, helping them interpret a range of CLD students' learning strengths and needs that are different from their own. Indeed, as negative stereotyping of CLD students persists, often due to a lack of exposure to diversity among prospective teachers (e.g., Sleeter, 2017; Youngs & Youngs, 2001), CBI and worked examples may provide the much-needed exposure, albeit 'virtual,' along with creating positive first experiences of successfully identifying and solving diversity-related cases of practice through connecting cross-cultural perspectives. Analysis of cases from practice allows teacher candidates to interact with complex problems while studying in non-threatening environments supportive of more reflective learning (Koehler et al., 2018). That said, although emergent evidence supports the benefits of CBI in enhancing teachers' facilities with CRP (e.g., Cochran-Smith et al., 2015), the generalizability of findings with worked examples as mechanisms for enhancing CRP needs to be empirically investigated, a gap in our study aims to address.

Present Study

Guided by the following research questions, we employed an explanatory sequential mixed-methods design (Creswell & Plano Clark, 2018; Teddlie & Tashakkori, 2009), seeking to evaluate the effectiveness (quantitative) and perception (qualitative) of using CBI to teach pre-service teachers about CRP. First, we asked: Compared to traditional approaches of teaching CRP (i.e., textbook), does reading classroom cases, with or without an expert worked example, influence pre-service teachers' ability to evaluate classroom cases across time? To provide evidence for this question, we conducted a study with 95 pre-service teachers who were assigned to one of four conditions created by crossing two factors: mode of instruction (i.e., CBI or textbook) and an expert worked example (i.e., present or not) and assessed by their written reactions to a classroom case. Grounded in theory and empirical work (Cochran-Smith et al., 2015), we anticipated that pre-service teachers who viewed classroom cases would increase their knowledge over time to a greater extent than those who learned the same content from a textbook. In relation to expert worked examples, and again, grounding our findings in theory (e.g., Kolb et al., 2000), we hypothesize that worked examples may further the effects of CBI in enhancing CRP.

Second, using focus groups, we asked three qualitative research questions: What are participants' perceptions of culturally responsive practices? What are the participants' perceptions of the study's content? Lastly, what are participants' perceived challenges and benefits of the two instructional factors (cases vs. text; expert worked example vs. student exploration)? To explore these perceptions, we selected twelve of the 95 participants to participate in focus groups. Following the integration of Teddlie and Tashakkori's (2009) methods, we developed a meta-inference from quantitative and qualitative findings to provide a more holistic, in-depth understanding of the phenomena under investigation.

Materials and Methods

Quantitative Strand

Participants

Pre-service teachers (*N* = 95) were recruited through emails and education courses at a Northwestern University. Participants were paid $15 for each week they attended their research session. Most participants were female (91.5%) and white (70.5%), with English as their first language (93.7%). Of the 95 participants, 8.4% self-identified as Asian; the remaining indicated a different race (e.g., Black, Native American, Latinx, and Hawaiian). Participants came from elementary (80.0%) and secondary (20.2%) general education teacher programs. Our sample was representative of the more extensive pre-service education programs at our largest campus, typically consisting of 80% white, approximately 15% Latinx, and around 5% Native American, Asian, Black, and Native Hawaiian, collectively. In addition, the majority of education students, in general, are female (80% in elementary education and 65% in secondary education).

Participants' exposure to and experience with CLD populations was minimal. At the programmatic level, all elementary and secondary programs require at least one course in these three areas: diversity, special education, and English learners. Although the program highlights culturally responsive pedagogy in program learning objectives, observation of information on CRP was rare outside of these three courses. At the individual level, many participants (71.6%) stated that their only experience was a once-a-week practicum. Although 22.1% of participants did have more exposure to classrooms through their work and student teaching, the remaining 6% either had no classroom

experience (2.1%) or only volunteer experience (4.2%). Informal exposure to CLD populations was also minor, with 47.4% of the participants stating that they had traveled abroad and only 12.6% saying that they came from a culturally and linguistically diverse high school.

Procedure

In week one, participants completed a demographic questionnaire and a CRP knowledge pre-test. During this week, all participants received instruction on how to evaluate information presented in cases and written text. In weeks 2-4, the focus of this study, participants received weekly one-hour condition-specific instructional sessions in a lab. Participants in the CBI-with-an-expert-worked-example (CE) and those in the textbook-with-an-expert-worked-example (TE) conditions read a classroom case or textbook excerpt and then read an expert-worked analysis of the information. Next, participants reviewed a new classroom case. Participants in the CBI or textbook with student exploration conditions (CSE and TSE) followed the same procedures; however, after reading the first case or text, they were asked questions about the case without reading an expert worked example before reading and evaluating the second novel case.

Text vs. Case

Each weekly textbook excerpt and classroom case were on the same CLD topic. In the first week of receiving information (week two), all participants read about differences in classroom management. In week three, they read about differences in language proficiency. Lastly, in week 4, participants read about differences related to student motivation. Table 1 provides an overview of each classroom case and text. Cases and textbook excerpts were adopted from the textbook *Educational Psychology* by Moreno (2010).

Table 1. Case and text topic and the main message

Topic	Case	Text	Expert Response
Differences in classroom behaviors	A student is labeled as "disruptive" and "out of control," and possible referral to special education, highlighting deficit thinking. (WC = 1130)	The effectiveness of specific rewards and deterrents of undesirable behavior can be influenced by students' differences, such as their interests, needs, and goals. (WC = 1219)	Cautions against biased thinking and labeling. Provides concrete strategies for behavior management based on self-regulation theory.
Language proficiency	A student is supported as a student with a learning disability, when, in fact, she needs support in the English language. (WC = 1407)	Respecting a student's first language is essential for building a solid classroom community. (WC = 1467)	Emphasizes using students' first language and setting high expectations for all students.
Between and within-group differences in motivation	To encourage participation, the teacher uses non-specific praise, which doesn't allow students to clarify responses or use their language and adversely affects students' level of engagement. (WC = 1079)	Students will vary in their levels of intrinsic motivation, need for choice, and autonomy. These individual differences help explain why some students respond more positively to classroom choices than others. (WC = 1103)	Suggests that when teachers integrate students' culture, language, and other motivational factors, they help make instruction more meaningful and relevant.

Note: WC = word count

Expert Worked Examples vs. Student Exploration

After reading the CLD information presented through a text or classroom case, participants were asked to either read an expert worked example or to write their evaluation of the information (i.e., student exploration). Specifically, participants either read information or wrote about their understanding of 1) the main idea of the text or case and how it related to student development, learning, assessment, or motivation; 2) what teaching strategies were associated with the presented information; and 3) how this information could be implemented in a classroom.

Instruments

We scored pre-service teacher evaluations on the focus, justification of practices, and use of culturally responsive practices. For all instruments, two trained raters independently scored all responses. Table 2 provides a breakdown of interrater reliability, measured by an ICC, for each instrument by week.

Table 2. Inter-rater reliability as measured by ICC by instrument and week.

Week	Pretest	Focus	Depth	CRP
One	.86	.78	.82	.79
Two	-	.79	.81	.80
Three	-	.80	.80	.80
Four	-	.80	.87	.81

Demographic Survey

Participants were asked to specify basic demographic information, including ethnicity, race, self-identified gender, education program, endorsement, GPA, and what languages they spoke. In addition, to gauge experience with CLD populations, we asked participants how diverse their high school was, if they have traveled abroad, and what, if any, experience they may have had working with CLD students.

Pre-test

To determine if group differences existed, we assessed participants' prior knowledge of CRP by asking participants to list up to ten teaching strategies for working with CLD students. Specifically, participants were asked *to list ten (or fewer if unknown) teaching strategies or practices that they feel are effective for teaching culturally and linguistically diverse students.* Each strategy was reviewed by the two independent raters, coded, and given a 0 if the strategy was not related to CRP or left blank. One point was awarded if the strategy was related (e.g., using translanguaging, universal design methods, or multiple means of representation). Scores across strategies were then totaled.

Focus and Justification

We used a measure of pedagogical content knowledge adopted from Authors (2019) to measure both focus and justification. The focus of the weekly evaluations pertained to the degree to which participants focused on the given case's problem. We also scored participants on their justification for using teaching practices in the case and on whether any additional teaching practices were suggested. Table 3 provides the rubric with examples used for scoring focus and justification.

Table 3. Focus and justification of teacher practices evaluation rubric

Score	Criteria	Example Responses
Focus		
0	The answer focus was not on the teacher or the student	The main problem in this case was that the flashcards were old and meaningless.
1-2	The answer focuses on the student	The issue in this case was that the student was different from everyone else and did not try to fit in with the school.
3-4	The answer focuses on the teacher	The main problem in this case was the lack of background knowledge the teacher had of the student.
5-6	The answer includes both teacher and student focus	In this case, the students did not seem to know how to work together, and the teacher showed favoritism.
	Justification of Teacher Practices	
0	Repeat of case strategies: Restates what the teacher did	I would use the strategies that this teacher used because she did really well.
1	Surface features: Pure description of strategies	I would give students non-examples of arthropods.
2	Simple structural based explanation-misconception: Based on misunderstandings of theory or misuse of theory	I would bring in science books to teach the students because research says they learn more when the information is organized in books.
3	Simple structural-based explanations: Based in theory however, does not explicitly state how the strategy relates to the theory but the response is principle-based	I would use student's names to keep their attention.
4	Elaborated structural-based explanations based on theory: Makes statements on how the strategy relates to theory/why they are using strategy	I would have students translate the text into modern language so they can relate better to the characters.
5-6	Metacognition: Strategies for reflection on teaching practices, reevaluation of case, evidence of taking multiple perspectives	I would keep a journal and use an assessment so I can reflect back on what was working and what was not working.

Culturally Responsive Practices Rubric

We adopted Santamaria's (2009) framework to assess CRP. Based on case study findings, Santamaria (2009) developed guidelines and ten indicators of what CRP and differentiated instruction might look like in the classroom. For our study, we developed a rubric that classified these indicators into three categories: 1) academic achievement (e.g., presumes student is capable); 2) cultural competence (e.g., promotes flexible use of students' local and global cultures); and 3) multidimensionality (e.g., use of encompassing curriculum, content, learning contexts, and classroom climate). For each culturally responsive practice listed on the rubric, we scored the practice as present (1) or not present (0) in a

participant's evaluation. A half point was awarded if there was some discussion of the indicator. We then created a total score ranging from zero to ten by adding across all indicators.

Data Analysis

A multilevel growth model examined the effect of cases and expert worked examples across time. Multilevel modeling allowed for the examination of variance at two separate levels: time-specific growth at Level 1 and nested within individual level intercepts and slopes for each outcome variable at Level 2. More specifically, growth models examined changes in pre-service teachers' focus, justification of practices, and use of culturally responsive practices across the three weeks of lab learning activities. To determine if changes in these outcomes differed by learning condition, assignment to each factor and the interaction between these two conditions were entered as a possible predictor of growth at Level 2.

Qualitative Strand

Participants

We recruited a sub-sample of participants from our original sample of 95. The sub-sample consisted of volunteers willing to participate in a one-hour focus group session. These focus group participants were compensated $20. The sub-sample of 12 were similar in their demographic backgrounds to our original sample, with 91.6% of participants identifying as female and 83.3% as white. Of the 12 participants, two were from a secondary education program, while the remaining ten were from an elementary education program. The sub-sample included representative participants for each of the four conditions.

Procedure

We conducted two one-hour focus groups two weeks after the end of the quantitative data collection. We met in a lab space with one large rectangular table and chairs for each participant for their one-hour session. The first focus group included six female participants, the majority white (83.3%), with one participant identifying as Hispanic. Participants in this group came from all four conditions, with overrepresentation from two conditions (CE and TSE). The second focus group, again with six participants, represented each condition with overrepresentation from two conditions (CSE and TE). Most were female (83.3%) and white (83.3%). The lack of diversity among this focus group may have influenced the themes that emerged during our session.

The sessions began with the lead author introducing the second author and reading the consent script. The main author led the conversation while the second author took notes and asked additional questions when needed. We invited all participants to participate but noted that they were not required to answer each question. Both focus groups were audio recorded.

Focus Group Questions

Informed by previous research, the results of the quantitative analysis, and our initial research questions, we asked questions related to participants' perceptions of their CRP knowledge, the content of the study, and their opinions on the strengths and weaknesses of learning in their assigned conditions. For example, we asked questions related to CRP, such as: *What were some of the big ideas you*

learned? Strategies?; condition format, such as: *How did you feel about how the information was presented to you*; and specific content, such as: *Which classroom scenario or text did you find most helpful? Least helpful? Why?*

Data Analysis

We employed a thematic analysis (Braun & Clarke, 2006) to understand the phenomena under investigation during the qualitative data analysis. Although the quantitative results guided some focus group interview questions, an inductive approach was taken when coding and building themes. The qualitative data analysis was reflexive (Braun & Clarke, 2019) and contained several iterations of coding the data. Before conducting the focus groups, the authors reviewed the data and reflected on possible interview questions that could help inform the research questions posed. During the focus group interview process conducted by the two first authors, both researchers wrote extensive notes and memos and debriefed as soon as the focus group concluded. These discussions formed and reconciled the first coding between both researchers. Braun and Clarke (2019) explain this reflexive analysis method as a theme development process in which the researchers are immersed in the data, questioning, reflecting, wondering, writing, and more, as a pre-conceptualization of the themes. Once all data were collected, and following the transcription of the focus group interviews, the second author led the formal coding and thematic analysis by using coding patterns to determine specific placements of pre-service teachers' discussion, understanding, and learning about culturally responsive practices, as well as the CBI process in which they had engaged.

Grounded in theory and using a reflexive process, the second author dove deep into the data at several points in time, and using the memos written during the focus groups, and returned to the data to "continuously and rigorously reflect [in our] own taken for granted thinking" (Ho et al., 2017, p. 1760), the first author then served as a coder to reach consensus. In our codes, we considered each researcher's positionality as a teacher educator whose work focuses on using culturally responsive practices in teacher education. Two of the researchers come from white, privileged backgrounds, while the other two authors were not born in the United States and are from CLD backgrounds. The second author, who led the qualitative data analysis, identifies as a person of color and was labeled as an English learner when they immigrated to the United States at an early age. Three of the authors are bilingual, and two are parents of mixed-ethnic children. The positionality of the entire research team, as teacher educators, researchers, and former K-12 teachers, is important to note, as our perspective, background, and expertise in this topic could have led to asking specific questions and leading the conversation to a more social-justice-oriented one. This intersectionality could also play a role in the thematic analysis.

Meta-Inference

Upon completing both quantitative and qualitative data analyses, we engaged in an integrative approach to develop meta-inferences (Teddlie & Tashakkori, 2009) about the phenomenon under investigation. More specifically, from the conception of the research study, a mixed-methods research design was developed to strengthen the results through observation and understanding the depth and breadth of our study's impact on pre-service teachers' culturally responsive practices. The design included the development of inference or meta-inferences to yield a more well-rounded and detailed analysis of the phenomenon.

Results

Quantitative Results

Basic descriptive statistics, including means and standard deviations for weekly scores (weeks 2-4), are provided in Table 4. Before any analysis, assumptions associated with general linear models (e.g., homoscedasticity) were tested and passed. Using a series of analyses of variance (ANOVAs) and chi-squares, we assessed if there were any differences by conditions in participants' prior knowledge of CRP teaching strategies (i.e., pretest asking participants to list up to ten teaching strategies for working with CLD students), as well as other demographic variables, that might influence participants' response. No differences in prior knowledge were detected for viewing cases or expert responses, $F(1,91) = 1.13$, $p = .29$, and $F(1,91) = 0.07$, $p = .77$, respectively. Demographic responses were also similar across all groups (all $p > .05$). As noted earlier, we initially examined an unconditional means model to calculate the ICC. The ICC for the two-level unconditional model provides an estimate of the variance proportion at each level. Results from the unconditional means model indicated that for focus, justification, and culturally responsive practice outcomes, 54%, 18%, and 20% of the variance were at the assigned condition (Level 2). The ICC values for all models suggested that multilevel modeling was an appropriate analytic approach, as all models surpassed the recommended standard of at least 10% of variance at each level (Kreft & De Leeuw, 1998).

Table 4. Means and standard deviations for case evaluations by week and condition.

	Expert Worked Example		Student exploration	
Instrument	*Case*	*Textbook*	*Case*	*Textbook*
Focus				
Week 2	3.15 (0.88)	1.79 (0.73)	3.16 (0.56)	2.14 (0.53)
Week 3	3.84 (0.73)	2.16 (0.48)	3.62 (0.49)	1.95 (0.49)
Week 4	4.61 (0.75)	2.33 (0.56)	4.45 (0.83)	2.33 (0.48)
Justification				
Week 2	2.11 (0.99)	2.04 (1.39)	2.08 (1.31)	1.45 (1.21)
Week 3	2.92 (1.29)	2.25 (0.98)	3.00 (1.02)	2.00 (1.26)
Week 4	4.00 (1.13)	2.87 (1.03)	3.79 (0.93)	2.95 (0.86)
Culturally responsive practices				
Week 2	5.26 (1.74)	1.00 (1.47)	5.54 (1.74)	3.23 (1.04)
Week 3	6.30 (3.06)	4.00 (3.81)	6.91 (3.51)	4.28 (3.40)
Week 4	11.23 (5.40)	5.45 (4.51)	13.62 (5.37)	5.71 (4.81)

Next, we examined a conditional time growth model with an assignment to condition (cases vs. text and expert worked example vs. no expert worked example) at Level 2 and time centered on

the last measurement point. The condition of classroom case was coded as 1 for those participants reading the case and 0 for those who read the text. Similarly, the expert worked example condition was coded as 1 for those who viewed an expert worked example and 0 for those who did not. We used the assignment to condition as a predictor of time-specific outcome, wherein slopes induced a cross-level interaction of time-by-case and time-by-expert. The expected difference in scores at the last measurement point is of interest to the current study and how the assignment to conditions impacted each slope. Table 5 provides estimates for each model.

Table 5. Estimates for the effect cases, expert worked examples, and time.

Variable	Coefficient	*SE*	*t*	*p*-value
	Unconditional Means Model			
Focus Intercept	3.01	0.09	30.31	<.001
Justification Intercept	2.64	0.09	28.99	<.001
CRP Intercept	6.14	2.52	15.57	<.001
	Unconditional Growth Model			
Focus				
Intercept	2.10	0.11	18.35	<.001
Time	0.45	0.05	8.39	.001
Justification				
Intercept	1.13	0.17	6.58	<.001
Time	0.75	0.07	10.40	<.001
CRP				
Intercept	0.78	0.62	1.26	0.20
Time	2.68	0.31	8.40	<.001
	Conditional Growth Model			
Focus				
Intercept	4.67	0.12	37.29	<.001
Time	0.48	0.05	9.36	<.001
Case	2.32	0.16	13.90	<.001
Expert	0.21	0.16	1.28	.20
Case X Expert	0.16	0.18	0.86	.39
Time X Case	0.32	0.06	5.36	<.001
Time X Expert	0.06	0.06	0.99	.32
Justification				
Intercept	4.05	0.19	21.29	<.001
Time	0.62	0.07	8.22	<.001
Case	1.13	0.25	4.37	<.001
Expert	0.23	0.25	0.92	.57
Case X Expert	0.25	0.32	0.43	.38
Time X Case	0.19	0.09	2.14	.03
Time X Expert	0.09	0.09	1.05	.29
Culturally responsive practices				
Intercept	11.63	0.92	12.58	<.001
Time	2.34	0.33	6.99	<.001
Case	6.51	1.20	5.39	<.001
Expert	1.08	1.20	0.89	.37
Case X Expert	0.39	1.26	0.30	.75

Time X Case	1.28	0.39	3.23	.002
Time X Expert	0.12	0.40	0.32	.74

Focus

Results from the focus model indicate that at the last evaluation, participants who viewed classroom cases scored, on average, $\beta = 2.32$, $p < .001$ points higher than those who did not view classroom cases. This finding suggests a statistically significant main effect of classroom cases. In addition, the interaction between time and cases was statistically significant, suggesting a significant difference in slopes for those who viewed cases and those who did not. The results indicated that for every evaluation point, those who viewed cases increased by $\beta = 0.32$, $p < .001$ points beyond the growth of those who did not view cases. Figure 1 provides a visual of the relationship between cases and time. No effects (i.e., main effect or interaction) associated with expert worked examples were found.

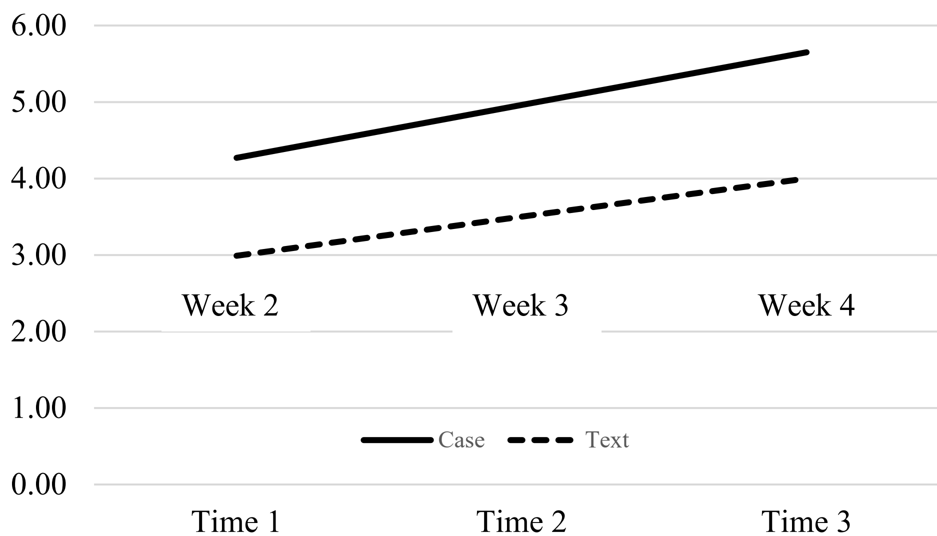

Figure 1. Relationship between time and the effect of reading a classroom case on the outcome of focus.

Justification for Teaching Practices

For the justification growth model, results revealed a similar pattern to focus with significant effects emerging for case versus text and no significant finding associated with viewing an expert worked example. Specifically, on their last evaluation, participants who viewed cases had a statistically significantly higher score than those who did not, $\beta = 1.13$, $p < .001$. The interaction between time and cases was also statistically significant. The latter result indicated that at each evaluation point, those who viewed cases increased by $\beta = 0.19$, $p = .03$ points beyond the growth of those who did not. Figure 2 provides a visual of the relationship between cases and time. No effects related to expert worked examples emerged as statistically significant.

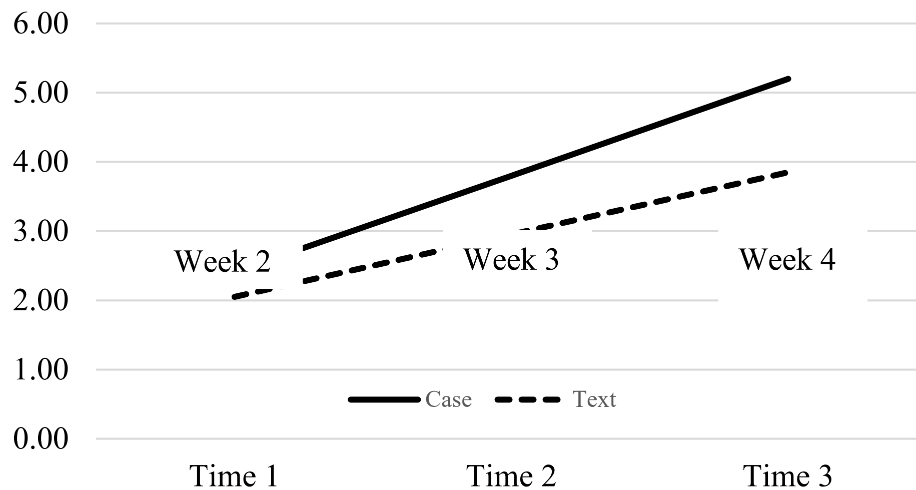

Figure 2. Relationship between time and the effect of reading a classroom case on the outcome of justification.

Culturally Responsive Practices

Lastly, for the outcome of culturally responsive practices, participants who viewed cases, again, outperformed those who did not with no effect of expert worked example found. On average, participants who viewed the cases scored $\beta = 6.51$ $p < .001$, points higher than those who did not. The interaction between viewing cases and time was also significant, $\beta = 1.28$, $p < .001$, suggesting that at each evaluation point, those who viewed cases increased by 1.28 points beyond the growth of those who did not view cases (see Figure 3). As with the results for Focus and Justification, no effects related to expert worked examples were found.

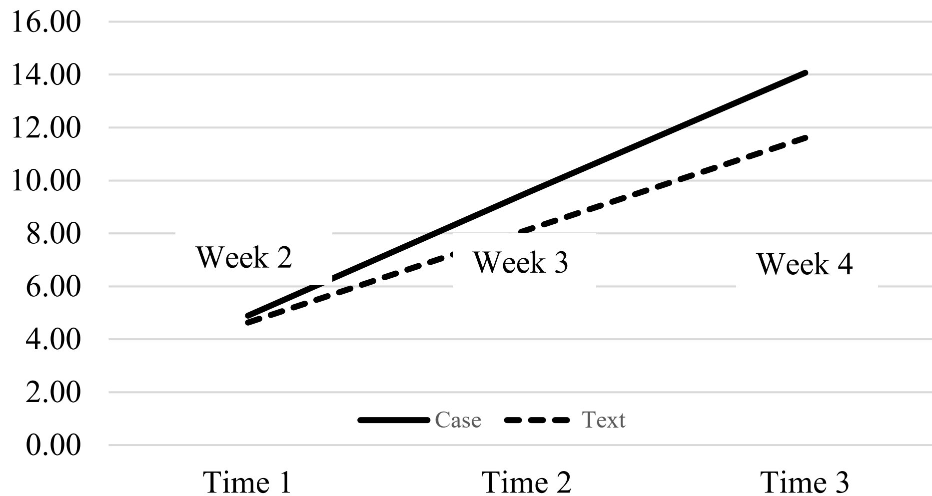

Figure 3. Relationship between time and the effect of reading a classroom case on the outcome of CRP.

Qualitative Results

Qualitative results from the focus groups yielded deeper consideration of the effects of using culturally responsive case-based instruction and provided in-depth information that supported the quantitative results. More specifically, the pre-service teachers' understandings of culturally responsive practices learned through this study, regardless of their condition, were detailed through five themes. These themes, selected through thematic analysis (Braun & Clarke, 2006), encompassed *In-Depth Reality, Application and Connection to Previous Knowledge, Inclusion, Multiple Perspectives,* and *the Importance of learn*ing. Across conditions, all participants agreed that classroom cases—used as either the learning and assessment tool (case conditions) or only as the assessment tool (text conditions)—were most helpful in eliciting their thinking about using culturally responsive practices.

In-Depth Reality

Most pre-service teachers expressed the central theme during this study: *In-Depth Reality*. This theme stemmed from participants' conversations about how culturally responsive pedagogy facilitated a more realistic impression of students and their lived experiences, especially as presented in cases. For example, one pre-service teacher stated that the cases "challenged me to think more" while discussing culturally responsive case-based instruction as a guide for reflecting upon the student as a real person rather than as an "unknown." Another pre-service teacher agreed by saying that the "complexity was good… building on high[er] learning experiences" by pursuing a more realistic and in-depth understanding than the traditional way of "romanticizing" diversity (e.g., coloring sheets about different holidays). More importantly, many pre-service teachers discussed how, although they may feel more confident and comfortable working with CLD students, they "now know that [they] need to learn more."

Application and Connection to Previous Knowledge

The second most frequently discussed theme was the use of culturally responsive practices through CBI to apply and connect their knowledge. One pre-service teacher stated they "didn't think about implementing [culturally responsive practices] into my curriculum before," but now they do. The pre-service teachers could connect these practices with various courses in their teacher preparation program. They stated that this had "taken them a step further" toward creating and applying culturally responsive practices. For example, one pre-service teacher in secondary education stated that "representation is very important" when discussing the importance of integrating books and authors from the same background as their students. More specifically, they expressed the usefulness of cases to embed culturally responsive thinking throughout their teacher preparation program rather than just discussing it in their diversity course. Others agreed and expressed how the behavior case included in this study helped them "think about behavior and how to view it differently," as they had never considered differences in cultural practices related to behavior. The same thing was discussed from a diversity-in-language perspective, as pre-service teachers said the CBI study made them "go deeper" and helped them apply concepts for English learners from their English Language Learning courses rather than remaining focused on basic conceptual understandings of different topics.

Inclusion

Based on the conversations from the focus groups, and similarly to the theme of *Application and Connection to Previous Knowledge*, *Inclusion* reflected a more comprehensive range of understanding of diversity and willingness to build a more inclusive and safer environment. That is, the pre-service teachers' attitudes of acceptance suggested a deeper and more inclusive level of thinking, including disability as part of diversity. For example, many discussed how accommodations are primarily focused on within their Special Education course but should be included "in every other subject." They also established, as previously discussed, a better understanding of behavior and behavior management in relation to differences in culture and background. Many in the focus group discussed how they had never thought about diversity within a cultural context and how this context affects how we view or manage behavioral needs in students with or without disabilities. They even made connections with building inclusive classrooms, such as making sure they "connect materials [for CLD students with disabilities] to participate in" (e.g., science instruction in Spanish with accommodations). Although this was a focused theme, they believed they needed further knowledge and skills to build a safe and inclusive classroom where confronting disrespectful or even racist comments could be more effectively addressed.

Multiple Perspectives

The *Multiple Perspectives* theme included discussion from pre-service teachers about how classroom cases in our study helped them see that their perspectives may differ from their students' perspectives and that they need to pay closer attention to observe "student-to-student interaction and perspectives." The Motivation Case was one of the cases the pre-service teachers referred to as being the most eye-opening and most useful. They recognized that motivation theories had not been discussed much in their teacher preparation program and had yet to make the connection that diversity occurs in all theories, even motivation. One participant in the focus group called cases related to diversity in motivation "thought-provoking." The case helped them to "reflect and help [see] from a diverse perspective." An important finding related to this content was that the focus group participants

discussed how "listening to students is an important part of addressing problems," demonstrating a needed mindset for working with CLD students.

Importance to Learn

Finally, the last theme that emerged from the focus groups was *the Importance of learn*ing. As an overarching theme, pre-service teachers in the focus groups discussed the importance of learning to make connections from courses and experiences in a more profound manner, stemming from their reflection after the culturally responsive practices CBI study. For example, pre-service teachers discussed how they cannot be "colorblind" and how colorblindness does not provide equity, but rather, they need to continue to learn more and reflect to sustain their efforts at being culturally responsive. Many of the pre-service teachers we talked with referenced the importance of learning from their students and evaluating their mentor or current teachers' methods as examples or non-examples of culturally responsive teaching. They all discussed wanting to learn more about culturally responsive practices and how, in the context of working with students with disabilities, they did not feel prepared to do so.

Discussion

A focus on the intentional preparation of teachers to respond to and support students from diverse cultural and linguistic backgrounds, challenge inequities, and promote social justice has grown significantly over the past twenty years (Cochran-Smith et al., 2016). Although some studies have shown success in teacher education programs (Kreamelmeyer et al., 2016), most pre-service teachers still need help to apply culturally responsive practices (King & Butler, 2015). As teacher preparation programs extend their models to bridge theory into practice, embedding culturally responsive case-based instruction in all components of teacher preparation (e.g., courses, practica) could be a way to increase pre-service teachers' disposition, knowledge, and preparedness to enact culturally responsive teaching, as per Gay's (2018) recommendations. Yet, this assumption requires further empirical verification. Our study lays the foundation for this examination by assessing if learning in a lab setting case- or text-based content, with or without expert worked examples promotes pre-service teachers' ability to evaluate classroom cases.

Case-Based Instruction

We found that providing realistic cases as the primary source of information related to CRP benefited pre-service teachers in their pedagogical growth, which is evidence for part of our first research question. Although authentic experiences continue to be the best way pre-service teachers can enhance their culturally responsive practices (Gay, 2018), embedding culturally responsive case-based instruction could provide similar benefits (Herreid & Schiller, 2013) in a lower-stakes environment. This may be particularly beneficial in early coursework or while distance learning is a norm, as practicum experiences may be limited.

Indeed, the results of this study show that all participating pre-service teachers gained greater skills and the ability to apply culturally responsive practices through intentional exposure to this content. Yet, those pre-service teachers who were afforded CBI had greater gains than their counterparts. As Miller and Fuller (2006) and Gay (2018) suggest, building reflective practices about cultural diversity, exposing pre-service teachers to critical analysis of their self-consciousness and assumptions, and guiding them through opportunities to convert beliefs into practices provides pre-service teachers with a framework and tools for enhancing their culturally responsive teaching.

Through culturally responsive CBI, teacher preparation programs could increase pre-service teachers' knowledge and ability to enact culturally responsive classroom practices. Subsequently, increased culturally responsive practices should foster effective instructional outcomes associated with increased student learning and well-being (Byrd, 2016; Christianakis, 2011). As pre-service teachers learn to enact culturally responsive practices as a reflective and ongoing cycle, the academic and socio-emotional needs of culturally and linguistically diverse students will be met. Most importantly, the results of this study show that to increase equitable learning opportunities, preparing culturally responsive teachers through CBI could be a more in-depth, rich, realistic, and inclusive experience that could easily be included in pre-service teacher preparation.

Expert Worked Examples

Also related to our first research question, the lack of a statistically significant effect of including expert worked examples is somewhat unexpected. One plausible explanation may be that the domain of culturally responsive pedagogy and practices may lend itself to something other than the worked example approach. That is, although the approach is known to benefit, to some extent, learning in well-structured domains, such as mathematics, where worked examples are often used to show steps in solving mathematical problems (see Wittwer & Renkl, 2010), the approach may be less practical in instructional design due to the complexity of the information. Additional research is needed to examine if combining worked examples with elaborated feedback (Stark et al., 2011) would better support learning in such a complex domain as culturally responsive pedagogy.

Another plausible explanation for the lack of the hypothesized expert worked example effect may be that the participants in our study were false beginners, not needing to rely as much on expert evaluations of materials to support their learning as true novices or even advanced beginners might need (Dreyfus, 2004; see also Dall'Alba, 2009; Dall'Alba & Sandberg, 2006). Indeed, an examination of week two's means for focus, justification of practices, and use of culturally responsive practices (the first assessment point for these three variables; Table 4) indicates that, although not at a proficiency level, participants across conditions may have been at an early competency level as shown by their scores of least two or higher (with only one exception) on measures of pedagogical content knowledge. It is also important to remember that the participants' program required at least one course in these three areas: diversity, special education, and English learners. Evidence suggests that even though pre-service teachers may lack effective pedagogical practices, their pedagogical knowledge may be highly sophisticated (Smetana et al., 2020), indicating a need for teacher preparation programs to establish approaches supporting the developmental progression of teachers (McNew-Birren & van den Kieboom, 2017).

Focus Groups

Related to our second research question, our focus group conversations provide insight into pre-service teachers' thinking about CRP and how case-based instruction influenced their thinking. Findings suggest that learning about CRP through case-based instruction provides the needed exposure to realistic teaching conditions. Exposure to a more in-depth understanding of diversity could positively impact how pre-service teachers think about and enact CRP. This shift is needed within pre-service teacher education. This statement is supported by studies finding only surface-level references and definitions within our teacher preparation programs. For example, Bennet (2013) explored pre-service teachers' CRP knowledge while tutoring CLD students and found that many pre-service teachers' definitions of culturally responsive teaching are overly simplistic, for example, events that present various cultural foods, holidays, and heritage months. Pre-service teachers did not

demonstrate knowledge of how to help students use their cultural backgrounds and experiences as tools for empowerment or to critically analyze the world around them and link learning to their lives.

Surface-level understandings of CRP plague our education programs (Author, 2020), which, in turn, has a negative effect on CLD students' achievement (Aronson & Laughter, 2016). Compared to traditional didactic approaches of reading text and generating "activities" related to CRP, our study was perceived as helpful for furthering pre-service teachers' knowledge (research questions three and four). Participants suggested that CBI provides exposure to culturally and linguistically diverse topics while exposing them to methods for identifying and reflecting upon their biases related to working with CLD students. Reflection and identification of biases are key aspects of Ladson-Billings' (1994) tenets of CRP, which indicate that teachers' practices need to go beyond the surface level of multicultural education.

Meta-Inference

Using Teddlie and Tashakkori's (2009) framework, a meta-inference was developed to better understand the phenomena in a deeper and more holistic manner. The sequential process of understanding the results from the quantitative analyses guided the qualitative strand. Through this meta-inference process, as well as using a reflective process, mixing of the data results came in several phases to better understand the overall phenomenon. First, with the understanding that the quantitative strand yielded specific results, the first and second authors utilized this data to guide the qualitative strand. Although the qualitative strand followed an inductive approach to the data analysis and thematic analysis, the reflective and iterative approach helped the researchers construct a holistic meta-inference once the results of both quantitative and qualitative strands were established. This "mixing of the methods" process was done with the intentionality of viewing the results from an overarching phenomenon with a wide and deep perspective.

The meta-inference we constructed from both quantitative and qualitative strands suggests that any instructional approach used to discuss culturally responsive practices resulted in learning. Specifically, all pre-service teachers in the study demonstrated a positive effect of time in their focus, justification, and culturally responsive practices ($\beta = 0.48$, $\beta = 0.62$, $\beta = 2.34$, $ps < .00$, respectively). This was also demonstrated in our findings of the focus groups, as differences in the mode of instruction between cases and text were not even mentioned as pre-service teachers were discussing their perceptions of the study; instead, they all focused on the content of the cases presented during instruction and/or assessment, even though it was explicitly stated that individuals saw similar content in different formats. Although growth in CRP occurred for all pre-service teachers, the greatest effects were observed for those who were able to use the cases as an instruction format to reflect and apply their current knowledge and skills as a way of transferring their learning about culturally responsive teaching. With this conclusion, we provide evidence that CBI provides a deeper approach that may empower pre-service teachers to celebrate learners as individuals who see the world through different perspectives and who know how to connect personal experiences and resources to their learning in school (Samuels, 2018).

Limitations

Across disciplinary fields, CBI has been highly praised for its positive learning benefits (Herreid & Schiller, 2013). Aligned with this research, our results show growth in pre-service teachers' culturally responsive practices when those are presented through the CBI format. These findings justify the exploration and potential inclusion of culturally responsive CBI in teacher preparation programs and suggest that engagement with issues of practice using cases may be more beneficial for learning than

simply reading about theories underlying such issues of practice. Although this is the case, we have to caution the reader in regard to generalizing our results, as one limitation of the study is our assessment of only one teacher education preparation program. Unique to our sample may be the fact that issues of diversity still tend to be siloed in specific courses. A program with more fluid attention to CRP may differ in its results. Future research should focus on determining if the effect of cases is robust across different samples.

Additionally, it should be noted that our experiment set up a dichotomy between textbook readings and cases and does not consider other important factors such as teaching practica, cases nested within instruction, or problem-based learning. Our goal was to examine the efficacy of reading a case compared to reading a traditional text passage; further evaluation of case-based instruction should consider the effectiveness of this approach nested in an authentic course rather than outside coursework. Lastly, as with any subjective scoring of participants' work, our rating of student case evaluations may influence the results of our study. For example, on our rubrics, we allowed raters to assign a wider point range (5 or 6 points instead of a single point value) within higher levels of the rubric classifications (see Table 3). We did this intentionally to align with the variability in how participants evaluated their classroom cases.

Conclusion

With the understanding that culturally responsive practices do not stem from a single class or workshop, nor are they specific to one content area, teacher preparation programs must embed opportunities to develop culturally responsive teachers in every program component. Integrated findings from quantitative and qualitative data suggest that the culturally responsive case-based instructional sequence for pre-service teachers had positive effects. More specifically, the greatest effects were observed when the pre-service teachers could use the cases to reflect and apply their current knowledge and skills to transfer their learning about culturally responsive teaching. Following the sequential mixing of the methods, qualitative results supported the quantitative findings in a deeper manner, showing that the use of CBI to enhance pre-service teachers' culturally responsive practices can yield broad and deep positive effects. For future teachers to learn, apply, and practice CRP, CBI could be an avenue to provide these experiential opportunities.

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References

Andrews, L. (2002). Preparing general education pre-service teachers for Inclusion: Web-enhanced case-based instruction. *Journal of Special Education Technology, 17*(3), 27-35. https://doi.org/10.1177/016264340201700302

Aronson, B., & Laughter, J. (2016). The theory and practice of culturally relevant education: A synthesis of research across content areas. *Review of Educational Research*, *86*(1), 163-206. https://doi.org/10.1080/09540253.2018.1496231

Atkinson, R. K., Derry, S. J., Renkl, A., & Wortham, D. (2000). Learning from examples: Instructional principles from the worked examples research. *Review of Educational Research*, *70*(2), 181-214. https://doi.org/10.3102/00346543070002181

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, *3*(2), 77-101. https://doi.org/10.1191/1478088706qp063oa

Braun, V., & Clarke, V. (2019). Reflecting on reflexive thematic analysis. *Qualitative Research in Sport, Exercise and Health*, *11*(4), 589-597. https://doi.org/10.1080/2159676X.2019.1628806

Bokosmaty, S., Sweller, J., & Kalyuga, S. (2015). Learning geometry problem solving by studying worked examples: Effects of learner guidance and expertise. *American Educational Research Journal*, *52*(2), 307-333. https://doi.org/10.3102/0002831214549450

Byrd, C. M. (2016). Does culturally relevant teaching work? An examination from student perspectives. *SAGE Open, 6*(3), 1-16. https://doi.org/10.1177/2158244016660744

Chen, O., Kalyuga, S., & Sweller, J. (2015). The worked example effect, the generation effect, and element interactivity. *Journal of Educational Psychology*, *107*(3), 689-704. https://doi.org/10.1037/edu0000018

Christianakis, M. (2011). Hybrid texts: Fifth graders, rap music, and writing. *Urban Education*, *46*, 1131-1168. https://doi.org/10.1177/0042085911400326

Cochran-Smith, M., Villegas, A.M., Abrams, L., Chavez Moreno, L., Mills, T. & Stern, R. (2015). Critiquing teacher preparation research: An overview of the field, part II. *Journal of Teacher Education. 66*(2), 109-121. https://doi.org/10.1177/0022487114558268

Creswell, J. W., & Plano Clark, V. L. (2018). *Designing and conducting mixed methods research* (3rd ed.). SAGE.

Crippen, K. J., & Earl, B. L. (2004). Considering the effectiveness of web-based worked example in introductory chemistry. *Journal of Computers in Mathematics and Science Teaching, 23,* 151–167. https://www.learntechlib.org/primary/p/12876/

Dall'Alba, G. (2009). Learning professional ways of being: Ambiguities of becoming. *Educational Philosophy and Theory, 41*(1), 34–45. https://doi.org/10.1111/j.1469-5812.2008.00475.x

Dall'Alba, G., & Sandberg, J. (2006). Unveiling professional development: A critical review of stage models. *Review of Educational Research, 76*, 383–412. https://doi.org/10.3102/00346543076003383

Dreyfus, S. E. (2004). The five-stage model of adult skill acquisition. *Bulletin of Science, Technology & Society, 24*(3), 177-181. https://doi.org/10.1177/0270467604264992

Ensign, J. (2003). Including culturally relevant math in an urban school. *Educational Studies*, *34*, 414–423.

Gay, G. (2018). *Culturally responsive teaching: Theory, research, and practice*. Teachers College Press.

Gay, G., & Kirkland, K. (2003). Developing cultural critical consciousness and self-reflection in preservice teacher education. *Theory Into Practice*, *42*(3), 181–187. https://doi.org/10.1207/s15430421tip4203_3

Goeze, A., Zottmann, J. M., Vogel, F., Fischer, F., & Schrader, J. (2014). Getting immersed in teacher and student perspectives? Facilitating analytical competence using video cases in teacher education. *Instructional Science*, *42*(1), 91-114. https://doi.org/10.1007/s11251-013-9304-3

Gravett, S., de Beer, J., Odendaal-Kroon, R., & Merseth, K. K. (2017). The affordances of case-based teaching for the professional learning of student-teachers. *Journal of Curriculum Studies*, *49*(3), 369-390. https://doi.org/10.1080/00220272.2016.1149224

Herreid, C. F., & Schiller, N. A. (2013). Case studies and the flipped classroom. *Journal of College Science Teaching, 42*(5), 62-66. https://www.jstor.org/stable/43631584

Ho, K. H., Chiang, V. C., & Leung, D. (2017). Hermeneutic phenomenological analysis: The 'possibility' beyond 'actuality' in thematic analysis. *Journal of advanced nursing*, *73*(7), 1757-1766. https://doi.org/10.1111/jan.13255

Kalyuga, S., Chandler, P., Tuovinen, J., & Sweller, J. (2001). When problem solving is superior to studying worked examples. *Journal of Educational Psychology*, *93*(3), 579-588. https://doi.org/10.1037/0022-0663.93.3.579

Kane, T. J., Taylor, E. S., Tayler, J. H., & Wooten, A. L. (2011). Identifying effective classroom practices using student achievement data. *The Journal of Human Resources, 46*(3), 587–613. https://doi.org/10.1353/jhr.2011.0010

King, E., & Butler, B. R. (2015). Who cares about diversity? A preliminary investigation of diversity exposure in teacher preparation programs. *Multicultural Perspectives*, *17*(1), 46-52. https://doi.org/10.1080/15210960.2015.994436

Koehler, A. A., Ertmer, P. A., & Newby, T. J. (2018). Developing preservice teachers' instructional design skills through case-based instruction: Examining the impact of discussion format. *Journal of Teacher Education*. Advance online publication. http://journals.sagepub.com/doi/abs/10.1177/0022487118755701

Kolb, D., Boyatzis, R., & Mainemelis, C. (2000). Experiential learning theory: Previous research and new directions. In R. J. Sternberg & L. F. Zhang (Eds.). *Perspectives on cognitive, learning, and thinking styles* (pp. 227-248). Lawrence Erlbaum.

Kreamelmeyer, K., Kline, A., Zygmunt, E., & Clark, P. (2016). To see or not to see: Preservice teacher attitudes toward color blindness. *The Teacher Educator*, *51*(2), 136-152. https://doi.org/10.1080/08878730.2016.1152841

Kreft, I. G., & De Leeuw, J. (1998). *Introducing multilevel modeling*. Sage.

Ladson-Billings, G. (1995). Toward a theory of culturally relevant pedagogy. *American Educational Research Journal*, *32*(3), 465-491. https://doi.org/10.3102/00028312032003465

Ladson-Billings, G. (2001). *Crossing over to Canaan: The journey of new teachers in diverse classrooms*. Jossey-Bass.

Ladson-Billings, G. (2008). "Yes, but how do we do it?": Practicing culturally relevant pedagogy. In W. Ayers, G. Ladson-Billings, G. Michie, & P. Noguera, (Eds.), *City kids, city schools: More reports from the front row* (pp. 162-177). New Press.

Ladson-Billings, G. (2014). Culturally relevant pedagogy 2.0: Aka the remix. *Harvard Educational Review*, *84*(1), 74-84. https://doi.org/10.17763/HAER.84.1.P2RJ131485484751

McFarland, J., Hussar, B., de Brey, C., Snyder, T., Wang, X., Wilkinson-Flicker, S., Gebrekristos, S., Zhang, J., Rathbun, A., Barmer, A., Bullock Mann, F., and Hinz, S. (2017). *The Condition of Education 2017* (NCES 2017- 144). U.S. Department of Education. Washington, DC: National Center for Education Statistics. Retrieved from https://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2017144

McNew-Birren, J., & van den Kieboom, L. A. (2017). Exploring the development of core teaching practices in the context of inquiry-based science instruction: An interpretive case study. *Teaching and Teacher Education, 66*, 74-87. https://doi.org/10.1016/j.tate.2017.04.001

Miller, K. J., & Fuller, D. P. (2006). Developing cultural competency in early childhood preservice educators through a cultural self-analysis project. *Journal of Early Childhood Teacher Education*, *27*(1), 35-45. https://doi.org/10.1080/10901020500527152

Moreno, R. (2010). *Educational Psychology*. John Wiley & Sons.

Nieto, S. (2010). Language, culture, and teaching: Critical perspectives. Routledge.

Paas, F., & Van Gog, T. (2006). Optimising worked example instruction: Different ways to increase germane cognitive load. *Learning and Instruction*, *16*, 87–91. https://doi.org/10.1016/j.learninstruc.2006.02.004

Renkl, A. (2014). Toward an instructionally oriented theory of example-based learning. *Cognitive Science*, *38*(1), 1-37. https://doi.org/10.1111/cogs.12086

Samuels, A. J. (2018). Exploring Culturally Responsive Pedagogy: Teachers' Perspectives on Fostering Equitable and Inclusive Classrooms. *Srate Journal*, *27*(1), 22-30. https://eric.ed.gov/?id=EJ1166706

Santamaria, L. J. (2009). Culturally responsive differentiated instruction: Narrowing gaps between best pedagogical practices benefiting all learners. *Teachers College Record*, *111*(1), 214-247. https://doi.org/10.1177/016146810911100105

Schwaighofer, M., Bühner, M., & Fischer, F. (2016). Executive functions as moderators of the worked example effect: When shifting is more important than working memory capacity. *Journal of Educational Psychology*, *108*(7), 982-1000. https://doi.org/10.1037/edu0000115

Schworm, S., & Renkl, A. (2006). Computer-supported example-based learning: When instructional explanations reduce self-explanations. *Computers & Education*, *46*(4), 426-445. https://doi.org/10.1016/j.compedu.2004.08.011

Smetana, L. K., Sanei, J. C., & Heineke, A. J. (2020). Pedagogical language knowledge: An investigation of a science teacher candidate's student teaching strengths and struggles. *Action in Teacher Education*, *42*(2), 149-166. https://doi.org/10.1080/01626620.2019.1650841

Stark, R., Kopp, V., & Fischer, M. R. (2011). Case-based learning with worked examples in complex domains: Two experimental studies in undergraduate medical education. *Learning and Instruction*, *21*(1), 22-33. https://doi.org/10.1016/j.learninstruc.2009.10.001

Sleeter, E. C., (2017). Critical race theory and the whiteness of teacher education. *Urban Education, 52*(2), 155-169. https://doi.org/10.1177/0042085916668957

Teddlie, C., & Tashakkori, A. (2009). *Foundations of mixed methods research: Integrating quantitative and qualitative approaches in the social and behavioral sciences*. Sage.

van Loon-Hillen, N., Van Gog, T., & Brand-Gruwel, S. (2012). Effects of worked examples in a primary school mathematics curriculum. *Interactive Learning Environments*, *20*(1), 89-99. https://doi.org/10.1080/10494821003755510

Wittwer, J., & Renkl, A. (2010). How effective are instructional explanations in example-based learning? A meta-analytic review. *Educational Psychology Review, 22*(4), 393-409. https:/doi.org/10.1007/s10648-010-9136-5

Youngs, C. S., & Youngs, G. A., Jr. (2001). Predictors of mainstream teachers' attitudes toward ELL students. *TESOL Quarterly, 35*(1), 97–120. https://doi.org/10.2307/3587861

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Are writing questions in math fair?

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Abstract: In this paper, we examine whether a student's language background and other demographic factors have any relationship to their performance on prose questions in math, which we define as questions with open-ended answers containing one or more complete sentences of English. Prose questions stand in contrast to non-prose questions, which are more traditional questions in math courses, requiring an objective answer, such as a number, an equation, a diagram, etc. Performing an exploratory analysis on exam scores for 463 students in a first-year linear algebra course, we use step-down regression to identify significant factors contributing to a student's non-prose tilt: how much better a student performs on non-prose versus prose questions. We find that gender is the only significant factor contributing to a student's non-prose tilt. In particular, no linguistic factors we considered, including whether or not a student was a native English speaker, emerged as significant.

Keywords: equitable assessment, language bias, gender gap

In a math course, is asking a writing question—one that must be answered in full sentences—fair? What if a large portion of your students are not native speakers of the language of instruction? What if you are asking students to provide an informal explanation, rather than a more technical proof with conventionalized structure and language?

Written communication plays an important role in mathematics (NCTM, 2008), but it may be difficult to assess students' mathematical communication skills fairly. At the authors' institution, a large public research university in Canada, more than a quarter of all students come from other countries (where English is often not a dominant language), and even many of our domestic students use languages other than English in the home. This raises questions of whether asking students to write and be assessed on their English prose in a math course might be unfair or inequitable, given that native English speakers would seem to have certain advantages: being able to write more quickly under time pressure, avoiding grammatical errors, using more colloquial and fluid verbiage, etc.

In this paper, we examine whether a student's language background and other demographic factors have any relationship to their performance on *prose questions*, which we define here as questions with open-ended answers containing one or more complete sentences of English. Prose questions stand in contrast to *non-prose questions*, which are more traditional questions in math courses, requiring

an objective answer, such as a number, an equation, a diagram, a formally defined mathematical object, a selected choice from a list of options, etc.

We study this issue in the context of a first-year linear algebra course, and we find that prose questions do *not* appear to give an advantage (or disadvantage) to native English speakers or domestic students; that is, they are fair. A student's performance on prose questions is consistent with their performance on non-prose questions, regardless of which languages they use in the home or whether they are domestic or international. That said, we do see signs of (dis)advantage in the social dimension of gender, which requires further study.

Background

With increased globalization and the greater access to information it brings, science communication is an important skill for our students to practice (Kahan et al., 2012). In addition, a focus on written communication specifically is known to have broad educational and cognitive benefits (National Commission on Writing in America's Schools & Colleges, 2003; McArthur, Graham, & Fitzgerald, 2006, Menary, 2007; National Institute for Literacy, 2007), including in mathematics education (Pugalee, 2005).

However, mathematics instructors usually have little training in teaching or assessing writing themselves, so they can struggle with evaluating the *quality* of a student's argument or explanation as different from its *correctness* (Moore, 2016). Further, since mathematics questions can often be asked and answered in ways that minimize the use of ordinary natural language, mathematics teachers may strive to assess their students only in a language-agnostic way, with non-prose questions. For example, questions could be asked that require answers with only equations, diagrams, or true/false responses. In the extreme, questions could even be phrased using only symbolic logic.

Despite the challenges of using prose questions, we believe that they should be used in the mathematics classroom. Not only do they provide the benefits mentioned above, it can also be useful for the instructor to examine a student's writing to provide insights into their (mis)conceptions about the course material and to provide a method of evaluation that focuses on process and understanding rather than just getting the "right" answer (Seto & Meel, 2006).

To that end, we partnered with the Writing-Integrated Teaching program at our institution to bring mathematical writing and communication tasks to our first-year math courses for non-majors. These tasks require students to write multiple sentences or paragraphs of mathematical prose which are evaluated on both correctness and clarity of communication. An example of a prose question for linear algebra is given in Figure 1.

Let $\mathcal{T} : \mathbb{R}^2 \to \mathbb{R}^3$ be a linear transformation defined by $\mathcal{T}\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} x \\ y \\ 0 \end{bmatrix}$.

Lu and Deno are discussing whether $\mathcal{T}$ is invertible.

Lu thinks: $\mathcal{T}$ can be undone. For example, if $\mathcal{T}(\vec{v}) = \begin{bmatrix} 2 \\ 3 \\ 0 \end{bmatrix}$, then we know that $\vec{v} = \begin{bmatrix} 2 \\ 3 \end{bmatrix}$. Therefore $\mathcal{T}$ is invertible.

Deno replies: But, $\mathcal{T}$ is not a square matrix, so it cannot be invertible.

Explain to Lu and Deno, using complete English sentences, whether $\mathcal{T}$ is invertible.
Your explanation must (i) include relevant definitions, and (ii) point out where Lus and Denos reasoning is correct/incorrect.

Figure 1: Example prose question.

International students make up 56% of students in our first-year linear algebra course, and many of these students, as well as many of our domestic students, grew up in homes using languages other than English. Students' language backgrounds have been shown to affect academic achievement (Grayson, 2009), with English as an Additional Language (EAL) students often put in a disadvantaged position relative to their non-EAL peers. In addition, there is variation across countries (Hunt & Wittmann, 2008; Becker, Coyle et al., 2022) and between genders (Turner & Bowen, 1999; Munir & Winter-Ebmer, 2018) in relative performance in math and science versus reading and writing, a so-called "ability tilt" (Coyle et al., 2015), where a *tilt* is an individual's difference across two dimensions of ability (for example, math versus verbal ability). We might expect these observed ability tilts to affect performance on prose versus non-prose questions.

Given the potential for such differences, we worry that questions that rely on English (or any particular language), such as prose questions, might incorrectly assess a student's math knowledge due to their language background, country of origin, gender, or other factors. For example, we might naively expect that students with the same underlying level of mathematical ability would score differently on prose questions if their English skills are different. If there are differences between students, we can better make early identification of which students need the most support and provide appropriate interventions.

Methods

We explored this issue by examining data from two midterm exams in a large, multi-section introductory linear algebra course in the fall of 2021 (the final exam for this course was canceled due to the COVID-19 pandemic, so it could not be included). Data was collected and analyzed with respect to the protocol approved by the university's Research Ethics Board.

Exam Format

Students in all sections took the same two 110-minute in-person midterm exams. The graded portion of the exams consisted of eight questions, each with multiple subparts. Both exams shared the following format:

- one question asking for students to state definitions
- one *long-form writing question*, where students explain a linear algebra concept and are instructed to do so in full paragraphs
- one question where a student's solution consists of pictures/graphs, without explanations
- one question where students are asked to provide mathematical examples satisfying specific properties or explain why such an example is impossible
- 2–3 multiple choice questions

For reference, the exact questions for Midterm 1 can be found in Appendix 1.

Two Types of Questions

We coded the questions from these exams as either prose questions or non-prose questions, as defined in Section 1. Some questions we coded as mixed between the two styles and were excluded from the analysis. There were only two types of questions that qualified as prose questions: (i) definition questions that could not be completed using only a formula and (ii) the long-form writing questions,

where students were instructed to write in complete paragraphs. Examples of each of these two types of prose question are given in Figures 2 and 3. Across both exams, seven questions totaling 22 points were categorized as prose questions (approximately 20% of the exams' points).

Complete the following sentences with a mathematically correct definition.

- A system of equations in the variables x, y, and z is called inconsistent if ...
- The non-empty subset $X \subseteq \mathbb{R}^3$ is a subspace if ...

Figure 2: Example definition questions. First type of prose question, requiring students to state definitions.

Let $\vec{v} \in \mathbb{R}^2$ and define $A = \{\vec{v}\}$.
Sally and Mir are discussing whether A must be a linearly independent set.

> *Sally thinks no*: A cannot be linearly independent. Because $\vec{v} \in \text{span}(\{\vec{v}\})$, by the geometric definition of linear dependence, $\vec{v}$ is a "redundant" vector. Therefore A contains a redundant vector, and so A is linearly dependent.
>
> *However, Mir disagrees*: A *must* be linearly independent because span($\{\}$) contains no vectors. Therefore $\vec{v} \notin \text{span}(\{\})$, and so by the geometric definition, A is not linearly dependent, therefore A is linearly independent.

Explain to Sally and Mir, using complete English sentences, whether A must be a linearly independent set.
Your explanation must (i) include relevant definitions, and (ii) point out where Sally's and Mir's reasoning is correct/incorrect.

Figure 3: Example long-form writing question. Second type of prose question, requiring students to provide an explanation in complete English sentences.

Most other questions, including definitions that could be stated via a formula, multiple choice questions, and drawing questions were categorized as non-prose questions. Overall, 49 questions totaling 95 points were classified as non-prose questions.

Differences Between Question Types.

Overall, student performance on non-prose questions was higher than on prose questions by about 3 percentage points (see discussion in Section 4). We define the *non-prose tilt* for a student as the difference between the student's average scores on non-prose questions minus their average score on prose question. In this case, the average non-prose tilt for all students is positive. This is expected, given that non-prose questions are more common in mathematics education, so they are more familiar. Indeed, anecdotally via course evaluations and informal discussions, the authors have found that students are often surprised to find prose questions in math courses.

If prose questions are fair, then we would expect non-prose tilt to vary randomly across students rather than being biased (positively or negatively) for certain demographics. In particular, if prose questions are *linguistically* fair, students' non-prose tilt should not be sensitive to their language background or related demographics like international status, which might correlate with language background. That is, we would expect every language-related demographic group to have roughly the same non-prose tilt.

By focusing on non-prose tilt, we attempt to disentangle students' underlying math ability from the impact of having to express themselves in English. In essence, we expect that students with

the same mathematical ability, but different linguistic ability, should perform the same on non-prose questions, but we could potentially see differences in their performance on prose questions, if those questions are not fair.

Grading Details

The grading of exams was done online using the *Gradescope* distributed marking platform. Teaching assistants (TAs) were provided with a rubric (see Appendix 2 for the full rubric for Midterm 1), and exams were anonymized, so that TAs were only presented with a student's response to questions with no other identifying information present. For most questions, TAs were asked to grade 20 papers and then wait for feedback from their marking coordinator (an experienced TA or instructor who was assigned to supervise the marking process) before continuing. Most questions were graded strictly and few partial marks were awarded.

The exception to the above process was for the long-form writing question (Figure 3). TAs assigned to mark this question met virtually for a *benchmarking session*. At this benchmarking session, the marking coordinator reviewed several sample student responses with the TAs, and they discussed what points should be awarded to which answer. After the benchmarking session, TAs graded independently and were spot-checked by the marking coordinator. TAs were instructed to mark the question out of 6 points, with half the points assigned for mathematical correctness and half for the quality of presentation. The rubric for this question is as follows:

- Mathematics (3 points, minimum of 0) To get these points, a student must include relevant definitions and have a correct explanation. Deduct points as follows:
  -1pt for not including the definition of linear independence.
  -1pt for not correctly showing when A is linearly independent.
  $-1/2$pt for not explaining what part of Sally's reasoning is incorrect.
  $-1/2$pt for not explaining what part of Mir's reasoning is incorrect.
  $-1/2$pt for not explaining what part of Sally's reasoning is correct.
  $-1/2$pt for not explaining what part of Mir's reasoning is correct.
- Presentation (3 points, minimum of 0) To get these points, a student must provide a well written response with a logical flow. Deduct points as follows:
  -1pt for an answer that is difficult to follow.
  -1pt for an answer that is incorrect but is well written.
  -2pt for an answer that is very difficult to understand or is not written in complete sentences.
  -2pt for an answer that did not include a sufficient amount of detail to answer the question.

Three example responses to the long-form writing question from Midterm 1 are given in Figures 4–6, along with their scores according to the rubric. The samples were originally hand-written, but they have been typed here for clarity, with each student's original formatting replicated.

> Mir is wrong because this span does have a vector within it, $\vec{v}$. She is correct about A being linearly independent because linear independence is just the trivial solution where $a_1v_1 + a_2v_2, \ldots a_nv_n = 0$ and $a_1 = a_n = 0$. However she is wrong for saying there is no vector. Sally is incorrect for saying A cannot be linearly independent. The vector is on its own and span does contain an empty set. Sally is wrong for saying it is a redundant vector, and using that as the reason why it is linearly dependent.

Figure 4: First example response. This response to the long-form writing question on Midterm 1 was scored 1 out of 6 points.

The first example response to the long-form writing question (Figure 4) received 1/6 points. The student lost 3 points for mathematics: 1 point for not stating definitions correctly, 1 point for not correctly showing when A is linearly independent, 0.5 points for not pointing out where Sally's reasoning is correct, and 0.5 points for not showing where Mir's reasoning was correct. This student also lost 2 points for presentation, receiving the rubric feedback item "You have not correctly answered a sufficient amount of the question", with additional clarifying comments provided on the student's paper.

Linearly independent means the only linear combination of vectors in a set that equals zero is a trivial solution where the coefficients are all zero. Sally is incorrect because only the other vectors in a set should be included when seeing if $\vec{v}$ is an element of the span, as a vector is always an element of a span including itself.

Mir's reasoning is incorrect since not all vectors in a set must be an element of the span of the other vectors for it to be linearly dependent. For example in the set $\left\{\begin{bmatrix}1\\0\end{bmatrix},\begin{bmatrix}0\\1\end{bmatrix},\begin{bmatrix}2\\0\end{bmatrix}\right\}$, $\begin{bmatrix}0\\1\end{bmatrix}\notin \operatorname{span}\left(\begin{bmatrix}1\\0\end{bmatrix},\begin{bmatrix}2\\0\end{bmatrix}\right)$ yet the set is linearly dependent.

A would be linearly dependent if $\vec{v}=\begin{bmatrix}0\\0\end{bmatrix}$, and linearly independent if $\vec{v}\neq\begin{bmatrix}0\\0\end{bmatrix}$ since the only solution would be trivial.

Figure 5: Second example response. This response to the long-form writing question on Midterm 1 was scored 3.5 out of 6 points.

The second example response to the long-form writing question (Figure 5) received 3.5/6 points. The student lost 1.5 points for mathematics: 0.5 points each for not explaining where Sally's reasoning is correct, where Mir's reasoning is correct, and where Mir's reasoning is incorrect. The student also lost 1 point for presentation, receiving the comment "Although your answer is not correct or is incomplete, it is very well-written".

A is linearly independent unless $\vec{v}$ is $\vec{0}$.

The algebraic definition of linear dependency states that all the vectors in the given set must have a non-trivial linear combination the results in $\vec{0}$. Else, the set is linearly independent. As the only vector in A is $\vec{v}$ and no linear (non-trivial) combination of $\vec{v}$ can result in $\vec{0}$, it is linearly independent. (Unless $\vec{v}$ is $\vec{0}$, in which case all linear combinations of $\vec{v}$ result in $\vec{0}$.)

The geometric definition of linear dependency states that if any vector in the given set is an element of the span of the set of vectors excluding the vector in question, it is linearly dependent. Otherwise, it is linearly independent.

Therefore, Sally is incorrect in referring to $\operatorname{span}(\{\vec{v}\})$ when discussing $\vec{v}$'s linear dependency, as that span is of the set containing $\vec{v}$. When one compares to $\{\}$, which is the set A excluding $\vec{v}$, $\vec{v}\notin\operatorname{span}(\{\})$ (for $\vec{v}\neq\vec{0}$), thus is linearly independent even by the algebraic definition. However, Mir is also wrong that $\vec{v}$ must be linearly independent, as if $\vec{v}=\vec{0}$, then $\vec{v}\in\operatorname{span}(\{\})$ as $\vec{0}$ is a member of every span.

Figure 6: Third example response. This response to the long-form writing question on Midterm 1 was scored 5.5 out of 6 points.

Finally, the third example response to the long-form writing question (Figure 6) received 5.5/6 points. The student lost 0.5 points for mathematics, for not explaining what part of Mir's reasoning is correct. The student received full marks for presentation.

Demographics

Students in the course were primarily in their first year of university. In a typical year, approximately 80% of students who enroll in this course are studying a Science, Technology, Engineering, and Mathematics-related (STEM-related) field, while 20% are studying business, economics, or a liberal arts/social science (statistics for course of study for students in the specific academic session for this study were not collected, but there is no reason to believe that they differed from those of a typical year). Approximately 56% of students in this study were international students (that is, they did not qualify for domestic tuition), with the majority of these international students coming from mainland China. Near the end of the semester, a survey was sent to all students asking about:

1. their use of English as a home language;
2. which languages they are fluent in;
3. their self-assessed proficiency in academic English writing; and
4. their living situation.

We supplemented this survey data with their registration status as an international or domestic student, their gender, their overall exam scores on the two midterm exams, their scores on individual prose and non-prose questions from the midterm exams, and their non-prose tilt (calculated as described above).

Identifying Significant Factors

This research is exploratory: we want to know what demographic factors might impact a student's non-prose tilt and, in particular, whether their language background is relevant. For this reason, we used a step-down regression procedure, which starts with a model with many predictors and iteratively removes non-significant predictors to find the subset of predictors that builds the best model, as measured by the Akaike information criterion (Akaike, 1974). The step-down regression models were built using the step() function from the stats package in R (R Core Team, 2020). The significance level was set to $a = 0.05$, and p-values were calculated using the lmerTest package (Kuznetsova et al., 2017).

The factors we considered were:

- *native English speaker* (binary, based on whether English was or was not used as a home language)
- *multilingualism* (binary, based on whether the student was fluent in one or more than one language)
- *self-assessed writing proficiency* (linear scale, 1–4, with 4 the highest)
- *living situation* (ternary: on campus, off campus alone or with roommates, and off campus with family)
- *gender* (binary, based on university records; we excluded the 15 students who did not have a recorded gender)
- *international student status* (binary, based on whether their home country was the same or different from the location of the university).

We used these factors to model their (i) midterm average (the average of the scores of the two midterm exams), (ii) average score on all prose questions, (iii) average score on all non-prose questions, and (iv) non-prose tilt (that is, (iii) minus (ii)).

Results

In total, there were *n* = 463 students who took both midterms and filled out the survey with interpretable results. The results for the class as a whole are given in Table 1. We find a non-prose tilt of 2.83 Note that the overall midterm average is closer to the non-prose average, because non-prose questions make up the majority of the midterm questions. We also carried out preliminary analyses for the two midterm exams separately, but due to their high correlation ($R^2 = 0.68$), the results were similar enough that we instead report here aggregated results from the two midterm exams together.

Table 1: Combined midterm scores (*n* = 463).

Score Type	Score (%)	SD
Non-prose Questions (Mean)	67.4	18.1
Prose Questions (Mean)	64.6	21.0
Non-prose Tilt (Non-prose – Prose)	2.83	15.0
Overall Midterm (Mean)	66.9	17.7

For midterm averages and the average on non-prose questions, we find three significant factors out of all those tested: living situation, gender, and self-assessed writing proficiency. For the average on prose questions, we find only two significant factors: living situation and self-assessed writing proficiency. The averages for each of these groups for non-prose and prose questions are given in Tables 2–4 and graphed in Figures 7–9.

Table 2: Average scores by question type and living situation.

	Campus (*n* = 200)		Self or roommate (*n* = 195)		Family (*n* = 68)	
Question Type	Score (%)	SD	Score (%)	SD	Score (%)	SD
Non-prose	72.3	2.2	65.1	2.6	59.8	4.6
Prose	68.7	2.7	61.8	2.9	60.7	5.6

Table 3: Average scores by question type and gender.

	Female (*n* = 195)		Male (*n* = 268)	
Question Type	Score (%)	SD	Score (%)	SD
Non-prose	65.0	2.4	69.2	2.2
Prose	64.6	2.8	64.6	2.6

Table 4: Average scores by question type and self-assessed writing proficiency.

	1 = weaker (*n* = 14)		2 (*n* = 122)		3 (*n* = 207)		4 = stronger (*n* = 120)	
Question Type	Score (%)	SD	Score (%)	SD	Score (%)	SD	Score (%)	SD
Non-prose	64.7	12.2	64.3	3.2	67.8	2.4	70.2	3.4
Prose	59.3	16.5	62.0	3.7	64.2	2.8	68.5	3.8

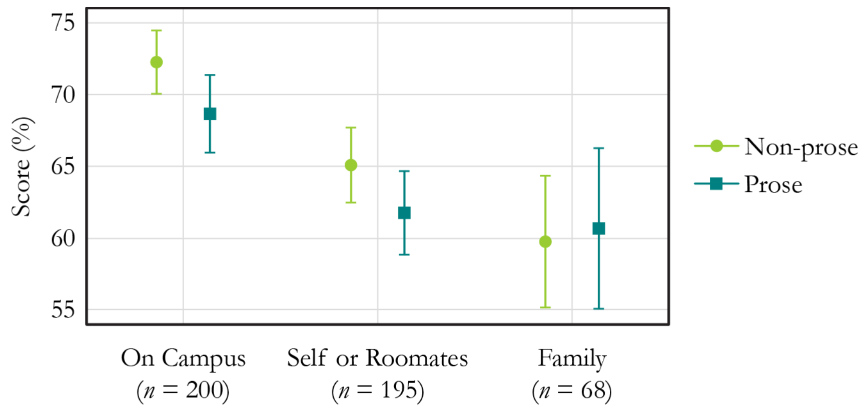


Figure 7: Average scores by question type and living situation. Living situation was a significant factor in non-prose and prose questions.

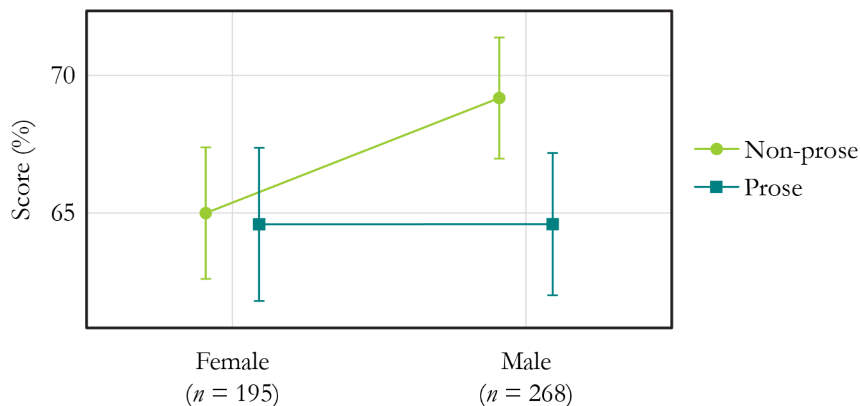


Figure 8: Average scores by question type and gender. Gender was a significant factor only for non-prose question scores. Prose scores are included here for completeness.

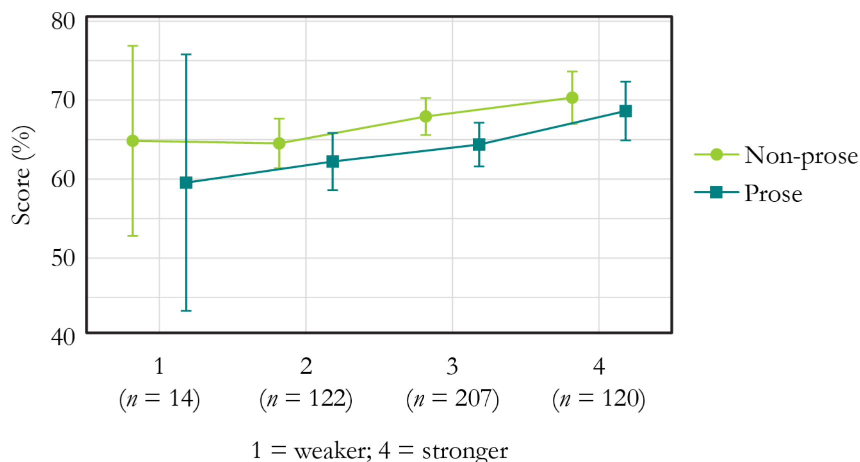


Figure 9: Average scores by question type and self-assessed writing proficiency. Self-assessed writing proficiency was a significant factor in non-prose and prose questions.

The non-prose tilt for each group can be seen in the graphs in Figures 7–9 as the difference in height between the non-prose and prose questions: the higher the non-prose score (the lime green dot) is above the prose score (the dark green square), the greater the non-prose tilt. For example, for

living situation (Figure 7), although students living on campus performed the highest overall on both question types, the non-prose tilt is about the same for those students as those living off campus alone or with roommates, with a similar difference between the two question types, while students living with family have a slightly negative non-prose tilt due to scoring higher on prose questions.

For both living situation and self-assessed writing proficiency, the differences between groups is fairly consistent across both question types, so there is no effect on non-prose tilt. However, gender turns out to be a significant factor for non-prose tilt, which is readily apparent in Figure 8, with female students performing about the same on both types of questions, while male students perform about the same as female students on prose questions, but much higher on non-prose questions. The actual non-prose tilt for these two groups is shown in Figure 10.

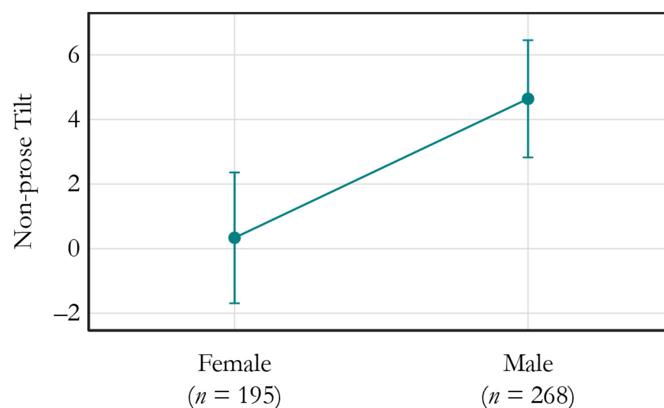


Figure 10: Non-prose tilt by gender.

Discussion

The original motivation for the study was primarily to see if language background might correlate to disproportionately lower scores on prose questions, indicating some sort of bias. For example, we expected to find a bias against non-native English speakers, with them having a higher non-prose tilt than native English speakers. We included other demographic variables to explore other possible factors that may also contribute to a bias in performance on prose questions.

Surprisingly, none of the language-related factors (native English proficiency, multilingualism, international status, and self-reported writing proficiency) are significant factors for non-prose tilt, and most linguistic factors (native English proficiency, multilingualism, and international status) are not significant factors for overall midterm scores or for prose or non-prose questions. The only language-related factor that is significant for any aspect of the analysis is self-assessed writing proficiency: students who self-report a higher writing proficiency perform better on both prose and non-prose questions.

The lack of linguistic bias between prose and non-prose questions is an important and valuable result, because it suggests that *writing questions are indeed fair*. They can be asked and evaluated in a math course in ways that do not disproportionately disadvantage students in the linguistic minority. In the rest of this section, we discuss why this superficially counter-intuitive result may arise, and we also consider some possible explanations for why the non-linguistic factors may contribute to a difference in non-prose tilt between certain groups.

Why Isn't Language Relevant to Non-prose Tilt?

We propose three possible explanations for why language background has no impact on non-prose tilt. First, the *nature of the grading* may have helped minimize biases from the graders. Student exams were anonymized, so graders would not be influenced by student names. The answers were also graded according to a rubric which had graders focus on content rather than gramamr. Furthermore, many of the graders were not native English speakers themselves, so they may have been less attuned to linguistic errors and/or more likely to overlook them.

Second, to be admitted to the university, incoming students who do not speak English as a native language must still demonstrate a *minimum level of fluency* by passing a standardized English test (TOEFL, IELTS, etc.). It may be the case that, when appropriate marking rubrics are used, the university's entry requirements put non-native speakers on a level playing field with native speakers.

These two explanations suggest that careful rubrics and existing university frameworks serve students of diverse language backgrounds equitably. However, it is also possible that students are instead impacted by the *use of English throughout the course*. All course instruction was conducted in English, and all midterm questions were written in English. Thus, students with less proficiency in English could end up with lower performance on all questions regardless of type, due to less effective learning from lectures and/or more difficulty in understanding the midterm questions. If these overall effects are strong enough, they could overshadow any effect of language ability that might be specific only to performance on prose questions.

Regardless, whatever barriers student may face to their performance due to their language background, it seems that prose questions are viable supplements and alternatives to the non-prose questions traditionally used in math courses.

Factors Affecting Absolute Scores Equally

Two factors, living situation and self-assessed writing proficiency, affect the absolute scores for both non-prose and prose questions, but they do so equally, so there is no difference in non-prose tilt. This means that the differences between these groups is not exacerbated or ameliorated by introducing prose questions.

Perhaps the more surprising of these two factors is living situation, but there are some reasonable explanations for why students living on campus perform might better than other students on both question types. For example, students living off campus have to commute, sometimes as much as 2–3 hours each way, so students living on campus may be able to spend more time studying and may be more likely to attend lectures. They may also make greater use of campus resources (office hours, writing centers, study groups, etc.). Given the high cost of campus residence, they may also be more likely to come from families of higher socioeconomic status, which is known to affect academic performance. More research is needed to untangle why living situation appears to have a significant impact on overall scores.

Explaining the correlation between self-assessed writing proficiency on absolute scores is more straightforward: writing skills and math skills co-vary. That is, students who think they can write better are also better at answering math questions. This may simply correlate to academic ability in a broader sense, because students who rate themselves highly on writing may be the students who just do well in all their school subjects. As with living situation, this affects the scores on the two question types roughly equally, and this effect essentially cancels out when looking at non-prose tilt. This is apparent in Figure 9, with the gap between the two question types remaining fairly constant across the four groups, resulting in mostly parallel trend lines.

Although living situation and self-assessed writing proficiency do not affect non-prose tilt, they do relate to performance on both question types, so it is still important that they be addressed. For example, there appears to be sufficient academic support and learning opportunities for students living on campus, so institutions and instructors should explore how they can better support other students, especially those living off campus with family, who have the lowest performance.

Self-assessed writing proficiency should also be taken more seriously. We see evidence that students are actually quite good at assessing their own ability, at least as it correlates to performance. Interestingly, we see that self-assessment of *writing* ability correlates to performance on *mathematical* questions. Perhaps the use of early self-assessments can be used to help identify students who need more or better support for their learning across the board.

Gender

Gender differences in STEM courses is an extensively studied subject (Eddy & Brownell, 2016), which is why we included it as a variable of interest. We find that overall midterm scores are statistically significantly higher for male students (68.3%) than for female students (64.9%), which follows the expected gender gap in STEM.

However, when we analyze the midterm scores separately by question type, we find that male and female students perform *equally* on prose questions (64.6% each). This means that gender differences in overall performance on the midterm exams are due to differences only in the non-prose questions, with male students scoring an average of 69.2% compared to female students with 65.0%. Consequently, this shows up as a difference in non-prose tilt, and indeed, gender was the only factor we looked at that had a statistically significant effect on non-prose tilt.

Research suggests that the gender gap in math is likely not due to innate differences between genders (Friedman, 1989; Hyde, 2014). If true, that could mean that prose questions may be a more equitable way to measure a student's math ability. Further theorizing, it is possible that students' lack of experience with prose questions in comparison to more traditional non-prose questions may put all students on more level ground and reduce the impact of existing biases and attitudes about math.

What do Prose Questions Measure?

A core issue in this analysis is whether (i) prose questions and non-prose questions both measure the same underlying mathematical skills, or whether (ii) these two question types measure distinct skills. Maybe both are true. More research is needed to draw strong conclusions, but we argue that our results support hypothesis (i).

If hypothesis (ii) were correct, we would expect students with a stronger background in English to have a smaller non-prose tilt than those with a weaker background. However, we see no such relationship between non-prose tilt and any linguistic traits. Meanwhile, self-assessed writing ability positively correlates to student performance on *both* prose and non-prose questions, suggesting that self-assessed writing ability may actually correspond to a student's general academic ability rather than writing ability specifically.

Further evidence for hypothesis (i) comes from comparing the two midterm exams to each other. If the skills for each question type were different, we might expect to see differences in improvement over time. For example, students who underperform on prose questions on the first midterm exam may adapt to the question type by the time of the second midterm exam and reduce their non-prose tilt. However, as noted at the outset of this work, our results hold for each midterm exam separately, in the same way. The same factors are significant (or not), to the same extent. Student

performance did indeed improve between the midterm exams, but it did so *uniformly* for all groups and for both question types.

Limitations

As with most educational research, there are many possible confounding variables that may offer alternative interpretations of our data:

- Data on language status and ability is self-reported, and we have evidence of at least some confusion in interpreting the survey questions based on student responses. For example, at least one student marked that they could not speak English, which is a university requirement for all courses.
- There is a selection effect related to who took the survey. About 65% of all students in the course took the survey, and those who did not take the survey scored 8% lower on their midterm exams overall ($p < 0.001$), indicating they are a distinct population.
- Only data from students who took both midterm exams *and* completed the course was analyzed; students who dropped the course may show different results.
- Our university has somewhat unusual demographics, with a large proportion of international students as well as domestic students raised without English as a home language, so these results may not generalize to other situations.

The last point is worth expanding upon. In a pilot phase of data exploration, we had initially assumed that domestic students would overwhelmingly be native speakers of English. However, while most international students in the course were not native English speakers (Mandarin was the most common home language), domestic students were split equally among those with English as a home language and those without. We had hoped to use international student status as a proxy for whether a student was a native English speaker, in order to analyze data from other courses that did not use our demographic survey. However, upon analyzing the survey results, we found that international student status is a poor proxy for whether a student is a native speaker.

Finally, because gender is such a key factor in the analysis, we must note that we are using a binary gender categorization that ignores the nuances of gender identity. The data in our study comes from the gender information provided by the university, and future studies of this type should instead survey gender directly from students.

Conclusion

We sought to determine whether asking prose and non-prose questions in a math course would lead to some groups, but not others, doing better or worse on one of the two types of questions. We were especially interested in whether linguistics factors might play a role, given that prose questions require writing prose answers using full sentences of English.

While we find that some populations do perform better or worse on all questions overall, only gender seems to correlate to a difference in performance between the two question types (that is, significantly affecting the non-prose tilt). Crucially, linguistic factors have no significant effect on scores at all, either within question types or for non-prose tilt. Thus, the kind of prose questions developed in this course do not seem to disadvantage linguistically minoritized students, or any student, based on their language background. Furthermore, prose questions may offer another

possible tool for helping to narrow the gender gap in math. Mathematics instructors interested in providing more equitable assessment should consider adding more prose questions in their courses.

Prose questions must be used cautiously, of course. The questions and rubrics designed for this course turned out to be fair, but this may not always be the case with prose questions. It is important to make sure that the questions are still accessible regardless of a student's language background and that the rubric for grading focuses on content rather than linguistic form.

To answer the question in the title, writing questions are indeed fair. They allow us to test student knowledge in different ways. Where there are disadvantages, they do not vary by question type (prose versus non-prose), but instead may reflect larger social and structural issues within the education system.

Acknowledgements

We thank the audience at the 6th Northeastern Conference on Research in Undergraduate Mathematics Education for their feedback on this work. We thank the students in *Linear Algebra I* for their participation in this project. We thank the Writing-Integrated Teaching Program at the University of Toronto for their partnership, especially Andrea Williams and the Math Department's Lead Writing TAs.

Appendix

Appendix 1: Midterm 1.

A complete copy of Midterm 1, consisting of eight questions. Questions 1c, 1d, and 4 were coded as prose. Questions 1a, 1b, 1e, 2a, 3a–c, 3e, 5a–d, 6a–e, 7a–e, and 8b were coded as non-prose. Questions 2b, 2c, 3d, and 8a were coded as mixed.

1. Complete the following sentences with a mathematically correct definition. No marks will be awarded for a "close" but incorrect definition.
   (a) (2 points) The *span* of the vectors $\vec{v}_1, \vec{v}_2, \vec{v}_3$ is

   (b) (2 points) The vector $\vec{w}$ is a *linear combination* of the vectors $\vec{v}_1, \vec{v}_2, \vec{v}_3$ if

   (c) (2 points) The vectors $\vec{v}_1, \vec{v}_2, \vec{v}_3$ are *linearly dependent* if

   (d) (2 points) A system of equations in the variables x, y, and z is called *inconsistent* if

   (e) (2 points) The vector $\vec{u} \in \mathbb{R}^3$ is a *unit vector* if

2. Consider the system (A) $\begin{cases} 2x_1 + 4x_2 & = -2 \\ x_1 + 2x_2 + \frac{1}{2}x_3 = -\frac{1}{2} \\ -2x_1 - 4x_2 + 3x_3 = 5 \end{cases}$.

In this problem you may use the fact that

$$\operatorname{rref}\left(\begin{bmatrix} 2 & 4 & 0 & -2 \\ 1 & 2 & \frac{1}{2} & -\frac{1}{2} \\ -2 & -4 & 3 & 5 \end{bmatrix}\right) = \begin{bmatrix} 1 & 2 & 0 & -1 \\ 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 0 \end{bmatrix}.$$

(a) (2 points) Write the complete solution to system (A). Express your answer in vector form.

(b) (2 points) If possible, express the complete solution to system (A) using only a span. Otherwise, explain why it cannot be done. (Please mark **Possible** or **Not Possible** in addition to your answer/explanation.)

◯ Possible ◯ Not Possible

(c) (2 points) If possible, write down a system of **exactly two** linear equations in the variables x_1, x_2, x_3 whose complete solution is the same as the complete solution to system (A). Otherwise, explain why it cannot be done. (Please mark **Possible** or **Not Possible** in addition to your answer/explanation.)

◯ Possible ◯ Not Possible

3. For each of the following, mark **Possible** if the described object exists, otherwise mark **Not Possible**. If you marked **Possible**, provide an example. If you marked **Not Possible**, explain why it is not possible.

   (a) (2 points) A *unit* vector $\vec{v}$ such that $\vec{v}$ is orthogonal to $\begin{bmatrix}1\\1\end{bmatrix}$, $\begin{bmatrix}2\\2\end{bmatrix}$, and $\begin{bmatrix}0\\0\end{bmatrix}$.

   ◯ Possible ◯ Not Possible

   (b) (2 points) A *consistent* system of three linear equations in two variables.

   ◯ Possible ◯ Not Possible

   (c) (2 points) Distinct vectors $\vec{a}, \vec{b} \in \mathbb{R}^2$ such that span$(\{\vec{a}, \vec{b}\})$ is a *line*.

   ◯ Possible ◯ Not Possible

   (d) (2 points) Distinct vectors $\vec{a}, \vec{b}, \vec{c} \in \mathbb{R}^2$ such that $\{\vec{a}, \vec{b}, \vec{c}\}$ is linearly *independent*.

   ◯ Possible ◯ Not Possible

   (e) (2 points) A non-zero vector $\vec{v}$ such that $\vec{v}$ is orthogonal to *every* vector in the set $Z = \{\vec{p} \in \mathbb{R}^3 : \text{the coordinates of } \vec{p} \text{ sum to zero}\}$.

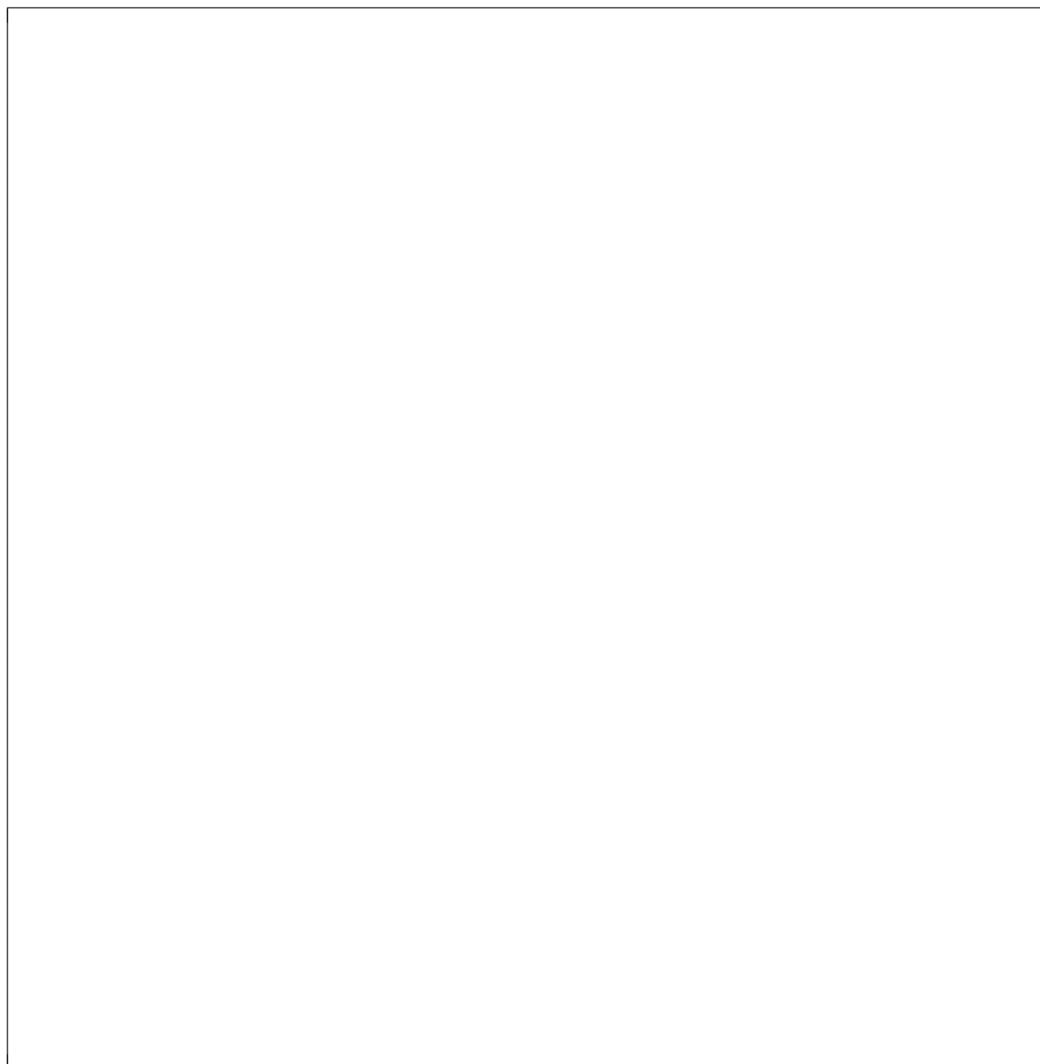
   ◯ Possible ◯ Not Possible

4. (6 points) Let $\vec{v} \in \mathbb{R}^2$ and define $A = \{\vec{v}\}$. Sally and Mir are discussing whether A must be a linearly independent set.

    Sally thinks no: A cannot be linearly independent. Because $\vec{v} \in \operatorname{span}(\{\vec{v}\})$, by the geometric definition of linear dependence, $\vec{v}$ is a "redundant" vector. Therefore A contains a redundant vector, and so A is linearly dependent.

    However, Mir disagrees: A *must* be linearly independent because $\operatorname{span}(\{\})$ contains no vectors. Therefore $\vec{v} \notin \operatorname{span}(\{\})$, and so by the geometric definition, A is not linearly dependent, therefore A is linearly independent.

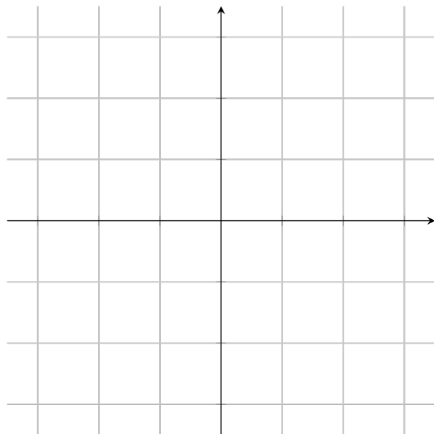
    Explain to Sally and Mir, using complete English sentences, whether A must be a linearly independent set. Your explanation must (i) include relevant definitions, and (ii) point out where Sally's and Mir's reasoning is correct/incorrect.



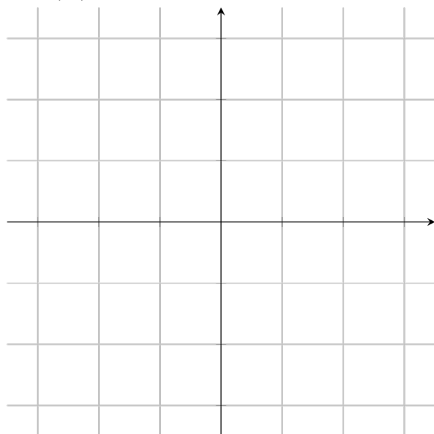
5. Let $B = \left\{ \begin{bmatrix} 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 1 \\ 0 \end{bmatrix}, \begin{bmatrix} 0 \\ 1 \end{bmatrix}, \begin{bmatrix} 1 \\ 1 \end{bmatrix} \right\}$ and let $\vec{\boldsymbol{k}} = \vec{e}_1 + \vec{e}_2$, where $\vec{e}_1, \vec{e}_2$ are the standard basis vectors for $\mathbb{R}^2$. Further, let $U = \left\{ \vec{u} \in \mathbb{R}^2 : \|\vec{u}\| = 2 \text{ and } \{\vec{u}, \vec{\boldsymbol{k}}\} \text{ is linearly } \textbf{\textit{independent}} \right\}$.

   Draw the following subsets of $\mathbb{R}^2$.

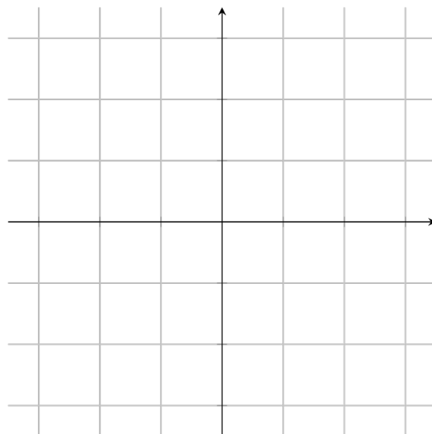
   (a) (2 points) A line $\ell \subseteq \mathbb{R}^2$ that ***cannot*** be expressed as a span.



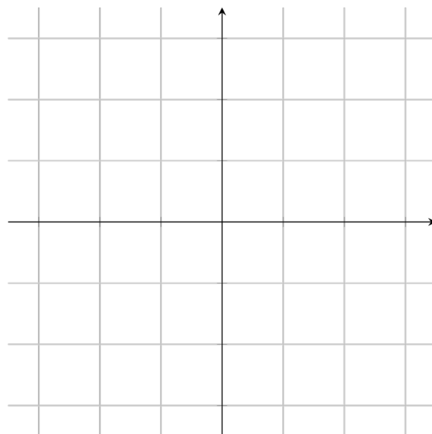
   (b) (2 points) A linearly ***dependent*** set $Y = \{\vec{a}, \vec{b}, \vec{c}\}$, consisting of three vectors, such that $\text{span}(Y)$ is a line.



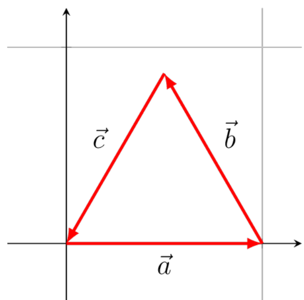
   (c) (2 points) U



   (d) (2 points) A set X such that $B + X$ consists of *exactly* six points. (Draw X, not $B + X$.)



6. Let $\vec{a}, \vec{b}, \vec{c} \in \mathbb{R}^2$ be ***unit*** vectors drawn below.



(a) (2 points) For $\vec{x} \in \{\vec{a}, \vec{b}, \vec{c}\}$, which $\vec{x}$ make $\vec{a} \cdot \vec{x}$ **positive**? Mark all that apply.

○ $\vec{a}$ ○ $\vec{b}$ ○ $\vec{c}$ ○ None of these

(b) (2 points) For $\vec{x} \in \{\vec{a}, \vec{b}, \vec{c}\}$, which $\vec{x}$ make $\vec{a} \cdot \vec{x}$ **negative**? Mark all that apply.

○ $\vec{a}$ ○ $\vec{b}$ ○ $\vec{c}$ ○ None of these

(c) (2 points) For $\vec{x} \in \{\vec{a}, \vec{b}, \vec{c}\}$, which $\vec{x}$ make $\vec{a} \cdot \vec{x}$ **zero**? Mark all that apply.

○ $\vec{a}$ ○ $\vec{b}$ ○ $\vec{c}$ ○ None of these

(d) (2 points) Which of the following vector equations are **consistent**? Mark all that apply.

○ $t\vec{a} + s\vec{b} = \vec{c}$ ○ $t\vec{a} + s\vec{b} = \vec{0}$ ○ $t\vec{a} = -\vec{b}$ ○ None of these

(e) (3 points) Let $\ell \subseteq \mathbb{R}^2$ be the line segment from $\vec{0}$ to $2\vec{a}$ (including its endpoints). Express ℓ in set-builder notation.

$$\ell = \left\{ \qquad \right\}$$

Scratch work:

7. Let $\vec{v}_1 = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}$, $\vec{v}_2 = \begin{bmatrix} 1 \\ a \\ 0 \end{bmatrix}$, and $\vec{v}_3 = \begin{bmatrix} b \\ b \\ b \end{bmatrix}$ for unknown constants $a, b \in \mathbb{R}$ which satisfy $a \geq 1$ and $b \leq 1$.

   For each question below mark

   - **ALWAYS TRUE** if the statement is always true,
   - **ALWAYS FALSE** if the statement is always false **or** if the statement does not make mathematical sense, and
   - **DEPENDS ON** $\boldsymbol{a/b}$ if the statement could be true or could be false, depending on the values of a and/or b.

   No justification is needed.

   (a) (2 points) $\begin{bmatrix} 2 \\ 0 \\ 0 \end{bmatrix} \in \mathcal{P}$ where $\mathcal{P}$ is given in vector form by $\vec{x} = t\vec{v}_1 + s\vec{v}_2$.

   ◯ **ALWAYS TRUE** ◯ **ALWAYS FALSE** ◯ **DEPENDS ON** $\boldsymbol{a/b}$

   (b) (2 points) The line $\ell = \operatorname{span}\{\vec{v}_1\}$ can be written in vector form as "$\vec{x} = t\vec{v}_1$ for some $t \in \mathbb{R}$".

   ◯ **ALWAYS TRUE** ◯ **ALWAYS FALSE** ◯ **DEPENDS ON** $\boldsymbol{a/b}$

   (c) (2 points) $\operatorname{span}\{\vec{v}_1, \vec{v}_2, \vec{v}_3\} = \mathbb{R}^3$.

   ◯ **ALWAYS TRUE** ◯ **ALWAYS FALSE** ◯ **DEPENDS ON** $\boldsymbol{a/b}$

   (d) (2 points) $\operatorname{span}\{\vec{v}_1, \vec{v}_2, \vec{v}_3\} = \mathbb{R}^2$.

   ◯ **ALWAYS TRUE** ◯ **ALWAYS FALSE** ◯ **DEPENDS ON** $\boldsymbol{a/b}$

   (e) (2 points) The set $\{\vec{v}_1, \vec{v}_2\}$ is linearly **independent**.

   ◯ **ALWAYS TRUE** ◯ **ALWAYS FALSE** ◯ **DEPENDS ON** $\boldsymbol{a/b}$

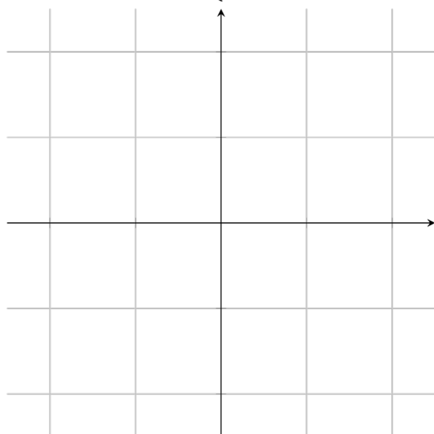
8. In this question, you will work with a new definition.

   Let $K \subseteq \mathbb{R}^2$. The set K is called $(1,1)$-*independent* if the vector $\begin{bmatrix}1\\1\end{bmatrix}$ can be written *uniquely* as a linear combination of vectors in K.

   (a) (3 points) Is $\left\{\begin{bmatrix}1\\2\end{bmatrix}, \begin{bmatrix}2\\1\end{bmatrix}\right\}$ a $(1,1)$-independent set? Mark **Yes** or **No** in addition to justifying your answer.

   ◯ Yes ◯ No

   (b) (2 points) Let $X = \left\{\vec{v} \in \mathbb{R}^2 : \text{ the set } \{\vec{v}\} \text{ is } (1,1)\text{-independent}\right\}$. Draw X.



Appendix 2: Midterm 1 Rubric.

Reproduced below is the rubric given to TAs, including instructions. In addition to the provided rubric, TAs were spot-checked in their marking by the marking coordinators and asked to redo any marking that was inconsistent or did not fit the rubric.

- Please use the rubric items provided. Do **not** change a rubric item without the permission of your marking coordinator (changing an item will change it for all tests simultaneously).
- If you feel like the rubric items don't fit well with the answers your seeing, talk to your marking coordinator about creating new/modifying the rubric items.
- If you need to add a one-off comment to a booklet, use the comment box at the bottom of the page. Do not attach points to your comment (all points must come from rubric items).
- Use the keyboard shortcuts! You will save a lot of time. See the cheatsheet on the top right corner from any grading page.

Grading scheme

1. (2 points each) Please read the definitions carefully. **We will not give any points for a "close" but incorrect correct definition.** For each part give:
   - 2 points for a correct definition
   - 0 points otherwise.
   - (a) Saying "all linear combinations" is worth 0. Saying "the **set** of all linear combinations of $\vec{v}_1, \vec{v}_2, \vec{v}_3$" is worth full points.
   - (b) 0 points if they omitted a quantifier.
   - (d) "there is a solution to the system" is worth full points.
   - (e) 0 points if they wrote "$\sqrt{u_1^2 + u_2^2 + u_3^2}$" if they didn't define what u_1, u_2, and u_3 were.

2.

(a) (2 points)

- 2 points for a correct answer written in vector form. If they write $\{\vec{x} : \vec{x} = t\vec{d} + \vec{p}$ for some $t\}$ (as long as the vectors are correct and the variable is quantified correctly) give full points.
- Give them 1 point if they write a correct solution to the system in a different form.
- 0 points otherwise.
- 0 points if they added a quantifier "for some" or "for all" to their vector-form equation.

(b) (2 points)

- 1 point for saying "No".
- 1 point for correct reasoning.

(c) (2 points)

- 1 point for saying "Yes".
- 1 point for correct example.

3. (2 points each)

Parts (d)

- 1 point for saying that it is impossible.
- 1 point for a correct explanation.

Parts (a),(b),(c),(e).

- 2 points for a correct example.
- 0 otherwise.

4. (6 points)

- Mathematics (3 points, minimum of 0) To get these points, a student must include relevant definitions and have a correct explanation. Deduct points as follows:
  −1pt for not including the definition of linear independence.
  −1pt for not correctly showing when A is linearly independent.
  −1/2pt for not explaining what part of Sally's reasoning is incorrect.
  −1/2pt for not explaining what part of Mir's reasoning is incorrect.
  −1/2pt for not explaining what part of Sally's reasoning is correct.
  −1/2pt for not explaining what part of Mir's reasoning is correct.
- Presentation (3 points, minimum of 0) To get these points, a student must provide a well written response with a logical flow. Deduct points as follows:
  −1pt for an answer that is difficult to follow.
  −1pt for an answer that is incorrect but is well written.
  −2pt for an answer that is very difficult to understand or is not written in complete sentences.
  −2pt for an answer that did not include a sufficient amount of detail to answer the question.

5. (2 points each)

- 2 points for a correct answer.
- 0 points otherwise.

Note: if their drawing is unclear and e.g., you can't tell what's a line segment and what's a vector, give them 0 with a comment explaining. If they indicated clearly but it is *close* to being unclear, give them full points, but add a comment.

6.

(a)–(d) (2 points)

- 2 points for circling **all** correct answers.
- 0 points otherwise.

(e) (3 points)

- 3 points for a correct set.
- 0 points for any errors.

Note: if they add their own set brackets, and have inadvertently written $\{\{\vec{v} : \dots\}\}$ do not take off any points.

7. (2 points each)

- 2 points for a correct answer.
- 0 points otherwise.

8.

(a) (2 points)

- 1 points for specifying "Yes"
- 2 points for a good explanation that is well written.
- 0 points otherwise.

(b) (2 points)

- 2 points for a correct drawing.
- 0 points otherwise.

Note: if $\vec{0}$ is included in their drawing, it is incorrect. They may have used words to further explain what is happening in their drawing. Please read the supporting words if there are any.

References

Akaike, H. (1974). A new look at the statistical model identification. *IEEE Transactions on Automatic Control*, *19*(6), 716-723. doi: 10.1109/TAC.1974.1100705

Becker, D., Coyle, T. R., Minnigh, T. L., & Rindermann, H. (2022). International differences in math and science tilts: The stability, geography, and predictive power of tilt for economic criteria. *Intelligence*, *92*(May–June), 101646.

Coyle, T. R., Snyder, A. C., & Richmond, M. C. (2015). Sex differences in ability tilt: Support for investment theory. *Intelligence*, *50*, 209–220.

Eddy, S. L., & Brownell, S. E. (2016). Beneath the numbers: A review of gender disparities in undergraduate education across science, technology, engineering, and math disciplines. *Physical Review Physics Education Research*, *12*(2), 020106.

Friedman, L. (1989). Mathematics and the gender gap: A meta-analysis of recent studies on sex differences in mathematical tasks. *Review of Educational Research*, *59*(2), 185–213. doi: 10.2307/1170414

Grayson, J. P. (2009). Language background, ethno-racial origin, and academic achievement of students at a Canadian university. *International Migration*, *47* (2), 33–67.

Hunt, E., & Wittmann, W. (2008). National intelligence and national prosperity. *Intelligence*, *36*(1), 1–9.

Hyde, J. S. (2014). Gender similarities and differences. *Annual Review of Psychology*, *65*, 373-398. doi: 10.1146/annurev-psych-010213-115057

Kahan, D. M., Peters, E., Wittlin, M., Slovic, P., Ouellette, L. L., Braman, D., & Mandel, G. (2012). The polarizing impact of science literacy and numeracy on perceived climate change risks. *Nature Climate Change*, *2*(10), 732–735. doi: 10.1038/nclimate1547

Kuznetsova, A., Brockhoff, P. B., & Christensen, R. H. B. (2017). lmerTest package: Tests in linear mixed effects models. *Journal of Statistical Software*, *82*(13), 1–26. doi: 10.18637/jss.v082.i13

McArthur, C., Graham, S., & Fitzgerald, J. (2006). *The handbook of writing research*. New York, NY: Guilford Press.

Menary, R. A. (2007). Writing as thinking. *Language Sciences*, *29*(5), 621–632.

Moore, R. C. (2016). Mathematics professors' evaluation of students' proofs: A complex teaching practice. *International Journal of Research in Undergraduate Mathematics Education*, *2*(2), 246–278.

Munir, F. M., & Winter-Ebmer, R. (2018). Decomposing international gender test score differences. *Journal for Labour Market Research*, *52*, 12.

National Commission on Writing in America's Schools & Colleges. (2003). *The neglected "R": The need for a writing revolution*. New York, NY: The College Board.

National Institute for Literacy. (2007). *What content-area teachers should know about adolescent literacy*. Washington, DC: National Institute for Literacy.

NCTM. (2008). *Principles and standards for school mathematics* (5th ed.). Reston, VA: National Council of Teachers of Mathematics.

Pugalee, D. K. (2005). *Writing to develop mathematical understanding*. Norwood, MA: Christopher-Gordon.

R Core Team. (2020). R: A language and environment for statistical computing [Computer software manual]. Vienna, Austria. Retrieved from https://www.R-project.org.

Seto, B., & Meel, D. E. (2006). Writing in mathematics: Making it work. *Problems, Resources, and Issues in Mathematics Undergraduate Studies*, *16*(3), 204–232.

Turner, S. E., & Bowen, W. G. (1999). Choice of major: The changing (unchanging) gender gap. *Industrial and Labor Relations Review*, *52*(2), 289–313.

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Moving Beyond Intelligence: Predicting Academic Behaviors and Official GPA in Undergraduate Students with Implicit Theories

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Abstract: People view many attributes, including intelligence, through implicit theories (or mindsets). Entity mindsets position the attribute as unchangeable or static, whereas incremental mindsets see the attribute as malleable or capable of being changed/improved (Dweck & Leggett, 1988). The present studies examined a new questionnaire designed to measure implicit theories of academic success in undergraduate students (the Academic Beliefs Scale, ABS) and its relationship to academic achievement (specifically grade point average, GPA). In Study 1, a negative relationship between the entity theory of academic success and GPA was mediated by poor study habits, procrastination, and self-handicapping while the positive relationship between the incremental theory of academic success and GPA was mediated by poor study habits. In Study 2A and 2B, the validity and reliability of the ABS were evaluated, with generally satisfactory findings. Study 2B also conceptually replicated the findings of Study 1, finding that another unique set of behaviors, good academic habits, mediated the relationship between the incremental theories of academic success and GPA. Future research with undergraduates should continue to examine implicit theories of academic success as a predictor of additional academic outcomes and the psychometric properties of the ABS.

Keywords: implicit theories, academic achievement, undergraduates, academic behaviors, Mindset

Undergraduate students' academic success is of interest to multiple people – students themselves, their parents, professors, administrators, and those financing students' educations. On average, individuals who earned a bachelor's degree had lower unemployment rates and a median weekly income almost $600 more than those who earned a high school diploma (U.S. Bureau of Labor Statistics, 2023). However, only 64% of first time, full-time undergraduate students (undergraduates) who start at a 4-year-college will earn a bachelor's degree within 6 years (National Center for Education Statistics, 2020). Given that it is important to succeed in, and graduate from, college and not just attend college for some period of time (Giani et al., 2019), it is important to examine predictors of academic success in hopes of developing appropriate interventions aimed at improving key outcomes, such as graduation.

The implicit theories of intelligence are a promising starting point, as research has found they have multiple implications for academic achievement. Dweck and Leggett (1988) refer to implicit theories as core assumptions, or beliefs, that shape the ways in which individuals think about

themselves and the world. These beliefs influence the goals people set, as well as the emotions they experience while working towards those goals. The belief that intelligence is changeable is referred to as having an *incremental* theory of intelligence, or a growth mindset, whereas the belief that intelligence is unchangeable is referred to as an *entity* theory of intelligence, or a fixed mindset (Dweck & Leggett, 1988). These theories are thought to predict student behaviors that, in turn, are predictive of academic achievement. A substantial amount of research has supported these theories, examining the effects of implicit theories of intelligence on academic outcomes, including multiple meta-analyses (e.g., Burnette et al., 2013; Costa & Faria, 2018; Sisk et al., 2018). Research also suggests that the environment or culture around people influences the way in which peoples' implicit theories are displayed and their relationship with relevant outcomes (Murphy & Dweck, 2010). For example, in a study of high school students across 78 countries, the link between growth mindset and academic achievement varied by whether there was a social norm endorsing more fixed or growth mindset (Lou & Li, 2022). In a sample of undergraduate students, both perceived peer implicit theories as well as one's own implicit theories predicted academic experiences and behaviors (Muenks & Yan, 2024). Although the average correlation between the incremental theory of intelligence and academic achievement found in meta-analytic studies is weak overall (between .10 - .12), it varies by age (Costa & Faria, 2018; Sisk et al., 2018). Sisk et al. (2018) found the average correlation between incremental theory of intelligence and academic achievement was only significant for children and adolescents, not adults. Of the studies included in their meta-analysis (including multiple unpublished studies conducted with undergraduates) only 37% found the expected positive relation; six percent found negative correlations between the incremental theory of intelligence and achievement[1]. Intervention research with undergraduates has also found mixed results, with interventions having varying impacts based on the outcome variable being measured (Sarrasin et al., 2018; Burnette et al., 2023). For example, Miller and Srougi (2021) found that a growth mindset intervention did improve academic performance, but ironically did not change actual implicit theories of intelligence in a sample of undergraduate biochemistry majors.

One potential explanation for the stronger relationship between the incremental theory of intelligence and academic achievement in children and adolescents compared to undergraduates and adults may lie in the difference between kindergarten – 12th grade (K – 12) education and higher education. For instance, while intelligence may accurately predict success in K – 12 contexts where intelligent children's high test scores alone may lead to good grades, innate ability is frequently insufficient to succeed in undergraduate courses which require students take responsibility for their learning and work (e.g., submitting assignments on time, following guidelines). A meta-analysis conducted by Schneider and Preckel (2017) found that while intelligence did predict achievement in higher education and had the 30th highest ranking in terms of effect size, multiple student strategy variables had stronger associations (e.g., goal setting (rank 5), class attendance (rank 6), persistence/effort (rank 13)).

Given the promising results of research on implicit theories of intelligence in K – 12 but the mixed results in undergraduates, our intention was to add to the literature on implicit theories by evaluating if implicit beliefs about academic success correlate with student behaviors and predict academic achievement. Many researchers have applied Dweck and Leggett's (1988) original framework of incremental and entity implicit theories to additional constructs successfully, including romantic beliefs (Knee, 1998), human character/personality (Hong et al., 2003), and health (Schreiber et al., 2020). Therefore, we created a measure of implicit theories of academic success, the Academic Beliefs Scale (ABS), that reflects the environment of college and undergraduates' expectations (i.e., beliefs about succeeding in class), with the intention of measuring the entity and incremental implicit belief

[1] We also found a negative correlation between the incremental theory of intelligence and GPA in a pilot study.

constructs first delineated by Dweck and Leggett (1988) and subsequently found in other measures of implicit beliefs.

Study 1

In the first study we set out to examine the implicit theories of academic success and determine whether they would significantly predict academic achievement as well as determine their relationships with three behaviors previously found to influence academic achievement in undergraduates: effective study skills and attitudes (Credé & Kuncel, 2008), academic self-handicapping (Schwinger et al., 2014), and procrastination (Kim & Seo, 2015); all are described in more detail in the Methods section. Furthermore, we sought to examine if the relations between the implicit theories of academic success and GPA would be mediated by these self-reported behavioral variables.

Hypotheses

1. Students' implicit theories of academic success will be significantly correlated with GPA, with (a) incremental beliefs positively correlated and (b) entity beliefs negatively correlated with GPA.
2. The incremental theory of academic success will be negatively correlated with procrastination and self-handicapping, and positively correlated with study habits.
3. The entity theory of academic success will be positively correlated with procrastination and self-handicapping, and negatively correlated with study habits.
4. The relationships between the entity theory of academic success and GPA and between the incremental theory of academic success and GPA will be statistically mediated by academic behaviors (procrastination, self-handicapping, and study habits).

See Table 1 for all predicted correlations and summary results for Studies 1, 2A, and 2B.

Table 1. Hypothesized Correlations and Results Across Studies

Variable	Correlated with:	Hypothesized correlation	Study 1 correlation	Study 2A correlation	Study 2B correlation
Entity theory of academic success	Incremental theory of academic success	Negative	-.19**	-.28***	-.22***
	GPA	Negative	-.30***		-.15**
	Self-handicapping	Positive	.25***		
	Procrastination	Positive	.17**		
	Study habits	Negative	-.32***		
	Good academic habits	Negative			-.21***
	Problematic academic behaviors	Positive			.24***
	Incremental theory of intelligence	Negative	-.17**	-.35***	
	Entity theory of intelligence	Positive		.42***	
	Growth theory of intelligence	Negative		-.23***	
	Destiny theory of romantic beliefs	Positive		.33***	

Variable	Correlated with:	Hypothesized correlation	Study 1 correlation	Study 2A correlation	Study 2B correlation
	Growth theory of romantic beliefs	Negative		-.21***	
	Academic locus of control[a]	Positive		.33***	
Incremental theory of academic success	GPA	Positive	.06		.22***
	Self-handicapping	Negative	-.06		
	Procrastination	Negative	-.05		
	Study habits	Positive	.29***		
	Good academic habits	Positive			.34***
	Problematic academic behaviors	Negative			-.09
	Incremental theory of intelligence	Positive	.11	.32***	
	Entity theory of intelligence	Negative		-.20***	
	Growth theory of intelligence	Positive		.40***	
	Destiny theory of romantic beliefs	Negative		.16***	
	Growth theory of romantic beliefs	Positive		.43***	
	Academic locus of control[a]	Negative		-.26***	

[a] High scores on academic locus of control indicated external locus of control orientation.
Note. Blank cells indicate variables that were not measured in that study. $^{**}p<.01$, $^{***}p<.001$.

Method

Sample

The initial sample was comprised of 268 undergraduates at a large public university in the southern United States who participated for class credit. Eighteen students were removed from analyses: two for failure to follow directions, eight due to computer malfunctions, and eight due to research assistant error.

The final sample (N = 250) was comprised primarily of freshmen (74%) and female participants (72%). Participants' ages ranged from 18 to 28 years (M = 19.18, SD = 1.35), with one participant failing to provide their age. The majority (71.2%) identified as White (not of Hispanic origin), 18.8% identified as African-American, and the remaining students identified as other ethnicities. A small percentage reported being first-generation college students (15.2%).

Measures

Demographics

Participants completed a brief questionnaire to obtain information including their age and ethnic identity.

GPA

Official end-of-the-semester GPAs were obtained from the University Registrar's office. End-of-the-semester GPAs were used to ensure all students' GPAs were based on the same time-period instead of cumulative academic performance over varying lengths of time. GPAs were reported on a 4.0-point scale ranging from 0.00 (*F*) to 4.00 (*A*).

Incremental Theory of Intelligence

Students' implicit theories of intelligence were assessed using the Theories of Intelligence Scale (TIS) – Self Form for Adults (Dweck, 1999). This scale consists of four incremental and four entity theory statements. Scores on the incremental theory statements were reverse-scored and all items were averaged to obtain a score from 1 (*pure entity theory*) to 6 (*pure incremental theory*) (see Rickert et al., 2014).

Study Habits

Students' study habits were assessed with the 24-item Work Habits Subscale from the original Survey of Study Habits and Attitudes (SSHA; Brown & Holtzman, 1955, 1966). This subscale measures behaviors such as being organized, seeking assistance when needed, active engagement in recall while studying, and completing work on time and according to directions. Eight items were reverse-scored and all items were averaged so that higher scores on the 5-point scale reflect better study habits.

Self-handicapping

Students' self-handicapping behaviors were measured using the Patterns of Adaptive Learning Scales 6-item Academic Self-Handicapping Subscale (Midgley et al., 2000). Academic self-handicapping refers to engaging in behaviors that increase the likelihood of doing poorly on academics so that if they do, they have an excuse other than a lack of ability (e.g., staying up late the night before an exam) (Midgley et al., 2000). Items were averaged such that higher scores on the 5-point scale indicate higher levels of self-handicapping behaviors.

Procrastination

Students' procrastination behaviors were measured with the 35-item Tuckman's Procrastination Scale (Tuckman, 1991). Procrastination refers to waiting to engage in, or avoiding, a task under the person's control. Ten items were reverse-scored and all items were summed (range 35 – 140), such that higher scores indicate higher levels of procrastination.

Incremental and Entity Theories of Academic Success

A new measure was created, entitled the Academic Beliefs Scale (ABS), by generating 22 statements reflecting incremental and entity beliefs about academic success that college students are likely to have (see Table 2 for the full list of statements). Participants indicated their agreement with each statement using a 7-point Likert-type scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). Through consultation with four colleagues familiar with implicit theories and/or higher education pedagogy, we determined the measure had good face validity for assessing academic beliefs in undergraduates.

Table 2. Academic Beliefs Scale Items and Loadings for Study 2A

Factor	Item	Factor Loading
Entity Theory of Academic Success	Someone's GPA is either destined to be above a 3.0 (B-average) or it is not.	1.71
	If someone does not understand class material in the first week, they will inevitably fail the class.	1.53
	Whether someone succeeds or fails in the class is destined from the very beginning.	1.42
	People cannot learn how to learn.	1.32
	To learn a new topic, it must seem easy / effortless from the start.	1.29
	Struggling with class material at the beginning of a semester is a sure sign that someone will have trouble learning other material in the class.	1.27
	People don't have all that much control over their GPA.	1.18
	Someone is either smart or they are not.	1.15
	Early troubles in class signify that the person will not do well in that class.	1.13
	If someone cannot learn something right away, they will never be able to learn it.	1.00
	Except for required classes, people should only take classes in topics that they are naturally good at.	.79
	Challenges in a class will bring your grade and GPA down.	.63
Incremental Theory of Academic Success	Learning requires hard work, challenging oneself, and changing one's approach when needed.	2.56
	Even smart people may struggle learning new material.	2.22
	Doing well in a class requires quality effort.	2.18
	Assignments that challenge people to think deeply are needed to learn that information.	1.96
	It takes both wise use of time and quality effort to cultivate a GPA above a 3.0 (B-average).	1.90
	Challenges / difficulties in a class actually help people learn.	1.71
	Having a GPA above a 3.0 (B-average) is mostly a matter of trying your hardest.	1.64
	With enough effort, anyone can graduate with a 4.0 GPA.	1.24
	If someone is struggling with class material, they just need to make some changes in order to improve.	1.00
	People often fail classes because they do not try hard enough.	.95
	Without difficulty from time to time, one can never learn anything new.	.85
	Some people just "get it", while the rest struggle to learn new material.	

Removed items	Getting an "A" or a "B" in class is mostly a matter of finding a professor with a teaching style that is compatible with your learning style.

Procedure

The study was conducted during in-person lab sessions with approval from the University's Institutional Review Board (IRB). Participants signed in, reviewed an informed consent letter, and signed a FERPA release granting the researchers permission to later obtain that semester's GPA from the Registrar's office. After verifying their student ID number, they were given a study ID number to later match their survey data to their GPA. Participants completed the measures online on Qualtrics. To reduce the possibility of participants rushing to leave, they were informed they were required to stay for the entire thirty minutes and reminded to take their time answering. Participants were given course credit for their participation.

Results

Psychometric Analysis

To check if the dimensions underlying the ABS items were consistent with theory and the intent of the measure, exploratory factor analysis (EFA) was conducted in Mplus v8 (Muthén & Muthén, 1998-2017) using the default Geomin rotation approach. Given both positive and negative skewness observed on most items, we compared the model fit treating all items as continuous and as ordered categorical (i.e., ordinal) variables. There was a better model fit when the ABS items were defined as ordered categorical; therefore, all model results treat the items as ordered categorical.

The results of the EFA were evaluated to determine the best factor fit for the data. The scree plot showed three factors had an eigenvalue over 1.0, and the elbow of the scree plot also indicated the possibility of a third factor. The model fits for a one-, two-, and three-factor model are shown in Table 1 of the supplementary materials. Model fit was evaluated according to the criteria outlined by Byrne (2006). Following these guidelines, the one-factor model demonstrated very poor fit, the two-factor model demonstrated an acceptable fit, and the three-factor model demonstrated a better fit (e.g., CFIs = .76, .90, and .93, respectively). However, examination of the loadings from the three-factor model revealed the loadings on the third factor were low (most of them < .30) and several items demonstrated substantial cross-loadings on the other factors, indicating the third factor did not represent a distinct conceptual factor. Furthermore, a parallel analysis, as recommended by O'Connor (2000) suggested only two factors should be retained. Five items were removed due to cross-loadings and the two factors were labeled the Entity Theory of Academic Success and the Incremental Theory of Academic Success.

Next, a confirmatory factor analysis (CFA) of the two-factor model was conducted to evaluate if it demonstrated acceptable fit, which it did, $\chi^2(188) = 346.44$, $p < .001$, CFI = .92, TLI = .91, RMSEA = .09 (see Table 2 in the supplementary materials for factor loadings of each item). Thus, consistent with the theory of, and existing research on, implicit theories, the ABS measures two unique factors: students' entity and incremental theories of academic success.

We calculated the raw, summed score of the items for each factor, yielding two total scores, one each for Entity and Incremental Theory of Academic Success (Cronbach's alphas .84 and .71, respectively).

Hypothesis Testing

To examine Hypotheses 1-3, a series of correlation analyses were conducted. See Table 3 for descriptive statistics and correlations among all study variables for Study 1. As hypothesized, the entity theory of academic success was significantly negatively correlated with GPA and good study habits, and significantly positively correlated with self-handicapping and procrastination. The incremental theory of academic success showed a more mixed pattern. It was a significantly and positively correlated with good study habits, as predicted, but was not related to GPA, self-handicapping, or procrastination.

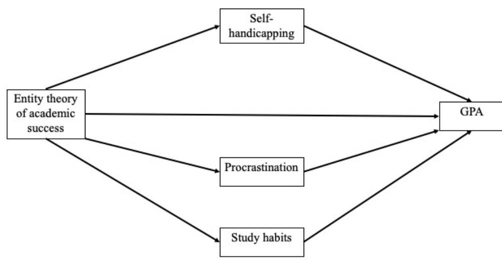
Table 3. Descriptive Statistics and Correlations among Major Study Variables for Study 1

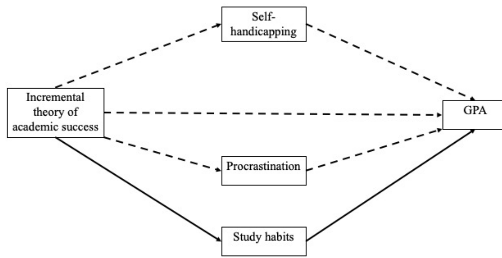
Variable	1	2	3	4	5	6	7
1. GPA	-						
2. Entity theory of academic success	-.30***	-					
3. Incremental theory of academic success	.06	-.19**	-				
4. Self-handicapping	-.28***	.25***	-.06	-			
5. Procrastination	-.18**	.17**	-.05	.43***	-		
6. Study habits	.27***	-.32***	.29***	-.35***	-.58***	-	
7. Incremental theory of intelligence	.03	-.17**	.11	-.05	-.10	.12	-
Mean	3.00	24.81	37.52	2.28	37.52	3.36	4.22
Standard deviation	.74	9.48	6.77	.96	9.38	.40	.88
n	249	250	250	250	250	250	250

*p<.05, **p<.01, ***p<.001.

To examine Hypothesis 4, a series of multiple mediation analyses were conducted predicting GPA from each implicit theory of academic success variable with three mediators: self-handicapping, procrastination, and study habits. The multiple mediation analyses were conducted using percentile bootstrap tests (e.g., Fritz et al., 2012) via the PROCESS macro (Hayes, 2018) in SAS 9.4, which have demonstrated the best balance between power and Type I error prevention in sample sizes similar to the current study. The path coefficients for all direct effects are presented in Table 3 of supplemental materials.

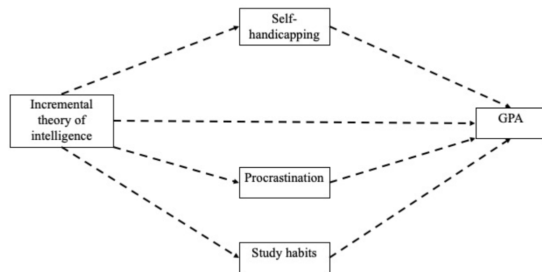
As can be seen in Figure 1, the relationships between the implicit theories of academic success (both incremental and entity) and GPA were statistically mediated by the academic behaviors of procrastination, self-handicapping, and study habits. When the predictor was participant's entity theory of academic success, the indirect paths through self-handicapping, procrastination, and study habits were statistically significant, (95% CIs [.01, .04], [.05, .29], and [-.02, -.01], respectively). The total indirect effect was also significant, 95% CI [-.01, -.003]. When the predictor was participants' incremental theory of academic success, only the indirect path through study habits was statistically significant, 95% CI [.01, .03] whereas the indirect paths through self-handicapping 95% CI [-.03, .01] and procrastination 95% CI [-.25, .10] were not statistically significant. However, the total indirect effect was significant, 95% CI [.003, .02]. Thus, hypothesis 4 was supported for both implicit theories of academic success.





Caption: Relation between entity theory of academic success and GPA is mediated by self-handicapping, procrastination, and study habits, with all indirect paths significant.

Caption: Relation between incremental theory of academic success and GPA is mediated by self-handicapping, procrastination, and study habits, with only the indirect path through study habits significant.



Caption: Relation between incremental theory of intelligence and GPA is not mediated by self-handicapping, procrastination, and study habits.

Figure 1. Mediation Models for Study 1.
Note. Bold lines indicate significant indirect paths through the mediators, dashed lines indicate non-significant indirect paths through the mediators. The total indirect effects for the entity and incremental theories of academic success were significant but the total indirect effect for the incremental theory of intelligence was non-significant.

Finally, we examined the correlations between academic achievement, student behaviors, and the Theories of Intelligence Scale (TIS, Dweck, 1999) given the inconsistent findings seen in previous studies. The incremental theory of intelligence was not significantly correlated with GPA and was only significantly correlated with the entity theory of academic success. Further, self-handicapping, procrastination, and study habits did not significantly mediate the relation between the incremental theory of intelligence and GPA. When participants' incremental theory of intelligence was the

predictor, none of the indirect paths were significant: 95% CI [-.19, .08] for self-handicapping, 95% CI [-2.22, .44] for procrastination, and 95% CI [-.01, .11] for study habits, nor was the total indirect effect, 95% CI [-.01, .07].

Discussion

Study 1 provides evidence that the link between participants' implicit theories of academic success and GPA were mediated by multiple academic behaviors. These results suggest that to the extent students report higher levels of belief in an entity theory of academic success, they are more likely to report engaging in the problematic academic behaviors of procrastination, self-handicapping, and poor study habits, and these problematic academic behaviors predict lower semester GPAs. By contrast, to the extent that students endorse beliefs in the incremental theory of academic success, they are more likely to engage in better study habits, and these behaviors predict higher semester GPA. These results are consistent with previous work finding various constructs, including incremental theories of intelligence, study skills, self-handicapping, and procrastination, influence academic achievement in undergraduates (e.g., Credé & Kuncel, 2008; Grant & Dweck, 2003; Kim & Seo, 2015; Schwinger et al., 2014; Schwinger et al., 2022) and in K – 12 students (e.g., Blackwell et al., 2007; Rickert et al., 2014; Schwinger et al., 2022). Furthermore, the results of the mediational analyses suggest that while the entity theory of academic success may play a direct role in the prediction of GPA, the incremental theory of academic success only does so through its association with effective study behaviors. By contrast, no academic behaviors significantly mediated the non-significant correlation between the incremental theory of intelligence and GPA.

In sum, Study 1 suggests students' implicit theories of academic success are meaningful predictors of GPA and are associated with relevant academic behaviors. Study 1 also provides preliminary evidence of the psychometric viability of the ABS. The measure demonstrated reasonable internal consistency as well as some predictive validity demonstrated by its correlations with academic behaviors. As such, the aims of Study 2A and 2B were to further explore the psychometric properties of the ABS and replicate and extend the correlational and mediational results.

Study 2A & 2B

Overview

The first goal of Studies 2A and 2B was to evaluate the factor structure of the ABS with a larger sample and assess its reliability and validity. Study 2B had a secondary goal of replicating and extending the mediational analyses conducted in Study 1 with related but slightly different mediating variables. Given that study skills were a strong mediator in Study 1 and study skills can be taught to students (e.g., Wibrowski et al., 2017), we sought to determine if there were unique aspects of study skills that mediate the relationships between the implicit theories of academic success and GPA.

Hypotheses

1. The ABS will be comprised of two factors, one measuring the incremental theory of academic success and the second measuring the entity theory of academic success. (Study 2A)
2. The ABS will demonstrate good validity (e.g., construct, convergent, and divergent). (Study 2A and Study 2B)

3. Incremental and entity theories of academic success will show evidence of reliability. (Study 2A and Study 2B)
4. Students' implicit theories of academic success will be significantly correlated with GPA, with (a) incremental beliefs positively correlated and (b) entity beliefs negatively correlated with GPA. (Study 2B)
5. The negative correlation between the entity theory of academic success and GPA and the positive correlation between the incremental theory of academic success and GPA will be statistically mediated by students' self-reported study skills. (Study 2B)

Method

Procedure

Approved by the university's IRB, Study 2 had two parts. All participants were required to complete a prescreening survey to create an account on the department's online participant management system. The prescreening survey included the measures for Study 2A, which we refer to as "test" data. Students were allowed to skip questions they did not feel comfortable answering. Course credit was given for the pre-screening survey.

After completing the pre-screening, participants signed up for Study 2B during the same semester, allowing us to collect a retest measure for the ABS and additional data from a subsample of Study 2A participants. The procedure was identical to Study 1 (see Section 2.3 for a review) with three minor changes. First, Study 2B was completed in sixty minutes to obtain more measures. Second, to ensure accurate matches for official GPAs, university-provided ID numbers were used instead of study IDs. Third, the IRB required signed consent forms (unlike Study 1's consent letters) due to a new determination that official GPAs were sensitive information.

Samples

Study 2A

The initial sample was comprised of 1,121 undergraduates at a large university in the southern United States who participated for course credit. Of the original sample, 246 (21.94%) were removed for failing the attention check item nested in the survey and one was removed for being below the required age to consent. Thus, data from 874 students were used for analysis purposes. Participants were primarily female (71%) and ranged in age from 18 - 36 (M = 18.67, SD = 1.30).

Study 2B

All participants signed up to participate in Study 2B after participating in Study 2A during the pre-screening process. There were 414 original participants but 20 (4.83%) were removed from analysis (ten due to lack of survey completion or failure to follow directions and ten due to failing the attention check), resulting in a final sample of 394 participants. Participants ranged in age from 18 to 22 (M = 18.48, SD = .82) and were primarily female (74.4%).

Measures

All measures included in Study 2A were included in the pre-screening survey and were therefore part of a large pool of measures. Measures in Study 2B were completed in a lab session.

Demographics

Students provided demographic information such as their age and sex.

Incremental and Entity Theories of Academic Success

Students' implicit theories of academic success were measured with a slightly revised version of the ABS used in Study 1. Following Study 1, through consultation with four colleagues regarding the items, half of the items were reworded for clarity and three were added to more fully capture relevant beliefs, for a total of 25 items. Items can be seen in Table 2 and the full measure can be seen in the supplementary materials. Items that loaded on the incremental theory factor and entity theory factor, respectively, were summed to create scores such that the incremental factor score could range from 11 – 77 and scores on the entity factor could range from 12 – 84 with higher scores indicating higher levels of agreement with the theory. See Results section for more information on psychometric properties. Participants completed this measure during Study 2A and 2B.

Construct Validity Measures

Given the fact that the ABS is the first measure we are aware of to measure implicit theories of academic success, there are no measures available to truly establish construct validity. However, we felt it was important to get as close as possible and we adopted three strategies. First, to examine whether the ABS conceptually measured the construct of entity beliefs and incremental beliefs, or the idea that an attribute is fixed or malleable, we correlated the ABS with several other measures of implicit theories. Dweck et al. (1995) noted that some people have a unified implicit theory that applies to multiple attributes while other people have unique implicit theories for different attributes (e.g., intelligence and romantic relationships). Given this, we expected the ABS to be significantly correlated to these alternative measures but with small to medium effect sizes. Further, we expect correlations between the same type of belief (e.g., entity) to be positive while correlations between different types of beliefs (entity and incremental) to be negative. To that end, we used the following measures:

- **Theory of Intelligence.** Students' incremental theory of intelligence was again measured with the TIS (Dweck, 1999) as well as the 14-item Implicit Theory of Intelligence Scale (Abd-El-Fattah & Yates, 2006). The scale results in two factor scores, growth and entity, which are created by averaging the items on each factor such that higher scores (on a 4-point Likert-type scale) indicate higher levels of beliefs in that implicit theory of intelligence. (Study 2A)
- **Implicit Theories of Romantic Beliefs.** Students' implicit theories of romantic beliefs were measured with the 8-item Romantic Beliefs Scale (Knee, 1998). The scale consists of two subscales, with four items each summed to create a destiny and a growth score (such that a score of 28 indicates the highest level of agreement with that implicit theory). (Study 2A)

Second, we sought to establish that our measure was conceptually similar to other measures that assess how people think about academic success (i.e., convergent validity). We turned to the motivation literature and the concept of locus of control – whether outcomes are the result of personal effort (internal) or factors outside of one's control (external). This connection has been suggested by Dweck and Leggett (1988), who proposed that entity beliefs about intelligence are associated with external locus of control, while incremental beliefs are associated with internal locus of control, and has been partially supported by subsequent research (Bodill & Roberts, 2013). We predicted that incremental beliefs about academic success would be negatively correlated with external locus of control and entity beliefs about academic success would be positively correlated:

- **Academic Locus of Control.** Students' academic locus of control, whether they view their academic success as due to things in or outside of their control, was measured with the 21-item Revised Academic Locus of Control Scale (Curtis & Trice, 2013). Scores were summed for a total academic locus of control score such that a score of 21 indicates a high external locus of control for academics, indicating they view their academics as outside of their control. (Study 2A).

Third, we wanted to ensure that our measure was conceptually distinct from other measures (i.e., divergent validity). We chose several concepts that have been related to academic outcomes or related to positive outcomes generally:

- **Conscientiousness.** Conscientiousness, a key personality trait involving higher levels of responsibility, reliability, and self-control, was measured with the Ten Item Personality Inventory (Gosling et al., 2003). Higher scores on this factor (range 1 – 7) indicate higher agreement with conscientiousness. (Study 2A)
- **Grit.** To further evaluate divergent validity, students' grit, how likely they are to persevere in efforts to meet long-term goals as well as passion for those goals, was measured with the 10-item version of the Grit Scale available at https://angeladuckworth.com/grit-scale (Duckworth, n.d.) and scored like the 8-item short grit scale (Duckworth & Quinn, 2009). The global score was computed and higher scores (range 1 – 5) indicate higher levels of grittiness. (Study 2B)
- **Self-esteem.** Students' self-esteem, the way they view and value themselves, was measured with Rosenberg's 10-item Self-Esteem Scale (Rosenberg, 1965). Higher scores (range 10 – 40) indicate higher self-esteem, meaning viewing and valuing themself positively. (Study 2A)
- **Socially Desirable Responding.** Students' socially desirable responding, responding in a manner that they believe portrays them in a socially desirable way, was measured with version six of the Balanced Inventory of Socially Desirable Responding (Paulhus, 1991). The total score was calculated by summing all items such that higher scores indicate more socially-desirable responding (range 40 – 280). (Study 2A)

Outcome Measures

GPA

Official end-of-the-semester GPAs from the semester in which students participated in the study were obtained from the University Registrar's office. GPAs were reported on a 4.0-point scale ranging from 0.00 (*F*) to 4.00 (*A*). (Study 2B)

Good Academic Habits and Problematic Academic Behaviors

Students' study habits were assessed with the 100-item Survey of Study Habits and Attitudes (SSHA; Brown & Holtzman, 1966). This scale has demonstrated strong internal consistency and construct validity (Brown & Holtzman, 1955; Cerasoli & Ford, 2014) and is recommended by Credé and Kuncel (2008) for use as a strong measure of study habits predicting collegiate GPAs. However, due to evidence in the literature that the original four-factor solution for the SSHA is not accurate (Bray et al., 1980), we conducted a factor analysis, which resulted in five meaningful factors. We used the two factor scores that most closely aligned with study skills, which we labeled Good Academic Habits and Problematic Academic Behaviors, both of which were scored by finding the mean of the items that loaded on the factor (range 1 – 5), with higher scores indicating higher levels of agreement that they engage in those behaviors. Good Academic Habits (Cronbach's alpha = .82) measured behaviors such as working hard even if they do not like a subject, organizing work, and using time effectively. Problematic Academic Behaviors (Cronbach's alpha = .89) measured behaviors such as procrastination, failure to persist, engaging in other activities more than school-work, and inefficient studying behavior. (Study 2B)

Results (Study 2A)

Factor Structure (Hypothesis 1)

To confirm the dimensions underlying the revised ABS were the same as in Study 1, EFA and CFA were again conducted via Mplus v8. Similar to Study 1, the revised ABS items were defined as ordered categorical because there was a better model fit than when they were defined as continuous.

Replicating the analyses of Study 1, the dimensionality of the items was examined via EFA, and the results were identical to those of Study 1. The scree plot indicated the possibility of up to three factors, so model fit was evaluated according to the criteria outlined by Byrne (2006). As can be seen in Table 4, the one-factor model demonstrated very poor fit, the two-factor model indicated an acceptable fit, and the three-factor model demonstrated better fit (e.g., CFIs = .76, .93, and .95, respectively). However, the loadings from the three-factor model also demonstrated the same problematic features as Study 1 (i.e., low loadings and cross-loadings), and the parallel analysis also demonstrated that the 2nd eigenvalue from our data was greater than the eigenvalue from the random data. Therefore, based on these combined results, we again determined the two-factor model was the best fit to the data. Two items were removed due to cross-loading in the two-factor EFA, see Table 2 for factor loadings. The CFA of the two-factor model demonstrated acceptable fit[2], $\chi^2(229) = 1595.61$,

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[2] *Note.* χ^2 = Chi-square test of model fit, *DF* = degrees of freedom, CFI = comparative fit index, LI = Tucker-Lewis index, RMSEA = root mean square error of approximation, SRMR = standardized root mean square residual.

$p < .001$, CFI = .93, TLI = .92, RMSEA = .08. Therefore, our first hypothesis that the ABS will be comprised of the same two factors as in Study 1 was supported. As in Study 1, the raw summed scores of the items from the two factors were computed as the total scores.

Table 4. Model Fit of EFA for Different Factor Models for Study 2A

Model\Index	χ^2	*DF*	*p*-value	CFI	TLI	RMSEA	SRMR
1-factor	4841.523	299	.000	.760	.739	.132	.117
2-factor	1595.430	274	.000	.930	.917	.074	.051
3-factor	1284.862	250	.000	.945	.929	.069	.045

Validity (Hypothesis 2)

To examine the validity of the ABS, we conducted a series of correlation analyses between the ABS and the various measures described above (see Table 1). First, we examined whether the ABS was related to other implicit theories measures. With one exception (a positive correlation between incremental beliefs toward academic success and destiny beliefs in romantic relationships), the incremental beliefs of the ABS were positively correlated with the incremental beliefs of other measures of implicit theories and negatively correlated with the entity beliefs of the other measures of implicit theories, as predicted. Consistent with predictions, the opposite pattern was found with the entity beliefs of the ABS. All correlations were small to moderate in size (absolute magnitude ≤ .43), indicating that the ABS is measuring a construct that is related to, but distinct from, other implicit theory constructs, which is consistent with the literature suggesting some people hold a generalized implicit theory while others hold different implicit theories for different attributes (Dweck et al., 1995). (See Table 4 of supplemental materials for descriptive statistics and correlations among the implicit theory measures.)

Next, we examined whether the ABS was significantly correlated with the Academic Locus of Control measure, given their marginal degree of conceptual similarity. As predicted, endorsing an external academic locus of control was positively correlated with entity beliefs ($r = .33$, $p < .001$) and negatively correlated with incremental beliefs ($r = -.26$, $p < .001$).

Finally, we examined whether the ABS was conceptually distinct from other measures (i.e., divergent validity). As can be seen in Tables 5 and 6, all correlations between the ABS factor scores and the measures of divergent validity were in the expected directions but small to moderate in size (absolute magnitude ≤ .34), indicating the ABS factors are measuring unique constructs from the divergent measures given in Studies 2A and 2B.

Table 5. Descriptive Statistics and Correlations among Divergent Validity Measures for Study 2A

Variable	1	2	3	4	5
1. Entity theory of academic success	-				
2. Incremental theory of academic success	-.28***	-			
3. Socially desirable responding	-.14***	.07	-		
4. Conscientiousness	-.24***	.22***	.29***	-	
5. Self-esteem	-.26***	.21***	.46***	.35***	-
Mean	31.32	58.90	161.10	5.29	30.44
Standard deviation	11.56	8.63	21.11	1.20	5.47
n	837	860	735	835	815

***$p < .001$.

Table 6. Descriptive Statistics and Correlations among Measures for Study 2B

Variable	1	2	3	4	5	6	7
1. GPA	-						
2. Entity theory of academic success	-.15**	-					
3. Incremental theory of academic success	.22***	-.22***	-				
4. Grit	.09	-.19***	.20***	-			
5. Good academic habits	.36**	-.21***	.34***	.47***	-		
6. Problematic academic behaviors	-.11*	.24***	-.09	-.58***	-.45***	-	
7. Incremental theory of intelligence	-.01	-.25***	.23***	.17**	.16**	-.18***	-
Mean	3.26	26.56	60.37	3.47	4.00	2.94	3.99
Standard deviation	.64	9.10	8.20	.62	.50	.67	.84
n	390	394	393	394	394	394	386

Note. All measures completed at re-test time point except for the TIS (Incremental theory of intelligence).
*$p < .05$, **$p < .01$, ***$p < .001$.

In sum, as can be seen in Table 1, the correlations across all three studies were in the expected direction with one exception as previously noted; additionally, 79% of the hypothesized correlations were statistically significant and in the expected direction, with 17% non-significant but in the expected direction. Therefore, our second hypothesis, that participants' implicit theories of academic success would show evidence of convergent and divergent validity is also supported with the caveat that it is not truly possible to assess the construct validity of the ABS given its novelty.

Reliability (Hypothesis 3)

Students could take the pre-screening measure at any point in the semester and we ran Study 2B (when they took the retest) throughout the semester as well, so the number of days between test and retest ranged between 1 and 101 days (M = 44.02, SD = 25.78). Therefore, to examine the test-retest reliability (how closely participants' scores matched each other the first and second time they completed the measure) of the ABS factor scores, the correlations between test and retest of the entity and incremental theories of academic success were computed with and without partialling out length of time between test and retest. Test-retest correlations for the entity and incremental theories of academic success were similar with and without partialling out length of time between test and retest (.32, $p < .001$ and .41, $p < .001$, respectively). Thus, our hypothesis that the ABS would show evidence of test-retest reliability is only partially supported. The correlations are statistically significant but lower than desirable.

Two measures of internal reliability were computed to examine the measure's reliability in Study 2A and 2B: Cronbach's alphas, which measure how well the items in the measure relate to one another as a group, and Spearman-Brown split-half reliabilities, which measures consistency between two halves of the measure to determine if they are measuring the same construct. In Study 2A, Cronbach's alphas were .88 and .78 and Spearman-Brown split-half reliabilities were .88 and .71 for participants' entity and incremental theories of academic success respectively. These results indicate good internal consistency and split-half reliability for both factors. In Study 2B, reliabilities of the ABS

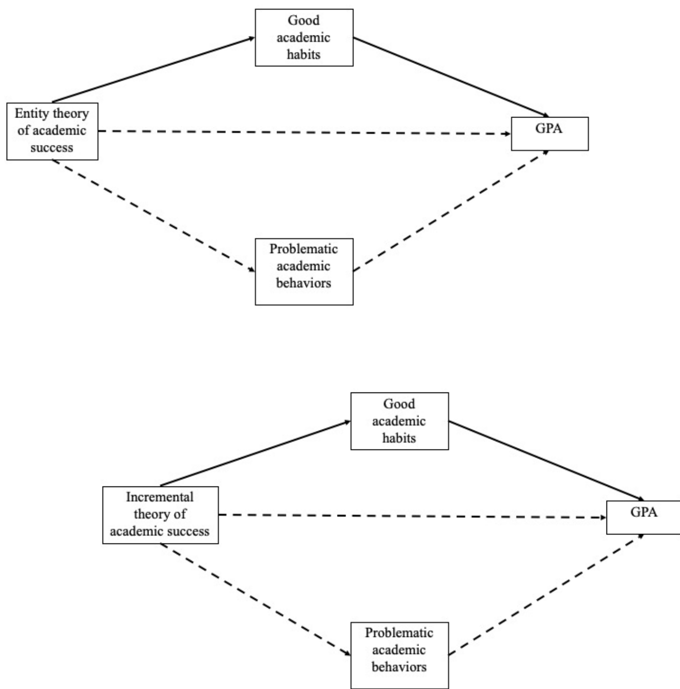
factors were examined again using the retest scores. Cronbach's alphas were .83 and .77 and Spearman-Brown coefficients were .81 and .73 for the entity and incremental theories of academic success respectively, again indicating good internal consistency for both factors.

Predicting Academic Outcomes (Hypotheses 4 and 5)

Correlation analyses were conducted to examine Hypothesis 4. Consistent with predictions, incremental beliefs about academic success were positively and significantly correlated with GPA and entity beliefs were negatively and significantly correlated with GPA (see Table 1).

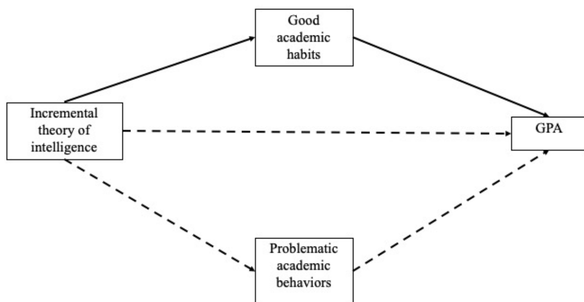
To test Hypothesis 5, the multiple mediation analysis conducted in Study 1 was repeated using Study 2B data and the same percentile bootstrap method. Participants' retest ABS factor scores were used as the predictors and good academic habits and problematic academic behaviors were used as the mediators to determine whether these factors would mediate the correlations between participants' entity and incremental theories of academic success and GPA. The direct path coefficients are presented in Table 5 of the supplementary materials.

As can be seen in Figure 2, the relationships between the entity and incremental theories of academic success and GPA were mediated by good academic habits, as predicted by Hypothesis 5. When the entity theory of academic success was the predictor, the total indirect effect of the model was significant, 95% CI [-.008, -.001], and the indirect path through good academic habits was significant, 95% CI [-.009, -.003], but the indirect path through problematic academic behaviors was not significant, 95% CI [-.000, .004]. When the incremental theory of academic success was the predictor, the total indirect effect of the model was significant, 95% CI [.005, .014], and the indirect path through good academic habits was significant, 95% CI [.006, .014], but the indirect path through problematic academic behaviors was not significant, 95% CI [-.002, .000]. These results provide additional support for the theory that students' implicit theories are associated with behaviors, and those behaviors, especially engaging in good academic habits, predict academic outcomes (in this case, GPA).



Caption: Relation between entity theory of academic success and GPA is mediated by good academic habits and problematic academic behaviors, with only the indirect path through good academic habits significant.

Caption: Relation between incremental theory of academic success and GPA is mediated by good academic habits and problematic academic behaviors, with only the indirect path through good academic habits significant.



Caption: Relation between incremental theory of intelligence and GPA is mediated by good academic habits and problematic academic behaviors, with only the indirect path through good academic habits significant.

Note. Bold lines indicate significant indirect paths through the mediators, dashed lines indicate non-significant indirect paths through the mediators. The total indirect effects for all models were significant.

Figure 2. Mediation Models for Study 2A & B

A secondary mediational analysis was done using the incremental theory of intelligence to re-examine the nonsignificant mediation found in Study 1. This analysis was secondary because the incremental theory of intelligence was measured as part of Study 2A whereas the mediators were measured as part of Study 2B. As can be seen in Figure 2, when the incremental theory of intelligence was the predictor and good academic habits and problematic academic behaviors were the mediators, the total indirect effect was significant, 95% CI [.01, .08], and the indirect path through good academic habits was significant, 95% CI [.02, .09], but the indirect path through problematic academic behaviors was not significant, 95% CI [-.03, .01]. Therefore, in this study, the relationship between the incremental theory of intelligence and GPA was mediated by good academic habits, providing further support for the theory that implicit beliefs are associated with behaviors and these behaviors predict academic outcomes.

Discussion

Replicating the findings of Study 1, the entity theory and incremental theory of academic success both predicted GPA through their relationship with positive study habits. Of note, the pathway through problematic academic behaviors was not significant.

Taken together, the results of Study 2 provide further support for the ABS as a useful measure. Study 2A suggests that the ABS measure is conceptually strong, again demonstrating a two-factor solution representing incremental and entity factors, and consistently related to similar constructs. However, the results of Study 2B provide some evidence that improvements to the ABS could be made at an item-level. The test-retest reliability is discussed further below. Internal reliability analyses suggested some degree of redundancy.

General Discussion

Given the mixed findings regarding implicit theories of intelligence's prediction of academic achievement in adults (Sisk et al., 2018) it is important to determine if implicit theories of a construct other than intelligence may predict this important outcome. The results of Studies 1 and 2 provide evidence that implicit theories of academic success may be just such a construct.

The results suggest that the measurement of this construct, the ABS, possesses acceptable psychometric properties for use in an undergraduate context. The factors derived with two separate samples are consistent with the literature on implicit theories, with one factor measuring the entity theory and the other measuring the incremental theory (Dweck & Leggett, 1988). The ABS is unique in that it is the only measure of which we are aware that measures implicit theories related to academic success in an undergraduate context. Both factors of the ABS (the entity and incremental theories of academic success) possess important predictive validity for studies examining the impact of implicit theories on academic success in undergraduates. The entity theory of academic success was significantly correlated with GPA and five academic behavior variables (e.g., self-handicapping and good academic habits) in two samples, with all correlations in the small to moderate range. Further, there was a significant indirect effect on GPA in two mediation models predicting GPA from the entity theory of academic success with different relevant academic behaviors as mediators. These mediational models indicate the entity factor is measuring a belief structure that is associated with students' behaviors and, through these behaviors, ultimately their academic achievement.

The incremental theory of academic success was not as consistently predictive of outcomes, but nevertheless has good predictive validity. The incremental factor was significantly correlated with GPA in only one of the two samples and was significantly correlated with two of the five academic behavior variables (study habits and good academic habits). Thus, it appears students who endorse

incremental theories of academic success are more likely to engage in desirable studying behaviors but not significantly less likely to avoid engaging in behaviors that might negatively impact their academic success; perhaps because the beliefs they endorse do not preclude behaviors like procrastinating but working hard right before a deadline. It may also be the case that students who endorse the incremental theory of academic success are more likely to engage in behaviors that foster academic success but were not measured in this study. For example, they may be more likely to ask questions and less likely to make internal attributions. When the incremental theory of academic success was the predictor in the mediation models predicting GPA with different relevant academic behaviors as mediators, there was a significant indirect effect on GPA in both studies. Like the entity theory, it appears the incremental theory is measuring a belief structure that has meaningful relations to students' studying behaviors and ultimately their academic achievement. However, it may also be the case that holding an entity theory of academic success may have a more significant association with students' behaviors and success than holding an incremental theory of academic success. In other words, the undesired impacts of an entity theory of academic success may be larger than the desired impacts of an incremental theory of academic success.

Taken together our results suggest students' implicit theories of academic success play a small, but important, role in students' academic success that likely functions by influencing relevant academic behaviors. Although the coefficients of the entity and incremental theories of academic success were relatively small, these relatively small effect sizes are consistent with the literature which finds the incremental theory of intelligence and academic achievement are significantly correlated but the effect size is small to moderate depending on age of the participants (Sisk et al., 2018).

Although we did not set out to evaluate the TIS, our results are consistent with research showing inconsistent findings when predicting academic achievement from the TIS in undergraduates, in which incremental theories of intelligence have been found to either be negatively related to measures of academic achievement (Aronson et al., 2002; Kornilova et al., n.d.) or not significantly related (Kornilova et al., 2009; Stump et al., 2014). However, our results are inconsistent with the results found in K–12 populations (e.g., Blackwell et al., 2007; Romero et al., 2014) and one study with Chinese undergraduates (Chen & Wong, 2015). When examining the correlations between the incremental theory of intelligence and the outcome variables, the correlations were in the expected directions, but the incremental theory of intelligence was not significantly correlated with GPA in either sample and was only significantly correlated with the two academic behavior variables measured in Study 2A. When the incremental theory of intelligence was the predictor in the mediational models, there was not a significant mediation in Study 1 but there was a significant indirect effect on GPA for Study 2. Thus, our results call into question whether the inconsistent findings in undergraduates may be due, at least in part, to the measurement of implicit theories being used. Future research exploring the impact of implicit theories on academic achievement in undergraduates should examine the validity of the TIS for use with undergraduates and consider using the ABS in addition to, or in place of, the TIS.

In addition to promising predictive validity, the results suggest the ABS has acceptable levels of construct validity. With only one exception, the ABS factors correlate in expected directions with related measures of implicit theories and related constructs (e.g., grit), but not so highly that the factors appear to be measuring the same underlying constructs. As noted previously, it is important to keep in mind that the ABS is the only measure we are aware of that evaluates this exact type of implicit theory, so it is impossible to establish true convergent validity with other measures of academic beliefs. Even though only some people hold a generalized implicit theory that applies across attributes (Dweck et al., 1995), we found evidence that the ABS is measuring similar, but unique, constructs. The convergent and divergent correlation coefficients found for the ABS are similar to, or higher than, those found for related measures such as the Romantic Beliefs Scale (Knee, 1998).

The ABS factors displayed good internal consistency all three times the ABS was administered. However, given the high split-half reliability for the entity theory of academic success, future research with the ABS should explore whether some items on the ABS entity factor may be redundant, and thus can be removed.

One significant concern regarding the ABS is its potential for unreliability, given the moderate correlations found for test-retest reliability. The moderate correlations found in this study are much lower than the two-week test-retest reliability of .80 found for a shorter version of the TIS (Dweck et al., 1995) but like those found for the RBS, which were .52 and .40 (Knee, 1998). As Knee discusses, it is possible that undergraduates' beliefs are flexible and responsive to experiences over time. This would be consistent with more recent research by Murphy and colleagues (e.g., LaCosse et al., 2021; Muenks et al., 2020; Murphy & Dweck, 2010) which indicates that people's implicit theories are influenced by the implicit theory of the organization or classroom they are currently a part of. Furthermore, as DeVellis (2003) discusses, test-retest correlations can be caused by at least four different reasons, only one of which is unreliability of the measurement in question. It is therefore unknown if these moderate correlations are caused by unreliability, or some other reason. For example, they may be due to true temporal changes in scores over time, with some students decreasing their beliefs in the entity theory and increasing their beliefs in the incremental theory of academic success over the course of a semester. This would be consistent with the means of the two scales at each time point and research showing changes in the incremental theories across time (e.g., Costa & Faria, 2022; Gutentag et al., 2022). There are also two methodological reasons that cannot be ruled out as complicating interpretation of these correlations. First, the order of the items varied at test and retest, which may have influenced participants' response sets. Second, participants completed the measure in different settings at test and retest so situational factors may be at play. Future research should further examine the test-retest of the ABS, discerning whether it was an artifact of the current study, an aspect of the ABS measure, or the construct itself.

Strengths, Limitations, and Future Directions

There are multiple strengths of the current set of studies. First, the ability to replicate our major results in two samples with different measures suggests these results are robust. Second, by using official end-of-the-semester GPAs we ensured having a consistent and accurate measure of academic achievement across participants regardless of length of time in school or socially desirable responding, that is an externally valid measure because GPAs are influenced by multiple factors. Third, we collected data across the entire semester to ensure we captured the full range of students on our constructs of interest (e.g., procrastination). Fourth, students completed the measures in a laboratory setting in Study 1 and 2B and were required to stay the duration of the study to increase chances they took their time and focused on the items. Finally, the ability to measure undergraduates' implicit theories of academic success with a measure that predicts relevant behaviors and outcomes is an important contribution to the field that will allow researchers across disciplines to further explore predictors of academic success in undergraduates and potentially assist with intervention targets.

However, the following limitations should be kept in mind when interpreting our results. First, both studies were conducted at the same university, which is a large, research-focused university in the southern United States. Therefore, it will be important to replicate the results in other university and college settings. Second, by using different methodology for Studies 2A and 2B and having variable measurement times, we were unable to obtain an ideal measurement of test-retest reliability. Thus, it is possible the ABS has low test-retest reliability. Future research using the ABS should consider this and attempt to determine test-retest reliability using consistent methodology across time points. Third, all of our variables are based on students' self-reports, with the exception of GPA. Self-

report measures, although useful and common, may suffer from several notable limitations, especially in the realm of education (Duckworth & Yeager, 2015). Future research should include behavioral measures, such as the likelihood of students' choosing to engage in challenging optional work. Finally, research has found multiple necessary-but-not-sufficient conditions for academic success (Tynan, et al., 2020), and the present studies evaluated a small subset of those variables. Future research should continue to explore the relative importance of variables in the prediction of academic achievement so that research may focus on the constructs that are found to be the most highly predictive of this important outcome. Additionally, this research should continue to explore the mechanisms through which these variables, including the implicit theories of academic success, predict relevant behaviors and outcomes.

We recommend future research on implicit theories related to academic success in undergraduates use the ABS in addition to, or perhaps in place of, the TIS. Future research should also continue to explore the psychometric properties of the ABS. Based on the work of De Castella and Byrne (2015) who found revising the wording of items on the TIS to become self- rather than other-referential predicted greater outcome variance on dependent measures, future research should explore whether the same would hold true for the ABS. Finally, if our results are replicated in other settings, future research could explore the possibility of interventions related to the implicit theories of academic success to determine whether an intervention could reduce the negative impact of the entity theory of academic success on behavioral mediators and ultimately academic achievement outcomes.

Conclusion

Understanding factors that can promote college success is important for a variety of reasons. Given the promise of implicit theories to understanding people's behavior but the inconsistent finding of existing measures, the ABS is a promising new measure for evaluating relevant entity and incremental theories of academic success in undergraduates which is easy to administer and has promising psychometric properties. The ABS significantly predicted GPA and was correlated with relevant academic behaviors in two samples. Further, we found academic behaviors mediated the relationship between the implicit theories of academic success and GPA, adding to the literature and supporting the theory that implicit beliefs influence relevant behaviors and, through these behaviors, ultimately influence academic success. We encourage researchers interested in implicit beliefs related to academic achievement in undergraduates to include the ABS in their measurements.

References

Abd-El-Fattah, S. M., & Yates, G. C. (2006, November). Implicit theory of intelligence scale: Testing for factorial invariance and mean structure. Paper presented at the Australian Association for Research in Education Conference, Adelaide, South Australia.

Aronson, J., Fried, C. B., & Good, C. (2002). Reducing the effects of stereotype threat on African American college students by shaping theories of intelligence. *Journal of Experimental Social Psychology, 38*(2), 113-125. http://dx.doi.org/10.1006 /jesp.2001.1491

Blackwell, C. S., Trzesniewski, K. H., & Dweck, C. S. (2007). Implicit theories of intelligence predict achievement across an adolescent transition: A longitudinal study and an intervention. *Child Development*, *78*(1), 246-263. http://doi.org/10.1111/j.1467-8624.2007.00995.x

Bodill, K., & Roberts, L. D. (2013). Implicit theories of intelligence and academic locus of control as predictors of studying behaviour. *Learning and Individual Differences, 27*, 163-166. https://doi.org/10.1016/j.lindif.2013.08.001

Bray, J. H., Maxwell, S. E., & Schmeck, R. R. (1980). A psychometric investigation of the Survey of Study Habits and Attitudes. *Applied Psychological Measurement, 4*(2), 195-201. http://doi.org/10.1177/014662168000400206

Brown, W. F., & Holtzman, W. H. (1955). A study-attitudes questionnaire for predicting academic success. *The Journal of Educational Psychology*, *46*(2), 75-84. http://doi.org/10.1037/h0039970

Brown, W. F., & Holtzman, W. H. (1966). *Manual of the Survey of Study Habits and Attitudes*. New York, NY: Psychology Corporation.

Burnette, J. L., Billingsley, J., Banks, G. C., Knouse, L. E., Hoyt, C. L., Pollack, J. M., & Simon, S. (2023). A systematic review and meta-analysis of growth mindset interventions: For whom, how, and why might such interventions work? *Psychological Bulletin, 149*(3-4), 174-205. https://doi.org/10.1037/bul0000368

Burnette, J. L., O'Boyle, E. H., VanEpps, E. M., Pollack, J. M., & Finkel, E. J. (2013). Mind-sets matter: A meta-analytic review of implicit theories and self-regulation. *Psychological Bulletin, 139*(3), 655-701. http://doi.org/10.1037/a0029531

Byrne, B. M. (2006). *Structural equation modeling with EQS: Basic concepts, applications, and programming* (2nd ed.). Lawrence Erlbaum Associates Publishers.

Cerasoli, C. P., & Ford, M. T. (2014). Intrinsic motivation, performance, and the mediating role of mastery goal orientation: A test of self-determination theory. *The Journal of Psychology, 148*(3), 267-286. http://doi.org/10.1080/00223980.2013.783778

Chen, W., & Wong, Y. (2015). Chinese mindset: Theories of intelligence, goal orientation and academic achievement in Hong Kong students. *Educational Psychology, 35*(6), 714-725. https://doi.org/10.1080/01443410.2014.893559

Costa, A. & Faria, L. (2018). Implicit theories of intelligence and academic achievement: A meta-analytic review. *Frontiers in Psychology, 9,* 1 – 16. https://doi.org/10.3389/fpsyg.2018.00829

Costa, A., & Faria, L. (2022). Trajectories of implicit theories of intelligence and emotional intelligence in secondary school. *Social Psychology of Education: An International Journal (26),* 191 - 209. https://doi.org/10.1007/s11218-022-09695-6

Credé, M., & Kuncel, N. R. (2008). Study habits, skills, and attitudes: The third pillar supporting collegiate academic performance. *Perspectives on Psychological Science, 3*(6), 425-453. http://doi.org/10.1111/j.1745-6924.2008.00089.x

Curtis, N. A., & Trice, A. D. (2013). A revision of the academic locus of control scale for college students. *Perceptual and Motor Skills: Physical Development & Measurement, 116*(3), 817-829. http://doi.org/10.2466/08.03.PMS.116.3.817-829

De Castella, K., & Byrne, D. (2015). My intelligence may be more malleable than yours: The revised implicit theories of intelligence (self-theory) scale is a better predictor of achievement, motivation, and student disengagement. *European Journal of Psychology of Education*, *30*(3), 245-267. http://doi.org/10.1007/s10212-015-0244-y

DeVellis, R. F. (2003). *Scale development: Theory and applications (2nd ed., Applied Social Research Methods Series, Volume 26)*. Thousand Oaks: Sage Publications.

Duckworth, A. L. (n.d.). Grit Scale. Obtained from https://angeladuckworth.com/grit-scale/.

Duckworth, A. L., & Quinn, P. D. (2009). Development and Validation of the short grit scale (Grit-S). *Journal of Personality Assessment, 91*(2), 166 – 174. http://doi.org/10.1080/00223890802634290

Duckworth, A.L., & Yeager, D.S. (2015). Measurement matters: Assessing personal qualities other than cognitive ability for educational purposes. *Educational Researcher, 44* (4), 237-251. https://doi.org/10.3102/0013189X15584327

Dweck, C. S. (1999). *Self-theories: Their role in motivation, personality, and development.* Philadelphia, PA: Psychology Press.

Dweck, C. S., Chiu, C., & Hong, Y. (1995). Implicit theories and their role in judgments and reactions: A world from two perspectives. *Psychological Inquiry, 6(4),* 267–285. https://doi.org/10.1207/s15327965pli0604_1

Dweck, C. S., & Leggett, E. L. (1988). A social-cognitive approach to motivation and personality. *Psychological Review*, *95*(2), 256-273. http://doi.org/10.1037/0033-295X.95.2.256

Fritz, M. S., Taylor, A. B., & MacKinnon, D. P. (2012). Explanation of two anomalous results in statistical mediation analysis. *Multivariate Behavioral Research, 47*(1), 61-87. http://doi.org/10.1080/00273171.2012.640596

Giani, M. S., Attewell, P., & Walling, D. (2019). The value of an incomplete degree: Heterogeneity in the labor market benefits of college non-completion. *The Journal of Higher Education, 91*(4), 514-539. https://doi.org/10.1080/00221546.2019.1653122

Gosling, S. D., Rentfrow, P. J., & Swann, W. B., Jr. (2003). A very brief measure of the Big-Five personality domains. *Journal of Research in Personality, 37*(6), 504-528. http://doi.org/10.1016/S0092-6566(03)00046-1

Grant, H., & Dweck, C. S. (2003). Clarifying achievement goals and their impact. *Journal of Personality and Social Psychology, 85*(3), 541-553. https://doi.org/10.1037/0022-3514.85.3.541

Gutentag, T., John, O. P., Gross, J. J., & Tamir, M. (2022). Incremental theories of emotion across time: Temporal dynamics and correlates of change. *Emotion, 22(6),* 1137–1147. https://doi.org/10.1037/emo0000945

Hayes, A. F. (2018). *Introduction to mediation, moderation, and conditional process analysis* (2nd ed.). New York: The Guilford Press.

Hong, Y.Y., Chan, G., Chiu, C.Y., Wong, R.Y., Hansen, I.G., Lee, S.L., Tong, Y.Y., & Fu, H.Y. (2003). How are social identities linked to self-conception and intergroup orientation? The moderating effect of implicit theories. *Journal of Personality and Social Psychology, 85* (6), 1147-1160. https://doi.org/10.1037/0022-3514.85.6.1147

Kim, K. R., & Seo, E. H. (2015). The relationship between procrastination and academic performance: A meta-analysis. *Personality and Individual Differences, 82*, 26-33. http://doi.org/10.1016/j.paid.2015.02.038

Knee, C. R. (1998). Implicit theories of relationships: Assessment and prediction of romantic relationship initiation, coping, and longevity. *Journal of Personality and Social Psychology, 74*(2), 360-370. http://doi.org/10.1037/0022-3514.74.2.360

Kornilova, T. V., Chumakova, M. A., & Izmailova, A. M. (n.d.). *Implicit theories of intelligence and personality, attitudes towards uncertainty, and academic achievement in college students: a cross-cultural study.* https://pdfs.semanticscholar.org/a067/ b73425071db02a631bfe0ca43d3764c2ebf6.pdf

Kornilova, T. V., Kornilov, S. A., & Chumakova, M. A. (2009). Subjective evaluations of intelligence and academic self-concept predict academic achievement: Evidence from a selective student population. *Learning and Individual Differences, 19*(4), 596-608. http://doi.org/10.1016/j.lindif.2009.08.001

LaCosse, J., Murphy, M. C., Garcia, J. A., & Zirkel, S. (2021). The role of STEM professors' mindset beliefs on students' anticipated psychological experiences and course interest. *Journal of Educational Psychology, 113(5)*, 949–971. https://doi.org/10.1037/ edu0000620

Lou, N. M., & Li, L. M. W. (2023). The mindsets × societal norm effect across 78 cultures: Growth mindsets are linked to performance weakly and well-being negatively in societies with fixed-mindset norms. *British Journal of Educational Psychology, 93*(1), 134-152. https://doi.org/10.1111/bjep.12544

Midgley, C., Maehr, M. L., Hruda, L. Z., Anderman, E., Anderman, L., Freeman, K. E., … Urdan, T. (2000). *Manual for the Patterns of Adaptive Learning Scales.* Retrieved from http://www.umich.edu/~pals/PALS%202000_V13Word97.pdf

Miller, H. B., & Srougi, M. C. (2021). Growth mindset interventions improve academic performance but not mindset in biochemistry. *Biochemistry and Molecular Biology Education, 49*(5), 748-757. https://doi.org/10.1002/bmb.21556

Muenks, K., Canning, E. A., LaCosse, J., Green, D. J., Zirkel, S., Garcia, J. A., & Murphy, M. C. (2020). Does my professor think my ability can change? Students' perceptions of their STEM professors' mindset beliefs predict their psychological vulnerability, engagement, and performance in class. *Journal of Experimental Psychology: General*, *149*(11), 2119–2144. https://doi.org/10.1037/xge0000763

Muenks, K., & Yan, Y. (2024). Do my peers have a fixed or growth mindset? exploring the behaviors associated with undergraduate STEM students' perceptions of their peers' mindsets about intelligence. *Motivation and Emotion, 48*(1), 17-35. https://doi.org/10.1007/s11031-023-10049-8

Murphy, M. C., & Dweck, C. S. (2010). A culture of genius: How an organization's lay theory shapes people's cognition, affect, and behavior. *Personality and Social Psychology Bulletin*, *36*(3), 283–296. https://doi.org/10.1177/0146167209347380

Muthén, L.K., & Muthén, B.O. (1998-2017). *Mplus User's Guide* (*8th ed.*). Los Angeles, CA: Muthén & Muthén

O'Connor, B. P. (2000). SPSS and SAS programs for determining the number of components using parallel analysis and Velicer's MAP test. *Behavior Research Methods, Instruments, & Computers, 32*(3), 396-402. https://doi.org/10.3758/BF03200807

Paulhus, D. L. (1991). Measurement and control of response bias. In J. P. Robinson, P. R. Shaver & L. S. Wrightsman (Eds.), *Measures of personality and social psychological attitudes* (pp. 17-59). San Diego, CA: Academic Press. Retrieved from https://sjdm.org/dmidi/Balanced_Inventory_of_Desirable_Responding.html

Rickert, N. P., Meras, I. L., & Witkow, M. R. (2014). Theories of intelligence and students' daily self-handicapping behaviors. *Learning and Individual Differences*, *36*, 1-8. http://doi.org/10.1016/j.lindif.2014.08.002

Romero, C., Master, A., Paunesku, D., Dweck, C. S., & Gross, J. J. (2014). Academic and emotional functioning in middle school: The role of implicit theories. *Emotion, 14*(2)*,* 227-234. http://doi.org/10.1037/a0035490

Rosenberg, M. (1965). *Society and the adolescent self-image*. Princeton, NJ: Princeton University Press.

Sarrasin, J. B., Nenciovici, L., Foisy, L.-M. B., Allaire-Duquette, G., Riopel, M., & Masson, S. (2018). Effects of teaching the concept of neuroplasticity to induce a growth mindset on motivation, achievement, and brain activity: A meta-analysis. *Trends in Neuroscience and Education, 12*, 22–31. https://doi.org/10.1016/j.tine.2018.07.003

Schneider, M., & Preckel, F. (2017). Variables associated with achievement in higher education: A systematic review of meta-analyses. *Psychological Bulletin, 143*(6), 565-600. https://doi.org/10.1037/bul0000098

Schreiber, M., Job, V., & Dohle, S. (2020). Is your health malleable or fixed? The influence of implicit theories on health-related attitudes and behaviour, *Psychology & Health, 35*(12), 1421-1439. https://doi.org/10.1080/08870446.2020.1761975

Schwinger, M., Trautner, M., Pütz, N., Fabianek, S., Lemmer, G., Lauermann, F., & Wirthwein, L. (2022). Why do students use strategies that hurt their chances of academic success? A meta-analysis of antecedents of academic self-handicapping. *Journal of Educational Psychology, 114*(3), 576-596. https://doi.org/10.1037/edu0000706

Schwinger, M., Wirthwein, L., Lemmer, G., & Steinmayr, R. (2014). Academic self-handicapping and achievement: A meta-analysis. *Journal of Educational Psychology, 106*(3), 744 – 761. http://doi.org/10.1037/a0035832

Sisk, V. F., Burgoyne, A. P., Sun, J., Butler, J. L., & Macnamara, B. N. (2018). To what extent and under which circumstances are growth mind-sets important to academic achievement? Two meta-analyses. *Psychological Science, 29*(4)*,* 549-571. http://doi.org/10.1177/0956797617739704

Stump, G. S., Husman, J. & Corby, M. (2014). Engineering students' intelligence beliefs and learning. *Journal of Engineering Education, 103*(3)*,* 369 – 387. http://doi.org/10.1002/ jee.20051

Tuckman, B. W. (1991). The development and concurrent validity of the procrastination scale. *Educational and Psychological Measurement*, *51*(2)*,* 473-480. http://doi.org/ 10.1177/0013164491512022

Tynan, M. C., Credé, M., & Harms, P. D. (2020). Are individual characteristics and behaviors necessary-but-not-sufficient conditions for academic success?: A demonstration of Dul's (2016) necessary condition analysis. *Learning and Individual Differences, 77*. https://doi.org/10.1016/j.lindif.2019.101815

U.S. Bureau of Labor Statistics (2023). *Earnings and unemployment rates by educational attainment, 2023.* https://www.bls.gov/emp/chart-unemployment-earnings-education.htm on 6/4/24.

U.S. Department of Education, National Center for Education Statistics. (2020). *Undergraduate graduation rates.* https://nces.ed.gov/fastfacts/display.asp?id=40

Wibrowski, C. R., Matthews, W. K., & Kitsantas, A. (2017). The role of a skills learning support program on first-generation college students' self-regulation, motivation, and academic achievement: A longitudinal study. *Journal of College Student Retention: Research, Theory and Practice, 19*(3), 317–332. http://doi.org/10.1177/1521025116629152

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Measuring Student Success Using the High-Impact Practices Spectrum: Evidence for the Value of High Engagement Experiences

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Abstract: The High-Impact Practices (HIPs) Spectrum is a taxonomy for assessing and categorizing courses along a continuum based on elements of High Impact Practices (Marten et al., in press). This study provides quantitative evidence for the validity and impact of the HIPs Spectrum by analyzing seven years of enrollment data in a Midwestern regional comprehensive university School of Business. Along the HIPs Spectrum, courses are categorized as High Impact Practice (HIP), High Engagement Experience (HEE), or Neither. Labeling the medium-intensity HEE courses allows for a detailed analysis of their effect on students, which is a gap in previous literature. Results show supportive evidence for both HIP and HEE courses significantly increasing student persistence, and HEEs significantly decreasing time to graduation in comparison with Neither courses. Students earned an average of half a letter grade higher in HIP courses than in Neither courses. Surprisingly, HEE courses had a larger positive effect on students than HIP courses for some variables, justifying the importance of researching and implementing HEEs as a pedagogical tool to support student success. Classification of courses along the HIPs Spectrum is now an important step in accurate measurement of how engaged learning affects students. As the HIPs Spectrum grows in use, it has the potential to shift how we classify, measure, and evaluate courses under the umbrella of High-Impact Practices.

Keywords: high-impact practices, high-engagement experiences, high-impact practices spectrum, student success, historically underserved students, regional comprehensive university

The High-Impact Practices (HIPs) Spectrum (Marten et al., in press) is a new classification taxonomy for courses that expands the traditional view of HIPs from a binary concept (e.g., not a HIP versus HIP) to a three-part continuum. This continuum introduces the High-Engagement Experience (HEE) as a middle ground for the courses that contain some of the universal elements (Kuh et al., 2013) of a HIP course, but not quite enough to fully qualify as a HIP course. Therefore, the HIPs Spectrum ranges from *Neither HIP nor HEE* at the beginning, to *HEE* in the middle, with *HIP* at the far end of the continuum. Using the HIPs Spectrum Course Classification Questionnaire (HSCCQ), (Marten et al., in press), we define HIPs as courses that contain a substantial amount of universal elements, which are high-quality learning activities or practices that foster student engagement and have been shown to have a beneficial impact on students (Kuh et al., 2013). Some examples of the high-quality universal

elements of HIPs include *high levels of performance expectations, a significant time and effort investment over an extended period of time, and faculty and peer interactions regarding substantive matters* (Kuh et al., 2013, p. 10). The HEEs are courses that have some of these high-quality universal elements, but not enough to qualify for a HIP. Neither courses have little to none of the high-quality universal elements.

The HIPs Spectrum (Marten et al., in press) allows researchers to study the impact of universal elements of HIPs by categorizing courses along a continuum based on the level of high impact, engaged learning in the course. Analysis of seven years of enrollment data in a Midwestern regional comprehensive university's School of Business show quantitative support for the implementation of the HIPs Spectrum, as well as quantitative evidence supporting the validity and impact of High Engagement Experiences (HEE), which fall in the middle of the HIPs Spectrum.

High Impact Practices

High Impact Practices (HIPs) engage students in experiential teaching methods to support learner retention and academic achievement. As a relatively new field of study within higher education, Kuh (2008) uses the term HIPs to describe hands-on courses such as First Year Seminars, Internships, Capstones, Service Learning, Undergraduate Research, and Study Abroad. Over the past 16 years, researchers have studied these course types and their impact on students (Brownell & Swaner, 2010; Finley & McNair, 2013; Fischer, et al., 2021; Johnson & Stage, 2018; Kilgo et al., 2015; Myers et al., 2019; Price, 2021), often through data from the National Survey of Student Engagement (NSSE) (Kuh, 2020). Kuh and Kinzie (2018) agree that other experiences in college may also have similar positive effects. What are these experiences? To find and explore these gaps in the literature, we took an unconventional approach to assessing HIPs. By using the HIPs Spectrum, we analyze the assessment and student data to provide a unique perspective on the outcomes of student engagement.

It is imperative to define what makes a HIP and how we understand them to affect students. HIP experiences include certain universal elements: *high levels of performance expectations; a significant time and effort investment over an extended period of time; faculty and peer interactions regarding substantive matters; experiences with diversity; frequent, timely and constructive feedback; periodic and structured opportunities to reflect and integrate learning; real world applications; and public demonstration of competence* (Kuh, et al., 2013, p. 10). Through these course elements, the goal is that students will think critically and make decisions about their education, form meaningful relationships, and develop applicable skills, leading to favorable learning outcomes and degree attainment.

High Engagement Experiences (HEEs)

In reflecting on the course offerings at the School of Business, we knew that some courses had many of these universal elements of HIPs but would not match the course titles of the list of 11 recognized HIP types (e.g., First Year Seminar, Internships, Capstone Courses) (Kuh et al.
, 2017). In his foreword, Kuh stated that "there are doubtless other high impact activities" (Brownell & Swaner, 2010, p. ix). To reconcile this difference, we used the above listed universal elements of HIPs to assess every course offered in the School of Business, using the HSCCQ (Marten et al., in press). Although a labor-intensive process, it provided a clearer picture of experiential course offerings, increased faculty buy-in about the value and recognition of HIPs, and aligned with a comment at the 2021 Assessment Institute by Kinzie, who posed the following question:

> We've been very focused on who is in HIPs and who benefits. I think there's a whole other population of students who are not being involved in HIPs and we need to better understand,

> are they having other high impact experiences that we're just not capturing in the existing 11 recognized high impact practices? (Daday et al., 2021).

Our answer is a resounding "yes!", there are other high impact experiences that are not currently being captured. Our approach responds to the growing call for assessing HIPs based on quality rather than course title alone (Kinzie et al., 2021; Zilvinskis, 2019; Zilvinskis et al., 2022).

We further recognized that some courses had multiple elements of a HIP but could not quite meet the higher standards of those intensive courses. Therefore, we developed a new taxonomy to recognize these medium-intensity level courses as *High Engagement Experiences (HEEs)* and created the *HIPs Spectrum* to visualize this new way of considering HIPs (Marten et al., in press). In this taxonomy, rather than a binary designation of the 11 HIPs course types being studied on their own, the HIPs spectrum labels courses as HIP, HEE, or Neither, classified according to the universal elements listed above, allowing for a more nuanced analysis of student engagement.

Assessment

To assess and label each School of Business course along the HIPs Spectrum, we created a survey called the HIPs Spectrum Course Classification Questionnaire (HSCCQ) (Marten et al., in press) where instructors reported how frequently each universal element of HIPs is used in their class throughout a semester. We then quantified results, verified answers by comparing to the content of syllabi, and allowed department Chair and individual instructors to appeal and discuss their course category. If instructors teaching different sections of the same course were found to be teaching in different categories, we labeled the course as the less intensive option and encouraged instructor collaboration and re-assessment to better align in future semesters (Marten et al., in press).

In the School of Business, we aim to guarantee that every student who obtains their bachelor's degree through the School of Business will complete at least four HIPs courses, and that transfer students will complete at least three HIPs courses. This number was influenced by Kuh's (2008) recommendation that each student ideally complete one HIP per year of college, while also recognizing that this scaling needs to be intentional and equitable (Kuh & Kinzie, 2018; Price, 2021; Kilgo et al., 2019). Simply offering HIPs does not ensure that students will enroll in them, but by assessing the courses for universal elements and by incorporating them into degree requirements, we are able to ensure quality and access to HIPs for all School of Business students.

Both the University's and School's missions focus on being an access institution: providing quality, inclusive education to all who wish to learn (University of Wisconsin – Green Bay, 2022a; University of Wisconsin – Green Bay, 2022b). In Fall 2021, within the School of Business, 51% of students were first-generation, 38% were age 25+, 21% identified as a minority ethnicity, and 44% of undergraduates were transfer students (University of Wisconsin – Green Bay, 2022c). Although the University is a Predominantly White Institution (PWI), students' racial diversity has increased over recent years, (University of Wisconsin – Green Bay, 2022c), and the university strives continuously to improve how we serve the increasingly diverse students in this region of the Midwest. As the implementation of HIPs also increases, this emphasizes the importance of understanding how HIPs affect our student population, including various historically underserved subgroups of students.

Impact of HIPs

In this study, we examine the HIPs literature, diving into what should be recognized as a HIP, and how these experiences relate to student retention, graduation rates, and academic performance. "Being willing to question the by now taken-for-granted wisdom about the benefits of educational practices

is a valuable attribute at a time of disruption and challenge to the higher education status quo" (Kilgo, et al., 2019, p. 434).

Many studies have found a positive association between HIPs participation and student success metrics (Bhatt, et al., 2022; Kilgo et al., 2015; Hall & O'Neal, 2016). Finley and McNair (2013) found that students perceived deep gains in their learning through the HIPs of Learning Communities, Service Learning, Study Abroad, Internships, Student/Faculty Research, and Senior Capstones. Deep learning gains also increased more when students participated in multiple HIPs, a trend which held true for first-generation students, transfer students, and students of varying racial or ethnic backgrounds (Finley & McNair, 2013). Studying Black students through 2015 NSSE data, Dorimé-Williams and Choi (2023) found that student involvement in HIPs was significantly and positively associated with obtaining a bachelor's degree. "Our findings indicate a 75% increase in the odds of earning a bachelor's degree or above for every one-unit increase of involvement while the other predictors in the model were held constant" (p. 199). When examining the specific HIP of Undergraduate Research, Chan, Bhattacharyya, and Meisel (2018) found that participating in a First-Year undergraduate research assistant program was associated with significantly higher first-to-second-year retention rate for Underrepresented minority students and Pell Grant Recipients. Similarly, Bhattacharyya and Chan (2021) found that 6-year graduation rate of first-time, full-time students increased significantly from 58% in the overall student body to 84% for students who participated in undergraduate research, with similarly significant results for transfer students, first-generation students, members of underrepresented minorities, and Pell Grant recipients. In sum, there is evidence for the positive effects of HIPs.

We theorize that these positive effects are due to the presence of universal elements of HIPs. We expect to also see positive effects from HEEs, which share many of the same impactful universal elements. Therefore, based upon the studies discussed above, we propose the following hypothesized positive effects:

H1: Student completion of HIPs and HEEs will be more strongly related, respectively, to a) persistence, b) time to graduation, and c) performance (graduation grade point average, GPA), than completion of Neither courses.

H2: Course performance (course GPA) in both HIPs and HEEs courses will be greater, respectively, than in Neither courses.

Differences Between Groups

Kilgo et al. (2019) assert that if HIPs are required for everyone, educators need to ensure that they benefit everyone, and not harm students of certain identities. The AAC&U report by Brownell and Swaner (2010) analyzed the field of research on HIPs, finding examples of positive impacts on students' persistence, graduation rates, short-term-GPA, engagement, and critical thinking, but with comparatively limited research available to understand HIPs' effect on underserved students.

One concern is that minority students tend to have lower participation rates in HIPs than their counterparts (Dorimé-Williams & Choi, 2023; Kuh, et al., 2017; Martin, 2017; Roldan, et al., 2020). This motivates us to eliminate barriers to access and enrollment in HIPs, so that historically underserved students can actively participate in HIPs at comparable rates to their counterparts, and therefore have more meaningful educational experiences than they would have had otherwise.

Building on the concern of lower participation rates in HIPs, some claim that "a HIP experience typically has *compensatory effects* for undergraduates who are first in their family to attend college, are less well prepared academically, and are members of historically underrepresented racial and ethnic groups" (Kuh et al., 2017, p. 9). A study by Price (2021) through the National Association

of System Heads (NASH) and the Lumina Foundation, found multiple indicators of HIPs benefiting students. Students overall – including subgroups of Black students, Hispanic students, and students age 25 or older – who participated in HIPs reported a significant boost in academic and practical learning gains (Price, 2021).

However, some research contradicts the claim of HIPs having a compensatory effect for historically underserved students. Roldan, Kothari, and Dunn-Jensen (2020) studied business students and found that HIPs participants not from underrepresented groups had larger gains than underrepresented participants. Zilvinskis (2019) also refutes the compensatory effect, with findings that students who are Black, Hispanic, and first-generation students had lower opinions of HIPs and academic outcomes than their majority counterparts after participating in HIPs. The concern here is that if all students' success metrics improve after participating in HIPs, but that non-historically underserved students improve at a higher rate, then the achievement gap worsens even if everyone gains some benefit.

With equity in mind, more research is needed to understand how specific populations of students are affected by HIPs participation. We explore whether there are differences in outcomes among various groups of students, such as students coming from low resources (lower socioeconomic status), underrepresented minorities (URM), first-generation students, and high academic performers. More specifically, our study explores the following research question:

Research Question: Are there differences in outcomes in the proposed relationships for H1 and H2 for subgroups (low resource, minority race, first-gen, high academic performers)?

Methods

Data Source and Sample

This research analyzes the impact of HIP, HEE, and Neither courses on a student's persistence, time to graduation, and graduation GPA at the University of Wisconsin – Green Bay (UWGB) Cofrin School of Business. In addition, it also reviews the course GPA by classification category (HIP, HEE, Neither, or TBD) at the same institution. UWGB is a regional comprehensive university in the Midwest section of the United States. Data were obtained from the UWGB Registrar's Office and the Office of Institutional Strategy and Effectiveness (ISE) using the Cofrin School of Business enrollment data. Data included individual student course results and student demographics for each Cofrin School of Business course taught between fall 2015 and spring 2022, a seven-year window. Student demographics obtained included sex, age, ethnicity, first-generation status, and Pell Grant recipient status. The data set also included the student admit term, completion term (if graduated), admit type, persistence status, and final cumulative graduation GPA (if graduated). Select variables and respective coding are found in Table 2. The data set included 6,104 unique students across 45,305 course enrollments.

To begin analysis, student identification numbers were de-identified. As the study focused on the undergraduate bachelor's program, data from associate degree and graduate programs were deleted. Course credit that had been transferred in from another institution was removed. Student admit types were limited to new students, reentry students (students who stopped out and later reapplied to continue without enrolling at another institution(s)), and transfer students. This excluded "special admit" students who were perhaps only taking one course to transfer back to their home institution. The analysis focused on completed courses; out of the 44,872 undergraduate course enrollments, 3,212 were excluded from the analysis as they were incomplete, withdrawal, withdrawal/fail, dropped, or transfer courses.

In the data set, 114 unique courses were identified. Based on the classification criteria discussed in the Assessment section above, 33 courses were identified as HIPs, 41 were HEEs, and 33 were Neither. An additional seven were considered unclassified (TBD). Unclassified courses not determined to be either a HIP, HEE, or Neither were from the Economics major, which transitioned to the School of Business partway through the multi-year HIPs assessment process. For graduation GPA and course GPA analyses, two HIP courses (Internships and Volunteer Income Tax Assistance (VITA)) were omitted as they are graded on a pass/no-pass grading system which results in zero points per credit to calculate GPA.

Measures

Table 1 provides a detailed list of the variables and measurements used in this study.

Table 1. Overview of Variables Used and Coding.

Variable	Description
Course Classification	Classification of course based on HIPs Spectrum using HSCCQ (0=*to be determined*, 1=*neither*, 2=*high engagement experience (HEE)*, 3=*high impact practice (HIP)*)
Course Count	Based on HIP_HEE course designation, count of the number of courses a student has taken (*TBD count, neither count, HEE count, HIP count*)
Persistence	Binary enrollment status of student (0=*discontinued not graduated,* 1=*current active or graduated*)
Course Grade	Earned course grade as recorded by the university, converted to numeric value (0.0=*F*, 1.0=*D*, 1.5=*CD*, 2.0=*C*, 2.5=*BD*, 3.0=*B*, 3.5=*AB*, 4.0=*A*)
Graduation GPA	Overall GPA at time of graduation as recorded by the university (*scale of 0.00-4.00*)
Years to Graduation	Calculated numbers of years to graduation based on admit date and graduation date, rounded up to the nearest whole year
CONTROL VARIABLES	
Sex	Student's self-reported sex (0=*female*, 1=*male*)
Age	Calculated age based on student provided birthdate
Minority	Student's self-report data when enrolling at the university with underrepresented status determined relative to the context of this PWI university (0=*non-underrepresented racial or ethnic minority*, 1=*underrepresented racial or ethnic minority*)
Pell Grant Eligible	Pell Grant eligibility status as reported by the university (0=*non-Pell Grant recipient*, 1=*Pell Grant recipient*)
First-Generation	First-generation student status as self-reported to the university (0=*non-first-gen student,* 1=*first-gen student*)

Sample Demographics

As shown in Table 2, the School of Business Pell Grant eligible students represented 38.3% of the student body studied, first-generation students represented 52.7%, and minority students represented

15.3%. In comparison, the University currently (as of Fall 2022) has 24.6% Pell Grant eligible students, 45.4% first-generation students, and 22.4% minority (University of Wisconsin – Green Bay, 2022d). The studied sample includes 54.1% of students who self-identified as female. At the University level, 66.2% self-identified as female (University of Wisconsin – Green Bay, 2022d). 71.2% of the students in the studied sample were traditional-aged university students (younger than 25), compared to 78.5% at the University level. Additional details regarding demographics can be found in Table 2.

Table 2. School of Business Students' Demographics, Based on Persistence.

	Persist		Did Not Persist		Total	
	n	%	*n*	%	*n*	%
Sex						
Female	2,543	54.7%	759	52.1%	3,302	54.1%
Male	2,102	45.3%	698	47.9%	2,800	45.9%
No Data					2	0.0%
Low Resource						
Pell Grant Eligible	1,818	39.1%	520	35.7%	2,338	38.3%
Non-Pell Grant Eligible	2,829	60.9%	937	64.3%	3,766	61.7%
First-Generation						
First-Generation Student	2,485	53.5%	734	50.4%	3,219	52.7%
Non-First-Generation Student	2,162	46.5%	723	49.6%	2,885	47.3%
Race						
Minority Status	691	15.1%	242	17.0%	933	15.3%
Non-Minority Status	3,872	84.9%	1,178	83.0%	5,050	82.7%
No Data					121	2.0%
Age						
Traditional (Under 25)	3,285	71.1%	1,061	73.0%	4,346	71.2%
Non-traditional (25-50)	1,273	27.6%	376	25.9%	1,649	27.0%
Senior (50+)	60	1.3%	17	1.2%	77	1.3%
No Data					32	0.5%

Results

To test hypotheses, dependent variables of persistence, graduation GPA, and course GPA were analyzed separately.

Hypothesis 1 – Student Completion of HIPs and HEEs

Hypothesis one predicted that *student completion of HIPs and HEEs will be more strongly related, respectively, to a) persistence, b) time to graduation, and c) performance (graduation GPA), than completion of Neither HIPs nor HEEs courses.* This was examined through multiple statistical methods.

H1a) Student Completion of HIPs and HEEs with Persistence

Logistic regression was used to analyze this hypothesis, as the outcome of persistence is a dichotomous variable. While holding sex, age, minority status, Pell Grant status, and first-generation status constant, logistic regression analysis determined that for each additional HIPs course taken, a student's chance of persistence increases by .283 ($p<.001$) and for each additional HEEs course taken, a student's chance of persistence increases by .464 ($p<.001$). Results for hypothesis 1a can be found in Table 4 and Figure 3. In contrast, while holding sex, age, minority status, Pell Grant status, and first-generation status constant, logistic regression analysis determined that for each additional Neither course taken, a student's chance of persistence decreases by .087 ($p<.001$). Therefore, hypothesis 1a is supported.

H1b) Student Completion of HIPs and HEEs with Time to Graduation

For this analysis, the data was initially analyzed using OLS regression analysis with *all* students who graduated in our sample. Results for hypothesis 1b can be found in Table 5 and Figure 4.

HIPs. The results of the regression analysis (see Table 4) shows that while controlling for sex, age, minority status, Pell Grant status, and first-gen status, the number of HIPs courses taken were *not* a significant predictor of time to graduation for all students (β = - 0.032, $p=.385$.)

HEEs. The results of the regression analysis (see Table 4) shows that while controlling for sex, age, minority status, Pell Grant status, and first-gen status, with each additional HEEs courses taken, student's time to graduation decreased by 1.84 months (β = - 0.153, $p<.001$); or in other words, *for every four HEEs classes taken, a student graduated a* <u>*full*</u> *semester sooner.*

Neither. The results of the regression analysis (see Table 4 and Figure 3) shows that while controlling for sex, age, minority status, Pell Grant status, and first-gen status, with each additional Neither course taken, student's time to graduation increased by 2.82 months (β = 0.235, $p<.001$); or in other words, *for every four Neither classes taken, a student graduated a full year later.*

In summary, hypothesis H1b is partially supported.

H1c) Student Completion of HIPs and HEEs with Performance (Graduation GPA)

For this analysis, the data was analyzed using OLS regression analysis with students who have graduated in our sample. Results for hypothesis 1c can be found in Table 6. While holding sex, age, minority status, Pell Grant status, and first-generation status constant, there was no significant relationship between the number of HIPs (β = 0.037, $p=.311$), HEEs (β = - 0.010, $p=.762$), or Neither (β = 0.039, $p=.219$) courses taken by a student in the business school and their subsequent overall performance as measured by Graduation GPA. Therefore, hypothesis H1c is not supported.

Hypothesis 2 - Course Category and Course Performance

The second hypothesis stated that course performance (course GPA) in both HIPs and HEEs courses will be respectively greater than in Neither courses. This was examined with linear regression with 105 different courses classified as 1= Neither, 2=HEE, and 3=HIP, and course GPA was calculated as the average GPA over time, over all students, for each specific course. The TBD courses were

excluded from this analysis as well as two HIPS courses that are graded on a Pass/No Pass scale: VITA and Internship. Results for hypothesis 2 can be found in Table 3.

Table 3. GPA by Course Classification.

		Unstandardized Coefficients		Standardized Coefficients			95.0% Confidence Interval for *B*	
Model		*B*	Std. Error	Beta	*t*	Sig.	Lower Bound	Upper Bound
1	(Constant)	2.856	0.077		36.991	0.000	2.703	3.008
	Course Classification	0.248	0.037	0.479	6.741	0.000	0.175	0.321

a. Dependent Variable: Average GPA

Table 3 shows regression results. It indicates that as course type moves by one unit across the HIPs Spectrum, there is a corresponding significant increase in Course Average GPA (β = 0.48, p<.001). The model indicates that course classification type explains 22% of the variance in Average GPA (Adjusted R^2=.224, p<.001). Additional post hoc testing was performed on this model and is described in the discussion section.

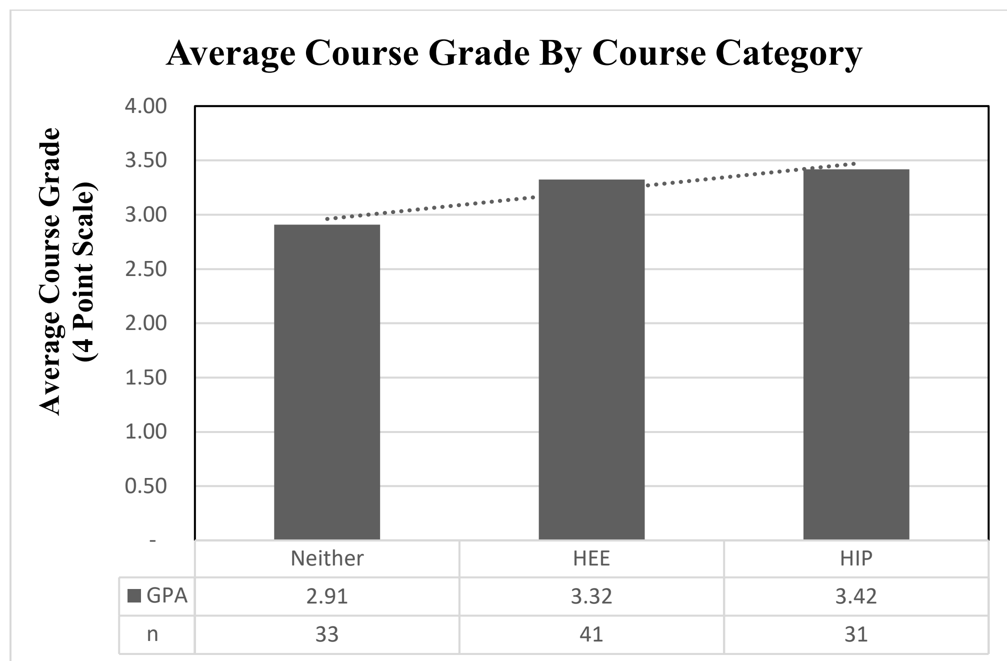

Figure 2. Average Course Grade by Course Category

Figure 2 presents the results demonstrating support for hypothesis 2 with average course GPA increasing along the HIPs Spectrum (Neither Average Course GPA =2.91/4.00; HEEs Average Course GPA = 3.32/4.00; and HIPs Average Course GPA = 3.42/4.00).

Research Question

Our exploratory research question for this paper was, "*Are there differences in the proposed relationships for H1 and H2 for subgroups (low resource, minority race, first-gen, high academic performers)?*" This was tested

through Logistical Regression, comparing counterpart groups (i.e., first-generation vs. non-first-generation students) for each of the aspects of the hypotheses: persistence, time to graduation, and graduation GPA. Course GPA was not included in these analyses, because that is calculated at a course level, not at an individual student level.

HIPs and HEEs had strong effects on different subgroups of students in terms of Persistence, shown in Table 4. For students overall, and when broken into subgroups, the impact of HEEs was stronger than the impact from HIPs for all groups of students. Non-minority students' persistence rates benefit significantly from HIPs (β=.303, *p*<.001), but HIPs do not significantly increase persistence for minority students (β=.142, *p*=.161). However, HEEs show to be significantly beneficial to minority students when it comes to persistence (β=.528, *p*<.001), even more so than for non-minority students (β=.430, *p*<.001). For the non-minority students, every additional Neither class that they took decreased their likelihood of persistence (β=-.084, *p*<.001), but that affect was not significant for minority students (β=-.079, *p*=.120). HIPs significantly affected likelihood of persistence for both first-gen (β=.278, *p*<.001) and non-first-gen students (β=.275, *p*<.001). HEEs also significantly increased likelihood of persistence for both first-gen (β=.451, *p*<.001) and non-first-gen students (β=.435, *p*<.001), and the positive impact was slightly stronger for first-gen. Additionally, each Neither class taken by non-first-gen students (β=-.112, *p*<.001) significantly decreased their likelihood of persistence, but that affect was not significant for first-gen Students (β=-.049, *p*=.102). HIPs and HEEs significantly positively impacted likelihood of persistence for both Male (HIP: β=.260, *p*<.001; HEE: .473, *p*<.001) and Female students (HIP: β=.288, *p*<.001; HEE: β=.420, *p*<.001) with slight differences between the groups.

Table 4. Impact of HIPs and HEEs on Persistence.

Variable	*n*	HIPs	HEEs	Neither
Overall Model	5,949	.283 ***	.464 ***	- .087 ***
Low Resource				
Pell Grant Eligible	2,325	.257 ***	.437 ***	-0.063
Non-Pell Grant Eligible	3,624	.289 ***	.443 ***	-.093 ***
Race				
Minority	929	0.142	.528 ***	-0.079
Non-Minority	5,020	.303 ***	.430 ***	-.084 ***
First-Generation				
First-Gen Status	3,187	.278 ***	.451 ***	-0.049
Non-First-Gen Status	2,762	.275 ***	.435 ***	-.112 ***
Sex				
Male	2,713	.260 ***	.473 ***	-.125 ***
Female	3,236	.288 ***	.420 ***	-.031

Note: Table shows Beta value from logistic regression. Pell Grant eligibility, sex, age, minority race, and first-generation status were held constant as control variables when not the variable in question. High performers were excluded from this analysis as a variable because it was measured by graduation GPA, and by definition, reaching graduation means that the student persisted.
*** *p*<0.001

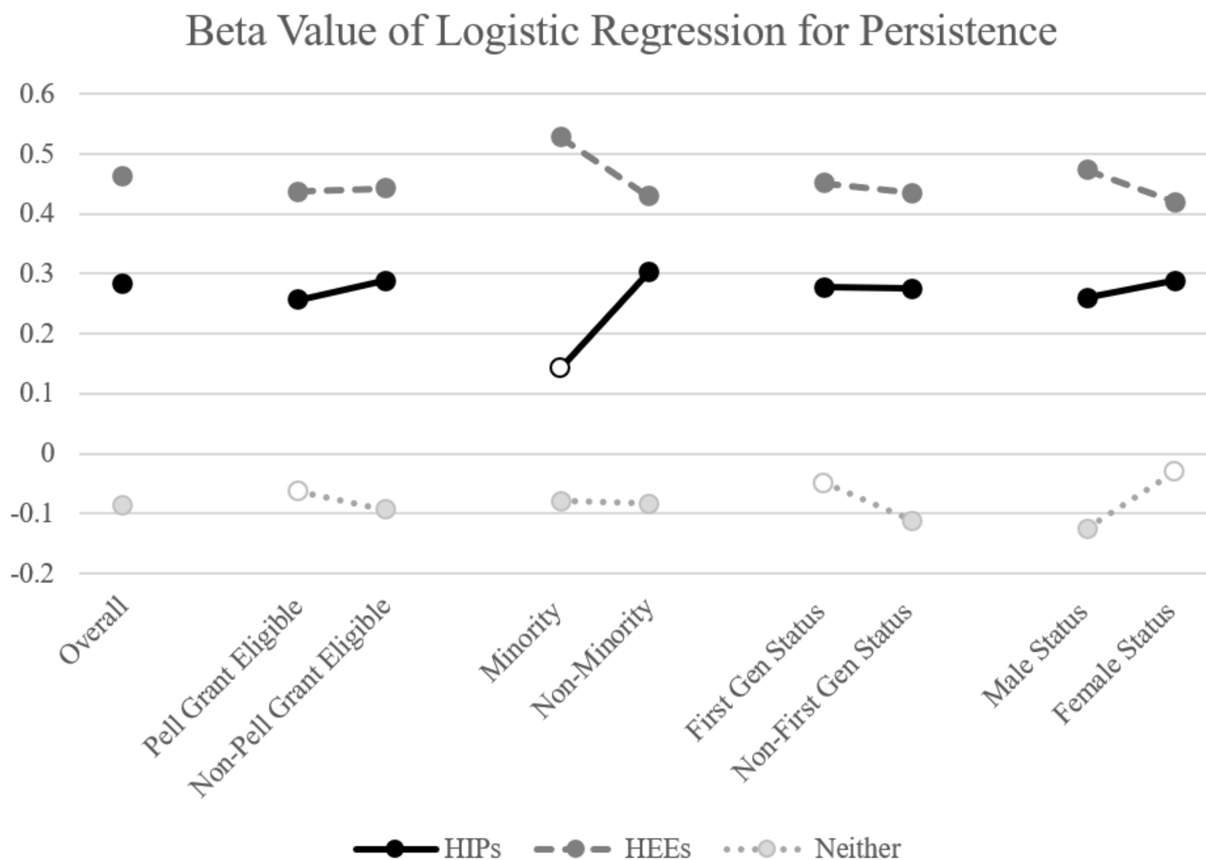

Figure 3. Beta Value of Logistic Regression for Persistence. Pell Grant eligibility, sex, age, minority race, and first-generation status were held constant as control variables when not the variable in question. Solid circles indicate significant results; open circles indicate non-significant results.

When examining Hypothesis 1b about HIPs and HEEs impacting Time to Graduation, we found that HIPs do not significantly affect time to graduation for any of the tested subgroups, shown in Table 5. HEEs significantly decrease time to graduation for students overall, but the effect sizes are lower for subgroups of students, even when significant. For female students, Neither courses significantly decrease time to graduation, whereas Neither courses increase time to graduation for male students and all other subgroups tested.

Table 5. Impact of HIPs and HEEs on Time to Graduation.

Variable	*n*	HIPs	HEEs	Neither
Overall Model	2,873	-0.032	- 0.153 ***	0.235 ***
Low Resource				
Pell Grant Eligible	1,164	-0.033	-0.024	.054 ***
Non-Pell Grant	1,709	-0.002	-.082 ***	.073 ***
Race				
Minority	361	0.027	-.105 *	.079 ***
Non-Minority	2,512	-0.019	-.056 ***	.063 ***

First-Generation				
First-Gen Status	1,553	-0.021	-.043 *	.056 ***
Non-First-Gen Status	1,320	-0.008	-.080 ***	.078 ***
Sex				
Male	1,264	0.007	-.089 ***	.075 ***
Female	1,609	-0.027	-.039 *	-.057 ***
High Performers				
GPA>or= 3.5	1,191	0.006	-.089 ***	.083 ***
GPA <3.5	1,682	-0.03	-.041 *	.055 ***

Note: Table shows Beta value from OLS regression. Pell Grant eligibility, sex, age, minority race, and first-generation status were held constant as control variables when not the variable in question.
* p<0.05, *** p<0.001

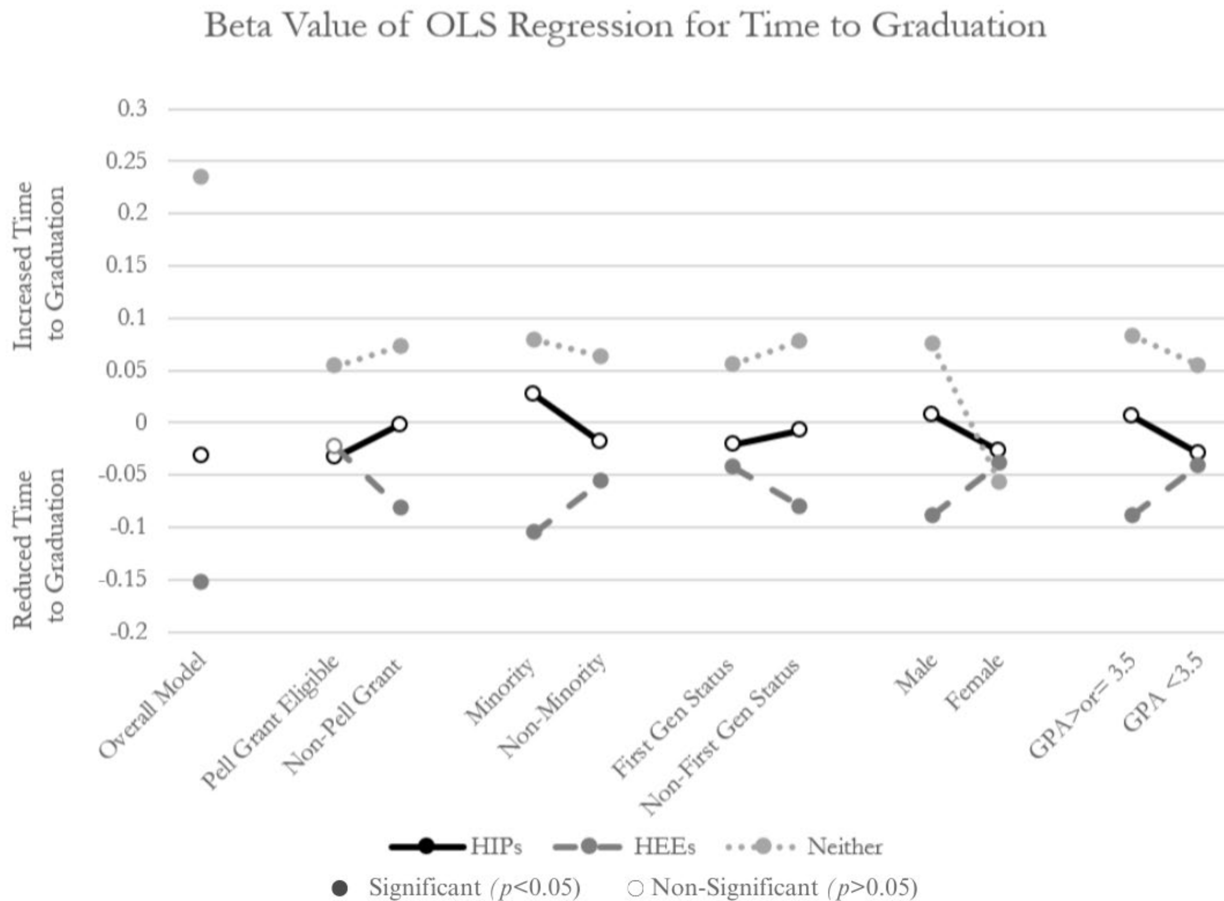

Figure 4. Beta Value of OLS Regression for Time to Graduation. Pell Grant eligibility, sex, age, minority race, and first-generation status were held constant as control variables when not the variable in question. Solid circles indicate significant results; open circles indicate non-significant results.

The third analysis examined differences between subgroups of students regarding graduation GPA. As shown in Table 6, no significant results came from this analysis.

Table 6. Impact of HIPs and HEEs on Graduation GPA.

Variable	*n*	HIPs	HEEs	Neither
Overall Model	2,856	0.037	-0.010	0.039
Low Resource				
Pell Grant Eligible	1,158	0.010	-0.004	0.002
Non-Pell Grant Eligible	1,698	0.003	0.000	0.005
Race				
Minority	356	0.027	0.001	-0.006
Non-Minority	2,500	0.002	-0.001	0.005
First-Generation				
First-Generation Status	1,540	0.001	-0.001	0.007
Non-First-Generation Status	1,316	0.011	-0.003	0.000
Gender				
Male	1,257	0.005	-0.004	0.006
Female	1,599	0.006	0.001	0.002
High Performers				
GPA>or= 3.5	1,158	-0.003	-0.001	0.000
GPA <3.5	1,698	0.003	0.007	0.004

Note: Table shows Beta value from OLS regression. Pell Grant eligibility, sex, age, minority race, and first-generation status were held constant as control variables when not the variable in question.

Discussion

Overall, this study provides evidence in support of the HIPs Spectrum. Results showed quantitative full support for hypothesis 1a in that HIPs and HEEs significantly increase odds of student persistence. Hypothesis 1b was partially supported, as evidence showed that taking HEEs courses *decreases* time to graduation, while taking Neither courses *increases* student time to graduation. Finally, hypothesis 2 was also fully supported, because average course GPA significantly increased along the spectrum when moving from Neither, to HEE, to HIP.

In this article, we take a novel approach to HIPs research, both by analyzing courses along the HIPs Spectrum based on a detailed assessment of course pedagogy rather than title alone, and by analyzing student outcomes based on enrollment data. Results showed positive outcomes in many regards for HIP and HEE courses, supporting the importance of the universal elements of HIPs for student success and establishing the importance of the impact of HEEs.

Impact and Relevance of HEEs

Hypothesis one predicted that persistence, time to graduation, and graduation GPA would be positively impacted by taking HEE and HIP courses, more so than taking Neither courses.

Persistence

As predicted, a student's likelihood of persistence increased for each HEE or HIP course they took and decreased for each Neither course. *Surprisingly*, the impact of HEE courses was even greater than the positive impact of HIP courses on persistence. One interpretation of this could be that HEE courses are still very engaging for students but are less intense for students who are burning out or struggling with external factors diminishing their ability to stay enrolled at the university. The intensity of HIP courses could be overwhelming for some students.

Time to Graduation

Following a similar pattern of HEEs benefiting students, each additional HEE course taken by students *reduced* their Time to Graduation, whereas each additional Neither course *increased* students' time to graduation. Surprisingly, HIPs courses did not have a significant impact on time to graduation. The number of HIPs courses could have been a minor factor in these results, as HIPs had a count of 33 courses, in comparison to HEEs at 41 and Neither at 33.

HEEs courses' strong positive impact on persistence and time to graduation justifies delineating and measuring high impact activities along a spectrum. Given this study's large sample size of 6,104 students over 7 years, the value that HEEs provide is well-supported. So far in this School of Business, a benchmark goal of how many HEEs courses to integrate into each major pathway has not been set, but we are hopeful that the significant positive results of this study will allow for informed policies to increase access to HEEs for all our students.

Performance

The third part of hypothesis one predicted that students who took more HEE and HIP courses would have higher cumulative GPAs at graduation. This prediction was not supported, as results were insignificant. One explanation for this finding could be that any effect from an especially high or low grade in certain courses got washed out in the calculation for cumulative GPA. Students are required to complete at least 120 credits to graduate with a bachelor's degree, and our School of Business requires each student to take four 3-credit HIPs courses, meaning that 10% of the credits students take are guaranteed to be HIP. In other words, the field of the GPA calculation for 120 credits is too wide for the HIPs course grades to have a significant impact on an individual student's cumulative GPA. There are simply too many variables at play in this calculation, including courses outside of the business school.

Evidence for HIPs Spectrum through Average Course GPAs

Applying a different angle at measuring performance, in hypothesis two, we proposed that the average course GPA for HIPs and HEEs courses would be significantly greater than the average course GPA for Neither courses. Our data showed strong support for hypothesis two. On a 4.0 GPA scale, the average course grade students earned was .41 higher in HEE courses than in Neither courses, and .51 higher in HIP courses than in Neither courses. In tangible terms, this would be the difference between earning a B on average in Neither courses and a B+ on average in HIP courses. While the challenge of HIP courses may scare away some students who are struggling academically, these results can serve as an example for both students and academic advisors that the engaging elements incorporated in HIP and HEE courses may actually benefit a student's final grade.

Our results led us to a post hoc question of whether the average course GPAs were significantly different between the HEE and HIP courses. In post hoc analyses, we conducted a Tukey honestly significant difference test (Tukey's HSD) to test differences among samples means for significance. The Tukey post hoc analysis showed the course GPA increase from Neither to HEE (0.37, 95% CI (0.35 to 0.40) was statistically significant (p<.001), as well as from HEE to HIP (0.10, 95% CI (0.07 to 0.13), p<.001). In addition, the increase from Neither to HIP was also statistically significant (0.48, 95% CI (0.45 to 0.50), p<.001). This statistical significance and positive trend of the average course grade from Neither to HIPs provides further quantitative evidence for the continuum of the HIPs Spectrum.

Compensatory Effects

Our exploratory research question examines how HIP and HEE courses affect students of different subgroups. Previous literature is inconclusive on whether HIPs provide a compensatory effect – in other words, a disproportionate positive impact – for first-gen or minority race students (Kuh, 2008; Kuh et al., 2017; Roldan, et al., 2020; Zilvinskis, 2019). In seeking further evidence for an answer to this pending question, we analyzed the effects of HIPs and HEEs on Pell Grant vs. Non-Pell Grant eligible students, minority vs. non-minority race students, and first-generation vs. non-first-generation students. After testing each of these comparative groups for our hypotheses, we found significant evidence of a compensatory effect in two instances, both involving HEEs rather than HIPs. For each HEE course taken, minority race students experienced a greater positive impact on both persistence and reduced time to graduation than non-minority students. The fact that these disproportionate positive impacts were found when analyzing HEEs but not HIPs could help to explain why previous literature disagrees on the compensatory effect of student engagement, once again justifying the importance of assessing HEEs.

Contradicting the compensatory effect, some previous studies have found an achievement gap for historically underserved students taking HIPs (Roldan, et al., 2020; Zilvinskis, 2019), meaning that their majority counterparts disproportionately benefited from HIPs. Our data did not show evidence of such an achievement gap for persistence. The differences between Pell Grant eligible and non-Pell Grant eligible students were small for the positive impacts on persistence from HIPs and HEEs, as were the differences between first-generation and non-first-generation students (refer to Table 4 and Figure 3). Conversely, non-first-generation students tended to benefit from more reduced time to graduation from HEEs than first-generation students. Courses designated Neither increased time to graduation for all subgroups except Females, but that detrimental effect was slightly higher for minority students and slightly lower for Pell Grant eligible students and first-generation students than their majority counterparts. We all need to work together to ensure that students are participating in HIPs and HEEs that will benefit them best as unique individuals.

Effect on Males vs. Females

The effects of HIPs, HEEs, and Neither course classifications on persistence and time to graduation varied by sex. For persistence (refer to Table 4 and Figure 3), HIPs courses had a stronger positive impact for women, HEEs had a stronger positive impact on men, and Neither courses negatively impacted men, but had no impact for women. For time to graduation (refer to Table 5 and Figure 4), HEEs courses similarly had a stronger impact on men (i.e., reducing their time to graduation), and similarly Neither courses were more detrimental to men (i.e., increasing their time to graduation). However, Neither courses positively impacted women (i.e., decreasing their time to graduation). In sum, it appears that HEEs were more beneficial to men and Neither courses were more detrimental

to men for both outcomes of persistence and time to graduation, as compared to women. For women, the HIPs courses were more beneficial for persistence increases, and Neither courses were more beneficial for time to graduation, than compared with men. However, we are hesitant to make any strong interpretations at this point, until we have more research to explore these nuances further.

Effect on High Performers

Our study also explored whether there would be differential impact of the HIPs, HEEs, and Neither courses on time to graduation for those graduating with very high graduating GPAs (equal to or greater than 3.5 on a 4.0 scale), whom we referred to as the high performers. HEEs courses had a stronger negative impact on high performers (i.e., increasing their time to graduation) and Neither courses had a less negative impact on the higher performers (i.e., increasing their time to graduation) in comparison to the students below a 3.5 graduating GPA (refer to Table 5 and Figure 4). As discussed previously, HIPs courses were not predictive of time to graduation for any of the subgroups or even overall. At a rudimentary level, regarding time to graduation, it appears that the high performers benefit from taking Neither courses and the non-high performers benefit from taking HEEs courses. However, as with the results in the previous paragraph, we are hesitant to make any strong interpretations at this point, until we have more research to further explore these nuances.

Limitations

Due to the expansive nature of the enrollment data we were working with, spanning from Fall 2015 to Spring 2022, it is difficult to know if the course that students experienced years ago would match the current version of a course, and therefore guarantee whether it would have been categorized in the same way. We have worked to mitigate this limitation by talking with the School of Business' Advising Manager and Student Success Committee to track major curriculum changes. This allowed us to separate new versions of courses from old versions of courses when there had been significant changes, such as to course number or title. In those instances, we assessed the older and newer versions of the course separately. An additional limitation was that we were interested in more student demographics but were unable to retrieve them from the Registrar. Additional variables of interest were students' declared major and whether the student lived on or off campus. Along the lines of demographics, our findings are also limited by the differential sample size of minority race students (n=933, 15%) to the non-minority race students (n=5050, 82.7%).

The focus of this study was centered around *course* designations of HIPs, HEEs, or Neither. The definition of HIPs may include experiences outside of the classroom, such as undergraduate research, internships, study abroad, etc. Our study is limited in that it excludes HIPS beyond the classroom or those taught in courses outside of the School of Business. On the other hand, the strength of this study is the detailed look at a school of business' courses.

Future Research

As we analyzed our data set and began to run statistical analysis, we realized that our data set included the possibility of exploring many interactions and variables that we had not originally hypothesized about. In future research, we plan to analyze within-group effects and intersectionality of student demographics. As time passes, our data set will grow with updated enrollment data, which we look forward to analyzing to better understand our current students. Another interesting possibility could be to compare the outcomes from this set of enrollment data with other sources of student outcome information across the university, such as surveys.

Time to Graduation could also be affected by transfer student status. Limited space and scope in this paper prevented us from addressing this consideration fully. Future research could investigate the differential effects of transfer student status on each hypothesis explored.

Implications

The HIPs Spectrum is not confined to courses only in the field of business. We encourage readers to imagine how the HIPs Spectrum and the HSCCQ could apply to their disciplines and have an interdisciplinary effect on HIPs initiatives at their institution. For example, at UWGB, the HIPs assessment within the Cofrin School of Business is informing an institution-wide HIPs assessment process. Additionally, it has informed discussions about faculty workload, student bandwidth, and how we communicate about HIPs with students during the course registration process.

In addition to opening future avenues of research, the HIPs Spectrum has various practical implications for colleges and universities: Which impactful courses are currently being taught as HIPs or HEEs, but go overlooked? How are those courses affecting our population of students? Are HIP and HEE courses equitably distributed across academic disciplines, major pathways, and instructors?

Conclusion

This study provides quantitative evidence for the effectiveness of the HIPs Spectrum, which categorizes courses along a continuum using the universal elements of high-impact practices (Kuh, et al., 2013). We analyzed seven years of enrollment data in a public, Midwestern School of Business using the HIPs Spectrum and the HSCCQ (Marten et al., in press). Results showed that students, both overall and in various identity-based subgroups, experienced positive effects on persistence from HIP and HEE courses, and that average grades tended to be higher in HIP and HEE courses than Neither courses. HEEs are a new area of study (Marten et al., in press), opening the door for many avenues of future research, especially considering that results found greater positive effects on students from HEEs than from HIPs for some variables, such as reduced time to graduation.

Appendix

Appendix 1: Descriptive Statistics.

	n	Min	Max	Mean	Std. Deviation
Number of Neither Courses Taken	6,103	0	24	3.20	3.641
Number of HEE Courses Taken	6,103	0	13	2.17	2.544
Number of HIP Courses Taken	6,103	0	16	1.71	2.382
Number of TBD Courses Taken	6,103	0	4	0.02	0.197
Sex	6,102	0	1	0.46	0.498
Age	6,072	17	68	24.57	7.450
Minority	5,983	0	1	0.16	0.363
Pell Grant Eligible	6,104	0	1	0.38	0.486
First-Generation	6,104	0	1	0.53	0.499
Valid N (listwise)	5,949				

References

Bhatt, R., Bell, A., Rubin, D. L., Shiflet, C., & Hodges, L. (2022). Education abroad and college completion. *Research in Higher Education, 63*(6). 987-1014. https://doi.org/10.1007/s11162-022-09673-z

Bhattacharyya, P., & Chan, C. W. M. (2021). Can undergraduate research participation reduce the equity gap? *Journal of the Scholarship of Teaching and Learning, 21*(1). 287- 300. https://doi.org/10.14434/josotl.v21i1.30462

Brownell, J. E., & Swaner, L. E. (2010). *Five high-impact practices: Research on learning outcomes, completion and quality.* Association of American Colleges and Universities.

Chan, C. W. M., Bhattacharyya, P., & Meisel, S. (2018). A model for successful cross-campus collaboration for engaging potentially at-risk students in mentored undergraduate research early in their college career. *Council on Undergraduate Research Quarterly, 1*(3), 48-56. https://doi.org/10.18833/spur/1/3/13

Daday, J., Kinzie, K., O'Donnell, K., Vande Zande, C., & Zilvinskis, J. (2021, October 26). *Preliminary impressions from delivering on the promise of high-impact practices.* [Conference presentation]. 2021 Assessment Institute, Indianapolis, IN, United States.

Dorimé-Williams, M. L., & Choi, S. (2023). Class, sex, and the role of involvement on Black collegians degree attainment. *Journal of Diversity in Higher Education, 16*(2), 194-204. https://doi.org/10.1037/dhe0000325

Finley, A., & McNair, T. (2013). *Assessing underserved students' engagement in high-impact practices.* Association of American Colleges and Universities.

Fischer, A. E., Immel, K. R., Wilkum, K., & Lee, L. R. (2021). A taxonomy for developing undergraduate research experiences as high-impact practices. *Journal of the Scholarship of Teaching and Learning*, *21*(1), 84-106. https://doi.org/10.14434/josotl.v21i1.30564

Hall, B., & O'Neal, T. (2016). The residential learning community as a platform for high-impact educational practices aimed at at-risk student success. *Journal of the Scholarship of Teaching and Learning, 16*(6), 42-55. https://doi.org/10.14434/josotl.v16i6.19585

Johnson, S. R., & Stage, F. K. (2018). Academic engagement and student success: Do high-impact practices mean higher graduation rates? *The Journal of Higher Education*, *89*(5), 753-781. https://doi.org/10.1080/00221546.2018.1441107

Kilgo, C. A., Ezell Sheets, J., & Pascarella, E. (2015). The link between high-impact practices and student learning: Some longitudinal evidence. *Higher Education*, *69*(4), 509-525. https://doi.org/10.1007/s10734-014-9788-z

Kilgo, C. A., Linley, J. L., Renn, K. A., & Woodford, M. R. (2019). High-impact for whom? The influence of environment and identity on lesbian, gay, bisexual, and queer college students' participation in high-impact practices. *Journal of College Student Development, 60*(4), 421-436. https://doi.org/10.1353/csd.2019.0038

Kinzie, J., Silberstein, S., McCormick, A. C., Gonyea, R. M., Dugan, B. (2021). Centering racially minoritized student voices in high-impact practices. *Change, 53*(4), 6-14. https://doi.org/10.1080/00091383.2021.1930976

Kuh, G. D. (2008). *High-impact educational practices: What they are, who has access to them, and why they matter.* Association of American Colleges and Universities.

Kuh, G. D. (2020). NSSE and NILOA: Compatriots in making outcomes assessment matter more. *Assessment Update, 32*(2), 10-12. https://doi.org/10.1002/au.30209

Kuh, G. D., & Kinzie, J. (2018, May 10). *What really makes a 'high-impact' practice high impact?* Inside Higher Ed. https://www.insidehighered.com/views/2018/05/01/kuh-and-kinzie-respond-essay-questioning-high-impact-practices-opinion

Kuh, G. D., O'Donnell, K., & Reed, S. (2013). *Ensuring quality & taking high-impact practices to scale.* Association of American Colleges and Universities.

Kuh, G. D., O'Donnell, K., & Schneider, C. G. (2017). HIPs at Ten. *Change*, *49*(5), 8-16. https://doi.org/10.1080/00091383.2017.1366805

Marten, K., Murphy, D. D., Kaminski, H. L., & Dornbush, M. (In Press). *Journal of the Scholarship of Teaching and Learning.*

Martin, R. R. (2017). Taking student success to scale. *Change, 49*(1), 38-47. https://doi.org/10.1080/00091383.2017.1265391

Myers, C. B., Myers, S. M., & Peters, M. (2019). The longitudinal connections between undergraduate high impact curriculum practices and civic engagement in adulthood. *Research in Higher Education*, *60*(1), 83-110. https://doi.org/10.1007/s11162-018-9504-4

Price, D. (2021). *Evidence from evaluation studies:* NASH TS3 HIPs initiative. NASH webinar presented on HIPs: May 10, 2021.

Roldan, M., Kothari, T., & Dunn-Jensen, L. M. (2020). Direct effects of high-impact practices on the success of business majors in large, mostly nonresidential public universities. *Journal of Management Education, 44*(1), 39-65. https://doi.org/10.1177/1052562919869384

University of Wisconsin – Green Bay. (2022a). Cofrin School of Business mission, vision, and values. Retrieved August 17, 2022. https://www.uwgb.edu/csb/about/mission

University of Wisconsin – Green Bay. (2022b). UWGB University Mission. Retrieved August 17, 2022. https://www.uwgb.edu/chancellor/university-mission/

University of Wisconsin – Green Bay. (2022c). UWGB University Detailed Factbook. Internal Private Document.

University of Wisconsin – Green Bay. (2022d). UWGB University Factbook. Retrieved August 17, 2022. https://www.uwgb.edu/CMSAssets/ISE/factbook.asp

Zilvinskis, J. (2019). Measuring quality in high-impact practices. *Higher Education*, *78*(4), 687-709. https://doi.org/10.1007/s10734-019-00365-9

Zilvinskis, J., Kinzie, J., Daday, J., O'Donnell, K., & Vande Zande, C. (Eds.). (2022). *Delivering on the promise of high-impact practices: Research and models for achieving equity, fidelity, impact, and scale.* Taylor & Francis Group.

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Student Perceptions of Faculty Mindset

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Abstract: This study investigates the influence of instructor mindset on student perceptions. Due to the need for increasing science, technology, engineering, and mathematics (STEM) student retention and the issue of underrepresentation of minority groups in STEM disciplines, we also examined whether instructor mindset impacts underrepresented students more than represented students in the context of STEM education. Undergraduate student participants (N = 273) reviewed growth and fixed mindset syllabi and responded to a questionnaire to assess perceptions about their likely response and the professor. The significant main effect of faculty mindset revealed that students anticipated better grades and reported a more positive view of the instructor, greater self-efficacy, and higher expectations the professor would treat them fairly after reading a growth mindset syllabus than after reading a fixed mindset syllabus. Women reported lower expected grades, less self-efficacy, and lower expectations of fair treatment than men after reading a fixed mindset syllabus; there were no gender differences after reading a growth mindset syllabus. The results of underrepresented racial/ethnicity group analyses were less clear cut. Our findings, alongside similar research, suggest that students have more positive perceptions of their ability to succeed when an instructor endorses a growth mindset than when an instructor endorses a fixed mindset. Implications include interventions to enhance growth-mindset orientation among instructors.

Keywords: instructor mindset, syllabus, student perceptions, STEM education

Considerable evidence suggests that an influential factor in student academic success is the mindset the student endorses (e.g., Blackwell et al., 2007; Burnette et al., 2013; Grant & Dweck, 2003). Although researchers have examined the impact of student mindset on student success, we know less about how an instructor's mindset may influence student motivation and expectations. This study considers how students' perceptions of instructor mindset, as conveyed in a course syllabus, may influence student expectations and efficacy in the context of science, technology, engineering, and mathematics (STEM) education. Students majoring in STEM disciplines are relatively likely to drop their STEM major or take a different direction (Whitcomb & Singh, 2021). Moreover, students who are underrepresented in STEM fields commonly exhibit higher attrition rates than represented students (Beasley & Fischer, 2012; National Science Board [NSB], 2015; Whitcomb & Singh, 2021). The issues of STEM student retention, in conjunction with issues of limited diversity in the STEM workforce (NSB, 2022), suggest a need for creating an open environment in which all students can thrive, regardless of minority or majority status (NSB, 2022; e.g., Canning et al., 2019).

Mindset

Dweck and Leggett's (1988) social-cognitive model connects implicit theories (i.e., mindset), motivation, and goal orientation to student learning. According to this model, individuals who believe intelligence cannot be changed (i.e., entity theorists) endorse a fixed mindset. They are likely motivated by performance goals and, therefore, seek validation of their competency and desire others to see them as capable and intelligent, both of which lead the individual to avoid possible challenges that might lead to failure. Conversely, individuals who consider intelligence to be malleable are likely to endorse a mastery goal orientation in which challenges are welcomed and failures are seen as opportunities to learn. Those individuals are, then, likely to exert effort to become more competent and to endorse a desire to learn. Individuals who view intelligence as malleable are considered to have a growth mindset (i.e., incremental theorists). Essentially, Dweck and Leggett's model proposes that an individual's mindset impacts the adoption of performance or mastery goals, and this goal orientation then affects behaviors such as facing or avoiding challenges. Burnette and colleagues' (2013) analysis of 113 studies indicates that, as a whole, research supports this theory. In their review, growth mindset was positively related to mastery goal orientation and negatively associated with performance goal orientation and behaviors such as avoiding challenges.

Instructor Mindset

Instructor mindset is related to teaching behaviors; instructors with more of a growth mindset are more likely to adopt evidence-based effective teaching practices (Ferrare, 2019; Richardson et al., 2020). Thus, the way a course is organized, presented, and taught by an instructor can reflect that instructor's mindset and beliefs about student success. The impact of such beliefs on students are seen in Rattan and colleagues' (2018) manipulation of instructor mindset. In this study, students read a paragraph presented as an instructor's introduction to a STEM course, communicating either that all students have the potential for success in the course or that only some students have the potential for success in the course. Their findings revealed that students, especially those underrepresented in STEM, were affected by the instructor's beliefs regarding student ability. Specifically, students from the majority group (European Americans) had a more positive view of the STEM course and instructor than students from the minority group (African Americans) when the instructor reported the belief that only some students would succeed. However, this racial gap did not exist when the instructor communicated that all students have the ability to succeed. They also found that men reported a greater sense of belonging than women when the instructor communicated that only some students have the potential for success, and again this difference was not apparent when the instructor told the students that everyone has the potential to succeed.

More evidence of the impact of instructor mindset is seen in LaCosse et al.'s (2020) research with a similar focus on STEM professor mindset. They found that students who read a review suggesting that an instructor had a fixed mindset reported lower course interest, expressed more concerns about being treated unfairly, anticipated poorer academic performance, and reported less sense of belonging than students who read the reviews of a STEM instructor with a growth mindset. Additionally, LaCosse and colleagues noted that women expected a more negative experience in courses led by fixed mindset instructors than men did, and that gender differences were not apparent in courses taught by an instructor with a growth mindset.

Canning et al. (2019) found that students taught by an instructor who endorsed a fixed mindset were less motivated, less likely to recommend the course to another student, and had more negative experiences in the class than students who were taught by an instructor who endorsed a growth mindset. Furthermore, results indicated that the racial achievement gap was more pronounced when

the instructor endorsed a fixed mindset than when the instructor endorsed a growth mindset. Subsequent research by Canning and colleagues (2022) revealed similar findings for gender. The gender achievement gap was greater when students imagined or took a course from an instructor who endorsed a fixed mindset than when the instructor endorsed a growth mindset.

Role of Syllabi

The present study examines how the instructor's mindset, as conveyed in a syllabus, may impact student expectations in a STEM course. While the primary purpose of a syllabus is to provide course information, it also functions as a first impression of the instructor (Nusbaum et al., 2021). Thus, syllabi outline fundamental information about course requirements, assignments, and grading, while simultaneously providing insight into the instructor's expectations of student performance in the class.

Considerable evidence suggests that the way information is conveyed in a syllabus impacts student evaluations and expectations of the instructor and the course (e.g., Lightner & Benander, 2018; Nusbaum et al., 2021). Harnish and Bridges (2011), for example, investigated differences between students who read a positive/friendly syllabus and students who read an unfriendly syllabus. Information about the course was consistent across both syllabi; however, the tone was manipulated such that the friendly syllabus used more positive language, incorporated humor, and conveyed compassion, while the unfriendly syllabus was harsher in tone and did not convey a positive outlook on student expectations. Students perceived the instructor of the friendly syllabus to be warmer, more approachable, and more motivated to teach the course than the instructor of the unfriendly syllabus.

Current Study

We evaluated academic self-efficacy and grade expectations, both of which reflect a student's expectation of success in the course (Honicke & Broadbent, 2016; van der Zanden et al., 2018). Additionally, we evaluated students' perceptions of the instructor, including the extent to which the instructor's characteristics were those expected from a growth-oriented instructor and the extent to which students would anticipate fair treatment from the instructor. Previous research has demonstrated that perceptions of the instructor are related to student engagement, actual and expected performance, and course interest (Canning et al., 2022; LaCosse et al., 2020; Muenks et al., 2020; Schussler et al., 2021). Thus, the first two hypotheses tested in this study are as follows:

- H1. Students who read a growth mindset syllabus will report higher expected grades and more academic self-efficacy than those who read a fixed mindset syllabus.
- H2. Students who read a growth mindset syllabus will report a more positive view of the instructor and greater expectations of fair treatment from the instructor than students who read a fixed mindset syllabus.

We also assessed student attributions for the grade they would receive in the class. Students made attributions about their grade along the stability and locus dimensions of Weiner's model of causal attributions (Weiner et al., 1971: Weiner, 1985). The four attributions included in Weiner's model are effort (unstable, internal), luck (unstable, external), intelligence (stable, internal), and difficulty of the course (stable, external). Although effort is an unstable attribution in Weiner's model, it is the internal factor over which students have some control. By definition, the fixed mindset syllabus emphasizes the importance of one's intelligence. Attributions to gender and minority status were also included due to our focus on underrepresented students. Thus, our third and fourth hypotheses were:

H3. Students who read a growth mindset syllabus will attribute their grade more to effort and less to intelligence than students who read a fixed mindset syllabus.
H4. Students who read a growth mindset syllabus will attribute their grade less to minority status and gender than students who read a fixed mindset syllabus.

Consistent with previous research (e.g., Canning et al., 2019; Canning et al., 2022; LaCosse et al., 2020; Rattan et al., 2018), we expected the negative effects of reading a fixed mindset syllabus to be stronger for students from underrepresented groups in STEM. That is, we anticipated:

H5. There will be fewer differences in expected grades, academic self-efficacy, perspective of instructor, and expected fair treatment between men and women after reading a growth mindset syllabus than after reading a fixed mindset syllabus.
H6. There will be fewer differences in the critical dependent variables between students from represented racial groups in STEM (White and Asian students) and students from underrepresented racial groups in STEM (all other racial groups) after reading a growth mindset syllabus than after reading a fixed mindset syllabus.

Method

Participants

Undergraduate students ($N = 294$) were recruited from the Psychological Sciences research participant pool and from Math and Computer Science classes at Augusta University to complete the study online via Qualtrics. Responses of participants who responded incorrectly to at least one of the two attention check items ($n = 17$) were removed from the dataset; additionally, one participant withdrew from the study following the debriefing statement at the end of the survey. Three reviewers blind to the experimental condition reviewed syllabus reflections. If all reviewers agreed that they could not determine if a response reflected either a growth or fixed mindset, that participant's data were removed ($n = 3$). Responses from 273 participants remained in the dataset.

Of the participants, 194 identified as female (71.1%), 74 as male (27.1%), 3 as transgender or non-binary (1.1%); 2 participants chose not to report gender (0.7%). Participants' age ranged from 18 to 44 years ($M = 20.69$, $SD = 3.30$). The largest proportion of participants (43.6%) identified as White ($n = 119$), 31.5% identified as Black/African American ($n = 86$), 11.0% as Asian ($n = 30$), 5.9% Hispanic/Latino ($n = 16$), 5.5% multi-ethnic ($n = 15$), 1.5% self-described as other ($n = 4$), 0.7% declined to state their racial identity ($n = 2$), and 0.4% did not respond to the item ($n = 1$). Sixty-seven participants (24.5%) indicated that they were in their first year in college; 61 (22.3%) in their second year; 67 (24.5%) in their third year; 52 (19%) in their fourth year; and 26 (9.5%) were either in their fifth year or other.

For this study, the most recent NSB report (2022) was used to classify participants into represented and underrepresented groups based on the race/ethnicity the participants reported. The represented group included participants who identified as White and Asian ($n = 149$), and the underrepresented group included participants who identified as any other race/ethnicity (i.e., Black/African American, Hispanic/Latino, Multi-ethnic, and Other; $n = 121$). Additionally, women were considered underrepresented in STEM (NSB, 2022).

Materials

Syllabi

Four syllabi were created, two to reflect a fixed mindset and two to reflect a growth mindset. For each set of mindset syllabi, one syllabus was for an introductory physics course and one for an introductory chemistry course. Each syllabus included the course title, semester and year, time of the class, available office hours, course description, course expectations, grading policy, exam policy, and homework policy. All syllabi depicted a difficult/intense course, and basic aspects of the course were held constant (e.g., time of the course, office hours, assignment of homework). Instructor mindset as projected in the syllabus was manipulated by varying the course expectations and policies to reflect behaviors and attitudes that have been found to be associated with instructor mindset (Ferrare, 2019; Richardson et al., 2020). The syllabi varied in messages about the malleability of ability, expectations for success, attitude about challenge, importance of effort, opportunities for feedback, and instructor availability.

The growth mindset syllabus included statements that reflected an instructor who believes all students can succeed with effort and willingness to face challenges and who is willing to support their learning:

> Although this is a challenging course, students can do well. When facing a challenge, it is best for students to embrace it and use it as an opportunity to develop. Students from previous semesters have done well in this course. This is a difficult course, and I am expecting students to come to me with any questions they may have and for constructive criticism. I would like for you to put in effort and seek help when you need it. Learning is a shared responsibility. I will do my best to facilitate your learning. If you complete the assignments and readings, you will do well.

The course design mirrored these beliefs, with the instructor allowing students to resubmit homework for additional points, including the homework grade as part of the final grade, and providing opportunities for feedback (e.g., answer keys for each exam and homework assignments).

The fixed mindset syllabus included statements that reflected an instructor who believes only some students will succeed, that effort does not guarantee success, and that it is the students' responsibility to learn:

> Not every student will do well in this…course. Students from previous semesters either do great or they fail. If a student consistently gets grades toward the lower end of the distribution of scores, they should consider withdrawing. You may put in a lot of effort and still perform poorly in this class…. Everything you need for this class will be in the textbook or on the class page. It is your responsibility to read the materials and come to class prepared.

The course design mirrored these beliefs, with homework not counting toward the grade in the course but reporting that students who do well on the homework typically do well in the course. The fixed mindset instructor's syllabus also suggested limited access to feedback (e.g., requiring students to make an appointment to come to the instructor's office to see the answer key), with an emphasis on comparative feedback (e.g., showing students where they place in the grade distribution).

Questionnaire

Expected grade was assessed by asking participants the grade they would expect to receive using a scale of "A" to "F" (i.e., $A = 5$, $B = 4$, $C = 3$, $D = 2$, and $F = 1$). They were also asked to indicate the extent to which six factors contributed to their grade in the class: gender, minority status, effort/hard work, difficulty of the course, luck, and intelligence/ability (1 = *No contribution*; 5 = *Major contribution*).

Perception of instructor characteristics was assessed by asking participants about the extent to which the instructor would be likely to have each of the following characteristics: helpful, approachable, encouraging, and believes students can succeed. Responses were reported on 5-point scales anchored with 1 (*Not at all likely*) and 5 (*Very likely*). These items created an internally consistent scale (fixed mindset $\alpha = .93$; growth mindset $\alpha = .92$), so the four responses were averaged to create a measure of Perception of Instructor.

Academic self-efficacy was assessed with 5 items from the Patterns of Adaptive Learning Strategies Scales (Midgley et al., 2000). Participants indicated the extent to which they agreed with items addressing their perception of their ability to do their course work (e.g., "I could do even the hardest work in this class if I tried") on 5-point scales anchored 1 (*strongly disagree*) to 5 (*strongly agree*). Internal consistency for this sample was strong (fixed mindset $\alpha = .89$; growth mindset $\alpha = .89$).

Fair treatment concerns were assessed with two items from LaCosse et al. (2020): "I think I would be treated fairly by the professor," and "I think I would trust the professor to treat me fairly," to which participants indicated their level of agreement on 5-point scales (1 = *strongly disagree*; 5 = *strongly agree*). The two items were highly correlated (fixed mindset $r = .88$; growth mindset $r = .85$).

Items were included at the end of the survey to gather information about gender, race/ethnicity, age, year in school, major and minor area of study, and the highest level of education obtained by each parent/guardian.

To encourage attention to the syllabus and to provide data for the manipulation check, participants provided a short reflection immediately following presentation of each syllabus: "After reading this syllabus, what would you tell other students about what to expect from this class? Please write one to two sentences." In addition, an attention check item appeared approximately halfway through each questionnaire (e.g., "If you are reading this, please select the option "Strongly agree" from those listed below").

Procedure

Participants were first presented with an informed consent statement; those who agreed to participate were presented with two syllabi, each followed by the manipulation check reflection and dependent variable measures. After completing the two sets of syllabus, reflection, and questions, participants then completed the background questions. In order to assure fully informed consent, participants were given the option to withdraw from the study after reviewing the debriefing statement. The study was reviewed and approved by the university's Institutional Review Board.

Design and Analysis

Faculty mindset as projected in the syllabus was manipulated as a within-subjects variable; that is, each participant responded to both a fixed and a growth mindset syllabus. In order to address possible order effects, mindset order and course order were randomized. Thus, we created syllabi for two courses (one physics syllabus and one chemistry syllabus) and created versions for each that reflected fixed and growth instructor mindsets.

Because we were especially interested in examining responses of students underrepresented in STEM disciplines, some of the analyses used gender as an independent variable and some used underrepresented racial group as an independent variable. We conducted analyses of variance (ANOVA) in which represented/underrepresented group (between-groups) and instructor mindset (repeated measure) served as independent variables. Order of syllabus orientation and order of course were initially included as independent variables. Those analyses indicated the order effects did not modify the interpretation of other effects, so we report analyses without order factors.

Results

Gender x Instructor Mindset Analyses

Instructor Mindset Effects

As reported in Table 1, the results of the 2 (Instructor Mindset) x 2 (Student Gender) ANOVA with repeated measures on the first factor revealed strong main effects of instructor mindset. Students anticipated making higher grades, reported greater academic self-efficacy, had higher expectations of fair treatment by the professor, and perceived the instructor more positively after reading a syllabus in which the instructor endorsed a growth mindset than after reading a syllabus in which the instructor endorsed a fixed mindset. Students also reported that gender would contribute more to their grade after reading a fixed mindset syllabus than after reading a growth mindset syllabus.

Table 1. Main Effects of Instructor Mindset.

Dependent Variables	Fixed		Growth		Main Effect of Instructor Mindset
	M (SD)	*95% CI*	*M (SD)*	*95% CI*	
Expected Grade	3.19 (1.02)	[3.14, 3.42]	4.37 (0.71)	[4.29, 4.49]	$F(1, 265) = 295.88$, $p < .001$, $\eta_p^2 = .53$
Self-Efficacy	2.95 (0.93)	[2.94, 3.18]	4.15 (0.73)	[4.07, 4.27]	$F(1, 266) = 300.17$, $p < .001$, $\eta_p^2 = .53$
Fair Treatment	2.87 (1.27)	[2.79, 3.13]	4.51 (0.74)	[4.40, 4.60]	$F(1, 266) = 255.97$, $p < .001$, $\eta_p^2 = .49$
Perception of Instructor	2.10 (1.14)	[1.98, 2.28]	4.46 (0.84)	[4.35, 4.57]	$F(1, 266) = 559.68$, $p < .001$, $\eta_p^2 = .68$
Gender Attribution	1.40 (0.90)	[1.22, 1.46]	1.26 (0.73)	[1.13, 1.33]	$F(1, 266) = 4.85$, $p = .029$, $\eta_p^2 = .02$

Attributions

A 2 (Student Gender) x 2 (Instructor Mindset) x 4 (Attribution Source) ANOVA with repeated measures on the second two factors revealed a main effect of instructor mindset, $F(1, 264) = 81.85$, $p < .001$, $\eta_p^2 = .24$, and of attribution source, $F(1, 264) = 163.09$, $p < .001$, $\eta_p^2 = .65$. The main effect of instructor mindset revealed that students made stronger attributions for their grades in the fixed condition ($M = 4.16$, $SD = 0.95$, 95% CI [4.10, 4.25]) than in the growth mindset condition ($M = 3.85$, $SD = 0.91$, 95% CI [3.75, 3.90]). Pairwise comparisons for the main effect of attribution source revealed statistically significant differences between each grade attribute; students attributed their expected grade to effort ($M = 4.60$, $SD = 0.80$, 95% CI [4.52, 4.69]) the most, followed by difficulty

of the course (M = 4.39, SD = 0.81, 95% CI [4.28, 4.46]), intelligence (M = 4.22, SD = 0.88, 95% CI [4.10, 4.30]), and lastly, luck (M = 2.79, SD = 1.21, 95% CI [2.69, 2.97]).

The significant interaction between Instructor Mindset and Attribution Source, $F(1, 262) = 28.00$, $p < .001$, $\eta_p^2 = .24$, provides a more nuanced picture of the effect of Instructor Mindset (see Table 2). Analysis of simple effects of syllabus mindset for each attribution revealed that, as expected, students attributed their anticipated grade more to course difficulty, luck, and intelligence in the fixed mindset condition than in the growth condition. Furthermore, analysis of simple effects of attribution source and pairwise comparisons indicated that after reading a fixed mindset syllabus, students reported that effort and difficulty of the course contributed more to their grade than intelligence; the attribution to intelligence was greater than to luck. After reading a growth mindset syllabus, students attributed their grade most to effort, followed by difficulty of the course and intelligence, with luck again being seen as the least likely contributor to the students' expected grade. Notably, although attributions to luck are the lowest in both conditions, luck is perceived to make a significantly greater contribution to the final grade in the fixed than in the growth condition.

Table 2. Descriptive statistics and simple effects for Instructor Mindset x Grade Attribution interaction.

Dependent Variables	Fixed			Growth			Simple Effect of Instructor Mindset
	M	*SD*	*95% CI*	*M*	*SD*	*95% CI*	
Effort/Hard work	4.53_a	0.93	[4.43, 4.68]	4.67_a	0.67	[4.56, 4.74]	$F(1, 263) = 2.19, p = .14, \eta_p^2 = .01$
Luck	3.07_c	1.32	[2.95, 3.31]	2.50_c	1.12	[2.38, 2.68]	$F(1, 263) = 52.52, p < .001, \eta_p^2 = .17$
Difficulty of Course	4.69_a	0.69	[4.60, 4.78]	4.09_b	0.94	[3.92, 4.17]	$F(1, 263) = 114.24, p < .001, \eta_p^2 = .30$
Intelligence	4.34_b	0.86	[4.21, 4.44]	4.12_b	0.90	[3.95, 4.19]	$F(1, 263) = 15.19, p < .001, \eta_p^2 = .05$
Simple Effect of Grade Attribution	$F(1, 262) = 100.38, p < .001, \eta_p^2 = .54$			$F(1, 262) = 190.56, p < .001, \eta_p^2 = .69$			

Note. Subscripts indicate differences in the column.

Gender Effects

As reported in Table 3, men anticipated better grades and reported greater self-efficacy than women, and women believed that gender would contribute more to their grade than men did.

Table 3. Main Effects of Gender.

Dependent Variables	Men		Women		Main Effect of Gender
	M (SD)	*95% CI*	*M (SD)*	*95% CI*	
Expected Grade	3.96 (0.78)	[3.79, 4.13]	3.71 (0.89)	[3.61, 3.81]	$F(1, 265) = 6.24, p = .013, \eta_p^2 = .02$
Self-Efficacy	3.74 (0.68)	[3.59, 3.90]	3.48 (0.87)	[3.38, 3.58]	$F(1, 266) = 7.94, p = .029, \eta_p^2 = .03$
Fair Treatment	3.81 (0.96)	[3.64, 3.99]	3.65 (1.02)	[3.54, 3.75]	$F(1, 266) = 2.62, p = .106\ \eta_p^2 = .01$
Perception of Instructor	3.33 (0.83)	[3.17, 3.49]	3.26 (1.04)	[3.17, 3.36]	$F(1, 266) = 0.44, p = .506, \eta_p^2 = .002$

Gender Attribution	1.18 (0.53)	[1.02, 1.35]	1.39 (0.89)	[1.28, 1.49]	*F*(1, 266) = 4.17, p = .042, η_p^2 = .02

The analysis also revealed significant interactions between Instructor Mindset and Student Gender for expected grade (*F*(1, 265) = 6.48, p = .011, η_p^2 = .024), self-efficacy (*F*(1, 266) = 4.34, p = .002, η_p^2 = .036), and professor fair treatment (*F*(1, 266) = 5.78, p = .017, η_p^2 = .021). Consistent with our expectation that the effect of instructor mindset would be greater for students from groups underrepresented in STEM disciplines, subsequent analysis of simple effects revealed that, when presented with a fixed mindset syllabus, women expected lower grades, reported less self-efficacy, and expected less fair treatment than men. However, men and women did not differ on these variables after reading a growth mindset syllabus (see Figure 1 and Table 4).

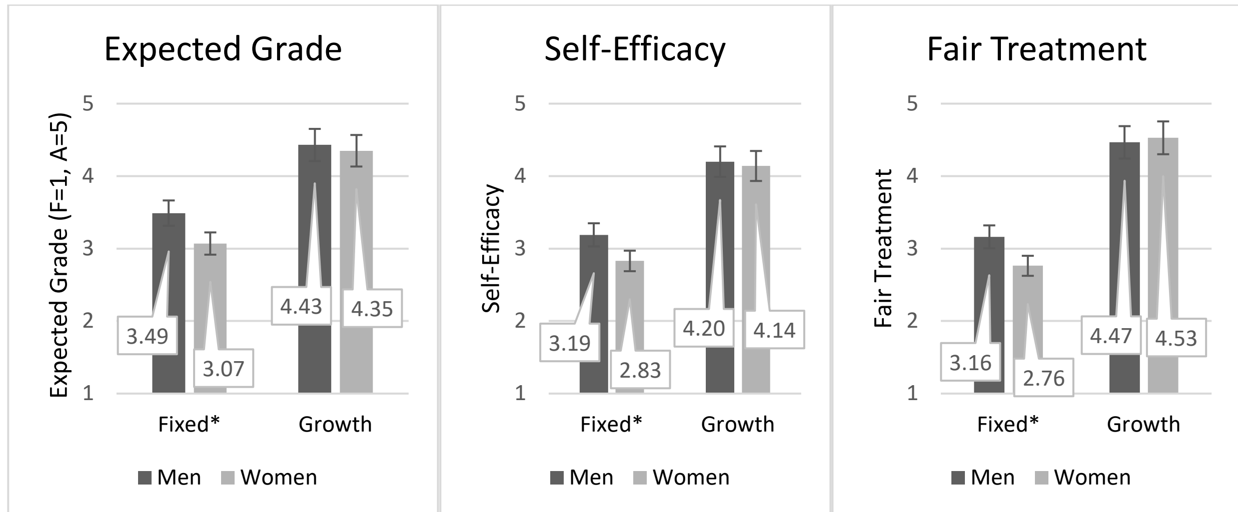

Figure 1. Syllabus orientation and student gender interactions on Fair Treatment, Self-Efficacy, and Expected Grade. Means are displayed inside bars. Error bars display 95% CI. Simple Effects of Gender: * $p < .05$.

Table 4. Descriptive statistics and simple effects for Syllabus Orientation x Gender interaction on Expected Grade, Self-Efficacy, and Professor Fair Treatment.

	Fixed			Growth			Simple Effect of Instructor Mindset
Expected Grade	*M*	*SD*	*95% CI*	*M*	*SD*	*95% CI*	
Men	3.49	0.94	[3.26, 3.72]	4.43	0.62	[4.37, 4.60]	*F*(1, 265) = 74.28, p < .001, η_p^2 = .22
Women	3.07	1.03	[2.93, 3.22]	4.35	0.74	[4.25, 4.45]	*F*(1, 265) = 351.74, p < .001, η_p^2 = .57
Simple Effect of Student Gender	*F*(1, 265) = 9.08, p = .003, η_p^2 = .03			*F*(1, 265) = 0.77, p = .381, η_p^2 = .00			
	Fixed			Growth			Simple Effect of Instructor Mindset
Self-Efficacy	*M*	*SD*	*95% CI*	*M*	*SD*	*95% CI*	
Men	3.19	0.77	[3.08, 3.50]	4.20	0.60	[4.03, 4.37]	*F*(1, 266) = 69.41, p < .001, η_p^2 = .21
Women	2.83	0.96	[2.70, 2.96]	4.14	0.75	[4.03, 4.24]	*F*(1, 266) = 379.54, p < .001, η_p^2 = .59

	Fixed			Growth			
Simple Effect of Student Gender	$F(1, 266) = 13.88, p < .001, \eta_p^2 = .05$			$F(1, 266) = 0.38, p = .537, \eta_p^2 = .00$			
	Fixed			Growth			Simple Effect of Instructor Mindset
Fair Treatment	*M*	*SD*	*95% CI*	*M*	*SD*	*95% CI*	
Men	3.16	1.20	[2.87, 3.45]	4.47	0.73	[4.30, 4.64]	$F(1, 266) = 63.82, p < .001, \eta_p^2 = .19$
Women	2.76	1.29	[2.58, 2.94]	4.53	0.75	[4.42, 4.63]	$F(1, 266) = 306.67, p < .001, \eta_p^2 = .54$
Simple Effect of Student Gender	$F(1, 266) = 5.36, p = .021, \eta_p^2 = .02$			$F(1, 266) = 0.38, p = .541, \eta_p^2 = .00$			

Race x Instructor Mindset Analyses

The 2 (Instructor Mindset) x 2 (Race) analyses of variance (ANOVA) with repeated measures on the first factor revealed the same main effects of mindset on the dependent variables as was found in the analysis including Gender. Results did not reveal main effects of race. However, interactions of Race and Syllabus Instructor Mindset were found for perception of instructor ($F(1, 268) = 4.18, p = .042, \eta_p^2 = .02$) and professor fair treatment ($F(1, 268) = 4.05, p = .045, \eta_p^2 = .02$), with simple effects of syllabus mindset indicating similar outcomes for the two dependent variables. Although students from both represented and underrepresented racial groups reported more positive perceptions of instructor and higher expectations of fair treatment after reading a growth mindset syllabus than after reading a fixed mindset syllabus, this difference was greater for represented students. See Figure 2 and Table 5 for descriptive statistics and results of analysis of simple effects.

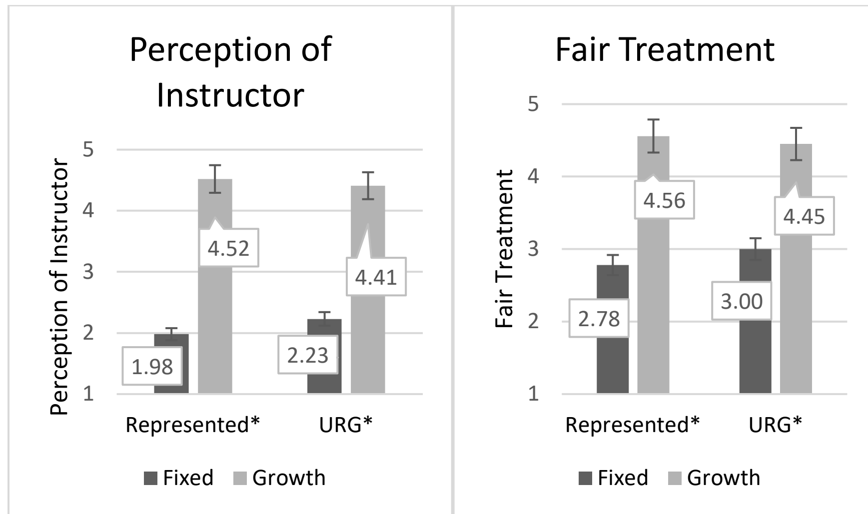

Figure 2. Syllabus orientation and student race/ethnicity interactions on Perception of Instructor and Fair Treatment. URG = underrepresented racial/ethnicity groups. Means are displayed inside bars. Error bars display 95% CI. Simple Effects of Mindset: * $p < .05$.

Table 5. Descriptive statistics and simple effects for Syllabus Mindset x Race/Ethnicity interaction on Perception Instructor and Professor Fair Treatment.

Perception of	Fixed			Growth			Simple Effect of
Instructor	*M*	*SD*	*95% CI*	*M*	*SD*	*95% CI*	Mindset
Represented	1.98	1.04	[1.80, 2.16]	4.52	0.76	[4.38, 4.65]	$F(1, 268) = 470.74, p < .001, \eta_p^2 = .64$
URG	2.23	1.23	[2.03, 2.44]	4.41	0.93	[4.26, 4.56]	$F(1, 268) = 282.22, p < .001, \eta_p^2 = .51$
Simple Effect of Group	$F(1, 268) = 3.37, p = .067, \eta_p^2 = .01$			$F(1, 268) = 1.02, p = .314, \eta_p^2 = .00$			

	Fixed			Growth			Simple Effect of
Fair Treatment	*M*	*SD*	*95% CI*	*M*	*SD*	*95% CI*	Mindset
Represented	2.78	1.23	[2.57, 2.98]	4.56	0.67	[4.44, 4.68]	$F(1, 268) = 240.72, p < .001, \eta_p^2 = .47$
URG	3.00	1.32	[2.78, 3.23]	4.45	0.81	[4.31, 4.58]	$F(1, 268) = 127.09, p < .001, \eta_p^2 = .32$
Simple Effect of Group	$F(1, 268) = 2.17, p = .142, \eta_p^2 = .0$			$F(1, 268) = 1.69, p = .195, \eta_p^2 = .01$			

Note. URG = underrepresented racial/ethnicity groups.

The 2 (Instructor Mindset) x 2 (Race/Ethnicity) ANOVA with repeated measures on the first factor revealed a main effect of instructor mindset on attribution of grade to minority status, $F(1, 266) = 13.82, p < .001, \eta_p^2 = .049$; students made more attribution to minority status after reading a fixed mindset syllabus ($M = 1.52$, $SD = 1.03$, 95% CI [1.42, 1.66]) than after reading a growth mindset syllabus ($M = 1.35$, $SD = 0.82$, 95% CI [1.26, 1.45]). No other effects were found in this analysis. The 2 (Instructor Mindset) x 4 (Attribution Source) x 2 (Race/Ethnicity) ANOVA with repeated measures on the first two factors revealed the same effects of instructor mindset, attribution source, and interaction between instructor mindset and attribution source as was found in the analysis including Gender (see Instructor Mindset Effects); there were no main effects of race.

Discussion

The purpose of this study was to investigate the role of instructor mindset on students' perception of success in the course and the instructor of the course. Prior research suggests that an instructor's beliefs can affect students' motivation, grade expectations, sense of belonging, interest in the course, and how the students view the instructor (e.g., Canning et al., 2019; Canning et al., 2022; LaCosse et al., 2020; Rattan et al., 2018). We found support for H1; students who read a growth mindset syllabus reported more academic self-efficacy and expected higher grades than students who read a fixed mindset syllabus. Results also revealed support for H2; students who read a growth mindset syllabus perceived the instructor more positively and expected fairer treatment from the instructor than students who read a fixed mindset syllabus.

The interaction between instructor mindset and grade attribution revealed that after reading a fixed mindset syllabus, students reported that effort and the difficulty of the course would have the greatest contributions toward their expected grade; on the other hand, after reading a growth mindset syllabus, students attributed their grade more to effort than to any other source. Moreover, students attributed their grade more to luck, intelligence, and difficulty of the course after reading a fixed

mindset syllabus than after reading a growth mindset syllabus. Considering the emphasis on effort within the context of the growth mindset syllabus and the emphasis on innate ability in the fixed mindset syllabus, we anticipated students would attribute their grade more to effort and less to intelligence after reading a growth-oriented syllabus than after reading a fixed-oriented syllabus (i.e., H3). While students did attribute their grade more to intelligence after reading a fixed mindset syllabus than after reading a growth mindset syllabus, this hypothesis as a whole was not directly supported as results did not reveal a statistical difference between the fixed and growth condition for the attribution to effort. Although, it is notable that students made stronger attributions to effort than to any other attribution after reading a growth mindset syllabus, while they made stronger attributions to difficulty of the course *and* effort after reading a fixed mindset syllabus. Taken together with the findings that students expected factors out of their control (i.e., luck, intelligence, difficulty of the course) to have greater influence after reading a fixed syllabus than a growth syllabus, these results suggest that students believe they have more internal control over their success in the growth mindset condition than in the fixed.

While prior work has found similar effects on different student perception measures with other manipulations of instructor attitude or mindset (e.g., Canning et al., 2019; LaCosse et al., 2020; Rattan et al., 2018), our findings show that instructor mindset conveyed in a syllabus can impact students' anticipated performance and their views of the instructor. Using a syllabus to convey the mindset of the instructor limits potential biases toward the instructor based on physical characteristics (e.g., gender, race/ethnicity, age). Additionally, our results show evidence of how a syllabus as a stand-alone document can impact student expectations of how well they will perform in the course. These results, coupled with prior studies' findings, show that when a student comes across a fixed mindset instructor, whether that be in the form of a course introduction, reviews of the instructor, or a syllabus, they anticipate worse performance in the course and view the instructor more negatively than when the instructor endorses a growth mindset.

Underrepresented Groups in STEM

We predicted that students would attribute their grade more to gender and minority status in the fixed mindset condition than in the growth mindset condition (H4). Our findings reveal support for this prediction as students reported that gender and minority status would contribute more to their grade after reading a fixed-oriented syllabus than after reading a growth-oriented syllabus. Additionally, one of the primary goals of this study was to examine whether the disadvantages experienced by underrepresented groups might be mitigated by a perceived growth mindset on the part of an instructor. Evidence from this study suggest that the answer may be "yes" for women as an underrepresented group. While men reported more self-efficacy, expected better grades, and expected fairer treatment than women after reading a fixed mindset syllabus, those gender differences were eliminated in the growth mindset condition. Thus, our results provided support for H5. Overall, these findings support the argument that a growth-oriented instructor's approach to teaching and learning may level the playing field for women who might otherwise doubt their own ability to succeed in STEM disciplines.

Further, women generally anticipated gender would contribute more to their grade than men did. This finding suggests that women may be more aware of gender stereotypes, resulting in a suspicion that their gender might impact their grade. This awareness may contribute to stereotype threat, which has been found to have an impact on women's performance in STEM disciplines (Canning et al., 2022; Spencer et al., 1999). Given that gender stereotypes commonly favor men and evidence suggests that stereotypes have a negative effect on women (Moè et al., 2021), women anticipating lower grades, lower self-efficacy, and that their gender contributes more to their grade

than men is not unexpected in today's climate of gender inequality awareness. Yet, it is possible that part of the explanation behind women being disadvantaged in STEM is rooted their perception of the beliefs endorsed by the instructor (e.g., Canning et al., 2022). The interaction found in the current study between syllabus orientation and gender provide evidence of this phenomenon.

The present study also examined how students from racial groups represented and underrepresented in STEM disciplines might respond to growth and fixed mindset instructors (i.e., H6). In this case, the findings were not what we had anticipated. We found few interactions between student race and instructor mindset, and those we did find were not what we expected; nor were our findings consistent with results from previous research (e.g., Canning et al., 2019; Rattan et al., 2018). We found that students from racially represented groups seemed to be more affected by a fixed mindset syllabus than were the students from underrepresented racial groups. Both groups reported more positive views of the instructor and expected more fair treatment after reading a growth mindset syllabus than after reading a fixed mindset syllabus; however, the difference was greater for the represented than the underrepresented students. It is possible that institutional cultures that may impact the experience of racially underrepresented students may play a role here. For example, at the university where this study was conducted, the representation of the racial groups categorized as underrepresented was notably larger than many other institutions. It would be interesting to examine, for example, how differences in proportion of underrepresented students in the student body, sense of belonging, and stereotype threat might play a role in students' response to fixed and growth mindset instructors.

Implications

Our findings add to the growing body of research indicating that projection of faculty mindset impacts student perceptions. To ensure all students have an equal opportunity to thrive in the learning environment, especially in the context of STEM education, faculty must be aware of the consequences of their mindset and beliefs regarding student ability. Faculty interventions aimed at increasing growth mindset could potentially lead to more growth mindset-oriented STEM professors, which in turn could lead to the retention of students from underrepresented groups. Additionally, encouraging underrepresented students (e.g., women) to develop and maintain a growth mindset orientation might also mitigate the effects of an entity-oriented professor.

The results of this study also suggest that the messages conveyed in a syllabus impact students' perception of the instructor and of their own ability to succeed. Thus, faculty should be acutely aware of how a course syllabus can set the tone for student success or failure in the class. Since the syllabus serves a variety of purposes (i.e., course introduction, explaining requirements, describing grade calculations, etc.), it is important that instructors are aware of the additional impact they can have on students' perceptions of their likelihood of success and of the instructor as someone who is likely to nurture student growth. As we only measured student perceptions immediately following presentation of the syllabi, it is possible that the effects may wear off over the course of the semester once students have more opportunity to interact with instructor and have their actual performance as an indicator for expectations. Nevertheless, the initial exposure may start students down a path of expecting success or failure, producing a self-fulfilling prophecy that will be borne out over the course of the term.

Limitations and Future Research

Students who participated in this study developed their perceptions solely on a short, focused syllabus. In the real world, the syllabi are much longer, and the context is somewhat different. First impressions of an instructor and the development of expectations about course and likely performance are conveyed to students through in-person or virtual interactions with an instructor, primarily in the classroom during class time. Interactions with, and the appearance/nonverbal communication from, the instructor provide additional information to influence student perceptions and expectations. Our results might be more applicable in the context of asynchronous online courses in which the students view the syllabus independently and have limited interactions with the instructor. Nevertheless, studies that have observationally investigated the effect of faculty mindset have found similar results (Canning et al., 2019; Canning et al., 2022). Therefore, while we were not able to see how these effects play out in actual classrooms in this study, our results do provide evidence that faculty mindset as expressed in syllabi can affect student perceptions.

As noted above, the institutional context and individual experiences of students may play a role in their response to syllabi representing fixed and growth mindset. For example, there is some evidence that the students' own mindset may interact with the instructor's apparent mindset (Yeager et al., 2021). Institutional context may involve factors such as geographical location, student population, and institutional history. Future research should also continue to consider and investigate other factors that may impact student perceptions, such as students' experience with STEM courses. Lastly, the mechanisms that underlie the effects of faculty mindset are an additional area ripe for future research. Canning et al. (2022) reported that students' sense of belonging and stereotype threat play a role in how they are affected by instructor mindset. Understanding the underlying mechanisms could help us create solutions to lessen the impact of fixed mindset faculty.

Conclusion

Within the context of STEM education, creating an atmosphere that encourages all students to succeed is vital for increasing student retention. The results of our study and other similar investigations tell a clear story: Instructor mindset matters. Instructors need to be aware of how their beliefs regarding student ability can impact students and how a syllabus can set the tone for student expectations of success or failure. Faculty workshops aimed at increasing growth mindset orientation in instructors and emphasizing the importance of syllabi for creating an atmosphere that encourages success could help mitigate the issue of retention in STEM disciplines.

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Appendix

Appendix 1. Sample Growth Mindset Syllabus.

Chemistry Syllabus- Fall 2019

Class Times
Mon/Wed/ Fri
8:00-8:50am
Office Location
Science Hall
Office Hours
Mon/Wed
10-11:45am or by appointment

Course Overview
In this course, students will learn about the theories and applications of chemistry in relation to research.

Course Expectations

Although this is a challenging course, students can do well. When facing a challenge, it is best for students to embrace it and use it as an opportunity to develop. Students from previous semesters have done well in this course. This is a difficult course and I am expecting students to come to me with any questions they may have and for constructive criticism. I would like for you to put in effort and seek help when you need it. Learning is a shared responsibility. I will do my best to facilitate your learning. If you complete the assignments and readings, you will do well.

Grade Distribution

Assignment	Percent of grade (out of 100%)
Homework assignments	20%
Exam 1	20%
Exam 2	20%
Exam 3	20%
Final Exam	20%

Exam Policy
In this course, there will be three exams and a final. Each exam will be worth 20% of the final grade and the final is worth 20% of the final grade. An answer key for each exam will be available online. Students may also come to my office hours to view what they missed and ask questions.
Homework Policy
For each homework assignment, an answer key will be posted two days after the graded assignment is returned. Students will have the opportunity within those two days to correct their answer to receive partial credit on the questions they missed. For homework assignments, students can come to my office hours or visit my office by appointment to get help with the questions they missed.

Appendix 2. Sample Fixed Mindset Syllabus.

Physics Syllabus- Fall 2019

Class Times
Mon/Wed/ Fri
8:00-8:50am
Office Location
Science Hall
Office Hours
Mon/Wed
10-11:45am or by appointment

Course Overview
This course covers the theories and applications of physical science with emphasis on evidence acquired through rigorous research.

Course Expectations

Not every student will do well in this physics course. Students from previous semesters either do great or they fail. This is a difficult course and I am expecting many students to drop this class within the first week. It is important for students to maintain a high rank in this course. It is important for students to make sure their grades are near the top of the class. If a student consistently gets grades toward the lower end of the distribution of scores, they should consider withdrawing. You may put in a lot of effort and still perform poorly in this class. It is your responsibility to do well in this class. Everything you need for this class will be in the textbook or on the class page. It is your responsibility to read the materials and come to class prepared.

Grade Distribution

Assignment	Percent of grade (out of 100%)
Exam 1	20%
Exam 2	20%
Exam 3	20%
Exam 4	20%
Final Exam	20%

Exam Policy
In this course, there will be four exams and a final. Each exam will be worth 20% of the final grade. If a student wishes to see the answer key, they must make an appointment to stop by my office. I will show students where they are in the grade distribution after every exam.

Homework Policy
The homework will not count for a grade. In the past, students who have done well on the homework have done well in the class.

References

Beasley, M. A., & Fischer, M. J. (2012). Why they leave: The impact of stereotype threat on the attrition of women and minorities from science, math and engineering majors. *Social Psychology of Education, 15*, 427–448. http://doi.org/10.1007/s11218-012-9185-3

Blackwell, L. S., Trzesniewski, K. H., & Dweck, C. S. (2007). Implicit theories of intelligence predict achievement across an adolescent transition: A longitudinal study and an intervention. *Child Development, 78*(1), 246-263. https://doi.org/10.1111/j.1467-8624.2007.00995.x

Burnette, J. L., O'Boyle, E. H., VanEpps, E. M., Pollack, J. M., & Finkel, E. J. (2013). Mind-sets matter: A meta-analytic review of implicit theories and self-regulation. *Psychological Bulletin, 139*(3), 655–701. https://doi.org/10.1037/a0029531

Canning, E. A., Ozier, E., Williams, H. E., AlRasheed, R., & Murphy, M. C. (2022). Professors who signal a fixed mindset about ability undermine women's performance in STEM. *Social Psychological and Personality Science, 13*(5), 927-927. https://doi.org/10.1177/19485506211030398

Canning, E. A., Muenks, K., Green, D. J., & Murphy, M. C. (2019). STEM faculty who believe ability is fixed have larger racial achievement gaps and inspire less student motivation in their classes. *Science Advances*, *5*(2). https://doi.org/10.1126/sciadv.aau4734

Dweck, C. S., & Leggett, E. L. (1988). A social-cognitive approach to motivation and personality. *Psychological Review, 95*(2), 256–273. https://doi.org/10.1037/0033-295X.95.2.256

Ferrare, J. J. (2019). A multi-institutional analysis of instructional beliefs and practices in gateway courses to the sciences. *CBE—Life Sciences Education*, *18*(2), ar26. https://doi.org/10.1187/cbe.17-12-0257

Grant, H., & Dweck, C. S. (2003). Clarifying achievement goals and their impact. *Journal of Personality and Social Psychology, 85*(3), 541–553. https://doi.org/10.1037/0022-3514.85.3.541

Harnish, R. J., & Bridges, K. R. (2011). Effect of syllabus tone: Students' perceptions of instructor and course. *Social Psychology of Education, 14*(3), 319-330. https://doi.org/10.1007/s11218-011-9152-4

Honicke, T., & Broadbent, J. (2016). The influence of academic self-efficacy on academic performance: A systematic review. *Educational Research Review, 17*, 63-84. https://doi.org/10.1016/j.edurev.2015.11.002

LaCosse, J., Murphy, M. C., Garcia, J. A., & Zirkel, S. (2020). The role of STEM professors' mindset beliefs on students' anticipated psychological experiences and course interest. *Journal of Educational Psychology, 113*(5), 949-971. https://doi.org/10.1037/edu0000620

Lightner, R., & Benander, R. (2018). First impressions: Student and faculty feedback on four styles of syllabi. *International Journal of Teaching and Learning in Higher Education*, 30(3), 443-453.

Midgley, C., Maehr, M. L., Hruda, L. Z., Anderman, E., Anderman, L., Freeman, K. E., Gheen, M., Kaplan, A., Kumar, R., Middleton, M. J., Nelson, J., Roeser, R., & Urdan, T. (2000) *Manual for the patterns of adaptive learning scales*. University of Michigan. http://websites.umich.edu/~pals/PALS%202000_V13Word97.pdf

Moè, A., Hausmann, M., & Hirnstein, M. (2021). Gender stereotypes and incremental beliefs in STEM and non-STEM students in three countries: Relationships with performance in cognitive tasks. *Psychological Research, 85*, 554-567. https://doi.org/10.1007/s00426-019-01285-0

Muenks, K., Canning, E. A., LaCosse, J., Green, D. J., Zirkel, S., Garcia, J. A., & Murphy, M. C. (2020). Does my professor think my ability can change? Students' perceptions of their STEM professors' mindset beliefs predict their psychological vulnerability, engagement, and performance in class. *Journal of Experimental Psychology: General, 149*(11), 2119-2144. https://doi.org/10.1037/xge0000763

National Science Board. (2015). Revisiting the STEM workforce, a companion to science and engineering indicators 2014. Retrieved from https://www.nsf.gov/nsb/publications/2015/nsb201510.pdf

National Science Board. (2022). The state of U.S. science and engineering in 2022. Retrieved from https://ncses.nsf.gov/pubs/nsb20221/u-s-and-global-stem-education-and-labor-force

Nusbaum, A. T., Swindell, S., & Plemons, A. (2021). Kindness at first sight: The role of syllabi in impression formation. *Teaching of Psychology, 48*(2), 130-143. https://doi.org/10.1177/0098628320959953

Rattan, A., Savani, K., Komarraju, M., Morrison, M. M., Boggs, C., & Ambady, N. (2018). Meta-lay theories of scientific potential drive underrepresented students' sense of belonging to science, technology, engineering, and mathematics (STEM). *Journal of Personality and Social Psychology, 115*(1), 54-75. https://doi.org/10.1037/pspi0000130

Richardson, D. S., Bledsoe, R. S., & Cortez, Z. (2020). Mindset, motivation, and teaching practice: Psychology applied to understanding teaching and learning in STEM disciplines. *CBE-Life Sciences Education, 19*(3). https://doi.org/10.1187/cbe.19-11-0238

Schussler, E. E., Weatherton, M., Chen Musgrove, M. M., Brigati, J. R., England, B. J. (2021). Student perceptions of instructor supportiveness: What characteristics make a difference? *CBE – Life Sciences Education, 20*(2). https://doi.org/10.1187/cbe.20-10-0238

Spencer, S. J., Steele, C. M., & Quinn, D. M. (1999). Stereotype threat and women's math performance. *Journal of Experimental Social Psychology, 35*, 4-28.

van der Zanden, P. J.A.C., Denessen, E., & Cillessen, A. H. N. (2018). Predictors of first-year student success: A systematic review. *Educational Research Review, 23,* 57-77. https://doi.org/10.1016/j.edurev.2018.01.001

Weiner, B. (1985). An attributional theory of achievement motivation and emotion. *Psychological Review, 92*(4), 548-573.

Weiner, B., Frieze, I. H., Kukla, A., Reed, L., Rest, S., & Rosenbaum, R. M. (1971). *Perceiving the causes of success and failure.* General Learning Press.

Whitcomb, K. M., & Singh, C. (2021) Underrepresented minority students receive lower grades and have higher rates of attrition across STEM disciplines: A sign of inequality? *International Journal of Science Education, 43*(7), 1054-1089. https://doi.org/10.1080/09500693.2021.1900623

Yeager, D. S., Carroll, J. M., Buontempo, J., Cimpian, A., Woody, S., Crosnoe, R., Muller, C., Murrary, J., Mhatre, P., Kersting, N., Hulleman, C., Kudym, M., Murphy, M., Duckworth, A. L., Walton, G. M., & Dweck, C. (2021). Teacher mindsets help explain where a growth-mindset intervention does and doesn't work. *Psychological Science, 33*(1). https://doi.org/10.1177/09567976211028984

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Flipping the First Year: A Case Study in Co-Teaching First-year Seminar as a Community of Inquiry

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Abstract: First-year seminar courses lay the foundation for student success in college, and it is important they engage students via social, cognitive, and teaching presence which are domains of the Community of Inquiry (CoI) Framework (Garrison et al., 2010). Previous evidence suggests that strategies such as a flipped classroom, co-teaching, and peer mentoring can improve course quality and learning outcomes both in-person and online. In this case study, qualitative and quantitative analyses of student evaluations of teaching were used to assess evidence of social, cognitive, and teaching presence for two instructors in online, co-taught, flipped first-year seminar courses compared to in-person instructor-centered versions of the course. Evidence suggested that the online courses received more positive and complex comments, encouraged greater social presence, and eliminated differences between instructors. Our work builds upon the CoI Framework and emphasizes collaborative activities which enhance social, cognitive, and teaching presence in learning environments. We discuss these dimensions of high-impact teaching and learning and how they worked to help prepare students for college success, both online and in-person. We include suggestions for how our case study can be generalized to other academic courses, modalities, and student populations.

Keywords: co-teaching, flipped classroom, Community of Inquiry, first-year seminar, peer mentoring

First-year seminars, designed to teach incoming college students basic social and academic skills, have been designated a high impact practice (Kuh, 2008; Steiner et al., 2019), and these courses have positive impacts on academic achievement, retention, and well-being (McBride et al., 2021; Permzadian & Crede, 2016; Qingmin et al., 2021). Although there are many different approaches to such courses, effective courses generally get students engaged through social, cognitive, and teaching presence (Panicker, 2017). This case study used a Community of Inquiry (CoI) framework (Garrison & Arbaugh, 2007; Garrison et al., 2010), an evidence-based pedagogical model for assessing online courses, to explore the effects of instructor-centered in-person first-year seminar courses versus co-taught flipped classroom online versions of the same course across multiple years to assess which method may be most successful. Thus, we used a variety of techniques to address the problem of transitioning first-year seminar courses, the purpose of which was to help students adjust to on-campus life, to an off-campus (online) format against the backdrop of the COVID-19 pandemic.

The transition to college is an important turning point in students' academic careers, and often involves significant changes in personal, social, and academic expectations (Andrews & Wilding, 2004; Cutrona, 1982; Shaver et al., 1985; Shell & Absher, 2019). This transition may be particularly challenging for students who entered college during the COVID-19 pandemic (Kinzie & Cole, 2022), and for first-generation college students and similarly vulnerable students from minoritized communities, who often have lower engagement, academic persistence, and poorer mental health in

college (Gopalan & Brady, 2020; Gopalan et al., 2022; Ostrove & Long, 2007). Our case study explored ways in which first-year seminar courses can facilitate this transition by promoting social, cognitive, and teaching engagement to help students learn the academic and social skills needed to succeed. Thus, our goals included effective teaching as well as supporting the more holistic academic and non-academic needs of first-year students facing multiple sources of precarity.

Theoretical Framework

One model that captures the multiple dimensions of dynamics that occur in a classroom is the Community of Inquiry (CoI) Framework first conceptualized by Garrison and colleagues (Garrison & Arbaugh, 2007; Garrison et al., 2010). The CoI Framework views the classroom as a community of learners and explores three dimensions of interactive presence within learning environments: social presence, cognitive presence, and teaching presence. These different types of presence can be used as a tool to evaluate classroom processes and compare across classes.

Social presence refers to learners' social and emotional engagement in a learning community, including emotional expression, open communication, and group cohesion (Garrison et al., 2010). This can involve engagement among students (through collaboration and discussion), and student-faculty engagement. In classes high in social presence, students feel comfortable expressing themselves and have many opportunities to do so; they engage in collaborative assignments and discussions which promote a sense of community within the class. Evidence suggests that engagement during class has positive impacts on student performance (Duncan et al., 2012), and in first-year seminars the opportunities to engage are particularly important to students (Sullivan & Haller, 2018).

Cognitive presence refers to the learner's own construction of meaning through reflection and discourse (Garrison et al., 2010). The focus is on critical thinking, which includes events that stimulate interest, exploration of material, integration across concepts, and application of material. Courses with high cognitive presence encourage students to think about and apply course material before, during, and after learning. Because first-year seminar courses focus on teaching students applied skills they can utilize in their studies, cognitive engagement and self-reflection are particularly important, and evidence suggests that students generalize these skills to other courses (Sullivan & Haller, 2018).

Finally, teaching presence refers to the ways in which course design, instructional facilitation, and instructional direction support meaningful learning outcomes (Garrison et al., 2010). This includes instructional management, classroom structure (e.g., student- vs. instructor-centered), and direct instruction. In classes with strong teaching presence, class information is presented clearly, instructors are effective at facilitating discussion, and students are presented with accurate, relevant, and developmentally appropriate material. Within first-year seminar courses, students report being strongly impacted by instructor enthusiasm, which significantly affects students' motivation to learn (Sullivan & Haller, 2018). Overall, the CoI framework provides a powerful tool for evaluating processes occurring within the classroom community, and this case study explored all three types of presence in first-year seminar courses.

Engaged and Collaborative Teaching Approaches in Online Classes

A goal of first-year seminar is to teach students classroom norms and encourage a sense of belonging in college, but there may be concerns about teaching such classes online, as students may not get the "true" classroom experience. Previous evidence suggests that online learning, and particularly online synchronous learning, can be just as effective as being in person when engaging relational strategies are applied (Yarmand et al., 2021). Furthermore, CoI studies have found that it is very possible to establish social, cognitive, and teaching presence in online classes (Fiock, 2020; Kim & Gurvitch, 2020;

Shea et al., 2022). Thus, we expected that with strategic efforts to focus on engagement, collaboration, and peer mentoring, online synchronous first-year seminar courses could be as effective as in-person courses (Yarmand et al., 2021). In order to ensure that our online first-year seminar courses contained strong social, cognitive, and teaching presence, we focused on promoting an engaged and collaborative environment via three strategies: (1) a flipped classroom model, (2) co-teaching, and (3) peer mentor engagement.

Flipped Classroom Model

A flipped classroom (FC) is defined as a methodology in which the more engaging and applied part of the class (e.g., activities and problem solving) is moved into the classroom session; while what traditionally is done in class (e.g., presentation of material) is moved outside and students are asked to complete those portions prior to the class (Galindo-Dominguez, 2021). In addition to offering students more pro-active and empowering roles in the class, FC offers a learner-centered and engaging community-building experience and contributes to teaching presence (Stover & Houston, 2019; Gunbatar, 2021). Compared to the traditional unidirectional lecture format, the FC experience is more interactive and social and transforms the classroom into a communal space. Evidence suggests that using learner-centered methods like FC can have a positive impact on overall learning achievement; self-efficacy and self-autonomy; cooperativeness and engagement; and a more positive and accepting classroom climate (Campillo-Ferrer & Miralles-Martinez, 2021; Galindo-Dominguez, 2021; Hew et al., 2020). Thus, it was expected that an FC model would improve social presence through more engaged and interactive class periods, cognitive presence through in-class applied activities, and teaching presence via the course structure.

Co-teaching

Collaborative teaching, or co-teaching, refers to the process wherein two educators co-plan, co-instruct, and co-assess the same course (Murawski & Lochner, 2011). These collaborative influences provide a depth of collegiality and support that often reinforces professional development and growth for instructors, and can also enhance the student experience. Previous research on co-teaching indicates that greater equity, inclusivity, positivity, and creativity can be achieved to benefit both partnering teachers and their collective students (Monteblanco, 2020). Co-teaching may be particularly important in first-year seminars, as the course involves exposing students to a broader range of instructional resources and skills from multiple perspectives. Furthermore, co-teaching may allow for improved teaching presence and more activities to promote social and cognitive presence, as course activities and structure are developed by multiple faculty with this in mind.

Peer Mentor Engagement

In addition to multiple instructors' perspectives, upper-class peer mentors can also support incoming first-year students across "social, emotional, or academic domains of life," (Lane, 2020, p. 483), and provide a range of learning resources. Peer mentors can be a source of holistic support whose involvement may alleviate transitional stress for first-year students, influence more realistic goal setting and first-year persistence (Fullick et al., 2012), and improve college adjustment, particularly for minority students (Graham & McClain, 2019). Peer mentors may help encourage social presence, but also provide real world examples to encourage cognitive presence. Overall, evidence suggests that online classes can be just as engaging as in-person courses, and particularly using an FC model, co-teaching, and utilizing peer mentors can help improve social, cognitive, and teaching presence. These

strategies may be particularly beneficial in first-year seminar courses as they set the stage for future learning expectations in college.

The Present Study

The current case study used student evaluations of teaching across four semesters to explore the effect of different course modalities (in-person vs. online synchronous) and structure on social, cognitive, and teaching presence in first-year seminar courses taught by two collaborating instructors. Previous evidence suggests that students are generally honest on student evaluations of teaching, particularly when they are perceived as a tool for improving classes (McClain et al., 2018), and that evaluation responses do reflect social, cognitive, and teaching presence (Ang et al., 2018). Although there are more formal assessments of CoI components (Garrison & Arbaugh, 2007; Garrison et al., 2010), in the context of this case study student evaluations of teaching provided standardized assessments of course quality across multiple years and instructors and aligned with CoI components. Qualitative analyses were used to code open-ended responses, and quantitative analysis of rating-scale items confirmed findings. It was hypothesized that, regardless of instructor, the students in online, FC, co-taught courses would report equal or greater social, cognitive, and teaching presence, compared to those in instructor-centered in-person courses.

Method

Participants

This study was done at a small, public liberal arts college in rural Appalachia, where many students are first generation and of low socioeconomic status. A total of 66 full-time, first-time freshmen (M_{age} = 18.21 years, SD = 0.48) completed course evaluations across four years (seven classes). Participants included 40 women (60.6%) and 26 men (39.4%). In terms of ethnicity, 50 participants identified as White (75.8%), 8 as Black/African American (12.1%), and 8 as other/unknown (12.1%). This sample is generally representative of the college population (61% female, 68.8% White, 11.7% Black/African American).

Context

The first-year seminar course was Freshman Success Seminar: a one-credit required course that "serves as an introduction to academic life, instruction about liberal arts core requirements, and the opportunity to develop skills that will serve the student academically." Faculty were given topics to cover, but freedom in how they approached topics. Each class had a peer mentor, an upper-level undergraduate student who assisted with the class. For the sake of anonymity, we designated one author as instructor A, and the other as instructor B.

In-person

The Freshman Success Seminar course was taught in person in fall 2018 (instructor A) and fall 2019 (instructors A and B), and during this time students did not have the option to take this course online. Classes were planned and taught independently, although classes covered the same topics and there were several similarities. In-person classes were instructor-centered and relied on lecture presentations or guest speakers. Classes had some large group instruction, but very few opportunities for small group interaction or group work outside of class. Peer mentors attended class but played a relatively small

role in the course (e.g., taking attendance).

Online Synchronous

During the COVID-19 pandemic, in fall 2020 and fall 2021, we transitioned to co-teaching Freshman Success Seminar in an online synchronous modality via Zoom. In fall 2020 students had the choice of online or in-person sections of the course, and those who selected the online sections had often opted for entirely remote classes due to the pandemic. In fall 2021, most classes at the college had returned to in-person. Both Freshman Success Seminar courses were originally scheduled to be in-person, but were switched to online shortly after classes started. In addition to modality change, we made significant changes in course structure. Although we each taught our own sections, we collaborated on planning and had the peer mentors play a more integral and interactive role. Several important components distinguished this version.

Flipped classroom

Students were provided with most of the content **before** class met each week. They did assigned readings or watched videos and completed a short weekly assignment to ensure they were prepared for class. Class meetings were used for engaging and interactive activities that applied course material, including discussions, small group work, and student-centered presentations.

Community building

Because online courses happened in the context of the pandemic, there was concern that students would feel isolated and lack a sense of social connection during classes as well as to the college experience. Thus, several assignments and activities were specifically designed to help build peer relationships and a classroom community. These included regular small group work, individual meetings with instructors and peer mentors, and long-term partner activities.

Co-teaching

In addition to establishing a community for students, we also worked to build a sense of community among the instructional team. The two faculty and two student peer mentors met weekly. Together, we developed foundational materials, debriefed about previous course meetings, and planned weekly activities. Peer mentors provided significant contributions, and also were regularly assigned to lead discussions and collect and develop materials. Their creativity and innovation was encouraged and led to deeper levels of student connection and open reflection during class discussions.

Measures

With approval from the Institutional Review Board, we reviewed the anonymous student evaluations of teaching from our in-person and online courses. We conducted qualitative analyses on open-ended questions and confirmed findings with the rating-scale questions.

Qualitative Coding

An analytic inductive coding strategy was used to code comments following the Charmaz (2006) constructivist grounded theory method. All open-ended responses were coded; however, responses

were considered in the context of the prompt. Repetitive words and phrases were coded into a data matrix that was mapped to identify an emerging pattern of conceptual themes (see Table 1). Emergent themes were compared for alignment with the CoI Framework domains: social, cognitive, and teaching presence.

Table 1. Qualitative coding matrix and sample responses.

CoI Domain	Emergent Themes	Sample of Student Reponses (with contextual prompts)	
Social Presence	social/ community	*"This fits as it helped me learn social skills."*	(Do the contents of this course fit the General Education requirements?)
	discussion	*"Class discussion and interaction"*	(What features of the course contributed most to your learning?)
Cognitive Presence	self-reflection	*"I learned more about myself"*	(In what ways have you benefitted from taking this course?)
	content/ order of assignments	*"Unnecessary work took away from my other classes"*	(What features of the course detracted from your learning?)
Teaching Presence	buy-in/ caring	*"I enjoyed the way that the material was taught. I feel as though it is easier when you learn most of the information beforehand, and then discuss it in class. Each week was a new subject, and I enjoyed the content.*	(What features of the course contributed most to your learning?)
	enthusiasm	*"Do more fun exciting things outside the classroom"*	(What changes would you make to improve the course?)
	online/ technology & resources	*"iPad"* *"Zoom"* *"Helpful tips to navigate the college"*	(What positive feedback would you give the instructor regarding the manner in which the course was taught?)

Quantitative Measures

No rating-scale items directly assessed social presence components of the course. To assess cognitive presence, "I would recommend this course to other students" (1 *strongly disagree* to 5 *strongly agree*) was seen as evidence that students perceived the value of the course based on cognitive engagement with the material (e.g., Ang et al., 2018). In addition, two questions assessed teaching presence. "The instructor taught with enthusiasm" (scaled from 1 *strongly disagree* to 5 *strongly agree*), reflected how much students saw instructors as caring. "What is your overall rating of this instructor's teaching effectiveness compared with other college instructors you have had?" (scaled from 1 *not at all effective*

to 5 *very effective*) also measured teaching presence. Although these questions differ slightly from the traditional CoI definition of teaching presence focused on course design, they do address instructional facilitation components of the construct.

Results

Qualitative Findings

For the open-ended questions, comparative differences were observed between in-person versus online courses. For in-person courses, a combined total of 100 comments were received. Compared to online versions, in-person comments were much shorter and many were not full thoughts or complete sentences, although they still conveyed positive or negative feedback. A total of 38% of in-person comments were positive and 62% were negative in tone or statement. Comparatively, 82% of the online comments were positive and 18% were negative. Both positive and negative online comments were longer, more descriptive, and richly detailed (see Table 2).

Social Presence

More comments expressed valued social presence online compared to in-person sections (21% online vs. 13% in-person, see Table 2). The emergent concepts of **social/community** and **discussion** were based on evaluative comments such as the following example: "*thank you for making me feel accepted :)*" (online). Similar feedback statements indicated that students experienced a greater sense of social presence online and this was conveyed in terms that were more richly described. Longer and more detailed comments from online students suggested a more connected and socially meaningful learning experience.

Cognitive Presence

The emergent concepts of **self-reflection** and **content** aligned strongly with the CoI domain of cognitive presence. Table 2 includes responses suggesting a more deeply engaged cognitive experience of learning resulted from the online community-oriented FC courses. It is important to note that although an approximately similar frequency of in-person and online responses indicated cognitive presence (8% online vs. 11% in-person), online comments were more complex, demonstrating a more profound cognitive experience.

Teaching Presence

For teaching presence, emergent concepts within this domain include increased perceptions of **buy-in**, **caring**, and **enthusiasm**, as well as comments about being online and having access to online and on-campus resources. Similar to other domains, qualitative differences were found between in-person versus online courses. Despite receiving a higher number of responses in-person (80%) versus online (72%), teaching presence was often qualified in brief or negative terms in-person. For example, in response to the question, "What [course] features contributed most to your learning?", an in-person student briefly responded, "*teachers*," whereas an online student more richly stated, "*I really liked this class. It was helpful being an incoming freshman and having help to relieve stress and to be able to understand how to use all our online materials effectively.*" Another online student stated, "*The professor was very kind and enthusiastic, as well as generally encouraging.*" Their statements indicated that the FC structure online not only supported a more valued perception of social presence, but also a more appreciative perception

of teaching presence wherein we came to be viewed as more caring and enthusiastic.

Table 2. Comparison of in-person versus online courses.

CoI Domain	Sample Comments	
	In-person	Online
Social Presence	*“class discussion”*	*"I think working in groups contributed the most. Getting to talk with my classmates about the material and hearing their opinions was very enlightening"*
	“Discussions”	*“The main feature that contributed to my learning was the in-class discussion that we participated in during every class period.”*
	“Interactive”	*“I benefited by learning the ability to engage with my fellow students easier.”*
Cognitive Presence	*“I learned more about myself”*	*"The added videos to watch as part of the weekly RSVP and in-class Powerpoints really helped me learn more about skills and topics related to my first semester in college."*
	“*course content, assignments*”	*"The reading selections of this course coupled with the weekly response assignments contributed the most to my learning as they gave me good information and space for reflection.”*
	“*clarity of the information”*	*“This course helps teach good study skills and time management.”*
Teaching Presence	*“Good teacher”*	*"The professor was very kind and enthusiastic, as well as generally encouraging."*
	“Organized.”	*"I really liked this class. It was helpful being an incoming freshman and having help to relieve stress and to be able to understand how to use all our online materials effectively”*
	“teachers”	*“I really enjoyed the broad range of information that was assigned throughout the semester. I was able to learn about a number of different topics on college and adult life, and I was also able to reflect upon my personal feelings. [The instructor] gave us multiple opportunities to reflect on our learning and reach out to her and [the peer mentor] if we wanted to talk, and I sincerely appreciated that.*

Quantitative Findings

Quantitative analyses of rating-scale items were used to confirm observations from qualitative analyses. A series of 2 (instructor) x 2 (modality: in-person vs. online) analyses of variance (ANOVAs) were computed.

Cognitive Presence

First, a 2 x 2 ANOVA was used to assess the effect of instructor and modality on student likelihood to recommend the course to other students. There was a significant Instructor x Modality Interaction, $F(1,62) = 8.22$, $p = .006$, indicating that in-person students were more likely to recommend instructor A (who had more experience teaching the course) compared to instructor B, but there were no significant differences online (see Table 3).

Table 3. Mean of Student Ratings.

	Recommend Instructor			Instructor Enthusiasm			Instructor Effectiveness		
Instructor	A	B	Sig(*p*)	A	B	Sig(*p*)	A	B	Sig(*p*)
In-person	3.77	2.57	0.009	4.47	3.43	<.001	4.00	3.14	0.010
Online	3.53	3.89	0.198	4.41	4.33	0.761	3.53	3.89	0.081

Note. Means are on a scale 1 to 5.

Teaching Presence

Next, a 2 x 2 ANOVA was used to assess the effect of instructor and modality on perceptions of instructor enthusiasm. There was a main effect of instructor, where instructor A ($M = 4.44$, $SD = 0.66$) had higher ratings than instructor B ($M = 3.88$, $SD = 0.95$), $F(1,62) = 8.89$, $p = .004$. There was also a main effect of modality, with instructors being rated as higher in enthusiasm online ($M = 4.37$, $SD = 0.69$) compared to in-person ($M = 4.00$, $SD = 0.97$), $F(1,62) = 5.07$, $p = .028$. Furthermore, there was an Instructor x Modality Interaction, $F(1,62) = 6.58$, $p = .013$, indicating that there were significant differences in enthusiasm between the instructors in-person, but not online. Similarly, for perceived instructor effectiveness there was a significant Instructor x Modality Interaction, $F(1,62) = 9.96$, $p = .002$, indicating that instructor A was perceived as more effective in-person, but there were no differences between instructors online.

Discussion

This case study evidence demonstrates that with strategic planning and a focus on collaborative engagement, online first-year seminar courses can provide just as much (if not more) social, cognitive, and teaching presence as instructor-centered in-person courses. Student comments on evaluations of teaching were substantially more detailed and positive in online versus in-person courses, and evidence suggests that students perceived social presence as a more meaningful and valued domain online. Although comments were less frequent about cognitive and teaching presence online, they were salient in both versions and were more positive and complex online. Quantitative findings confirmed that online courses increased perceptions of cognitive and teaching presence, particularly for the less-experienced instructor. These findings were particularly interesting given that a standardized curriculum was consistently used for all courses; thus, findings indicate that students experienced less connection in in-person instructor-centered courses, compared to FC online co-taught courses. Given the context of online courses and social isolation during the COVID-19 pandemic for many of these online students (Kinzie & Cole, 2022), improvements in feelings of community and social connection are particularly noteworthy. These findings suggest that course structure (e.g., FC and co-teaching) plays a significant role in student perceptions of social, cognitive, and teaching presence and indicate that implementing structural changes may improve student perceptions of the course regardless of

modality.

Our experience of transforming in-person first-year seminar courses into more impactful and engaged online classes not only reinformed our understanding of the importance of first-year seminar, an essential high impact practice (Kuh, 2008), but also deepened our understanding of the developmental and cognitive learning needs for emerging adults, as well as the importance of sustained and empowered active learning (Duncan et al., 2012). This case study reveals the possibilities of promoting more collaborative, equitable, and high-quality course delivery regardless of in-person versus online modality, and the ways in which doing so reinforces students' social skills, sense of belonging, and deeper levels of engagement. Our experience further aided each of us in our ability to generalize and globalize more engaged high impact teaching strategies across our other courses, both in-person and online.

Intersections with Existing Scholarship

Although this case study was conducted in a first-year seminar course, the multidisciplinary nature of the course itself, as well as the broad strategies collaboratively implemented provide connections with scholarship in many fields. This evidence not only underscores the significance and importance of high quality online teaching, but also suggests that, given the improvement over and above instructor-focused in-person sections, these same practices should be applied in-person as well. Thus, this case study demonstrates the effectiveness of a broad variety of existing evidence-based teaching strategies and suggests that similar strategies might be implemented beyond the pandemic and in both in-person and online courses.

CoI Framework

These findings support previous evidence for using the CoI framework to assess online courses (Garrison & Arbaugh, 2007; Garrison et al., 2010). Although some previous studies have found differences between online and in-person courses on the CoI metrics (e.g., Lee & Nuatomue, 2021; Mercado, 2022), our case study suggests that using learner-centered strategies such as FC can lead to online classes with just as much social, cognitive, and teaching presence (e.g., Miller et al., 2020). CoI has been used as a tool for evaluating instructor effectiveness after a course (e.g., Lawrence-Benedict et al., 2019), but our experience suggests that it might also be a tool for developing courses. Instructors who strategically consider how they will establish social, cognitive, and teaching presence during course development may be better able to address student needs.

Online Teaching and High Impact Practices

These findings are consistent with previous evidence suggesting that online courses can be as effective as in-person courses (Hew et al., 2020; Lawrence-Benedict et al., 2019; Yarmand et al., 2021). Furthermore, they bolster evidence that a focus on community building and the CoI framework can improve online course quality (Fiock, 2020). However, given the challenge that we faced (creating community in a course designed to orient first-year students, many of whom were isolated due to the COVID-19 pandemic, to a campus many did not yet physically attended), we view the strength of our online classes as evidence that the structure of the course (e.g., learner-centered vs. instructor-centered) may be more predictive of success than modality (Stover & Houston, 2019). Had we used the same instructor-focused, large group format online, we likely would not have seen such improvements. Conversely, had we implemented the same FC, peer mentor, and co-teaching strategies in-person we believe our in-person classes would have been much higher in quality. It was the change

in the structure of the course, not the modality, that enabled us to better meet the students' social and academic needs. Thus, a primary take-away is that, within the context of modality, course structure can set the stage for a more relational and interactive course that can promote social, cognitive, and teaching presence.

The COVID-19 pandemic revealed the essential utility of technology in modern life, and nowhere have we found it to more necessary than in promoting and sustaining equitable access to educational opportunities. Identifying the most effective pedagogical strategies and providing options for high quality courses both online and in-person provides greater opportunity for all students to benefit from such practices. For example, high impact practices such as first-year seminars have significant benefits for students in general (Steiner et al., 2019), and while historically underserved students are less likely to participate in such activities, they often experience greater benefits when they do participate (Zilvinskis et al., 2022). Offering high quality online as well as in-person options provides more equitable opportunities for students, regardless of their educational context and background (Finley et al., 2022). While the COVID-19 pandemic created the new challenge of a sudden pivot to online classes, the issue of needing to teach classes that are traditionally in-person in an online context continues today. Our case study reinforced this new reality and leaned into the promise of high impact teaching and learning in online courses which, when used with planning and intention, can deepen students' academic experience.

Flipped Classroom

Consistent with previous evidence demonstrating increased engagement in FC settings (Stover & Houston, 2019), we found that using an FC approach particularly improved student perceptions of social presence. Consistent with previous research (e.g., Hew et al., 2020), when students came to class prepared to discuss and engage with material, it created a community of learners where students learned, discussed, and experienced the social norms of college, even if not physically in a classroom. Furthermore, because first-year seminar course material is designed to help students succeed academically (Sullivan & Haller, 2018), this increase in both cognitive and social engagement was particularly important (Duncan et al., 2012).

Co-teaching

Finally, co-teaching and involving peer mentors contributed to improved student perceptions of the course. As instructors experiencing pandemic social isolation ourselves, co-teaching helped create a more interactive and engaging social space to discuss ideas and get excited about teaching (Monteblanco, 2020). This is consistent with previous findings that faculty who had learning approach goal orientations during the pandemic shift to online teaching viewed the change positively and had lower burnout (Daumiller et al., 2021). Our experiences of collaboratively experimenting with new co-teaching methods helped to provide each of us with professional **and** emotional support, and therefore enabled us to offer students more empathy and academic support. These processes are particularly reflected in the greater reports of social presence online.

Implications for Practice

These case study findings suggest several practices that can be implemented across higher education contexts to improve social, cognitive, and teaching presence. Although implemented online in a first-year seminar course, these strategies are not limited to this context. It is worth noting that there were multiple differences between in-person and online versions of the course, and that the online course

was done in the context of an ongoing global pandemic. Although we cannot identify one single practice that led to improvements, we have highlighted some of the most salient practices that we believe contributed to changes in various types of instructional presence. While this case study utilized these activities and tools only in the online context, the vast majority of these could easily be translated to in-person contexts as well. Therefore, many of these strategies could be used for any instructors seeking to establish social, cognitive, and teaching presence, regardless of modality or even course topic.

Social Presence

Encouraging social presence and connection was a key goal for the online course, given students were taking classes online during the pandemic and social isolation. One of the ways we established peer engagement was through long-term partner activities. In pairs, students did an activity (modified for online) designed to generate interpersonal closeness (Aron et al., 1997). After partner cohesion was established, pairs had out-of-class assignments to complete together, giving them opportunities for social engagement. In addition, we increased instructor social presence by assigning compulsory individual meetings with instructors and peer mentors, providing opportunities to ask questions and practice course skills. Peer mentors also provided additional support and advice.

Cognitive Presence

A variety of online tools were used to promote cognitive presence, which could also be accessible in-person and across educational domains. Each class period started with a check-in question - a light-hearted or thought-provoking question that students responded to via chat or polling. Thus, students were engaged from the first moments of class. Classes concluded with a check-out question related to the session topic. Throughout the class, online polling tools were used to assess understanding and ensure continuous cognitive engagement.

In addition to large group discussions, breakout groups were used each class period. Students were randomly assigned to small groups (3-4) to reflect on material, discuss personal applications, or collaboratively solve problems or identify resources. These smaller groups ensured students had opportunities to share thoughts in a less intimidating setting, increasing cognitive presence. Furthermore, breakout groups were often asked to post written responses to shared class tools (e.g., Google Docs). This held groups accountable for organizing and recording discussions, provided a non-verbal option for engagement, as well as a resource to which students could later refer.

Teaching Presence

A number of structural changes in the class improved teaching presence. The FC structure exposed students to material before class and allowed for engagement and interaction with material and peers during class. To confirm students were doing assigned work before class, they completed weekly R.S.V.P. assignments, in which they (1) **R**esponded to material, (2) **S**ummarized main findings, (3) Identified and defined **V**ocabulary terms, and (4) **P**osed a question. During class, teaching presence emerged primarily through discussion facilitation. On rare occasions when new material was presented in class, it was via student-led presentations. This changed our instructor role from lecturer to facilitator and guide, empowering students to take ownership of material and learning experiences.

Co-teaching also led to substantial changes in teaching presence. Although this may have been less visible to students, collaboratively planning the course enabled us to use a wider variety of activities, spend more time reflecting on goals for the class and how effectively they had been executed,

and further provided mutual social support to instructors.

Conclusions

In conclusion, we found through this multi-year collaborative teaching partnership that implementing an FC approach that was informed by the CoI framework was a better learning experience for students as reported in student evaluations of teaching. It also was a more positive and transformative teaching experience for us. Since completing this case study, both of us have worked individually and collaboratively to translate these strategies to other classes and modalities. We continue to find that these high-impact strategies allow for higher degrees of interactive and relational student engagement. As our case study demonstrates, the CoI framework offers a best-practice model for engagement, relationship-building, social support, learning, and collaborative social interaction. Our challenge centered on building an engaged classroom community in an online first-year seminar course during the COVID-19 pandemic, but our findings are readily generalizable to other modalities, courses, and student populations. Although the improvement in course quality via social, cognitive, and teaching presence was the primary focus, we also take away a greater appreciation for the co-teaching experience through which we gained new pedagogical insights and much valued peer support.

References

Andrews, B., & Wilding, J. M. (2004). The relation of depression and anxiety to life-stress and achievement in students. *British Journal of Psychology, 95,* 509–521. https://doi.org/10.1348/0007126042369802

Ang, L., Breyer, Y. A. & Pitt, J. (2018) Course recommendations as a construct in student evaluations: Will students recommend your course? *Studies in Higher Education, 43*(6), 944-959. https://doi.org/10.1080/03075079.2016.1199543

Aron, A., Melinat, E., Aron, E. N., Vallone, R. D. & Bator, R. J. (1997). The experimental generation of interpersonal closeness: A procedure and some preliminary findings. *Personality and Social Psychology Bulletin, 23*(4), 365-377. http://doi.org/10.1177/0146167297234003

Campillo-Ferrer, J. M., & Miralles-Martínez, P. (2021). Effectiveness of the flipped classroom model on students' self-reported motivation and learning during the COVID-19 pandemic. *Humanities and Social Sciences Communications*, *8*(1), 1-9. https://doi. org/10.1057/s41599-021-00860-4

Charmaz, K. (2006). *Constructing grounded theory: A practical guide through qualitative analysis*. Sage.

Cutrona, C. E. (1982). Transition to college: Loneliness and the process of social adjustment. In L. A. Peplau & D. Perlman (Eds.), *Loneliness: A sourcebook of current theory, research, and therapy* (pp. 291–309). Wiley Interscience.

Daumiller, M., Rinas, R., Hein, J., Janke, S., Dickahuser, O. & Dress, M. (2021). Shifting from face-to-face to online teaching during COVID-19: The role of university faculty achievement goals for attitudes towards this sudden change, and their relevance for burnout/engagement and student evaluations of teaching quality. *Computers in Human Behavior, 118*, 1-10. https://doi.org/10.1016/j.chb.2020.106677

Duncan, K., Kenworthy, A., & McNamara, R. (2012). The effect of synchronous and asynchronous participation on students' performance in online accounting classes. *Accounting Education: An International Journal, 21*(4), 431-449. http://dx.doi.org/10.1080/09639284.2012.673387

Finley, A., McNair, T., & Clayton-Pederson, A. (2022). Designing equity-centered high-impact practices. In J. Zilvinskis, J. Kinzie, J. Daday, K. O'Donnell, & C. V. Zande (Eds.), *Delivering on the promise of high-impact practices: Research models for achieving equity, fidelity, impact, and scale* (pp.

17-29). Stylus.

Fiock, H. (2020). Designing a community of inquiry in online courses. *The International Review of Research in Open and Distributed Learning*, *21*(1), 135-153. https://doi.org/10.19173/irrodl.v20i5.3985

Fullick, J., Smith-Jentch, K. A., Yarbrough, C. S., & Scielzo, S. A. (2012). Mentor and protege goal orientations as predictors of newcomer stress. *Journal of Scholarship of Teaching and Learning, 12(1),* 59-73.

Galindo-Dominguez, H. (2021). Flipped classroom in the educational system: Trend or effective pedagogical model compared to other methodologies? *Educational Technology & Society*, *24*(3), 44-60. https://www.jstor.org/stable/27032855

Garrison, D. R., Anderson, T., & Archer, W. (2010). The first decade of the Community of Inquiry Framework: A retrospective. *Internet and Higher Education, 13*, 5-9. http://dx.doi.org/10.1016/j.iheduc.2009.10.003

Garrison, D. R. & Arbaugh, J. B. (2007). Researching the Community of Inquiry Framework: Review, issues, and future directions. *Internet and Higher Education, 10*, 157-172. https://doi.org/10.1016/j.iheduc.2007.04.001

Gopalan, M. & Brady, S. T. (2020). College students' sense of belonging: A national perspective. *Educational Researcher, 49*(2), 134-137. https://doi.org/10.1016/j.iheduc. 2009.10.003

Gopalan, M., Linden-Carmichael, A. & Lanza, S. (2022). College students' sense of belonging and mental health amidst the COVID-19 pandemic. *Journal of Adolescent Health, 70*, 228-233. https://doi.org/10.1016/j.jadohealth.2021.10.010

Graham, J. & McClain, S. (2019). A canonical correlational analysis examining the relationship between peer mentorship, belongingness, imposter feelings, and black collegians' academic and psychosocial outcomes. *American Educational Research Journal, 56*(6), 2333-2367. https://doi.org/10.3102/0002831219842571

Gunbatar, M. S. (2021). Flipped classroom in higher education: Evaluation of the process in the framework of community of inquiry. *Journal of Educational Technology Systems, 50*(2), 215-254. https://doi.org/10.1177/00472395211031660

Hew, K. F., Jia, C., Gonda, D. E., & Bai, S. (2020). Transitioning to the "new normal" of learning in unpredictable times: Pedagogical practices and learning performance in fully online flipped classrooms. *International Journal of Educational Technology in Higher Education*, *17*(1), 1-22. https://doi.org/10.1186/s41239-020-00234-x

Kim, G. C., & Gurvitch, R. (2020). Online education research adopting the Community of Inquiry Framework: A systematic review. *Quest*, *72*(4), 395-409. https://doi .org/10. 1080/00336297.2020.1761843

Kinzie, J. & Cole, J. (2022). Education disrupted: Students beginning college during the COVID-19 pandemic. *New Directions in Higher Education, 199*, 27-40, https://doi.org/ 10.1002/he.20449

Kuh, G. D. (2008). Why integration and engagement are essential to effective educational practice in the twenty-first century. *Peer Review, 10*(4), 27–28.

Lane, S. R. (2020). Addressing the stressful first year in college: Could peer mentoring be a critical strategy? *Journal of College Student Retention: Research, Theory & Practice*, *22*(3), 481-496. https://doi.org/10.1177/1521025118773319

Lawrence-Benedict, H., Pfahl, M., & Smith, S. J. (2019). Community of Inquiry in online education: Using student evaluative data for assessment and strategic development. *Journal of Hospitality, Leisure, Sport & Tourism Education, 25*. https://doi.org/10.1016/j.jhlste.2019.100208

Lee, S. J. & Nuatomue, J. N (2021). Students' perceived difficulty and satisfaction in face-to-face vs. online sections of a technology-intensive course. *International Journal of Distance Education Technologies, 19*(3), 1-13. http://doi.org/10.4018/IJDET.2021070101

McBride, E., Murray, A. V. & Duggan, M. (2021) Academic self-efficacy, student performance, and well-being in a first-year seminar. *Journal of the First-year Experience & Students in Transition, 33*(1), 99-119. https://eric.ed.gov/?id=EJ1304155

McClain, L., Gulbis, A. & Hays, D. (2018). Honesty on student evaluation of teaching: Effectiveness, purpose and timing matter! *Assessment & Evaluation in Higher Education, 43*(3), 369-385. https://doi.org/10.1080/02602938.2017.1350828

Mercado, E. M. (2022). Preservice music educators' perceptions of in-person and asynchronous online fieldwork experiences. *Journal of Music Teacher Education, 31*(2), 41-54. https://doi.org/https://dx.doi.org/10.1177/10570837211061291

Miller, M. E., Newton, K., Stover, S., Miller, B., & Buttolph, J. (2020). Comparing delivery methods of an introduction to nutrition course using the community of inquiry. J*ournal of Nutrition Education and Behavior, 52*(4), 401-406. https://doi.org/10.1016/j.jneb.2019.09.007

Monteblanco, A. D. (2020). Power dynamics, common pitfalls, and successful strategies associated with co-teaching. *College Teaching*, *69*(2), 63-68. https://doi.org/10. 1080/ 87567555.2020.1810610

Murawski, W. W., & Lochner, W. W. (2011). Observing co-teaching: What to ask for, look for, and listen for. *Intervention in School and Clinic*, *46*(3), 174-183. https://doi.org/10 .1177/1053451210378165

Ostrove, J. M. & Long, S. M. (2007). Social class and belonging: Implications for college adjustment. *The Review of Higher Education, 30*(4), 363-389. https://doi.org/10.1353/rhe.2007.0028

Panicker, L. (2017). Experiences of flipping an online classroom: An appraisal using Community of Inquiry Framework. *GSTF Journal of Nursing and Health Care (JNHC)*, *5*(1), 1-8. https://doi.org/10.5176/2345-718X_5.1.170

Permzadian, V. & Crede, M. (2016). Do first-year seminars improve college grades and retention? A quantitative review of their overall effectiveness and an examination of moderators of effectiveness. *Review of Educational Research, 86*(1), 277-316. https://eric.ed.gov/?id=EJ1090528

Qingmin, S., Crooker, J. R., Drum, C. R. & Drake, B. M. (2021). Investigating the effect of first-year seminars on student success. *Journal of the First-year Experience & Students in Transition, 33*(2), 65-95. https://eric.ed.gov/?id=EJ1322574

Shaver, P., Furman, W., & Buhrmester, D. (1985). Transition to college: Network changes, social skills, and loneliness. In S. Duck & D. Perlman (Eds.), *Understanding personal relationships: An interdisciplinary approach* (pp. 193–219). Sage.

Shea, P., Richardson, J., & Swan, K. (2022). Building bridges to advance the Community of Inquiry Framework for online learning. *Educational Psychologist*, *57*(3), 148-161. https://doi.org/10.1080/00461520.2022.2089989

Shell, M. D. & Absher, T. N. (2019). Effects of shyness and friendship on socioemotional adjustment during the college transition. *Personal Relationships, 26*, 386-405. https://doi.org/10.1111/pere.12285

Steiner, H., Trivedi, N., & Brown, J. (2019). Bringing a learning strategies project to scale in a first-year seminar. *Journal of Effective Teaching in Higher Education*, *2*(1), 27-44. https://doi.org/10.36021/jethe.v2i1.36

Stover, S., & Houston, M. A. (2019). Designing flipped-classes to be taught with limited resources: Impact on students' attitudes and learning. *Journal of the Scholarship of Teaching and Learning, 19*(3), 34-48. https://doi.org/10.14434/josotl.v19i2.23868

Sullivan, C. J. & Haller, C. A. (2018). First-year seminar program evaluation: A focus group study. *Currents in Teaching and Learning, 10*(1), 109-118.

Yarmand, M., Solyst, J., Klemmer, S., & Weibel, N. (2021). "It feels like I am talking into a void": Understanding interaction gaps in synchronous online classrooms. *Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems, 351,* 1-9. https://doi.org/10.1145/3411764.3445240

Zilvinskis, J., Kinzie, J., Daday, J., O'Donnell, K., & Zande, C. V. (Eds.). (2022). *Delivering on the promise of high-impact practices: Research models for achieving equity, fidelity, impact, and scale*. Stylus.

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Learners' Collaboration Experiences and Perceptions of Teamwork Strategies in an Online Graduate Class

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Abstract: Collaborative teamwork has gained popularity as a vital strategy within online learning environments for constructing and negotiating knowledge. This study explores the implementation of seven distinct teamwork strategies, drawn from existing literature, in an online graduate course at a Turkish private university. It represents a single case study aimed at understanding and explaining the course's design as a collaborative learning environment and examining learners' experiences and perceptions regarding teamwork strategies in the class. Data obtained from learner interviews, document analyses, and observations revealed diverse participant perspectives on the various teamwork approaches. Sustained collaboration with consistent team members over the semester notably fostered trust and a sense of belonging within teams. While participants exhibited positive attitudes toward strategies based on shared working hours and styles, experienced graduate learners expressed discontent with the teamwork approaches. The systematic implementation of distributed leadership proved challenging, leading to team dynamics shaped largely by individual personalities and prior graduate study experiences, creating an implicit leadership structure. Additionally, peer assessment emerged as an ineffective strategy for participants driven by internal motivation and a sense of responsibility.

Keywords: Distance Education, Online Collaborative Learning, Virtual Teams, Teamwork Strategies, Constructivism.

Distance Education and Online Teams

New digital technologies, particularly the Internet and social media, have sparked diverse approaches to accommodate to the needs of 21st-century learners (Cabero-Almenara et al., 2022). Durthetimes, distance education (DE) has become the preferred choice for learners and institutions, particularly in higher education. Its learner-centric approach allows individuals to learn at their own pace, irrespective of their location or circumstances, even fostering connections between learners and instructors across different geographical regions (Murtazina et al., 2021). For introverted learners uncomfortable in face-to-face settings, online education offers a less intimidating platform with ample opportunities for active participation (Kamal et al., 2020). Additionally, online learning courses and programs provide career development prospects for full-time workers. DE tends to rapidly introduce new learning trends and technology-based opportunities. For instance, massive open online courses (MOOCs) offer personal development opportunities for millions of learners worldwide (Shah, 2020, 2021).

Social constructivist theory emphasizes the collaborative and social nature of knowledge construction, positing that knowledge is not passively received but actively built through social interaction and collaboration (Palincsar, 1998). This theory asserts that learning occurs within a social context, where individuals construct knowledge through interactions with others and the environment (Breen, 2013). Online collaborative learning plays a crucial role in the advancement

of online education. It focuses on constructing knowledge through shared ideas and understanding diverse perspectives, aiming for consensus in a digital learning context (Harasim, 2012).

This approach fosters a dynamic and participatory online learning environment, in line with contemporary educational trends. Chatterjee and Correia (2020 note that online collaborative groups foster critical interaction and engagement, crucial for effective DE environments. Research on optimizing teamwork effectiveness and identifying beneficial strategies is imperative for practitioners and researchers alike. Despite the many distinct advantages of DE for learning, challenges persist within online education courses utilizing teams and small groups. Studies indicate that interaction between learners and instructors significantly shapes learners' perception of online learning (Bolliger & Martin, 2018). Learners often experience isolation due to limited interaction in online environments (Johnson & Johnson, 2006). Consequently, dropout rates in online courses tend to be higher compared to face-to-face settings (Després-Bedward et al., 2018).

To enhance online learning effectively, it is important for both researchers and educators to focus more on interaction and collaboration (Molinillo et al., 2018). Palloff and Pratt (2007) define interaction as all forms of contact, including those between learners, between learners and instructors, and between learners and the content. While the virtual space offers various interaction methods, online courses often use different digital tools to engage students. These tools include synchronous and asynchronous discussion boards, chat boxes, bulletin activities, video conferences, and group assignments. These methods help make up for the absence of in-person contact in online teams (Romero-Hall & Ripine, 2021). Group assignments are a popular way to encourage different types of interactions in online courses (Vuopala et al., 2016). However, if instructional strategies are not applied effectively or if innovative strategies are not developed, online group work can become monotonous and boring. Such monotony can lead to a less satisfying learning experience (de Souza Santos & Ralph, 2022).

High dropout rates and feelings of isolation influence online collaborative teams (Gregori et al., 2018). Learners encounter numerous problems in their teamwork experiences, impacting their overall teamwork satisfaction. Those problems may include uneven task distribution among team members, team members engaging in social loafing, difficulty in establishing synchronous meeting times, and an opposing team climate (Morrison-Smith & Ruiz, 2020). Understanding online collaborative settings and learners' experiences within them have gained importance for online educators and administrators. Although virtual teams pose multiple positive outcomes for learners, they should be implemented cautiously since they may, in nature, present obstacles to trust-building, cohesiveness, and communication (Jony & Serradell-López, 2020). Therefore, it is essential to consider effective teamwork strategies when forming and designing online teams, in order to minimize the challenges they face. The current literature suggests that well-planned instructional strategies can significantly boost commitment and engagement in group activities (Azizan et al., 2018; Conrad & Openo, 2018).

Teamwork Strategies

Positive interdependence, group cohesion, and group composition are critical factors to consider when evaluating team performance (Beal et al., 2003; Ergulec, 2019). In this section those terms will be described and teamwork strategies related to these constructs will be explained.

Positive interdependence

Positive interdependence (PI) occurs when one person's success depends on other team members (Laal, 2013). The common goals among group members can foster motivation to achieve as a team while creating a sense of togetherness within the group (Johnson & Johnson 2018). Many teamwork strategies that promote positive interdependence have been described in the literature.

In the present study, *distributed leadership* and *peer assessment* strategies were selected as strategies contributing to PI (Ergulec, 2019).

Distributed leadership

Distributed leadership refers to the practice in which team members share the responsibility of the team administration (Mollenkopf et al., 2020). The literature reveals that distributed leadership has been employed in educational settings as well as in corporate settings where project teams can increase the task success through distributed leadership (Sweeney et al., 2019). In groups where distributed leadership is employed, each group member recognizes their obligation to the entire team's members, leading to trust among group members (Robert Jr & You, 2018). Additionally, such collaborative teams involve in distributed leadership that can successfully create a positive collaborative climate (Drescher et al., 2014). Along these same lines, the interaction between the team members contributes to group cohesion and promotes project quality (Imam & Zaheer, 2021).

Peer assessment

Virtual teams often face challenges such as a lack of active participation and social loafing, where individuals exert less effort in a group than when working alone (Davison et al., 2014; Gilovich et al., 2006). To address these issues, peer evaluation is a useful tool. It involves assessing team members through a rubric, reflection papers, and evaluation essays, and can influence overall teamwork scores (Fellenz, 2006; Tavoletti et al., 2019). Research by Román-Calderón et al. (2021) shows that peer assessment not only reduces the incidence of low effort in teamwork but also boosts collaborative motivation, enhances team performance, and improves self-assessment skills. Additionally, peer feedback has been found to have a positive effect on both the success of teamwork and the development of teamwork skills (Andrade et al., 2020; Donia et al., 2018; Sridharan & Boud, 2019). This approach fosters a more accountable and engaged team environment, promoting better results and skill development.

Group cohesion

Group cohesion, which refers to a team's shared commitment to goals and to each other, is a key factor in a team's success (Paulus et al., 2011). This cohesion is a driving force for achieving team objectives and plays a vital role in ensuring satisfaction for both the individual members and the team as a whole (Bravo et al., 2019; Uz Bilgin & Gul, 2020). According to Matt Graham and Jones (2019), every team needs a certain level of cohesiveness to function effectively. Cohesive groups are characterized by mutual respect, a sense of belonging, and a valuation of the team (Forsyth, 2018). However, it is important to note that while high group cohesion can enhance group achievements, low cohesion can lead to conflicts, negatively impacting the team's overall success (Uz Bilgin & Gul, 2020). Therefore, fostering a cohesive team environment is crucial for both individual and group efficacy.

Moreover, Gupta and Baker (2020) found that group cohesion leads to improved group task performance and student engagement. Numerous strategies have been noted that support group cohesion within the learning environments. For instance, determining a team name, writing the team's goals, and finding a group's motto through brainstorming in the early stages of team formation have been commonly used methods (e.g. Uz Bilgin & Gul, 2020; Cheng et al.,2021).

Team building activities and ice breakers

Team building activities are essential for developing teamwork, especially in virtual teams where participants might not know each other due to distance (Klein et al., 2009). Building relationships with peers, teachers, and the online community is crucial for effective learning in such settings (Dressel, 2020). These activities are known to foster team cohesion effectively, with icebreakers being one of the most popular methods used during the team-building process (Kaushik & Zinjarde 2020; Zhang et al., 2020). They help create a more connected and cooperative team environment.

Working style questionnaires, personality tests, and learning style inventory

Virtual teams may consist of participants who work in different time zones; therefore, setting a convenient time for teamwork can be challenging for the team members. Along these same lines, submission dates of the assignments may pose another difficulty for the participants when their working styles fail to align with each other, which causes negative experiences for the group members and may hamper working effectively in the teams. Additionally, the personal traits of the participants may have an impact on the team's formation and later performance.

Several team-forming strategies, models, and algorithms have been developed to facilitate the process (e.g., Miranda et al., 2020; Sadeghi & Kardan, 2016; Tacadao et al., 2016; Zheng et al., 2018). Furthermore, implementing various tests and inventories such as working styles questionnaires, learning styles inventories, and personality tests have been experimented with in forming groups when participants do not know each other. Such questionnaires can include questions that reveal learners' available times for teamwork and their working styles (i.e., deadline-oriented or procrastinators) (Ergulec, 2017). Previous research emphasized that participants, upon encountering a team formation strategy that solicited their preferences via a questionnaire, later expressed satisfaction with the teamwork once they actively participated in it (Kyprianidou et al., 2012).

Team charters

When groups are formed, it is of paramount importance that team members have an opportunity to understand each other's perspectives on the assorted tasks of the group (DiazGranados et al., 2017). Team charters can be defined as the tools that have been employed immediately after the formation of the groups, which enables team members to brainstorm ideas and reach a consensus regarding the goals, expectations, and norms of the teams (Barron, 2000). A team charter can include information regarding team name, mission, common goals, and arranged team meeting schedule. When the participants decide on the team's mission with a straightforward task and set the group's goals, they work more effectively (Zasa & Buganza, 2023). With the implementation of the team charters at the start of the teamworking process, learners feel a commitment to their teams and become aware of the expectations of the other group members; additionally, working together to form a team charter builds a positive learning experience for the participants of the team (Aaron et al., 2014).

Group Composition

Group composition refers to the characteristics of the members of a team (Hackman & Wageman, 2004). Elements that relate to group composition include group size, the duration of the group's work, personality characteristics of the individuals, and gender of the participants.

Team size

The number of team members is an essential component of group composition; however, the ideal number of members can vary depending on the type of task, the participants' age, and the context or setting (Karriker et al., 2017). The number of team members is an essential component of group composition. Keeping the group size small is recommended (Yukselturk & Cagiltay, 2008; Wheelan 2009). Large group size can lead to social loafing and negative group conflict between the participants.

Group diversity

The homogeneity and heterogeneity of online teams may influence the participants' interaction styles and the team's ultimate performance. The participants' cognitive skills, culture, and working habits are among the determinant elements of the homogeneity of the teams (Younis, 2019). Gender can also have a significant impact on the quality of teamwork in online courses. Research has shown that there are gender differences in online behaviors and course performance (Lowes et al., 2016).

Duration

Team development processes for face-to-face and virtual teams can be quite distinctive. Unlike with face-to-face teams, long-term virtual teams tend to form through a sequential team development procedure (Haines, 2014). Team members' sense of belonging tends to increase over time which is also quite crucial as they can solely interact through computer mediated tools (Haines, 2014). The duration that members work together is reported as a positive influence on teamwork satisfaction (Zwikael & Unger-Aviram, 2010). When team members meet frequently, their sense of trust in team members and emotional support increase, which also contributes to teamwork satisfaction (Handke et al., 2020).

Personality of the team members

Ford et al. (2017) suggest choosing team members depending on their personality types. Even though there is a lack of consensus on which personality types fit each other to work effectively, it has been found that personality traits and teamwork have been widely discussed themes in the literature (Rhee et al., 2013). Extraversion, conscientiousness, and agreeableness are among personality traits that influence team dynamics (Kelsen & Liang 2019; Kramer et al., 2014).

A review of existing literature reveals a significant focus on effective teamwork strategies, particularly in the business and medical sectors (Reeves et al., 2017; Rosen et al., 2018). However, studies examining online collaborative learning and group work, such as those by Benning (2022), Chang & Kang (2016), Tseng and Yeh (2013), Ergulec (2019), and Wilson et al. (2017), have mainly centered on specific aspects like team achievement and group formation strategies. They often prioritize face-to-face group interactions. This highlights a research gap in understanding teamwork strategies in fully online graduate courses, where the needs and experiences of learners might be distinct. This study aims to bridge this gap by addressing the following research questions:

1. When teamwork strategies are implemented in online education, how do learners describe their teamwork experience?
2. How do they perceive the benefits of online teamwork?
3. What challenges do they encounter when engaging in online teamwork?

Method

This single case study aims to comprehend the design of an online graduate course and explore students' collaborative experiences and insights within the collaborative teams. A single case study is a research design focused on deeply investigating a specific case, which could be an individual, a group, an event, or, in this instance, a single online course (Lazar et al., 2017). The purpose is to extensively examine and understand the details and dynamics of a particular case. In this study, the aim is to gain a comprehensive understanding of the design of the online course and to delve into the experiences, perceptions, and interactions of students involved in collaborative teams within this specific educational setting.

Participants

The study was conducted in a Turkish, non-thesis distance education program; therefore, some participants of the study were from different regions of Turkey. Thirteen individuals participated in the study. The participants were all teachers working in a private charter school in Turkey. The demographic info of the participants is illustrated in Table 1.

Table 1. Demographic Information of the Participants.

Participant	Gender	Teaching Areas
P1	Female	School Principal
P2	Female	Science
P3	Male	Music
P4	Female	School Principal
P5	Female	Music
P6	Female	English
P7	Female	Primary School
P8	Female	Pre-School
P9	Female	Pre-school
P10	Female	Primary School
P11	Male	PE group leader
P12	Female	School Principal
P13	Female	Primary School

Setting

The current study was conducted at a private university in İstanbul, Turkey, and employs a single-case approach to examine participants' experiences within an online graduate course. An online graduate course in the field of educational technology was selected to collect the data for the study. The course was a three-credit, fully online, 14-week course delivered in the Turkish language. The content of the course includes the fundamental elements of the educational technology field. In this course, there were three graded assignments; in addition, there were two other tasks required for course completion that were not graded. For the assignments, teamwork was obligatory. Apart from teamwork, each student had individual presentation assignments related to the educational technology field. They participated in weekly discussions asynchronously. A description of the teamwork assignments is provided in Table 2.

Assignment 1: Definition of the Field: Teams were supposed to define the educational technology field within the scope of their area of teaching. They brainstormed and created a visual as a product.

Assignment 2: Learning Theory Matrix: Teams described learning theories within their workplaces and created a matrix to illustrate how these strategies could be implemented in the field.

Final Assignment: Systematic Literature Review: For the final assignment, teams wrote a systematic literature review about a topic in the educational technology field. The assignment had sub-tasks which were supposed to be completed throughout the semester. Subtasks included a research proposal and an annotated bibliography.

Table 2. Course Assignments and Their Weights.

Team Assignments	Individual Assignments
Definition of the Field 15%	Weekly Presentations 10%
Learning Theory Matrix 15%	Weekly discussion boards 13%
Systematic Literature Review 42%	
-Research Proposal	+ *participation 5 %*
-Annotated Bibliography	

Design

Utilizing the research on the importance of positive interdependence, group cohesion, and group composition for effective teamwork performance (Ergulec, 2019), seven teamwork strategies were selected that were aligned with the learning objectives, learner needs, and the overall context of the course. Next, the course syllabus was redesigned with the instructor of the course. Teamwork assignments were included in the course design, which impacted the final grades of the participants.

To meet these team collaboration goals, each week, the participants met via Microsoft Teams for two hours or more of lessons. Learners were assigned weekly readings about educational technology, and they discussed the reading materials asynchronously on a discussion board in the learning management system. During the class hours, breakout rooms were created consisting of 3-4 members to discuss the week's topic. Students were given presentation tasks as individual assignments. Additionally, they were assigned three assignments and two subtasks in which they were supposed to work in teams. The weekly procedures are detailed in Table 3.

Table 3. Weekly Procedure.

Week	Teamwork Strategies	Assignments
1	Ice-Breakers	
2	No Teamwork	
3	Working Style Questionnaire	
4	Forming groups- Creating a team charter	
5	Peer Assessment- Teamwork experience report	Assignment 1 (Definition of the Field)
6	In Class Breakout room sessions	
7	In Class Breakout room sessions	Research Proposal
8	Peer Assessment- Group Reflections	Assignment 2 (Learning Theory Matrix)
9	In Class Breakout room sessions	
10	In Class Breakout room sessions	

11	In Class Breakout room sessions	Annotated Bibliography
12	In Class Breakout room sessions	
13	In Class Breakout room sessions	
14	In Class Breakout room sessions	
Final	Project Presentation-Peer Assessment and Group Reflections	Final Assignment (Systematic Literature Review)

Description of the Teamwork Studies in the Case

As detailed in Table 4, seven teamwork strategies were chosen from the literature, corresponding to components of team cohesion, team composition, and positive interdependence, all of which have been reported as elements of effective teams. The teamwork strategies selected were aligned with the learning objectives, learner needs, and the overall context of the course. Next, we needed to eliminate some of the strategies that were revealed in the literature and chose the most usable and suitable ones for the context of the course.

Table 4. Teamwork Strategies.

Components	Related Strategies
Positive Interdependence	• Distributed Leadership • Peer Assessment
Group Cohesion	• Team Forming Activities/ Ice Breakers • Team Charter • Working Styles Questionnaire
Group Composition	• Small Team Size • Duration

Icebreaker Activities

In the first week of the course, the researcher sent an introductory post. In addition, the other participants introduced themselves with the following elements: profession, years of experience in the profession, term in the master's program, areas of interest and hobbies, and expectations for the course.

At the conclusion of their posts, participants were prompted to share something distinctive about themselves, such as a quote, an illustration, or a piece of music. This request aimed to cultivate mutual knowledge and intersubjectivity, which denotes the shared understanding between individuals in communication. (Dennen, et al., 2023). Additionally, participants commented on two of their classmates' posts whom they perceived had similar interests and personalities. As an additional means to foster a sense of community in this online course, participants were requested to add profile photos.

Working Styles Questionnaire

To facilitate group formation, a working style questionnaire was used. Questions in this instrument aimed to determine participants' available times for teamwork, their working styles, and their tendency to procrastinate. The selection of these questions was based on Ergulec's (2017) dissertation study on students' collaboration experiences of a purposeful group assignment strategy and team building in an online graduate class. During Week 3 of the course, the students were provided with this questionnaire. In total, fourteen students completed it, though one student declined to participate in the study. Using the team forming criteria outlined in Ergulec's (2017)

study (See Table 5), participants were then assigned to groups. The assignment to teams was based on their availability for teamwork, inclination to procrastinate, and inclination to assume others' responsibilities within the group. Pseudonyms were assigned to the teams by the researchers to emphasize the team-forming criteria and were referred to by these names throughout the rest of the study. Team members themselves chose different names. Items related to participants' field of teaching and participants' technology expertise were given lower priority.

Table 5. Team Forming Criteria Based on Questionnaire.

Participants	Team	Forming Criteria
P1	Acquainted Team	
P2	Acquainted Team	Teachers who shared their preference to be in the same group based on where they work.
P3	Acquainted Team	
P4	Ambitious Team	
P5	Ambitious Team	Similar working styles, available hours, and icebreaker interaction, where they responded each other's posts in the icebreaker activity.
P6	Ambitious Team	
P7	Ambitious Team	
P8	Similar Team	
P9	Similar Team	Similar working hours, teaching fields and deadline orientation
P10	Similar Team	
P11	Disparate Team	
P12	Disparate Team	No match (participants have diverse available times, from different teaching fields)
P13	Disparate Team	

Team charter

In Week 4, the participants were informed about their groups. During class time, participants and the researcher had a Zoom meeting. The researcher told the participants which components they could include in their team charter. A pre-designed team charter form was shared with each team, and they were assigned to breakout rooms with their team members to discuss and fill out the team charter form. Participants decided on a team name, and they wrote their mission and goals of the team, the expected meeting days, and sanctions for non-contributing team members. After 20 minutes of discussion, participants joined the main room again and shared their team charters with the researcher. Throughout the entire semester, the same team members worked together on four assignments in total and in class-breakout room sessions.

Peer assessment and teamwork reflections

After each teamwork assignment, team members evaluated their teammates with a rubric. The rubric was given as an obligatory assignment for the completion of the tasks. Each peer assessment had a 3% contribution to the student's final grade. Also, participants wrote teamwork reflections to share their teamwork experiences, answering questions about their concerns, expectations, and satisfaction level related to the teamwork. These reflections had a 5% contribution to the final

grade of the learners. The teamwork reflections were also used as a data source for the document analysis.

Distributed Leadership

A distributed leadership strategy was utilized to reduce social loafing and hinder the creation of a team leader who dominates the other team members' decisions. For that strategy, an item was included in the team charter. Team members wrote their names for different teamwork tasks as initiators of the teamwork and group meetings. Each member was expected to take the role of initiator. However, in practice, participants were inclined to follow the order they planned in the charter.

Team Size

There was an uneven number of participants in the class; as a result, groups with 3 to 4 learners were formed.

Duration

The participants worked together for every team assignment and never changed groups. In addition, in Week 6, team members started to work together in breakout room activities. In Breakout room activities, they were engaged in the tasks about the weekly readings. Before attending class, the students were supposed to read the articles or book chapters assigned to the team as well as participate in the discussion board in the LMS. Having discussed the topics in the discussion boards, they participated in in-class breakout room sessions as well.

Research Procedure

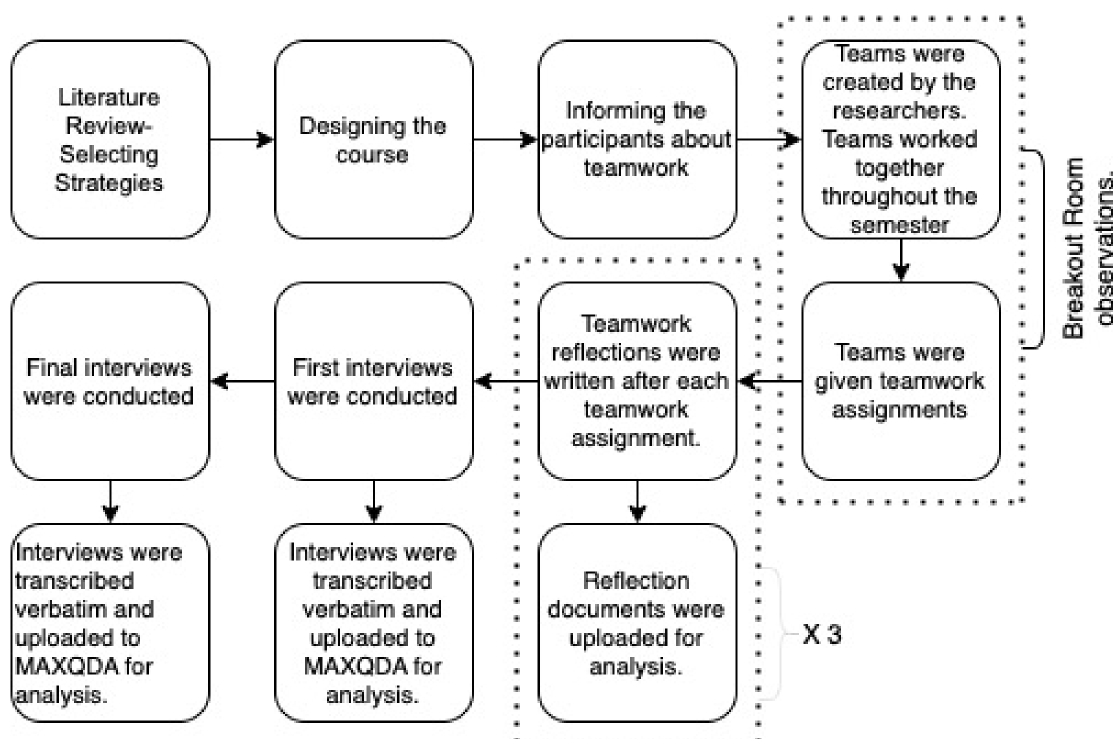

Figure 1. Research Procedure.

Data Resources

Qualitative Inquiry was used in the present study. After all the data was collected through interviews and documents, folders were uploaded to MAXQDA Analytics Pro software for analysis. The initial interviews took place right after the first group work assignment from a member of each team in order to have an initial glimpse of team experiences. They were asked about their ideal teamwork environment, their teamwork meetings, difficulties encountered, and their team products. Final interviews were conducted at the end of the semester wherein all the participants were interviewed about their overall teamwork experiences. The teamwork reflections that they wrote after each teamwork assignment was also used for document analysis. Groups were observed during the synchronous breakout room sessions. The Thematic Analysis method introduced by Braun and Clarke (2006) was used to analyze the findings.

All data were categorized and reread for better comprehension. Both inductive and deductive coding was utilized for the analysis. Inductive coding was employed for understanding the additional codes that emerged from the data, and deductive coding was used for the teamwork strategies used for the present study. Having completed the coding process, codes were categorized depending on the relations with the codes, and new categories were created. In reviewing these different categories, several themes were generated. Finally, the findings were reported by using excerpts from the documents.

To ensure trustworthiness, the verbatim transcription method was implemented. The researcher listened to participants' interviews and transcribed them word by word during the transcription process. Member checking was used after transcription of the interviews to validate participants responses and ensure research accuracy. Member checking, also known as participant or respondent validation, is a crucial instrument in ensuring the quality and credibility of qualitative research. It involves the process of seeking feedback from participants to validate the accuracy and credibility of the research findings (Birt et al., 2016).

Transcription folders and analyzed data were sent to the participants to ensure that the researcher did not include her personal bias and transcribed the interviews clearly and objectively. In addition, an independent researcher checked the codes that emerged from the data. Additionally, audit trails were used by the researchers throughout the analysis process. Validity and reliability were enhanced by using the triangulation method. Various data collection methods, including interviews, observations, and document analysis, were used in the research process.

Findings

The first research question asked: When teamwork strategies are implemented in online education, how do learners describe their teamwork experience? The findings for each teamwork strategy are summarized below in Table 6.

Table 6. Team Strategy Themes.

Strategy	Categories	Themes
Working Style Questionnaire	Concerns	Breaking Down the Prejudices
	Sense of Relief	
Team Charter	Time	Commitment to Team Procedure
	Unity	
	Internal Motivation	Non-Binding Team Charter
	Flexibility	
Peer Assessment	Task Motivation	Increased Motivation and Fair Assessment
	Evaluation	
Distributed Leadership	Single Leadership	Failure of Distributed Leadership
	Different Personality	
Team Size	Commonalities	Team Unity
	Similar Perspective	
Duration	Satisfaction	Team Familiarity & Product Progress
	Progress	

Working Styles Questionnaire

Breaking down prejudices refers to the participants' altered opinions regarding working in designated teams. All study participants were teachers from various subject areas. Consequently, their primary concerns involved collaborating with teachers from different grades and subject fields. At the initial stages of team formation, they harbored significant concerns and biases about their respective teams. For instance, during class interactions, one of the researchers observed that within the initial weeks, students expressed disinterest in collaborating within their assigned team due to their divergent interests and availability. For instance, participant #13 mentioned “lack of time due to family responsibilities outside of the class time.” Participant #11 shared having “different subject area of teaching” as a reason for lack of her interest working in her assigned team.

As they collaborated, their apprehensions eased, even within the Disparate Team, which comprised diverse members. Participant #12 expressed, "I had concerns; we were different, from different fields." Working in teams to complete assignments sparked fears for participants in other teams too. Participant #8 shared, "After the pandemic, I got used to being isolated; I questioned why I had to work in teams." Yet, as they continued working together, their concerns diminished. Reflecting on their initial worries, Participant #4 observed a transformation from concerns to satisfaction, stating, "...initially, being part of a team caused a lot of anxiety, but cooperating and sharing responsibilities had a positive impact on us. We're pleased with both our interaction and collaborative work."

Team Charter

Two themes arose from the implementation of the team charter strategy: (1) "commitment to the team procedure" and (2) "non-binding team charter." "Commitment to the team procedure" indicated participants' heightened dedication to their teams guided by the agreed-upon team charter. Some teams strictly adhered to their predefined rules: “Our pre-determined rules were to meet at around 9-10 at night. And we have always followed this rule” (P11).

Moreover, the team charter's impact on team identity is evident in how participants embraced their chosen team names. For instance, once they named themselves “Ambitious Team” as part of the charter process, they began to refer to themselves with pride and a sense of belonging. Participant #4 from the Ambitious Team expressed, “As members of Ambitious Team,

we always prioritized our team success." However, not all responses to the team charter were positive. Those with high self-motivation sometimes viewed the charter as superfluous, as evidenced by Participant #12's comment: "If we didn't have a team charter, my work approach wouldn't change."

Distributed Leadership

"Failure of distributed leadership" emphasize the difficulties the students encountered in rotating leadership roles for different assignments. It was observed that certain team members, not the designated leaders, naturally assumed leadership roles based on their personalities. These "invisible leaders," often perceived as perfectionists, dominant, or over-controlling, inadvertently took charge of their groups. Despite their somewhat strict approach, their leadership was viewed as effective in ensuring timely completion of tasks. Participant #9 shared: "Our team leader was [Participant 8] …Even with her dominance, she constantly put us under pressure, and luckily…we were able to submit our homework on time." Another element impacting leadership dynamics was the team members' prior academic experience. Specifically, those with master's degrees frequently emerged as unofficial leaders. This often resulted in dissatisfaction among the appointed leaders and led to an uneven distribution of tasks within the team. Participant #2 highlighted this issue: "It's about being familiar…in our assignment, simply reviewing the literature. They say you can handle this because I had a master's degree."

Peer Assessment

The key theme identified from the peer assessment strategy was "objective assessment and motivation." This theme highlighted how peer assessment influenced participants' motivation levels, leading to varied perceptions. Participants who were intrinsically motivated viewed the strategy as less effective. For example, Participant #2 expressed, "In other words, how my other friends would evaluate me was ineffective." She added, "I already have a responsibility; I acted with this awareness." Meanwhile, Participant #3 suggested the potential benefits of anonymous peer assessments, stating, "If there was an opportunity to evaluate at the beginning of the process, but if this evaluation was done anonymously, I think it would be a little more suitable for our culture." This observation is corroborated by the peer assessment documents of the Acquainted Team, which revealed a tendency among participants to award high grades to their peers regardless of their actual contribution to the teamwork.

Team Size

The "team unity" theme underscored participants' appreciation for smaller team sizes, finding them beneficial for fostering harmony and building consensus. The reduced size notably minimized conflicts, a crucial aspect in a setting where participants juggled busy work schedules. Smaller teams were particularly favored for their ease in scheduling synchronous meetings. Participant #6 explained, "I think a three-membered group is effective. Because it is tough to find a common time with four people."

However, transitioning to the challenges, a notable drawback of smaller teams was the increased workload per member. Participants felt that in larger groups, tasks would be more evenly distributed. Participant #8 highlighted this by saying, "If we were four people, I think our duties would have been even lighter." This observation suggests a trade-off between coordination ease in small teams and workload distribution in larger ones.

Additionally, the data revealed that small team sizes could limit exposure to diverse viewpoints, crucial for comprehensive understanding and innovation. Participant #11 advocated for larger groups: "I would like to increase the number of members and work with groups of five

people. The reason is that a different eye can see a different perspective." This comment highlights how team size can expand the spectrum of ideas and approaches, enriching the team's collaborative work.

Duration

The "team familiarity and product progress" theme highlighted participants' familiarity with their team members and its impact on enhancing performance in assignments. As participants grew acquainted, they expressed satisfaction with their collaborative work: "I felt that my self-confidence had improved a bit. When we came to the end of the term, especially in this final assignment, everyone was comfortable with what to do and what path we would follow" (P5). However, Participant #10 expressed a drawback, mentioning a preference for working with different individuals during online breakout room discussions. She noted missing the opportunity to learn from diverse participants: "There were people in the group that we called 'wow, outstanding students' who knew a lot in the course, and I would like to come to the same group with them."

Additional Themes

Apart from teamwork strategy themes, additional themes emerged from the data, providing a clear understanding of participants' experiences, and explaining research questions. These themes are summarized in Figure 2.

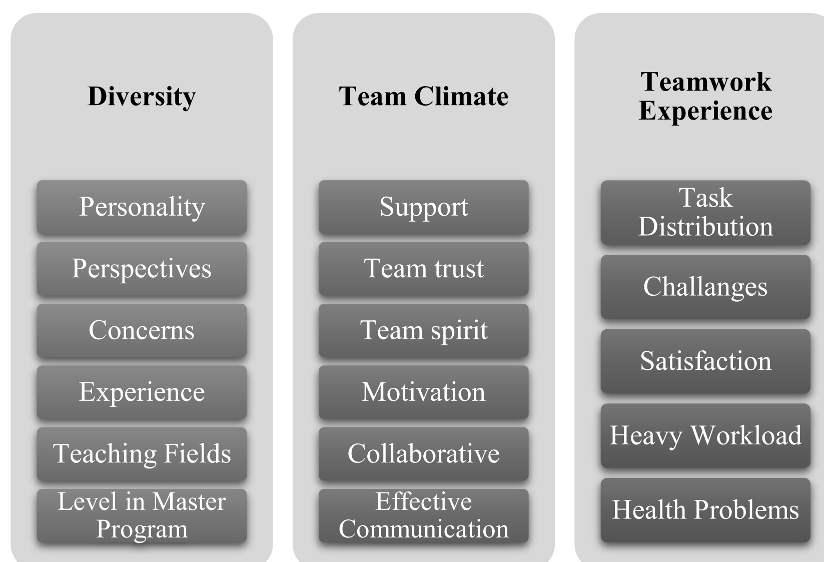

Figure 2. Additional Themes.

Team Diversity

This theme refers to participants' perceptions of working with team members in a master's program from different cohorts as well as different teaching fields, perceptions, and personalities. These components influenced participants' teamwork experiences.

Although participants were assigned to teams based on commonalities such as their available times, working habits, and due date orientation, some diversities remained in the groups. Working with members from different cohorts created a sense of relief for the first-year students, whereas second-year or second-semester students shared their dissatisfaction with the situation, as they were more experienced and knowledgeable regarding how to conduct research. They were

obliged to take on more responsibilities, stating they had to shoulder more responsibility as other team members did not know what to do in the last assignment. Participant #4 shared:

> The greatest difficulty I had in this team was that my friends were going to write a thesis proposal from other courses for the first time. They had just taken the Ethics Course and were still learning how to do it…this is my only negative experience because we couldn't work on the same project for a long time due to their responsibilities. I would recommend a team forming strategy based on levels.

The fact that the team members were also from different teaching fields seemed to help them develop different perspectives and contributed to teamwork products. According to Participant #4, once again, "Maybe it was better to be from different teaching fields to hear different perspectives." Additionally, participants' general abilities such as speaking English, degree of technology expertise, and being good at spelling rules and presentation skills compensated for participants' personal weaknesses and helped promote their product creations. According to Participant #8:

> In the group, for example, [Participant #10] was writing very well, I was putting it together well, but for example, [Participant #9] gave us positive energy. Just so you know, people shouldn't say that I had a significant role in this assignment; in fact, we all contributed.

As exemplified in the previous quote, the participants attributed certain positive personality traits to their team members, finding them a crucial element for a positive teamwork experience.

Team Climate

This theme refers to the team's characteristics rather than individuals in terms of collaboration, motivation, trust, and communication. Although similar strategies were implemented in the teams, their way of perceiving and implementing them differed. Interview data revealed that all the teams worked collaboratively. As noted in the following quote, only the Acquainted Team reported a social loafer team member and complained about uneven task distribution: "…In other words, we did it, but I feel like someone else also benefited from our effort." (P1)

Participants who were generally content with the fair task distribution stated that they had a productive team environment. As Participant #4 put it, "In general, we have become a moderate and cooperative group." It was also revealed that participants developed positive attitudes towards each other. "Every time we got together, apart from our teamwork assignment; we went into a conversation mode; I think we loved each other very much (P12)."

Teamwork Experience

This theme revolves around participants' perceptions of the benefits and challenges encountered during teamwork activities. Analysis of the interview data indicates a general satisfaction with the overall experience of working in teams. More specifically, participants noted that they learned from one another and gained an appreciation for different viewpoints, which they found beneficial. For instance, Participant #4 shared, "We had a working experience in which everyone acted together and took responsibility, ready for communication and sharing. We improved themselves in the process."

Supporting this positive outlook, synchronous class observation provided further evidence of these benefits. In the final online class meeting, Participant #3 expressed gratitude towards his group members for their support. He mentioned being a music teacher; he was initially unfamiliar

with completing paper-based assignments. Yet, he acknowledged, "thanks to my group members, I could learn and contribute in a better way." This highlights the collaborative learning and mutual support that characterized their teamwork experience.

Additionally, teamwork experiences reduced their isolation in distance education. Participant #10 stated, "Even though my group mates were far away, their motivating behaviors always made me feel like we were face-to-face in the same class." Some of the key perceived benefits of teamwork are summarized in in the quotes found in Table 7.

Table 7. Teamwork Benefit Elements that Emerged from Data.

Teamwork Benefits	Participant Quotations
1. Learning from others	"Maybe it was better to be from different fields to hear different perspectives... The perspectives of different field teachers are different. I put forward an idea; other team members think different; this enriches me, and I like it." (P12)
2. Socializing	"I became socialized and learned other points of view. I have seen different practices of friends from different disciplines." (P4)
3. Benefiting from others	"Ideas are respected within the team, and we contribute to the learning process by making explanations to each other on the issues we are stuck with." (P12)
4. Supporting each other	"The motivation we provided to each other, our support, our support for each other when we need… You know, all of these were very good things." (P3)
5. Positive team climate	"I think we are a cohesive and sharing group. It was nice to work with a focus on improving and contributing to our work." (P7)
6. Finding solutions together	"…You would see a very solution-oriented group…I would say that we can find solutions very easily." (P10)
7. Reduced feeling of isolation	"Even though my group mates were far away, their motivating behaviors always made me feel like we were face-to-face in the same class." (P10)
8. Reduced workload	"At first, we shared the three learning theories among ourselves and divided the work. This made our job easier in terms of time." (P2)
9. Networking	"The greatest satisfaction was meeting many new people and learning many new things from them." (P9)
10. Self Confidence	"I can't say that I was very active in group work at the beginning, but I can say that I realized my own strength thanks to the support of my group friends." (P5)

When it comes to challenges, participants frequently cited their heavy workload as a significant issue. All participants dedicated extensive hours to their workplaces, leading to delays in synchronous meetings due to their professional commitments. Participant 4 expressed, "As group members, each of us lives in different cities and under different conditions, sometimes we have difficulties in arranging our meeting times."

A team formation criterion based solely on participants' preferences resulted in a dissatisfactory teamwork experience for one group. The Acquainted Team, formed according to these preferences, shared their challenges regarding fair task distribution. Participant #4 shared:

> I think the preferences should not be considered; groups should be formed completely based on the personality. I think that relaxed people can be put in a group, and those responsible can be put into a group. So, preferences should be ignored.

Overall, each group conveyed their unique experiences with teamwork. Their heavy workload and health issues posed challenges in finding suitable synchronous meeting times. They also mentioned that through teamwork experiences, their workload lessened, and they could learn from others. Key teamwork challenges are summarized in Table 8.

Table 8. Teamwork Challenges that Emerged from Data.

Teamwork Challenges	Participant Quotations
1. Absent teammate	“At first, we were four people, but one person never participated in the meetings. We've never even met her.” (P10)
2. Uneven task distribution	“…So I don't think that collaboration was as it should have been. We couldn’t obey task-sharing we did in the beginning. I don't think it's quite equal.” (P2)
3. Scarce synchronous meetings	“In fact, in this last assignment, we met only once. I don't think it was satisfying.” (P2)
4. Busy schedule	“In group work, my only concern was the busy schedule of the teammates.” (P11)
5. Health problems	“We could not get together from time to time due to illness or workload.” (P4)
6. Finding a common meeting time	“That not everyone is available simultaneously causes delays in tasks.” (P2)
7. Inexperienced teammates	“… ‘how to write a thesis, write a citation with APA. It can be a bit tiring to come across a team stuck with these concepts or that concepts are not understood yet.” (P11)
8. Not following the syllabus	“If we had followed the syllabus and started the project much earlier, it was clear from the beginning of the course that the instructor would ask us for such an assignment. So that's the only thing we missed. I think I will pay the most attention to this in the next group work.” (P11)
9. Social loafer teammate	“We were 3 people, but we took more responsibility with my other teammate.” (P2)

Discussion

This study investigates how online learners in a Turkish private university's educational technology course navigate teamwork strategies and experiences. It delves into the perceived benefits and challenges encountered within these collaborative endeavors.

The participants of the study were assigned to their teams with a working style questionnaire. The findings suggest that learners needed flexibility regarding their team members choices. At first, they desired to be more flexible while selecting team members and worried about not being able to choose their team members. These concerns appeared to arise from social interdependence, which refers to social circumstances in which people share common goals and depend on each other for their successes and failures (Johnson & Johnson, 1989).

The socially interdependent nature of the collaborative teams raised many issues and concerns (e.g., social loafing, absent teammates, negotiating viable meeting times, inexperienced team members, etc.); nevertheless, as the learners spent time together, they built a sense of trust and friendship that ameliorated the worries and prejudices against working in a formed team. Correspondingly, Kyprianidou et al. (2012) found that although team members in a face-to-face setting had some hesitations at first, groups formed based on participants working styles and available times reached a positive teamwork experience. In accordance with Ergulec's (2017)

findings, learners shared positive experiences regarding the questionnaire. Given that the participants of the study consist of teachers working full-time and also have family responsibilities, they greatly benefited from the team-forming strategy. Prioritizing childcare, housework, and time zone elements is especially important for adult team members (Feitosa & Salas, 2021).

Team charters are crucial in forming teams and guiding them to agree on work processes and shared objectives, essential for collaborative success, as noted by Cox and Bobrowski (2016). The research indicates that team charters effectively encourage learners to adhere more strictly to scheduled meetings and foster a stronger sense of team belonging. This aligns with findings from Johnson et al. (2021), who also observed similar outcomes. Additionally, Aaron et al. (2014) highlighted that team charters serve as a strategy for promoting mutual understanding of team functions, while simultaneously enhancing learner accountability. However, it is also important to note that team charters appeared less effective for teams where intrinsic motivation was the primary driver for task completion.

Items for the team charters should be written based on the target age groups, and the charters should be considered as strategies for increasing team belonging. The findings demonstrate the significance of internal motivation for binding the team rules. If learners feel responsible for their team members, they are inclined to behave conscientiously about the shared goals and teams' missions.

Even though participants planned leadership schedules, natural leadership occurred in the teams. The personality of the team members was a key reason. Dominant, perfectionist, and controller participants were the leaders of the groups. Such findings parallel a study from Yukselturk and Cagiltay (2008) which argued that systematic, more experienced, and supporter participants were invisible leaders of their teams. Similarly, Chang and Kang (2016) reported similar characteristics of invisible leaders of online teams. Even though single leadership reduces team chaos, it can cause a failure of collaboration. However, as Novoselich and Knight (2019) stated, artificial leadership determined by the team charters could distort the natural flow of the team process and lead to negative consequences rather than an effective teamwork experience.

Peer assessment contributes to team members' self-regulation of their learning processes, and, as Nicol and Macfarlane-Dick (2006) found, learners feel more responsibility for team member learning. Notably, our findings suggested that while learners completed the peer assessment rubric, at the same time, they became aware of their own contributions. Thus, the peer assessment rubric promoted self-assessment instinctively in parallel with Sridharan and Boud's (2019) findings which indicate that peer assessment mediates the self-assessment abilities of the team members and overall team efficacy. Learners who expressed high intrinsic motivation and responsibility expressed concerns about the effectiveness of peer assessment; however, they indicated their team effort and success would not change. Such responses contradict the study from Andrade et al. (2020), in which participants displayed high scores in teamwork with peer assessment. Given the findings revealed in the present study, team dynamics that lead to such consequences must be examined. As Vu and Dall'Alba (2007) suggested, learners may consider reporting a social loafer team member as betraying their team members, and, therefore, they tend not to express their genuine opinions.

Small team size increased the opportunity to find a common meeting time that suited everyone. Also, it reduced team conflict and social loafing. In effect, we found similar results to the previous studies of Yukselturk and Cagiltay (2008). One of the drawbacks was fewer perspectives and a limited number of ideas represented in their teams due to the small team size. On the other hand, smaller team sizes led to reduced intragroup conflict; stated another way, a limited number of perspectives represented in the groups hastened them to reach a consensus.

Masih (2021) suggests that teams expect team cohesion and trust as they spend time together. In effect, team members developed friendship and confidence when they worked together on teamwork assignments. In terms of benefits and challenges of working in teams, they create an opportunity for the learners to engage in knowledge building and learn from their

teammates by following the path of social constructivist theory emphasizing the interaction between small groups and teachers (Johnson & Bradbury, 2015). Different perspectives were clearly a team-fostering element rather than a source of conflict in the present study. Learners not only learned course-related knowledge but also learned how to work together and gain perspectives and insights from their teammates from different teaching fields. Correspondingly, Ferreira et al. (2022) emphasized the social skills that teamwork gained for the participants.

Learners develop collaboration skills by observing team members in action, and the varied backgrounds of teammates can expand idea diversity in group activities. Team formation strategies, especially those based on questionnaires, significantly influence teamwork. Notably, only the Acquainted Team was formed based on participant preferences, consisting of members who were familiar with each other from the same school campus. This team uniquely reported collaboration failures, uneven task distribution, and issues with a social loafer. This finding contrasts with Staats et al. (2010), where familiarity within teams led to increased learning and psychological safety. However, in this study, such familiarity seemed to hinder open communication about team disturbances. Moreover, similar to Chang and Kang's (2016) findings, the presence of a social loafer in the Acquainted Team led to collaboration challenges and disappointment, highlighting the complex dynamics of team familiarity and efficiency.

Learners' prior experience with the topic and their advancement in the master's program can sometimes interfere with team collaboration. More experienced learners often failed to benefit as much from the teamwork experience in terms of learning course content, compared to their less experienced teammates. This led to dissatisfaction among team members, impacting the overall effectiveness of their collaboration and teamwork.

Regarding team diversity, there has been some vital recent research in the business field (Xu et al., 2019). Regarding team diversity, business literature comes up with varying findings. Each diversity aspects have an impact on team effectiveness, and some studies found that gender and cognitively diverse teams have a negative influence on team performance (Garcia Martinez et al., 2017). However, for the present case, learners' experience was found to be paramount for an effective team forming strategy.

When teamwork strategies are compared, face-to-face and online teamwork environments share certain commonalities. For example, shared and effective leadership to overcome social loafers within the teams and adequate time for teams to determine common goals and create team familiarity are required for both settings. On the other hand, a lack of physical cues such as gestures and mimicry may pose communication challenges for online teams (Saghafian & O'Neill, 2018). Therefore, when designing team-based learning environments for team cohesion, these communication barriers and challenges should be given additional priority (Hambley & O'Neill, 2007).

Limitations

The present study contains several limitations. First, it should be mentioned that two of the researchers took the role of instructor and the instructional assistant of the course. Therefore, the researchers were in the field throughout the data collection period, and, as such, it may have influenced participants' candidness throughout the data collection process. Additionally, as the participants of the teams established connections and friendships throughout the study, participants may not have been objective while sharing their teamwork experiences and discussing their team members' attitudes towards teamwork tasks.

Another limitation was that the number of study participants was limited to the 13 participants in the course and one of them refused to take part in the final interviews. In addition, not all the participants wrote cohesive and comprehensive teamwork reflections for the group reflections which resulted in some inadequacies within the data. Adding to this issue, the participants worked in a private school and had hectic schedules that caused attendance problems

for the class breakout room discussions; therefore, for some weeks, the same team members were not able to be in the breakout room discussions, which influenced the duration that the team spent together and likely negatively impacted the overall team climate.

Lastly, as the course was delivered in Turkish, only two participants felt comfortable using English. As a result, the data collection method was implemented in the Turkish language, and analysis of the data was conducted in Turkish; however, the results were translated into English. As such, the translation process may have caused some complications in the data analysis process.

Recommendations

The findings of the present study offer some recommendations for educators. Most fundamentally, we recommend that adequate time should be spent on team formation and ice breaker activities to create a sense of trust and community between the learners before any teams are formed. Without sufficient trust and a positive learning environment, learning cannot take place in online settings. Consequently, time spent with the learners should be extended to increase team familiarity and trust-building.

Secondly, structured team forming criteria should be implemented considering participants' personalities and prior experiences in their program as well as the requirements of the assignments. When previous experiences are not taken into consideration, it may pose collaboration problems, as happened in the present case.

Thirdly, to increase the efficiency of the peer assessment strategy, peers' scores could be counted as grades for the final assignment, which could reduce or abate social loafing. Without implementing any sanctions for the social loafers, peer evaluation strategies may fail to work for adult learner teams leading to a lack of positive interdependence among team members, which, as noted earlier, is a building block for online collaborative learning settings. If the instructors are involved in the sanctions process, they can be more of a deterrent for social loafers.

Strategies implemented in the present study may include variations for different contexts and learner needs. Instead of merely implementing each strategy, instructors could more heavily monitor learners' experiences and organize teamwork structurally to increase the efficiency of team learning. Due to the dynamic nature of the teams, alternative plans and strategies should be developed when online teams appear to be dysfunctional or lacking in one or more key elements. Taking into consideration these and other findings and implementing the various recommendations of this study and of those that follow it should foster more effectively functioning online teams and overall learner satisfaction and success.

References

Aaron, J. R., McDowell, W. C., & Herdman, A. O. (2014). The effects of a team charter on student team behaviors. *Journal of Education for Business*, *89*(2), 90-97. https://doi.org/10.1080/08832323.2013.763753

Andrade, M., Miller, R. M., & Ogden, M. (2020). Teamwork for business majors--The impact of peer evaluation. *e-Journal of Business Education and Scholarship of Teaching*, *14*(2), 1-18. doi: 10.5220/0009446504420449

Azizan, M. T., Mellon, N., Ramli, R. M., & Yusup, S. (2018). Improving teamwork skills and enhancing deep learning via development of board game using cooperative learning method in reaction engineering course. *Education for Chemical Engineers*, *22*, 1-13. https://doi.org/10.1016/j.ece.2017.10.002

Barron, B. (2000). Achieving coordination in collaborative problem-solving groups. *Journal of the Learning Sciences*, *9*, 403–436. https://doi.org/10.1207/S15327809JLS0904_2

Beal, D. J., Cohen, R. R., Burke, M. J., & McLendon, C. L. (2003). Cohesion and performance in groups: A meta-analytic clarification of construct relations. *Journal of Applied Psychology*, *88*(6), 989. https://doi.org/10.1037/0021-9010.88.6.989

Benning, T. M. (2022, September 16). Reducing free-riding in group projects in line with students' preferences: Does it matter if there is more at stake? *Active Learning in Higher Education*, 146978742211188. https://doi.org/10.1177/1469787422111886

Birt, L., Scott, S., Cavers, D., Campbell, C., & Walter, F. (2016). Member checking. *Qualitative Health Research, 26(*13), 1802-1811. https://doi.org/10.1177/1049732316654870

Bolliger, D. U., & Martin, F. (2018). Instructor and student perceptions of online student engagement strategies. *Distance Education*, *39*(4), 568-583. https://doi.org/10.1080/01587919.2018.1520041

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, *3*(2), 77-101. DOI: 10.1191/1478088706qp063oa

Bravo, R., Catalán, S., & Pina, J. M. (2019). Analysing teamwork in higher education: An empirical study on the antecedents and consequences of team cohesiveness. *Studies in Higher Education*, *44*(7), 1153-1165. https://doi.org/10.1080/03075079.2017.1420049

Breen, H. (2013). Virtual collaboration in the online educational setting: a concept analysis. *Nursing Forum, 48*(4), 262-270. https://doi.org/10.1111/nuf.12034

Cabero-Almenara, J., Guillén-Gámez, F. D., Ruiz-Palmero, J., & Palacios-Rodríguez, A. (2022). Teachers' digital competence to assist students with functional diversity: Identification of factors through logistic regression methods. *British Journal of Educational Technology*, *53*(1), 41-57.

Chang, B., & Kang, H. (2016). Challenges facing group work online. *Distance Education, 37*(1), 73-88. https://doi.org/10.1080/01587919.2016.1154781

Chatterjee, R., & Correia, A. P. (2020). Online students' attitudes toward collaborative learning and sense of community. *American Journal of Distance Education*, *34*(1), 53-68. https://doi.org/10.1080/08923647.2020.1703479

Cheng, F. F., Wu, C. S., & Su, P. C. (2021). The impact of collaborative learning and personality on satisfaction in innovative teaching context. *Frontiers in Psychology*, *12*, 713497.

Conrad, D., & Openo, J. (2018). *Assessment strategies for online learning: Engagement and authenticity.* Athabasca University Press.

Cox, P. L., & Bobrowski, P. E. (2016). The team charter assignment: Improving the effectiveness of classroom teams. *Journal of Behavioral and Applied Management*, *1*(2), 789.

Davison, H. K., Mishra, V., Bing, M. N., & Frink, D. D. (2014). How individual performance affects the variability of peer evaluations in classroom teams: A distributive justice perspective. *Journal of Management Education*, *38*(1), 43- 85. https://doi.org/10.1080/02602938.2018.1545898

de Souza Santos, R. E., & Ralph, P. (2022). Practices to improve teamwork in software development during the COVID-19 pandemic: An ethnographic study. *arXiv e-prints*, arXiv-2203. https://doi.org/10.1145/3528579.3529174

Dennen, V. P., Hall, B. M., & Hedquist, A. (2023). A systematic review of research on intersubjectivity in online learning: Illuminating opportunities for cohesion and mutual understanding in the research conversation. *Online Learning*. 27(1). https://doi.org/10.24059/olj.v27i1.3430

Després-Bedward, A., Avery, T. L., & Phirangee, K. (2018). Student perspectives on the role of the instructor in face-to-face and online learning. *International Journal of Information and Education Technology*, *8*(10), 706-712. doi: 10.18178/ijiet.2018.8.10.1126

DiazGranados, D., Shuffler, M. L., Wingate, J. A., & Salas, E. (2017). Team development interventions. *The Wiley Blackwell handbook of the psychology of team working and collaborative processes*, 555-586. https://doi.org/10.1002/9781118909997.ch24

Donia, M. B., O'Neill, T. A., & Brutus, S. (2018). The longitudinal effects of peer feedback in the development and transfer of student teamwork skills. *Learning and Individual Differences*, *61*, 87-98. https://doi.org/10.1016/ j.lindif.2017.11.012

Drescher, M. A., Korsgaard, M. A., Welpe, I. M., Picot, A., & Wigand, R. T. (2014). The dynamics of shared leadership: Building trust and enhancing performance. *Journal of Applied Psychology, 99*(5), 771–783. https://doi.org/10.1037/a0036474

Dressel, D. P. (2020). Breaking the ice to build relationships: Using icebreakers to create new relationships, promote emotional safety, and incorporate social and emotional learning. *Journal of Physical Education, Recreation & Dance*, *91*(5), 51-5. https://doi.org/10.1080/ 07303084.2020.1739434

Ergulec, F. (2017). *Students' collaboration experiences of a purposeful group assignment strategy and team building in an online graduate class* (Publication No. 10604243) [Doctoral dissertation, Indiana University]. ProQuest Dissertations Publishing.

Ergulec, F. (2019). Instructional strategies for forming online collaborative teams. *International Journal on E-Learning*, *18*(4), 349-372.

Feitosa, J., & Salas, E. (2021). Today's virtual teams: Adapting lessons learned to the pandemic context. *Organizational Dynamics*, *50*(1), 100777. https://doi.org/10.1016/j.orgdyn.2020.100777

Fellenz, M. R. (2006). Toward Fairness in assessing student groupwork: A protocol for peer evaluation of individual contributions. *Journal of Management Education, 30*(4), 570-591 https://doi.org/10.1177/1052562906286713

Ferreira, M., Manokore, V., & Gray, M. (2022). An exploratory study for the development of a survey on learning team process, impact, and tutor's role (PIT) in facilitating online learning. *European Journal of Education and Pedagogy*, *3*(2), 18-26. https://doi.org/10.24018/ejedu.2022.3.2.258

Ford, R. C., Piccolo, R. F., & Ford, L. R. (2017). Strategies for building effective virtual teams: Trust is essential. *Business Horizons*, *60*(1), 25-34. https://doi.org/10.1016/j.bushor.2016.08.009

Forsyth, D. R. (2018). *Group dynamics* (7th ed.). Cengage Learning.

Garcia Martinez, M., Zouaghi, F., & Garcia Marco, T. (2017). Diversity is strategy: The effect of R&D team diversity on innovative performance. *R&D Management*, *47*(2), 311-329. https://doi.org/10.1111/radm.12244

Gilovich, T., Keltner, D., & Nisbett, R. E. (2006). *Social psychology*. W W Norton & Company Incorporated.

Gregori, P., Martínez, V., & Moyano-Fernández, J. J. (2018). Basic actions to reduce dropout rates in distance learning. *Eval Program Plann*, 66:48-52. https://doi.org/10.1016/j.evalprogplan.2017.10.004

Gupta, M., & Bakker, A. B. (2020). Future time perspective and group performance among students: Role of student engagement and group cohesion. *Journal of Applied Research in Higher Education*. https://doi.org/10.1108/JARHE-05- 2019-0128

Hackman, J. R., & Wageman, R. (2004). When and how team leaders matter. *Research in organizational behavior*, *26*, 37-74. https://doi.org/10.1016/S0191-3085(04)26002-6

Haines, R. (2014). Group development in virtual teams: An experimental reexamination. *Computers in Human Behavior*, *39*, 213-222. https://doi.org/10.1016/j.chb.2014.07.019

Hambley, L. A., O'Neill, T. A., & Kline, T. J. (2007). Virtual team leadership: The effects of leadership style and communication medium on team interaction styles and outcomes. *Organizational Behaviour and Human Decision Processes*, *103*(1), 1-20.

Handke, L., Klonek, F. E., Parker, S. K., & Kauffeld, S. (2020). Interactive effects of team virtuality and work design on team functioning. *Small Group Research*, *51*(1), 3-47. https://doi.org/10.1177%2F1046496419863490

Harasim, L. M. (2012). *Learning theory and online technology*. Routledge.

Imam, H., & Zaheer, M. K. (2021). Shared leadership and project success: The roles of knowledge sharing, cohesion, and trust in the team. *International Journal of Project Management*, *39*(5), 463-473. https://doi.org/10.1016/j.ijproman.2021.02.006

Johnson, D. W., & Johnson, F. (2006). Joining together: Group theory and research (9th ed). Boston: Allyn & Bacon.

Johnson, D. W., & Johnson, R. T. (1989). *Cooperation and competition: Theory and research*. Interaction Book Company.

Johnson, D. W., & Johnson, R. T. (2018). Cooperative learning: The foundation for active learning. *Active learning—Beyond the future*. http://dx.doi.org/ 10.5772/intechopen.81086

Johnson, M. D., & Bradbury, T. N. (2015). Contributions of social learning theory to the promotion of healthy relationships: Asset or liability? *Journal of Family Theory & Review*, *7*(1), 1327. dx.doi.org/10.1111/jftr.12057

Johnson, W. H., Baker, D., Dong, L., Taras, V., & Wankel, C. (2021). Do team charters help team-based projects? The effects of team charters on performance and satisfaction in global virtual teams. *Academy of Management Learning & Education*, *21*(2), https://doi.org/10.5465/ AMBPP.2021.12545abstract

Jony, A. I., & Serradell-López, E. (2020, April). Key factors that boost the effectiveness of virtual teamwork in online higher education. *The International Research & Innovation Forum* (pp. 183-198). Springer, Cham. 10.1007/978-3-030-62066-0_15

Kamal, A. A., Shaipullah, N. M., Truna, L., Sabri, M., & Junaini, S. N. (2020). Transitioning to online learning during COVID-19 pandemic: Case study of a pre-university centre in Malaysia. https://dx.doi.org/10.14569/IJACSA.2020.0110628

Karriker, J. H., Madden, L. T., & Katell, L. A. (2017). Team composition, distributed leadership, and performance: It's good to share. *Journal of Leadership & Organizational Studies*, *24*(4), 507518. https://doi.org/10.1177/1548051817709006

Kaushik, K., & Zinjarde, S. (2020). An interactive, accessible, and affordable science- and art-based activity to foster team building among new students. *Journal of Microbiology & Biology Education*, *21*(2). https://doi.org/10.1128/jmbe.v21i2.2155

Kelsen, B. A., & Liang, H. Y. (2019). Role of the Big Five personality traits and motivation in predicting performance in collaborative presentations. *Psychological Reports*, *122*(5), 1907-1924. https://doi.org/1 0.1177%2F0033294118795139

Klein, C., DiazGranados, D., Salas, E., Le, H., Burke, C. S., Lyons, R., & Goodwin, G. F. (2009). Does team building work?. *Small Group Research*, *40*(2), 181- 222. https://doi.org/10.1177%2F1046496408328821

Kramer, A., Bhave, D. P., & Johnson, T. D. (2014). Personality and group performance: The importance of personality composition and work tasks. *Personality and Individual Differences*, *58*, 132-137. https://doi.org/ 10.1016/j.paid.2013.10.019

Kyprianidou, M., Demetriadis, S., Tsiatsos, T., & Pombortsis, A. (2012). Group formation based on learning styles: Can it improve students' teamwork? *Educational Technology Research and Development*, *60*(1), 83-110 DOI:10.1007/s11423-011-9215-4

Laal, M. (2013). Positive interdependence in collaborative learning. *Procedia-Social and Behavioral Sciences*, *93*, 1433-1437. https://doi.org/10.1016/j.sbspro.2013.10.058

Lazar, J., Feng, J. H., & Hochheiser, H. (2017). *Research Methods in Human- Computer Interaction* (2nd ed.). Morgan Kaufmann.

Lowes, S., Lin, P., & Kinghorn, B. (2016). Gender differences in online high school courses. *Online Learning, 20*(4), 100-117. https://doi.org/10.24059/olj.v20i4.1049

Masih, P. (2021). Hazy team composition processes: Shared team leadership, a strategy to team excellence in higher education. Digital Commons @ ACU, *Electronic Theses and Dissertations.* Paper 397. https://digitalcommons.acu.edu/etd/397

Matt Graham, C., & Jones, N. (2019). Impact of a social network messaging app on team cohesiveness and quality of completed team projects in an undergraduate team project. *Journal of Educational Technology Systems*, *47*(4), 539-553.

Miranda, P. B., Mello, R. F., & Nascimento, A. C. (2020). A multi-objective optimization approach for the group formation problem. *Expert Systems with Applications*, *162*, 113828 https://doi.org/10.1016/j.eswa.2020.113828

Molinillo, S., Aguilar-Illescas, R., Anaya-Sánchez, R., & Vallespín-Arán, M. (2018). Exploring the impacts of interactions, social presence, and emotional engagement on active collaborative learning in a social web-based environment. *Computers & Education*, *123*, 41-52. https://doi.org/10.1016/j.compedu.2018.04.012

Mollenkopf, D. L., Felton, M. K., Karabon, A., & Westerlin, S. A. (2020). Building higher education community: A lesson from Nebraska. In D. D. Cunningham (Ed.), *Professional and ethical consideration for early childhood leaders* (pp. 202-225). IGI Global.

Morrison-Smith, S., & Ruiz, J. (2020). Challenges and barriers in virtual teams: A literature review. *SN Applied Sciences*, *2*(6), 1-33. DOI:10.1007/s42452-020-2801-5

Murtazina, N., Shukshina, S., Akpayeva, A., & Khodakova, N. (2021). Distance learning of students in the modern world. *SHS Web of Conferences*, *98*, 05012. https://doi.org/10.1051/shsconf/20219805012

Nicol, D. J., & Macfarlane-Dick, D. (2006). Formative assessment and self-regulated learning: A model and seven principles of good feedback practice. *Studies in Higher Education*, *31*(2):199–218. https://doi.org/10.1080/03075070600572090

Novoselich, B. J., & Knight, D. B. (2019). Relating shared leadership to capstone team effectiveness. *International Journal of Engineering Education*, *35*(6), 1888-1906. DOI:10.1061/(ASCE)EI.1943-5541.0000376

Palincsar, A. (1998). Social constructivist perspectives on teaching and learning. *Annual Review of Psychology, 49*(1), 345-375. https://doi.org/10.1146/annurev.psych.49.1.345

Palloff, R. M., & Pratt, K. (2007). *Building online learning communities: Effective strategies for the virtual classroom* (2nd ed.). Jossey-Bass.

Paulus, P., Kohn, N., & Dzindolet, M. (2011). Teams. *Encyclopedia of Creativity*, 446–452. https://doi.org/10.1016/b978-0-12-375038-9.00217-x

Reeves, S., Xyrichis, A., & Zwarenstein, M. (2017). Teamwork, collaboration, coordination, and networking: Why we need to distinguish between different types of interprofessional practice. *Journal of Interprofessional Care*, *32*(1), 1–3.doi:10.1080/13561820.2017.1400150

Robert Jr, L. P., & You, S. (2018). Are you satisfied yet? Shared leadership, individual trust, autonomy, and satisfaction in virtual teams. *Journal of the Association for Information Science and Technology*, *69*(4), 503-513. https://doi.org/10.1002/asi.23983

Steffens, K. (2015). Competences, learning theories and MOOCs: Recent developments in lifelong learning. *European Journal of Education*, *50*(1), 41- 59. https://doi.org/10.1111/ejed.12102

Rhee, J., Parent, D., & Basu, A. (2013). The influence of personality and ability on undergraduate teamwork and team performance. *SpringerPlus*, *2*(1), 1-14. https://doi.org/10.1186/2193-1801-2-16

Román-Calderón, J. P., Robledo-Ardila, C., & Velez-Calle, A. (2021). Global virtual teams in education: Do peer assessments motivate student effort?. *Studies in Educational Evaluation*, *70*, 101021.

Romero-Hall, E., & Ripine, C. (2021). Hybrid flexible instruction: Exploring faculty preparedness. *Online Learning*, *25*(3). Retrieved from https://olj.onlinelearningconsortium.org/index.php/olj/article/view/2426/1101

Rosen, M. A., DiazGranados, D., Dietz, A. S., Benishek, L. E., Thompson, D., Pronovost, P. J., & Weaver, S. J. (2018). Teamwork in healthcare: Key discoveries enabling safer, high-quality care. *American Psychologist*, *73*(4), 433–450. https://doi.org/10.1037/amp0000298

Sadeghi, H., & Kardan, A. A. (2016). Toward effective group formation in computer-supported collaborative learning. *Interactive Learning Environments*, *24*(3), 382-395. https://doi.org/10.1080/10494820.2013. 851090

Saghafian, M., & O'Neill, D. K. (2018). A phenomenological study of teamwork in online and face-to-face student teams. *Higher Education*, *75*(1), 57-73. https://doi.org/10.1007/s10734-017-0122-4

Shah, D. (2020). By the numbers: MOOCs during the pandemic. *Class Central.* Retrieved from https://www.classcentral.com/report/mooc-stats-pandemic/

Shah, D. (2021). By the numbers: MOOCs in 2021. *Class Central.* Retrieved from https://www.classcentral.com/report/mooc-stats-2021/

Sridharan, B., & Boud, D. (2019). The effects of peer judgements on teamwork and self-assessment ability in collaborative group work. *Assessment & Evaluation in Higher Education*, *44*(6), 894-909. https://doi.org/10.1080/02602938. 2018.1545898

Staats, B. R., Gino, F., & Pisano, G. P. (2010). *Varied experience, team familiarity, and learning: The mediating role of psychological safety*. Working paper 10-016. Harvard Business School.

Sweeney, A., Clarke, N., & Higgs, M. (2019). Shared leadership in commercial organizations: A systematic review of definitions, theoretical frameworks and organizational outcomes. *International Journal of Management Reviews*, *21*(1), 115-136. https://doi.org/10.1111/ijmr.12181

Tacadao, G., & Toledo, R. P. (2016, September). Forming student groups with student preferences using constraint logic programming. In C. Dichev & G. Agre (Eds.), *Artificial Intelligence: Methodology, Systems, and Applications.* AIMSA 2016. Lecture Notes in Computer Science (pp. 259-268), vol 9883. Springer, Cham. https://doi.org/10.1007/978-3-319-44748-3_25

Tavoletti, E., Stephens, R. D., & Dong, L. (2019). The impact of peer evaluation on team effort, productivity, motivation, and performance in global virtual teams. *Team Performance Management: An International Journal.* https://doi.org/10.1108/TPM-03-2019-0025

Tseng, H. W., & Yeh, H.-T. (2013). Team members' perceptions of online teamwork learning experiences and building teamwork trust: A qualitative study. *Computers & Education*, 63, 1–9. https://doi.org/10.1016/j.compedu.2012.11.013

Uz Bilgin, C., & Gul, A. (2020). Investigating the effectiveness of gamification on group cohesion, attitude, and academic achievement in collaborative learning environments. *TechTrends*, *64*(1), 124-136. https://doi.org/10.1007/s11528- 019-00442-x

Vu, T. T., & Dall'Alba, G. (2007). Students' experience of peer assessment in a professional course. *Assessment & Evaluation in Higher Education*, *32*(5), 541-556. https://doi.org/10.1080/02602930601116896

Vuopala, E., Hyvönen, P., & Järvelä, S. (2016). Interaction forms in successful collaborative learning in virtual learning environments. *Active Learning in Higher Education*, *17*(1), 25-38. https://doi.org/10.1177/1469787415616730

Wheelan, S. A. (2009). Group size, group development, and group productivity. *Small Group Research*, *40*(2), 247–262. https://doi.org/10.1177/1046496408328703

Wilson, L., Ho, S., & Brookes, R. H. (2017). Student perceptions of teamwork within assessment tasks in undergraduate science degrees. *Assessment & Evaluation in Higher Education*, *43*(5), 786–799.doi:10.1080 /02602938.2017.1409334

Xu, N., Chiu, C. Y., & Treadway, D. C. (2019). Tensions between diversity and shared leadership: The role of team political skill. *Small Group Research, 50*(4), 507-538. https://doi.org/10.1177/10464964198404

Younis, R. (2019). Cognitive diversity and creativity: the moderating effect of collaborative climate. *International Journal of Business and Management*, *14*(1), 159-168. https://doi.org/10.5539/ijbm.v14n1p159

Yukselturk, E., & Cagiltay, K. (2008). Collaborative work in online learning environments: Critical issues, dynamics, and challenges. In K. L. Orvis & A. L. R. Lassiter (Eds.), *Computer-supported collaborative learning: Best practices and principles for instructors* (pp. 114-140). Information Science Reference

Zasa, F. P., & Buganza, T. (2023). Developing a shared vision: Strong teams have the power. *Journal of Business Strategy*, *44*(6), 415-425

Zhang, X. C., Balakumar, A., Rodriguez, C., Sielicki, A., & Papanagnou, D. (2020). The Zoom picture book game: A creative way to promote teamwork in undergraduate medical education. Cureus, 12(2). https//doi.org/10.7759/ cureus.6964

Zheng, Y., Li, C., Liu, S., & Lu, W. (2018). An improved genetic approach for composing optimal collaborative learning groups. *Knowledge-Based Systems*, *139*, 214-225. https://doi.org/10.1016/j.knosys.2017.10.022

Zwikael, O., & Unger-Aviram, E. (2010). HRM in project groups: The effect of project duration on team development effectiveness. *International Journal of Project Management, 28*(5), 413-421. https://doi.org/10.1016/j.ijproman. 2009.09.00

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Undergraduate Student Perceptions of Faculty Engagement During the Transition to Online Learning

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Abstract: *Undergraduate students have reported challenges with staying connected to course content, their peers, and to their instructors during the disruption and transition to virtual platforms during the COVID-19 pandemic (Hollister et al., 2022) and there has been a lack of readiness to effectively engage with students and deliver instructional content reported by post-secondary faculty members (Martin et al., 2019) despite a need for relationship-centered teaching. To investigate these problems, the following study examined the perceptions of faculty engagement practices for undergraduate students who endured this transition. Using Seif's learning engagement theory and dimensions of deep learning (2018), seven undergraduate students from one small private institution of higher education in the North Eastern United States were interviewed to learn more about how faculty engaged them as students during the online transition. Outcomes included five themes of a) feelings of empathy, b) a perception of, and/or interest in flexibility, c) a recognition that being a part of a learning community was important to their success, d) varying degrees of internal and/or external motivation, and e) real-world applications. Recommendations for teaching practice as a result of research findings included a focus on relationships, providing rich feedback and clear expectations for students, and making your online teaching memorable for students while adjusting teaching practices to align with the delivery method. Recommendations for future research included investigating student engagement perspectives in online courses now that the pandemic response has dissipated, how students perceive the shift to online learning has benefitted their learning and engagement, as well as faculty perceptions of how they have engaged learners in online courses.*

Keywords: Engagement, deep learning, online teaching, pandemic, disruption

Educational practitioners of students of all ages have an ethical and professional responsibility to their students' engagement. And the students in our respective classrooms, regardless of whether or not they are enrolled in an early childhood program or are adult undergraduate, graduate, or doctoral students, may hold perceptions of our adherence to this responsibility in opposition to what we intend. In the spirit of our collective ongoing commitment to improving educational practice, it is critical to actively seek out the student experience in order to better understand the efficacy of our intentions. This commitment is particularly relevant during unanticipated events that propel both ourselves and our students into emergency situations, such as the abrupt transition into an online learning context as a result of the COVID-19 pandemic.

All but very few schools around the world, their students, and their instructors faced an unanticipated crisis without either a viable strategic model to lead them or a clear indication of how or when the situation would be resolved. This crisis thrust many instructional facilitators and their students in a position to participate in a learning environment with which they were unprepared and often unfamiliar. The central research question of this study examined undergraduate students' perceptions of engagement strategies used by faculty during the transition to online learning during

the COVID-19 pandemic and how those strategies were perceived by students to affect their motivation.

Contextualizing the pandemic's disruption on the undergraduate experience is imperative to understanding the basis of this qualitative study. The reach of the pandemic, which the World Health Organization declared "a public health emergency of international concern (PHEIC)" on January 30th, 2020, was vast (World Health Organization, 2020, as cited in DeMartino & Weiser, 2021), ultimately forcing the transition of 98% of the world's schools to transition from a traditional to either an online or hybrid learning model (Keeling, 2020). The COVID-19 disruption, which contemporary educators had not experienced at this magnitude (Adams & Muthiah, 2020; Thien & Adams, 2021, as cited in Adams et al., 2021), resulted in the largest global shutdown of schools since World War II (d'Orville, 2020). Narrowing the focus to better understand the extent to which this transition impacted the undergraduate experience in the United States, specifically, there were 21 million students enrolled in institutions of higher education in 2021 (Duffin, 2022). Of these, at least 87%, or approximately eighteen and a half million undergraduate students, experienced enrollment disruption as a result of the shift to online learning (Hollister et al., 2022; NCES, 2022). Accordingly, there was a 93% increase in online enrollment of undergraduate students at National Council for State Authorization Reciprocity Agreements (NC-SARA) institutions in the Fall of 2020. This was an increase from 3 million in the Fall of 2019 to nearly 6 million in the Fall of 2020 (Lederman, 2021), which was the semester following the closing of campuses and the movement to online learning due to COVID-19 (Lederman, 2021). This upward trend in online enrollment enhances the significance of this study and our imperative to understand the online learning experiences of undergraduate students.

Given the high enrollment trends immediately following the COVID-19 pandemic, there is a possibility that educators working either partly or full-time in an online environment will be called upon to serve increasing numbers of students. The importance of leveraging pedagogical strategies aligned with the learning process in order to build rapport with an increasingly diverse field of students is critical in contemporary educational research (Sybing, 2019).

Literature Review

Online learning has experienced significant growth in global education because it provides opportunities for students in remote locations and with limited resources who may not be able to otherwise access post-secondary institutions (Delaney & Fox, 2013, Roll et al., 2013, as cited in Farrell & Brunton, 2020). Student engagement is an increasingly important area of scholarly interest, particularly due to the increase in online platforms available to students around the world (Bergdahl, 2022), however, how educators and researchers measure and understand engagement and disengagement is complex process due to a wide range of contextual variables (Grønborg, 2013, as cited in Bergdahl, 2022).

Relationships, specifically the building of rapport and a learning community, are necessary for student engagement in an online learning environment (Martin & Bollinger, 2018). It is through varying degrees of interaction that relationships may be built, which directly affect student learning and motivation (Gimpel, 2022). Existing scholarship affirms that student engagement in all learning contexts is critical to student success and satisfaction, especially in online learning formats (Martin & Bollinger, 2018 and Singh et al., 2019, as cited in Gimpel, 2022). Additionally, higher levels of engagement directly reduce issues related to feelings of isolation and increase retention rates towards degree completion (Banna et al., 2015, as cited in Martin & Bollinger, 2018; Bavli et al., 2021; Bergdahl, 2022).

The specific research problem driving this qualitative study was that undergraduates consistently reported difficulties in staying connected to course content, their peers, and to their

instructors during the transition to virtual and/or synchronous platforms during the COVID-19 pandemic (Hollister et al., 2022). A sample of 1,008 undergraduate students who had shifted to online learning in the spring of 2020 affirms this existence of this problem (Means & Neisler, 2020, as cited in Hollister et al., 2022). For instance, approximately half of respondents reported being very satisfied with in-person learning experiences prior to the pandemic, and only 19% reported being very satisfied with their online learning experience after campus closures (Means & Neisler, 2020, as cited in Hollister et al., 2022). Additionally, of 3,089 undergraduate respondents in another study, 78% shared that their online classes "were not engaging, and 75% [stated] they missed face-to-face interactions with peers and instructors" (Read, 2020, as cited in Hollister et al., 2022, p.1-2). Another aspect of the problem is a lack of readiness to effectively engage with students and deliver instructional content reported by post-secondary faculty members (Martin et al., 2019). While many institutions of higher learning offered online programs prior to the COVID-19 pandemic, not all faculty in all institutions were trained to effectively deliver content, which exacerbated the problem. For example, Lichoru (2016, as cited in Martin et al., 2019) discovered that many faculty members feel unprepared to teach in an online environment. And Downing and Dyment (2013, as cited in Martin et al., 2019) found faculty members' perceptions of online teaching to be too time-consuming. Multiple additional studies investigating undergraduate student experiences in online learning in a variety of different cultures and geographic regions mirror the problem of student engagement during online and virtual learning (Nambiar, 2020, Owusu-Fordjour et al., 2020, Xhelili et al., 2021, as cited in Jaradat & Ajlouni, 2021). Reasons for why student experiences can lack engagement can be due to many reasons, with lack of faculty empathy and course community (Fuller, 2008; Goyack, 2021) being common challenges.

Theoretical Framework

The deep learning framework is built upon the idea that 21st century learners must develop essential behaviors, including understanding, skills, and habits of mind, in order to be fully engaged in the learning process (Seif, 2018). There are four vital components of deep learning: instructors "must have a deep learning mindset," "students are heavily engaged in the learning process," the teaching of content must be carried out as a "high cognitive challenge," and students should have opportunities to apply what they learn in a real-world context (Seif, 2018, p.1). Effectively, a deep learning model ensures that students have opportunities to work with complex ideas, take risks, participate in, and lead, inquiries relative to subject discipline content, and understand and apply their learning beyond the classroom (Seif, 2018).

When teachers, regardless of grade level or subject discipline, create opportunities for students to extend their learning, practice critical and creative thinking skills, and develop an understanding for how knowledge is constructed, they are promoting a deep learning mindset (Seif, 2018). When students become increasingly comfortable with asking complex questions and work more effectively in collaboration with peers, can offer and examine alternative solutions to real-world problems, and are exercising more complex thought processes, they are purposefully engaged in their own learning process. (Seif, 2018). Students are exercising high cognitive ability when their individual agency experiments with content analysis, personal interpretations, alternate solutions to discipline-specific problems, and developing thoughtful and well-reasoned, evidence-based arguments (Seif, 2018). Authentic applications of solutions to existing problems builds a deep learning skillset, promotes curiosity, strengthens critical thinking, and amplifies the value of the learning process beyond a school-specific context (Seif, 2018). Deep learning is neither content nor subject specific; it is possible at all levels and in any learning context (Seif, 2018). Understanding the exceptional and sudden shift in learning platforms brought about by COVID-19 and realizing the vital need for undergraduate students working in an online forum to continue access to a deep learning experience, the co-

researchers wanted to better understand the extent to which their professors were perceived to create these opportunities.

Materials and Methods

In order to give context to the response of the institution to the COVID 19 pandemic, the following timeline benchmarks indicate the response from the state government and subsequent institution of higher education (Local News, 2024). The disaster declaration of the pandemic initially was declared on March 6, 2020 and within the next two weeks, all schools and businesses were closed to reduce the spread of the virus (Local News, 2024). Within this initial shutdown timeframe, a National Shut Down was also declared by the President of the United States. All guidance that led to classes resuming in an online format resulted from this initial shutdown, disaster declarations, and guidance from the Centers for Disease Control (CDC, 2023) and the National Institute of Health (NIH, n.d.).

The site in which the study took place was a private institution of higher education in the North Eastern part of the United States. Prior to the pandemic response shutdown, approximately nine percent of all undergraduate courses were offered in an online format and approximately two-thirds of all undergraduate students enrolled at the institution would consider it unlikely to take an online course (Site Institutional Research, 2024). Because of these trends, moving into a fully online environment at the onset of the pandemic was especially challenging for faculty and students in environments such as these, with online teaching and learning being somewhat foreign to many.

To ensure that this research closely followed strict ethical protocols, the researchers submitted their proposal to their University Institutional Review Board which approved the study. Once initial contact was made with prospective participants and informed consent was secured from each eligible individual, we scheduled one on one interviews. Interviews were approximately 30-45 minutes each, were carried out via the Zoom platform, and dually audio recorded on the researchers' voice recorders and on Zoom. Zoom recordings were destroyed after transcripts were generated. Transcripts are only accessible to the researchers on their private, password-protected computers. Both authors developed the interview protocol to align with Seif's (2018) dimensions of deep learning theoretical framework. Seif (2018) scaffolds this conceptual model beginning with the teacher having a mindset focused on deep learning, an expectation that students are highly involved in their own learning, the delivery of content requires high cognitive engagement, and applications of learning in a real-world context are offered. This model gave us an appropriate structural lens through which we could stage our inquiry. It was our intention to discover how this study's undergraduate student participants perceived their instructors' ability to engage in a deep learning model during the unanticipated transition to online learning as a result of the COVID-19 pandemic.

After gaining approval from the institutional review board, we broadcast a call for prospective participants. Participant selection was guided by criterion sampling, which dictated eligibility based on two pre-determined criteria: participants must have experienced a transition from a traditional face-to-face classroom environment to online learning as a result of the COVID-19 pandemic; participants must have been currently enrolled in an undergraduate program at this particular private institution of higher education in the United States. Additionally, in the pursuit of a campus-wide representation, we wanted our participant pool to reflect at least 5-7 individuals enrolled in distinctly different undergraduate programs. The rationale for this final criterion was to collect the experiences of students across multiple colleges represented within the university, rather than from within a single track. While this was our intention, it is also a limitation of the study, which we discuss in our findings. Table 1 is a demographic illustration of our selected participants, their declared major at the time of the study, and their assigned pseudonym to protect anonymity. No other demographic information was gathered

on the participants. We have redacted all other identifying information not pertinent to the study. In our discussion of findings, participants are referred to exclusively by pseudonym.

Table 1. Participant Pseudonyms.

Name	Declared Major	Gender
Aubrey	Environmental Science	Female
Lee	Biology	Male
Sandy	Biochemistry	Female
Stan	Chemistry	Male
Shelly	Psychology	Female
Jill	Management	Female
Willa	English Education	Female

Interview questions (Table 2) align with Seif's (2018) three levels of student engagement within the deep learning theoretical framework and were designed as open-ended and semi-structured in order to establish context and allow each participant to take any approach appropriate to their perceived experience (Seidman, 2013). It was our intention to create a setting in which participants could autonomously reflect on their own "understandings [and] perspectives, and attribution of meaning" (Merriam, 2002, p. 166). By subjectively focusing on their experiences, we intended for participants to reflect on which aspects of their faculty's engagement during online learning affected their levels of motivation, if at all (Seidman, 2013). In the crafting of our interview protocol, care was also taken to avoid asking leading questions which would have the potential to influence the direction participants might take in their responses (Seidman, 2013). The use of open-ended questions does have inherent limitations due to their inability to provide causal explanations (Krosnick & Pressner, 2010), and the researchers acknowledge this. As such, the findings of this qualitative study are indicative of their personal experiences and not generalizable to a population of undergraduate students beyond our participants and their unique experiences.

Table 2. Interview Questions.

1.	How would you describe your general approach to learning in a traditional classroom setting?
2.	How did faculty interact with you in traditional course(s)?
3.	How would you describe your initial expectations about online learning?
4.	How, if at all, have those initial expectations been affected in any of the online courses you have taken during the COVID-19 pandemic?
5.	How do/did faculty interact with you in online course(s)?
6.	In what way(s) have your motivation levels been influenced by faculty engagement in your online courses?
7.	How, if at all, have you been given opportunities to apply your learning in authentic, real-world situations in your online coursework?
8.	From your perspective, what strategies have faculty used to help create these opportunities for learning?
9.	What strategies have helped you maintain your levels of engagement in your online courses? Does this include interaction with your faculty and peers?
10.	Now that you have had some experience learning in an online setting, how interested would you be in enrolling in additional online courses in the future?

Validity and Reliability

To check reliability and ensure validity, each participant was given the opportunity to engage in a member-checking process. Member checking in a qualitative study is carried out by providing tentative findings to participants for their review (Merriam, 2002; Seidman, 2013). No discrepancies between our analysis and participants' intentions were noted. As another measure to preserve reliability and understanding as educational leaders ourselves who experienced COVID-19, teach in predominately online and hybrid learning environments, and that we share aspects of our participants' social world (Maxwell, 2013), we practiced reflexivity by openly discussing our assumptions and expectations of participant experiences prior to and during our interview process (Merriam, 2002). Though none of our participants have ever been either directly or indirectly our students, both researchers have a professional history as educational leaders in a variety of capacities, including the P-12 and higher education realms. Therefore, their individual and collective experience was a phenomenon we could understand and appreciate. In effect, their experience was separate, yet we did not want that separation to divide us from gleaning relevant insights and asking appropriate questions designed to explore the depth of their personal experience (Maxwell, 2013).

Findings

The researchers, who are also practitioners, acknowledge and understand that the instructors referenced by the participants in this study, were also subjected to the complexities, challenges, and uncertainties of COVID-19 in their personal and professional lives. It is reasonably expected that some, or all, of the instructors serving our participants had either no prior experience teaching in an online environment or were managing disruptions in their lives that would have likely affected their ability to teach at their highest capacity. This reality is a critical understanding in this study; at no point was there any attempt to evaluate instructional efficacy outside the scope of the COVID-19 context. This was made clear to each participant at the beginning of each interview session.

Of the seven participants of this study, only two had any pre-COVID-19 experience with online learning, and for both of those students, the exposure to a virtual learning platform had been only one class they had taken previously in their respective high schools. No participants had extensive experience with online learning as an undergraduate student.

The data from the interviews were analyzed and manually coded to determine themes. The experiences of the seven undergraduate students in this phenomenological study shared five common themes: a) feelings of empathy, b) a perception of, and/or interest in flexibility, c) a recognition that being a part of a learning community was important to their success, d) varying degrees of internal and/or external motivation, and e) real-world applications. In addition to the themes, which emerged from our data analysis and are specific to our inquiry, some participants also emphasized the difficulties they encountered in the first few days following the shift in learning platforms. This additional discovery is expanded upon in this section prior to the discussion of themes.

As universities were making plans to shift the entirety of their coursework to an online learning platform, each of the students in our study was actively engaged in trying to navigate their own uncertainties about COVID-19, including how, and in some cases, if, they were going to be able to continue their studies. The students were initially and continuously focused on how to connect with other peers, their professors, and the content of their courses in a meaningful, yet entirely unfamiliar manner while also trying to navigate a world in which personal health and safety were a top priority.

In all instances, the students of this study perceived that one of the most important qualities their most effective professors exhibited was empathy. In effect, it was the feeling of being understood and hearing from their instructors their shared experience as a means to convey a sense of common

humanity that was the difference maker for these particular undergraduates during the unknown that followed the immediate transition to online learning during COVID-19.

Finally, their common perception of, and experience with, professors who were accommodating, patient, and creative in how they established a unique, virtual learning community and integrated ways to think about and apply content outside of the context of that community enabled these students to feel like they were engaging in deep learning, despite the challenges of disruption.

Initial Feelings of Disruption

Some of the participants reflected on initial feelings of disruption during the early stages of the transition. While feeling unsettled or uncertain about how their role in an unanticipated virtual environment could be attributed to their lack of contextual experience, they all attributed their feelings of disruption to general concerns associated with the pandemic itself. For instance, Shelly, a psychology major, remembers thinking that shifting into an online learning platform might be easier and more efficient than sitting in traditional classrooms. However, while there were fewer distractions, Shelly reports that "It was definitely not easier." From Shelly's perception, the expectations of learning in an exclusively online environment dramatically contrasted with the realities of a virtual setting. Willa reflected on initially realizing that all of the relationships with peers and professors were dramatically altered as unreal. Prior to moving into an online format, she had been a highly motivated learner; however, she had to come to terms with learning synchronously, and while "it just didn't feel like it was real, [it was] just something [she] had to do." Willa had a particularly compelling statement in her reflection on the early days of online learning. She thought that life in general "just didn't feel like it was real" and that it was just something that she had "to deal with because even if it feels wrong, even though it's not technically wrong, it just [didn't] feel normal." Willa's unsettled feeling did begin to wane as she grew increasingly comfortable in her new existence, even as notions of discomfort persisted in the weeks following the initial transition.

Lee also expressed a similar sentiment. His initial reaction underscores the uncertainty about what life and learning was going to look like during the COVID-19 disruption. Lee realized that he "just didn't know [what to expect] because it was so crazy at the time . . . that all of this was happening." And for Lee, the disruption to his life extended beyond the immediate context of his classes into his personal life in general. He used the idiom "threw a monkey wrench in my plans" to describe how the dramatic changes in life that affected the fun things he and his friends were planning to do in and out of school. Lee also spoke to the initial disruption of having to get used to being on camera, feeling the need to respect professors' attempts to deliver content, and just not being able to have individual dialogues with instructors when desired. He expressed that these initial feelings were shared by his classmates:

> We just didn't want anyone to look at us and we didn't want to encroach on the professor's time and what they were doing. But in doing that . . . all [we] saw was a sea of black screens with the professors. So engagement, even with your friends and the teacher at the same time that you get in traditional [classrooms] was gone. So that just made it all harder. You couldn't stop by anybody's office because nobody was on campus.

Stan, a chemistry major, noted that one of the early anxieties of the virtual platform experience was associated with the challenges of "getting spotlighted" by the professors that just felt uneasy at first. Sharing ideas in a traditional face-to-face environment is a risk students might resist because they may sometimes feel vulnerable among their peers. Stan felt that being able to engage in class

discussions and responding to questions increased feelings of anxiety before students began to grow increasingly comfortable with these changes. Stan referred to this resistance as a "fear in people."

Sandy, a biochemistry major, openly talked about the initial challenges she faced in the early weeks of the transition. She stressed that it was "definitely difficult [because she] didn't expect it to be so hard . . . checking in and asking questions [and] seeing a blank screen." The adjustment was difficult for Sandy, she reasoned, because a perceived lack of engagement was "awkward and uncomfortable" and at times, there was just no "check back" from professors. Sandy was particularly open with her own mental health at the onset of the transition, which she described as a challenge because she felt that she had "no reason to get out of bed [and] there's no sort of rhythm [which made her] mental health decline horribly and that [made] everything harder." Sandy did reflect later in our discussion on the appreciation she had for her professors' tendency towards being flexible and understanding, which helped ease her initial struggles adjusting to online learning.

The initial disruption of COVID-19 caused anxiety, uncertainty, economic difficulties, and other stress-related concerns amongst undergraduate students around the world (Cao et al., 2020; Jia et al., 2021; Santabábara et al., 2022, as cited in Stock et al., 2022). While the emotional and social distress of the pandemic was not the primary focus of our inquiry, some participants independently acknowledged the difficulties of the transition that contributed to general engagement challenges. However, as participants began to settle into their new modes of learning and became increasingly comfortable in that context, they all spoke to the strategies their professors deployed to support degrees of deep learning.

In light of the difficulties these undergraduate students experienced with the initial disruption to their daily lives and their learning environment, one of the most common perceptions they shared was the understanding that their faculty were also undergoing a dramatic change. Some participants spoke to how their instructors verbally acknowledged the challenges beings shared, openly discussed how those challenges were affecting their personal lives, and reassured their students that they were all in it together. These expressions of understanding evoked feelings of empathy amongst some of our participants, which aided their comfort with the transition and supported their ability to engage purposefully with course content.

It was quite rare for students to describe perceptions of professors who did not prioritize an empathetic approach at the center of their online teaching. These expressions of empathy were demonstrated in a variety of ways. Lee, who majored in biology, acknowledged that all but one teacher was verbally "appreciative of the fact that [the new learning mode was] new [and this was] hard for everybody." Aubrey, who majors in environmental science, reflected on how her professors interacted with individual students during the transition and offered that most of her instructors approached teaching with a "I'm in the same boat as you" mind frame. While there were instances in which an instructor was perceived to lack empathy and flexibility with due dates and pandemic-related family conflicts, especially, Aubrey felt, if the professors themselves were experiencing crises, most were understanding of individual challenges, especially in the early days of the transition. She mused on her perception of professors' attitudes of empathy and simply offered that it felt like they also understood that "This pandemic sucks, but I know it sucks for [the students] too."

Stan spoke to the importance of care and the perception that his professors were actively trying to encourage and model student engagement by promoting a deep learning process, rather than simply asking to have information restated in assessments. In the demonstration of care, accessibility was critical for Stan. He spoke of one professor who went out of his way, even in a virtual environment, to be available and responsive. Stan reported that this professor's empathetic approach was characterized by taking the time to re-teach concepts and would repeatedly state his availability outside of class time to ensure that students could reach out with follow up questions or to request clarification of content. He was, in Stan's words, trying to "give [us] more than [basic] learning . . . and

cramming." Care was at the center of other participants' experiences as well, and like Stan, each of them spoke to the importance of feeling understood as a means to connect with their instructors and the learning process.

Shelly's perceiving being understood. She highlighted the practices of her professors who offered accommodations, verbalized appreciation for learners, and being made to feel like an individual, rather than a group. For instance, Shelly spoke of a professor who explicitly told students how eager they were to "go back in person [because I] miss you all" and who made deliberate attempts to "keep [learning] as normal as possible" and really went out of the way to "talk to us." Shelly noted how much she appreciated feeling like her professors "were struggling with [the transition] just as much as we were and [were] trying to keep [sessions] interesting and engaging." Another strategy Shelly expanded upon that made her feel like her instructors were actively empathizing was the use of humor to lighten class climate. The allowance for "joking around" Shelly experienced in some virtual sessions created an atmosphere in which she and her peers felt reduced anxiety and promoted a desire to really put her best effort in learning content. Additionally, having professors reach out directly either during a class or via email to simply check in with a basic "are you doing ok?" helped Shelly to feel a sense of belonging and diminished a sense of loneliness. Of her most empathetic and deeply engaging instructors, Shelly reported that "they definitely tried to be aware of how [we] were feeling and connect[ed] with [us to] be understanding."

Flexibility

Given the particularly unanticipated disruption of the COVID-19-influenced transition to virtual/hybrid learning models, undergraduate students have reported heightened feelings of vulnerability and psychological stress ("Education in a Pandemic," 2021). Post-secondary and P-12 students benefit from a synthesis of structure and flexibility, especially in times of crisis, in order to ensure their learning needs are being met while having opportunities to connect meaningfully with content (Anderton et al., 2021). Participants' reflections on the steps their professors took to support learning often identified qualities indicative of flexibility. Shelly shared a noticeable increase in degrees of understanding amongst her professors. She illuminated various strategies that were adopted that were, she felt, designed to promote the learning process. Examples included altering coursework to fit the unique needs of individual students and issues related to accessibility, recording lessons and sharing them for later, more convenient viewing and revisiting, adding notes to presentations, and so on. All of these efforts were unique to the changes in learning modalities brought about by the pandemic. Additionally, when prompted, Shelly offered that in spite of these student-centered changes, professors were also perceived to be doing what they could to "keep the integrity of their class so that it's not making it any harder or easier," but just to achieve as much normalcy as possible while being committed to the learning process. Shelly did suggest that "everyone appreciate[ed] it."

Lee spoke to his professors' general heightened practice of being flexible as a strategy to promote accessibility. He deeply appreciated a willingness to initiate impromptu Zoom meetings, sometimes as quickly as within half an hour of reaching out to his instructors with questions outside of class. The professor and he "would share screens and be very involved in helping [him] figure [content] out, [which] helped [him] feel safer to ask questions and ask for help." Lee's affirmation of the value of his professors' flexibility came through in his recognition of personal accomplishment. His experience with success was directly attributed to the teacher's help and the ability to use what he was learning and applying it in new contexts. These impromptu sessions "helped motivate" Lee as a student during the challenges brought about by the pandemic.

Other examples of flexibility in the delivery of content included prioritizing more dialogue during online sessions. In particular, Aubrey perceived that one professor in particular experimented

with emphasizing student voice and reflection by having students free-write about a lesson, which she described as "word vomit [in which] you just write about [content], which makes [me] embed it in [my] brain." Aubrey saw this practice as unique in her new learning environment and served as an important process of intentional reflection that supported her connection to previous and current course content.

Additionally, Sandy directly attributed her ability to ease into the new learning environment due to her professors' flexibility. She stated that "they were pretty understanding and definitely a lot more lenient about things like due dates and attendance." Her reflection on how teachers would check in with her just to ask if she was taking care of herself and acknowledging that this was more important than grades at the time was conveyed with thoughtful appreciation. She acknowledged that "it's hard for people to [reach out to others and], no one was expecting everyone to check up on each other all the time, but [she] did experience a lot more of [this behavior than she] would've in a [traditional] environment."

There were instances in which participants perceived professors' initial attempts to mirror face to face lessons in an online environment. Examples included depending on standard lectures, holding the same number of classes for the same amount of time, and either not encouraging dialogue or promoting reflective practices. However, these were generally earlier in the transition and were not the norm for the participants of this study. In each reference to a perceived lack of flexibility, participants voiced frustration and a feeling that the teaching and learning process was less effective than in a traditional environment. An example of what this looked and felt like was shared by Jill, who alluded to only one class in which a professor "didn't upload any lectures at all [and] we just had some PowerPoint with the summary and it seemed very difficult to [her]." In order to resolve those feelings of frustration with a lack of flexibility, Jill acknowledged that she sought "private lessons in order to pass the class." While this anecdote demonstrates the participant's personal responsibility and diligence, the data's emphasis clearly suggests that a general commitment to accommodating students' needs in a unique environment and being flexible with deadlines, course content, and experiment with various pedagogies was deeply appreciated and supported student learning in this context.

The Learning Community

Among the top five trends in the literature relevant to online learning modalities during the COVID-19 pandemic is the interaction among students, instructors, and content (Mark et al., 2022 as cited in Xuelan & Zhiqiang, 2023). If learners are to be at the center of any learning environment (Xuelan & Zhiqiang, 2023), better understanding how they interact with one another, course content, and how instructors facilitate group dynamics is an important element of the deep learning experience. One participant, Willa, summarized the concerns with building community in an online environment when asked why it can be so difficult to connect with instructors and peers in this setting. She acknowledged that making friends in a traditional setting is easier because of the natural tendency to interact with one another; however, she also noted that "it's hard to make friends through Zoom if you're only on Zoom during that class period [and] the teacher is talking." Willa's point, while the exception in our participants' narratives, captures the potential effects of not prioritizing relationships and can result in feeling disconnected from the learning experience for those who matter most.

The undergraduate students in this study noted their professors' intentionality in building community through collaborative practices, open discussions designed to promote student interaction with content and with each other, and prioritizing inclusive dialogic opportunities. Aubrey shared an appreciation for her professors' attempts to build more collaborative practices into the online sessions. In her reflection on how these attempts to collaborate were helpful to building rapport and community, she spoke to the value of being "more open with each other and more communicative

because [we did not] know what was going to happen [and] we should be friendlier with each other and talk more." In particular, there were a few classes where "professors really made an effort to keep engagement up . . . through discussion." She recalls "lov[ing]" these moments, which caused her to "fall in love" with the subject in general. Aubrey also fondly recalled one instructor's attempts to have fun with the class in a synchronous session in which the students were all tasked to stand up and "stretch or do something like clap if you hear [her]," which made Aubrey perceive an increased sense of togetherness.

Similar sentiments of the value of being together and building community were shared by other participants. Sandy also highlighted her perceptions of what she referred to as "fireside chats," which one professor would schedule every two weeks or so. The objectives of these sessions were to share personal struggles and just connect with each other. For Sandy, these informal meetings helped to build morale and share a sense of humanity amongst her peers and instructor.

Another method instructors used to promote inclusivity in a virtual environment was to exercise patience so that everyone in the class had opportunities to share opinions. When individual ideas were treated equally, participants felt that all learners were welcomed to the same degree. Stan spoke specifically to a strategy of encouraging the asking of questions, which would create a sort of chain reaction as individual students would see that doing so was low-risk, high yield. This didn't happen naturally at first when "nobody would speak," however, once this strategy was trusted by students "others would also start speaking" and being increasingly open to new ideas and the voices of their peers.

One student asserted that her levels of motivation were directly linked to the strategies professors took to enlist student engagement and thought these strategies were important not only to herself but to others in the way they invited participation. Jill recognized that some of her teachers were deliberately trying to encourage and motivate group dynamics by creating an expectation for cameras to be turned on throughout a synchronous session, using digital whiteboards and other technologies to enlist student interest, and being available after class for smaller study sessions for those students who needed it. Jill felt that these approaches were helpful to continuing relationships in courses that had started in a face to face setting but had transitioned to a virtual one.

Degrees of Motivation

There is research on the importance of self-regulation among undergraduates and their success in a traditional learning environment. For example, students who thrive in challenging situations tend to be deliberate at setting goals, demonstrate high levels of self-awareness, are motivated by internal, as well as external, forces, and gain enjoyment out of the process of learning, not only the product or outcome (Deci & Ryan, 2002, Li et al., 2013, Zimmerman, 1990, as cited in Luo et al., 2021). We were interested in our participants' experiences with and perceptions of self-motivation throughout the stages of learning online during the pandemic because deep learning is a consequence of the degree to which the learner has the capacity to fully engage in the experience of learning (Seif, 2018). The data were mixed with participants reporting wide ranges of motivation throughout their time engaged in a virtual learning platform.

One student, Aubrey, reported that professors who gave her opportunities "to do [her] own learning," she experienced "higher motivation" and when professors maintained high expectations of student achievement, the result was positive. She felt that being expected to "do a discussion posted, [attend sessions and be] ready for a discussion made [her] more prepared." Even when professors increased the number of online discussions students were expected to read and contribute to, Aubrey felt that "this is fun [which makes her] more motivated." She also reported that her most successful

experiences with virtual learning were in courses with professors who "were very active returning [assignments]" with feedback. Aubrey's level of motivation was a direct response to the commentaries she received on assignments, and felt that the time professors spent to provide immediate, constructive feedback supported her towards her goals. High expectations, along with infused comments and feedback seemed to equate to higher self-regulation and motivation levels.

Sandy spoke to the pressure professors would place on her and her classmates as an important factor in her level of motivation. She referred to this pressure as "force," though she also acknowledged that it was carried out in the most "organic way possible," and while she likes presentations and other responsibilities anyway, this approach helped her to "accomplish little things along the way," which "makes [tasks] easier." These strategies undertaken by her professors to obligate students to perform helped increase responsiveness and both individual and group engagement.

Lee's experience with motivation was mixed. While he did reflect on positive levels of motivation experienced when a professor would ensure availability outside of synchronous sessions to re-teach a concept or answer follow up questions, he generally expressed diminishing motivation corresponding to reduced interaction with professors. One strategy he applauded was exhibited by the aforementioned professor who would provide extensive and clear feedback on assignments, much like Aubrey reported. Lee identified this approach as a "sigh of relief" which "was motivating," though there was only one professor "out of all [his] other ones who would" practice this strategy. Stan also acknowledged that maintaining motivation levels were "more challenging during that first semester" and recognized that there were "a lot of factors" to consider as to what kept his motivation going. A self-proclaimed high-achiever, Stan referred to one professor who Stan felt like "pushed [him] to go even harder," which he could do because he realized this professor was a "driving force."

Shelly experienced an early setback with her motivation levels, despite being personally excited about the new semester prior to transitioning off-campus. She admitted that her motivation levels initially "died as bluntly as possible." She "missed everything," including her friends, other people, the classroom environment, and fears of either becoming ill and, given that she lived with a large family, getting others close to her was a significant challenge. Upon reflection, Shelly noted that simple techniques a professor would utilize, such as being highly responsive to every student on discussion boards, allowing opportunities to chat about life outside of the pandemic and the course content, and just trying to be relatable were appreciated and helped her to feel increases in motivation. At the time of this study, Shelly had moved back into some in-person classes and acknowledged that in doing so "her motivation levels [have] gotten better, and it makes [her] want to do [her] work and actually participate in things."

Consistency was essential for Willa to sustain her motivation in the online environment. In addition to her teacher typically organizing due dates in the virtual forum from week to week, utilizing some of the features on the virtual platform helped motivate Willa to plan ahead. Jill shared similar examples of digital resources her professors would use to help students organize their coursework as ways that she was able to maintain higher levels of motivation. Jill also stressed her reliance on internal motivation to be successful in a challenging situation. Her academic record, specifically her grade point average, was a driving force, as was the goal to secure a "good job" and to be seen by a "future employer as a good student." Though a self-proclaimed high-achiever, Jill felt like being motivated in most classes, virtual or face to face, was relatively easy because she like questions, being involved in discussions, and participating.

Real-World Applications

Seif's (2018) deep learning model recognizes the necessity of moving beyond a basic instruction approach in order for students to be able to extend their understanding of concepts, reflect on content

knowledge, and apply what they are learning in unique situations beyond the classroom. In our inquiry to better understand undergraduate student perceptions of instructor engagement through a deep learning lens, it was essential to explore how, if at all, the participants of this study were given opportunities to deepen their understanding of course content, communicate their thinking in novel ways, and creatively and critically apply lessons in a real-world context. While participants' experiences with the most meaningful level of deep learning was minimal, which we attribute to the unanticipated and uncertain nature of the transition, there were some references to extended applications of knowledge by a few participants. The limited ability to speak to learning in unique situations beyond the virtual learning environment is explored in our discussion section.

What we did glean from participants was that in general the context of virtual leaning during the pandemic response was not conducive to the deepest levels of learning and application. For instance, Lee reflected on his experience as primarily just trying to cover basic content. Professors would occasionally entertain questions, such as "'What are the implications of the real world?'" and "How might this apply to what people actually do?'" and these questions would help facilitate thinking "more than any homework assignment," however, carrying these ideas to fruition was limited. It did seem that Lee wished he had more opportunities for critical thought and real-world action in his virtual coursework, though this is only the researchers' perception.

Similar to Lee's experience, Shelly was unequivocal in her response that authentic, real-world application was not feasible. She acknowledged that, as a science major, the "lab component is where you would apply what you're learning," though she didn't "have labs while [learning] online." Rather, "the professor [would] record things [and] you get the data and they talk about . . . how [they would conduct] the experiment if [they] were with [the professor]." Shelly cited a frustration with not getting "that experience to be able to do things [herself]." Shelly did offer that aspects of her psychology class had informal applications beyond the scope of the standard coursework. For instance, she noted that the emphasis on self-analysis in the course influenced her relationships with her family at home. Shelly also encouraged some members of her family to take a personality assessment, which they would discuss over dinner. She reflected that "was a fun way to stay engaged, [and] it was definitely easier to do" this in one class than the others.

Willa, who reflected on her work in one class in particular, referenced her online writing course as beneficial to her personal creative writing interests. She enjoys writing short stories and poetry, and the descriptive writing lessons helped her "improve on how [she] writes in different styles." For Willa, the experience of transferring the skills she learned in class, especially through the "peer review process," to her own passions as a developing writer was highly valued. That she was able to think about writing in new ways, experiment with different styles, reflect on her own skill set, and apply new techniques aligns with Seif's (2018) tenets of deep learning.

The final participant to acknowledge an application of content in a real-world context, Aubrey, had the most direct experience with deep learning. Aubrey stressed the relevance of her coursework to her life in general. In doing so, she saw the world around her in relationship to the subjects of her study in environmental science and biology. For instance, being able to think more critically about weather patterns and animal anatomy as a result of the lessons she learned in class were examples Aubrey noted of extended applications. She also noted that "almost all of [her] classes involved some kind of project-based component," which she appreciated because they gave her opportunities to think more critically about content. Aubrey's experience of reaching levels of deep engagement, as described by Seif (2018), were a combination of her individual ability to see relevance in what she was learning in her personal world and deliberate attempts by professors to integrate projects into their online sessions.

Discussion

The transition to online teaching and learning due to the COVID-19 pandemic was abrupt and unexpected. Institutions of higher education, despite many offering online courses at their institutions, found themselves largely ill-equipped to manage this sudden transition from face-to-face instruction to online education with ease (Marinoni et al., 2020). While some faculty were able to gradually transition their practices and expertise from in-person instruction to online instruction, the unexpected nature of this demand was challenging and could have been exacerbated by the overall feelings of panic that the general public was experiencing (Marinoni et al., 2020). Despite these challenges, faculty and students embarked on the journey into online instruction in order to persist in the acts of teaching and learning during the 2020-2021 academic year. This study sought to better understand the student perceptions of ways faculty engaged students in their teaching practices and seek out ways that the academy could learn from these perceptions. The themes generated from the participant interviews were: a) feelings of empathy, b) a perception of, and/or interest in flexibility, c) a recognition that being a part of a learning community was important to their success, d) varying degrees of internal and/or external motivation, and e) real-world applications.

Teaching Recommendations

Participants in this study made recommendations for faculty teaching in their interview responses. The following recommendations are supported by research in various aspects of pedagogy.

Focus on Relationships

Demonstrations of empathy can show students that they are understood, their circumstances are noted, and that they are an integral part of a learning community, especially when circumstances are less-than ideal with connectivity, infrastructure, and technology challenges. Participants appreciated when faculty demonstrated empathy with learners: “Empathy is a cognitive skill that includes the ability to understand a person’s experience and communicate in a manner that conveys a recognition of individual concerns and perspectives” (Bradley et al., 2019, p. 252). This focus on empathy for individual students and the challenges they are facing is necessary, with the responsibility on faculty to appreciate and consider these challenging circumstances with students (Cartee, 2021).

Demonstrate that care is at the center of all you do. If timeliness and other behavioral goals are to be included in grading, could they be separated from academic outcomes so the student expectations are clearer on how they can use feedback to improve? Another way to demonstrate care is to check in with students via email, especially if seem disengaged during virtual sessions or miss class, to increase their feelings of being recognized and valued as individuals, rather than as a group.

Also, flexibility with pedagogical delivery and allowing for new teaching practices to be infused into courses was appreciated by students. Participants spoke directly about their frustration with the inability to contribute to discussions as being a barrier to learning. Transforming time spent in class to include more student voice is one way students can become more engaged in the learning process. Is there a way that lecture could be replaced with more dialogue? Could a dialogue become a debate? Could students become responsible for sharing portions of content with their peers instead of faculty being the only delivers of ideas? Including reflection opportunities in each session enhances the potential for content to be retained and applied. Peer review processes often helps students continue development of a project or writing assignment over time. Implementing these strategies in our teaching practices promotes deep student engagement with content.

In addition to empathy and flexibility, participants seemed to seek out ways for faculty to build and foster relationships as if to be seen and heard as individuals worthy of knowing. Faculty members could hold online office hours or informal sessions to answer questions, provide feedback, and establish sustainable rapport. Building relationships and genuinely helping to generate common understanding can solidify trust with students and demonstrate care for their learning and growth.

Feedback and Expectations

Have high expectations of students, but also provide guidance, prompt and relevant feedback, and ensure clear outcomes are articulated to students. Participants in the study mentioned faculty feedback as one of the best ways to scaffold learning. Practices such as including course and weekly unit objectives, assignment expectations with rubrics for transparent assessment, and individualized feedback on student work can foster learning and growth.

In tandem with high expectations and prompt feedback, acknowledging when content may become more challenging within a course can demonstrate care for students and assist their navigation of increasingly complex material. Ensuring availability as content becomes more challenging and offering practice or study sessions will help scaffold learning. These meetings could be preplanned to coincide with the flow of coursework, and they also could be unplanned as needed.

Online Learning

Make online learning memorable. Some examples could include online office hours, infusing current events into weekly course announcements, a link to a professional webpage, and a photo collage as part of a "Meet the Instructor" page. Demonstrating our own individuality can help convey the degree to which we value students as individuals too.

Keep course integrity consistent, but not necessarily the delivery method. Lectures can have benefits if recorded and included in course content for extended and repeated viewing, but if the length or other factors, such as sound and video quality are lacking, students will be less likely to engage or reengage with these tools. Also, synchronous sessions can be useful in engaging with students and allowing them to engage with each other, not just lecturing on topics. Balancing theory and practice by infusing dialogue, utilizing breakout rooms for discussion, allowing participants to contribute to a shared Google Doc, or other innovations can help students to see additional value in online synchronous sessions and incorporate their ideas and purposeful engagement into the time spent together (Coman et al., 2020).

It is often not the case that online equates to easier (Coman et al., 2020), and participants agreed that online learning was at least equally as challenging as a traditional face-to-face setting. Intentionality to online course development can help temper the amount of reading, studying, preparing, attending, and assessing that takes place in online environments, allowing for the rigor and content to remain similar and not overcompensate for accessibility to the online environment.

Recommendations for Future Research

While the results of this study were valuable in informing the field regarding student perspectives on learner engagement during the COVID-19 pandemic response, there are other areas that could be researched as a result of these findings. One such recommendation is to investigate student engagement perspectives in online courses outside of the COVID-19 pandemic response. Since online teaching and learning has been expanding now that more faculty have had the opportunity to experiment with this format, hearing from students on what practices faculty have been using in the

post-COVID-19 era may inform our understanding of how faculty can engage learners over time. Also, seeking to understand student perspectives on how the COVID-19 pandemic response actually influenced their current learning experiences could better inform teaching practices. Now that student perspectives have been articulated, faculty perceptions of how they have engaged learners in online courses could be important voices in the scholarship.

Conclusion

Educators work hard to ensure that learners are given the very best experiences when it comes to teaching and learning. As such, there is an ongoing commitment to improving our practice by seeking out the experiences that our students have as we teach them. The disruption that occurred due to the COVID-19 pandemic thrust teachers and learners into the online learning space, and this disruption forced a vastly different experience with educating and learning. Because of this disruption to online teaching and learning, this research study was conducted out of a curiosity of the experiences that students had in that transition with faculty and how motivation and engagement were influenced. Outcomes of this qualitative investigation included themes of a) feelings of empathy, b) a perception of, and/or interest in flexibility, c) a recognition that being a part of a learning community was important to their success, d) varying degrees of internal and/or external motivation, and e) real-world applications. Additionally, recommended practices students discussed were to focus on relationships, effective communication of feedback and expectations, and practical tips for online teaching success. While the transition to online teaching and learning was abrupt due to the pandemic, students articulated that faculty have the power to make a substantial difference in the experiences of undergraduate students. The lessons learned from these participants can inform our approach to effectively teaching and motivating our students in all circumstances and contexts.

References

Adams, D., Cheah, K. S. L., Thien, L. M., & Md Yusoff, N. N. (2021). Leading schools through the COVID-19 crisis in a South-East Asian country. *Management in Education*, *0*(0). https://doi.org/10.1177/08920206211037738

Adams, D., & Muthiah, V. (2020). School principals and 21st century leadership challenges: A systematic review. *Journal of Nusantara Studies (JONUS)*, *5*(1), 189-210.

Anderton, R. S., Vitali, J., Blackmore, C., & Bakeberg, M. C. (2021, January). Flexible teaching and learning modalities in undergraduate science amid the COVID-19 pandemic. In *Frontiers in Education* (Vol. 5, p. 609703). Frontiers Media SA.

Banna, J., Lin, M.-F. G., Stewart, M., & Fialkowski, M. K. (2015). Interaction matters: Strategies to promote engaged learning in an online introductory nutrition course. *Journal of Online Learning and Teaching*, *11*(2), 249–261. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4948751/

Bavli, B., Uslu Kocabaş, H. (March, 2021). *Addressing the challenges of online student engagement during the covid-19 pandemic* [Paper presentation]. 8th International Congress on Curriculum and Instruction Curriculum Studies in Life Long Learning, Yildiz Technical University, Turkey. Retrieved May 4, 2023 from https://www.researchgate.net/publication/350604364_ADDRESSING_THE_CHALLENGES_OF_ONLINE_STUDENT_ENGAGEMENT_DURING_THE_COVID-19_PANDEMIC

Bergdahl, N. (2022). Engagement and disengagement in online learning. *Science Direct*, *188*. https://doi.org/10.1016/j.compedu.2022.104561

Bradley, H., Cook, L. L., Morrow, L., Leasca, J. B., & Lampley, T. (2019). Refocusing the lens: Caring and compassion in an online nursing environment. *Nursing Education Perspectives,* 40(4), 252–253. https://doi.org/10.1097/01. NEP.0000000000000399

Cao, W., Fang, Z., Hou, G., Han, M., Xu, X., Dong, J., & Zheng, J. (2020). The psychological impact of the COVID-19 epidemic on college students in China. *Psychiatry Research*, *287*, 112934. doi: 10.1016/j.psychres.2020.112934

Cartee, J. (2021). Strategic empathy in virtual learning and instruction: A contemplative essay about teacher-student rapport during times of crisis. *Journal of Instructional Research,* 10*, 12-19*. https://files.eric.ed.gov/fulltext/EJ1314158.pdf

Centers for Disease Control (2023). *Isolation and precautions for people with COVID-19*. https://www.cdc.gov/coronavirus/2019-ncov/your-health/isolation.html

Coman, C., Țîru, L. G., Meseșan-Schmitz, L., Stanciu, C., & Bularca, M. C. (2020). Online teaching and learning in higher education during the Coronavirus Pandemic: Students' perspective. *Sustainability*, 12(24), 10367. https://doi.org/10.3390/su122410367

Deci, E. L., & Ryan, R. M. (Eds.). (2004). *Handbook of self-determination research*. University Rochester Press.

Delaney, L. & Fox, S. (Nov. 7, 2013). The role of distance education in broadening access to Irish higher education. In: How equal? Access to higher education in Ireland, Dublin, Ireland. http://doras.dcu.ie/19966/

DeMartino, L. & Weiser, S.G. (2021). Striving for equity in pandemic times: The administrator's role in the shift to online education in k-12 and higher education spaces. Faculty Publications: College of Education, Illinois State University.

Department of Education Office for Civil Rights (2021). Education in a pandemic: The disparate impacts of COVID-19 on America's students. *Department of Education Office for Civil Rights*. https://www2.ed.gov/about/offices/list/ocr/docs/20210608-impacts-of-covid19.pdf

d'Orville, H. COVID-19 causes unprecedented educational disruption: Is there a road towards a new normal? *Prospects* 49, 11–15 (2020). https://doi.org/10.1007/s11125-020-09475-0

Downing, J. J., & Dyment, J. E. (2013). Teacher educators' readiness, preparation, and perceptions of preparing preservice teachers in a fully online environment: An exploratory study. *The Teacher Educator, 48*(2), 96–109. https://doi.org/10.1080/08878730.2012.760023

Duffin, E. (2 November, 2022). Undergraduate enrollment in U.S. colleges and universities from 2011/12 to 2021/22. https://www.statista.com/statistics/235406/undergraduate-enrollment-in-us-universities/

Farrell, O. & Brunton, J. (2020) A balancing act: A window into online student engagement experiences. *International Journal of Education and Technology in Higher Education*, 17(25). https://doi.org/10.1186/s41239-020-00199-x

Fuller, R. D. (February 2008). *11 Practice Priorities to Promote Empathy in Online Classes*. Eastern Illinois University. https://www.eiu.edu/adulted/docs/empathy_online.pdf

Gimpel, G. (2022). Bringing face-to-face engagement to online classes: Developing a high-presence online teaching method. *Journal of the Scholarship of Teaching and Learning*, *22*(4). https://doi.org/10.14434/josotl.v22i4.32702

Goyack, A.M. (Jan 25, 2021). *Our Online Learners Need More Empathy and Less Criticism.* https://www.facultyfocus.com/articles/online-education/online-assessment-grading-and-feedback/our-online-learners-need-more-empathy-and-less-criticism/

Grønborg, L. (2013). One of the boys: Constructions of disengagement and criteria for being a successful student. *International Journal of Qualitative Studies in Education*, *26*(9), 1192-1209. https://doi.org/10.1080/09518398.2013.816889

Hollister, B., Nair, P., Hill-Lindsay, S., & Chukoskie, L. (2022). Engagement in online learning: student attitudes and behavior during covid-19. *Frontiers in Education*, 7. https://doi.org/10.3389/feduc.2022.851019

Jaradat, S. & Ajlouni, A. (2021). Undergraduates' perspectives and challenges of online learning during the Covid-19 pandemic: a case from the University of Jordan. *Journal of Social Studies Education Research, 12(1)*, 149-173.

Jia, Q., Qu, Y., Sun, H., Huo, H., Yin, H., & You, D. (2022). Mental health among medical students during COVID-19: A systematic review and meta-analysis. *Frontiers in Psychology*, *13*.

Keeling, A. (2020). Understanding the use of technology during campus closures and its impact on international schools is the focus of a new report from ISC Research. *Impact of COVID-19 on Education Technology in International Schools*. Retrieved from https://asia.bettshow.com/articles/impact-of-covid-19-on-education-technology-in

Krosnick, J.A. & Presser S. (2010). Question and questionnaire design. *Handbook of Survey Research*. 2nd Edition. Emerald Group Publishing Limited. ISBN: 978-1-84855-224-1

Li, X., Hsieh, J. P. A., & Rai, A. (2013). Motivational differences across post-acceptance information system usage behaviors: An investigation in the business intelligence systems context. *Information systems research*, *24*(3), 659-682. http://www.jstor.org/stable/42004287

Luo, Y., Lin, J., & Yang, Y. (2021). Students' motivation and continued intention with online self-regulated learning: A self-determination theory perspective. *Zeitschrift fur Erziehungswissenschaft : ZfE*, *24*(6), 1379–1399. https://link.springer.com/article/10.1007/s11618-021-01042-3

Lederman, D. (2021). Detailing last fall's online enrollment surge. *Tech and Innovation: Inside Higher Ed*. https://www.insidehighered.com/news/2021/09/16/new-data-offer-sense-how-covid-expanded-online-learning

Marinoni, G.; Van't Land, H.; Jensen, T. (2020) The impact of COVID-19 on higher education around the world. *International Association of Universities*. https://www.iau-iu.net/IMG/pdf/iau_covid19_and_he_survey_report_final_may_2020.pdf

Martin, F. & Bolliger, D. (2018). Engagement matters: Student perceptions on the importance of engagement strategies in the online learning environment. *Online Learning, 22*(1), 205- 222. doi:10.24059/olj.v22i1.1092

Martin, F., Budhrani, K., & Wang, C. (2019). Examining faculty perception of their readiness to teach online. *Online Learning*, *23*(3), 97-119. doi:10.24059/olj.v23i3.1555

Maxwell, J.A. (2013). *Qualitative Research Design: An Interactive Approach*. 3rd Edition. Sage.

Means, B., & Neisler, J. (2020). *Suddenly Online: A National Survey of Undergraduates During the COVID-19 Pandemic*. San Mateo, CA: Digital Promise.

Merriam, S.B. (2002). Qualitative Research in Practice: Examples for Discussion and Analysis. Jossey-Bass.

Nambiar, D. (2020). The impact of online learning during COVID-19: Students' and teachers' perspective. *The International Journal of Indian Psychology*, 8(2), 783–793

National Center for Education Statistics. (2022). Undergraduate Enrollment. *Condition of Education*. U.S. Department of Education, Institute of Education Sciences. https://nces.ed.gov/programs/coe/indicator/cha.

National Institute of Health (n.d.). *NIH strategic response to COVID-19*. https://covid19.nih.gov/old-nih-strategic-response-covid-19

Owusu-Fordjour, C., Koomson, C. K., & Hanson, D. (2020). The impact of Covid-19 on learning: The perspective of the Ghanaian student. *European Journal of Education Studies*, 7(3), 88–101. http://doi.org/10.5281/zenodo.3753586

Read, D. (2020). *Adrift in a Pandemic: Survey of 3,089 Students Finds Uncertainty About Returning to College.* Toronto, ON: Top Hat.

Roll, I., Russell, D. M., & Gašević, D. (2018). Learning at scale. *International Journal of Artificial Intelligence in Education (2018)*, 28(4), 471- 477. https://doi.org/10.1007/s40593-018-0170-7.

Santabárbara, J., Olaya, B., Bueno-Notivol, J., Pérez-Moreno, M., Gracia-García, P., Ozamiz-Etxebarria, N., & Idoiaga-Mondragon, N. (2021). Prevalence of depression among medical students during the COVID-19 pandemic. A systematic review and meta-analysis. *Rev. Med. Chil*, *149*, 1579-1588. https://doi.org/10.4067/s0034-98872021001101579

Seidman, I. (2013). *Interviewing as qualitative research: A guide for researchers in education and the social sciences* (4th ed.). Teachers College Press.

Seif, E. (2018). Dimensions of deep learning: Levels of engagement and learning. http://68.77.48.18/RandD/Education Week/Dimensions Of Deep Learning - Self.pdf

Singh, A., Rocke, S., Pooransingh, A., & Ramlal, C. J. (2019). Improving student engagement in teaching electric machines through blended learning. IEEE Transactions on Education, 62(4), 297-304. https://doi.org/10.1109/TE.2019.2918097

Site Institutional Research, Personal Communication on January 3, 2024

Stock, C., Helmer, S.M., & Heinrichs, K. (2022). COVID-19 related disruption in higher education students' health and wellbeing: implications for university action. *Frontiers in Public Health. 10*. https://doi.org/10.3389/fpubh.2022.1015352

Sybing, R. (2019). Making connections: Student-teacher rapport in higher education classrooms: Student-teacher rapport in higher education classrooms. *Journal of the Scholarship of Teaching and Learning*, *19*(5). https://doi.org/10.14434/josotl.v19i5.26578

Thien, L. M., & Adams, D. (2021). Distributed leadership and teachers' affective commitment to change in Malaysian primary schools: the contextual influence of gender and teaching experience. *Educational Studies*, *47*(2), 179-199. https://doi.org/10.1080/03055698.2019.1680349

World Health Organization (WHO). (2020a, March 12). Coronavirus disease 2019 (COVID-19) situation report – 52. https://www.who.int/publications/m/item/covid-19-public-health-emergency-of-international-concern-(pheic)-global-research-and-innovation-forum

Xhelili, P., Ibrahimi, E., Rruci, E., & Sheme, K. (2021). Adaptation and perception of online learning during COVID-19 pandemic by Albanian university students. *International Journal on Studies in Education (IJonSE), 3*(2), 103–111. https://doi.org/10.46328/ijonse.49

Xuelan, L. & Zhiqiang, P. (2023). Improving effectiveness of online learning for higher education students during the COVID-19 pandemic. *Secondary Educational Psychology. 13*. https://doi.org/10.3389/fpsyg.2022.1111028.

Zimmerman, B. J. (1990). Self-regulated learning and academic achievement: An overview. *Educational Psychologist*, *25*(1), 3-17. https://doi.org/10.1207/s15326985ep2501_2

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