Journal of Humanistic Mathematics

Volume 12 | Issue 1 January 2022

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Recommended Citation

Shane K. Smith, Tyson H. Walsh & Lee Evans, "Navigating a Calculus Course During a Pandemic: A USMA Perspective," *Journal of Humanistic Mathematics*, Volume 12 Issue 1 (January 2022), pages 219-237. DOI: 10.5642/jhummath.202201.17. Available at: https://scholarship.claremont.edu/jhm/vol12/iss1/17

JHM is an open access bi-annual journal sponsored by the Claremont Center for the Mathematical Sciences and published by the Claremont Colleges Library | ISSN 2159-8118 | http://scholarship.claremont.edu/jhm/

Navigating a Calculus Course During a Pandemic: A USMA Perspective

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Synopsis

In this article we analyze publications written about different teaching modalities and evaluate how each applies to a calculus class during the on-going COVID-19 pandemic. We focus on the positives and negatives of teaching and learning in a virtual, classroom, or HyFlex environment. Although arguments could be made for each environment, especially given different institutional objectives, this work aims to explain why we eventually preferred teaching our Fall 2020 multivariable calculus course in a face-to-face classroom setting at the United States Military Academy at West Point. We also offer measures of performance to compare the current COVID-19 semester with previous semesters. The results support two major conclusions drawn from our decision to teach in-person under in a time constrained environment: learning modality matters in mathematics and this pandemic will influence student-teacher interaction for semesters to come.

Keywords: *remote learning, in-person learning, classroom learning, emergency remote teaching*

1. Introduction

As institutions worldwide struggled to decide whether to teach students remotely, in-person, or via some modality in between for the fall term of 2020, the United States Military Academy at West Point found itself in a similar position. However, no matter the institution and no matter the modality, the objective remained the same. Educators at all levels researched ways to discover the best possible way to deliver course material to their student population. Some initial questions included: What does a classroom look like during a pandemic? How can we achieve our objectives? What modality best fits our teachers' skill sets while complementing our students' needs?

As the United States Military Academy (USMA) logistically prepared to receive students back to West Point from a disjointed spring term for summer training, concurrent academic planning increased in effort. Within the Department of Mathematics (D/Math), the MA205 (Multivariable Calculus and Introduction to Differential Equations) course leadership team researched different teaching approaches to meet the Academy's mission, while prioritizing the health and welfare of each student and instructor. In short, we set out to answer the question "what is the best way to design and deliver a calculus course during a pandemic?" In this paper we compare different teaching modality approaches and aim to address how we thought about how each modality could fit into MA205 course design and instruction.

2. Teaching Modalities

2.1. Emergency Remote Teaching

It is important to first define where we are before exploring options for where we plan to go with respect to course design. According to authors of *Difference Between Emergency Remote Teaching and Online Learning* [8], Emergency Remote Teaching (ERT) happens when "colleges and universities are facing decisions about how to continue teaching and learning while keeping their faculty, staff and students safe when a natural disaster, or most recently, a pandemic occurs. Ultimately, the "just get [the material] online" course should only be accepted as a temporary solution to a temporary problem [8].

However, if the crisis cannot be resolved in an anticipated time frame, the permanent solution to ERT is online learning. ERT should not "go away."

It is critically important for institutions to capture and preserve ERT's lessons learned as they may form a critical baseline in the event of natural disasters, man-made disasters, or health emergencies [8].

2.2. Online Learning

Online learning is a structured education experience received over the internet. One characteristic that connects ERT with online learning is the digital means which students and instructors interact. One of the most glaring differences between ERT and online learning is the ecosystem surrounding both the instructors and students. Solid online learning programs take years to build, and therefore, online education has the training, resources, and infrastructure to support sustained learning from digital platforms [8]. When resourced and planned properly, the product of online learning often debunks the lower quality education stigma when compared to face-to-face (FTF) learning. Research shows online learning can be just as effective [8]. Aten and DiRenzo agree, explaining "one power of virtual learning environments is that students *potentially develop more personal learning strategies* than is possible in face-to-face settings [1].

Hodges *et al.* compare the amount of infrastructure that goes into a FTF education to the amount of cognitive effort required to surround online students with a proper ecosystem geared toward learning in order to produce a successful product [8]. The amount of time to properly execute an online course far exceeded the amount of time USMA had to transition to ERT. While implementation of the remote teaching took a little over a week from conceptualization to execution of students learning in a remote environment, Hodges et al. note that typical planning, preparation, and development time for an online university course is six to nine months before the course is delivered [8].

2.3. Teaching in a Classroom Environment (Time-Constrained)

Surprisingly, research does not lead us to many conclusions about an optimal length of class time. However, according to Rochester Institute of Technology and supported research [13], "a best practice for designing long classes is to divide the class time into segments," by reengaging students in new content every 25-30 minutes to increase their attention. Bradbury supports this claim in his article "Attention Span During Lectures: 8 seconds, 10 minutes,

or more?" [4]. He cites a 1982 study by Giles *et al.* [7], which mentions that material covered during the latter half of a lecture is more readily retained by students. In their study of medical student retention, Giles *et al.* found that information presented between the 15-minute and 30-minute time segments was recalled best, whereas material presented during the first 15 minutes had the worst retention [7].

However, given the physical stresses and emotional and psychological burdens of the pandemic, we believe that shorter 10 to 15 segments of instruction seem to benefit the COVID classroom environment. This resonates with other perspectives. In a virtual interview with USMA [12], Salman Khan, Bangladeshi American educator and founder of Khan Academy, mentioned that keeping his instructional videos short kept the viewer's attention. He explained that an optimal video length ranged from 5-10 minutes. After fifteen minutes, students began to lose focus.

Instructor and student success in time-constrained FTF and virtual environments depends largely on pre-training or priming; in our context, this involves USMA's Thayer Method [1]. "USMA's Thayer Method" is USMA jargon for a learning methodology that requires students to prepare for the lesson before attending class. As Aten and DiRenzo explain, "student motivation should be aimed toward achieving success and the attainment of goals, as opposed to avoiding failure and fears and punitive repercussions" [1]. While this strategy can be implemented within the traditional framework of USMA's Thayer Method, the out-of-class requirements for a compressed FTF classroom environment should focus on building an appropriate foundation for students' long-term success in their chosen fields of study.

In their article, "A Hybrid and Flipped Version of an Introductory Mathematics Course for Higher Education" [9], Martinez and Rodriguez offer a hybrid and flipped model which leverages self-paced, asynchronous learning to maximize efforts in class. "This (hybrid and flipped) model is based on the idea that outside of the classroom, students can learn from online videos, thus arriving to class with this task accomplished and promoting a different environment inside the classroom". By having students remotely, asynchronously learn the material typically presented in lecture format, the instructor can free up class time to address more complex topics. It is important to thoroughly vet the assigned videos or create videos that are appropriate for the difficulty level of the proposed topics. If done correctly, the flipped classroom

will not only save instructors time in class, but provide an opportunity for in-class active learning as students demonstrate and build on the concepts learned in the remote environment.

2.4. Teaching in a HyFlex Environment

Most published works do not explicitly address the proposed 'hybrid' learning approach where half of the class in FTF and the remaining class tunes in to the class via a video-conference platform. However, we were able to find articles that did mention a 'HyFlex' e-learning model where different types of learning media platforms were used to teach students. While only loosely related, the hybrid option, toggling between multiple learning environments, may give a HyFlex-like feel to class. Switching back and forth from platform to platform requires practice for the students and instructors.

In the article titled "Synchronous collaboration competencies in web-conferencing environments: their impact on the learning process" [3], Matt Bower explicitly addresses four competencies of *web-conference* remote learning environments which include operational competence, interactional competence, managerial competence, and design competence.

From [3], we learn that with repetition, operational competence, or "the ability to operate the tools and functions of the collaborative technology, is quickly gained. Indeed, switching from program to program, screen to screen is doable, but requires good organization, patience, and a lot of practice [3].

We can think of the matter at hand in terms of three different kinds of competences: interactional competence, managerial competence, and design competence. According to [3], interactional competence is the "ability to effectively interact to perform a task or solve a problem using the technology (including the ability to apply interactional tactics to collaborate effectively)". Interactional competence may be a challenge in a hybrid environment when attempting to effectively connect FTF and virtual students during class instruction.

Managerial competence is "the ability to manage a group or class including providing support on how to use the technology and interact effectively." This competency applies to teachers/instructors and, if mismanaged, the effects are felt by the learning audience [2].

Design competence is "the ability to select and [organize] tools in a way that optimises interaction and best supports activity management (including the ability to dynamically design the environment based on emerging collaborative and cognitive requirements)" [3].

Initially, students and instructors may face a steep learning curve with new technology or programs. However, over time, unique and innovative ideas will enhance the remote environment and the learning experience. If the 2020 spring term is any indication of the issues of introducing additional collaborative web conferencing environments, especially with students utilizing residential networks, connectivity and internet speed issues may perpetually haunt virtual classes.

3. Concerns for Students

During the COVID-19 global pandemic, there are health concerns associated with meeting in a traditional setting. These health risks come in the form of both physical and mental health concerns, and appropriate course design should take both into consideration.

Douglas *et al.* explain that "as pandemics can occur in waves over a long period of time, there is a correlation between the degradation of mental health and social isolation" [6]. After careful review of 16 articles related to mental health themes resulting from social isolation, social (physical) distancing, quarantine, caregiver stress, unemployment, and death/illness, Sritharan and Sritharan concluded that "a decline in mental health is expected given the lack of common social interactions" [14]. Understanding that any individual can be a vector for virus transmission, which is a fact that should not be ignored, we nonetheless were influenced by this work, which shows that mental health is a topic worthy of consideration when designing a course during a global pandemic.

Given the close living quarters between students, USMA remained especially vulnerable to community transmission. Were we to decide on face-to-face instruction, we had to accept prudent risk of virus transmission. We saw that it was essential to balance this risk against the great importance of student mental health.

Approximately 75% of the students at USMA are male, and nearly all are less than 24 years of age. Since 2000, there has been a nearly a 50% increase

in the rate of suicides in young adults between the ages of 20 and 24, with the 2017 rate among females at 6.2 per 100,000 and the rate of males at 27.1 per 100,000 [11]. As of June 24, 2020, only 132 Americans between the ages of 15 and 24 had succumbed to COVID-19, or a death rate of 0.314 per 100,000 [5, 16]. Given the USMA gender composition, we would assume a suicide rate of 21.8 per 100,000. This suicide rate dwarfs that of the expected COVID-19 fatality rate of the students we teach. Knowing that one benefit of in-class learning has very little to do with students learning mathematics, that FTF classes are opportunities for human interaction that improve the mental health of both students and faculty, we could see that these numbers were heavily favoring FTF instruction.

4. Concerns for Faculty

Hodges *et al.* [8] address important considerations that include faculty training, resourcing, and morale. For example, in addition to time needed to deliver an online course, the time required for a faculty member to reach a comfortable online teaching level requires two or three teaching iterations of a particular course. Another challenge faculty members expressed in the virtual environment was practice and feedback. As class size increases, it's harder, if not impossible, for an instructor to provide quality feedback, especially for young learners. When the situation dictated ERT, the instructors were thrown into a situation where everyone is trying to do "their best":

> Faculty might feel like instructional MacGyvers, having to improvise quick solutions in less-than-ideal circumstances. No matter how clever a solution might be—and some very clever solutions are emerging—many instructors will understandably find this process stressful. [8]

In contrast, Aten and DiRenzo [1] point to instructor preparation as the crux in the virtual environment, supporting the notion that "instructors should be primed to express enthusiasm for the virtual learning environment and training for competence in using technology ... translated into greater engagement by students and ultimately better learning outcomes." Technology should serve to enhance the learning experience. Without proper preparation, the contrary is often true; technology will detract from the learning experience.

Overall, instructor wellness remains equally important as student wellness, and we needed to consider the risks of COVID-19 for the age group the instructors were from. Besides that, instructors balanced additional time to prepare a lesson with added family demands. Course leadership was aware of faculty burnout and the impact of additional unforeseen stresses. With little to no notice, a coverage plan could have been employed to give instructors needed time-off or time to address family matters. Our coverage plan proved successful in practice.

5. Brief Analysis and Application to MA205's 2020 Fall Term

After comparison of each teaching approach, we decided that a singular approach was not appropriate for teaching during these unprecedented times. Literature cautioned against comparing ERT (emergency remote teaching) and FTF (face-to-face) classroom instruction [8]. If a WC (web conferencing) teaching approach was the answer, USMA, and specifically MA205, needed to reflect and ask if we were *really ready* to deliver quality WC classes in an effective matter, or if this coming semester would just be *an extension* of last term's ERT. Did the HyFlex model have too many moving parts and would it be too hard for us to satisfy Bower's competencies in web-conferencing environments?

If FTF were to be the best approach, would instructors and students feel rushed to address all material needed for subsequent Science Technology Engineering Mathematics (STEM) courses? At the same time, would FTF teaching provide enough learning flexibility when students could not physically be in class for weeks at a time?

In the end, MA205 instructors took a simplified approach for students and instructors alike while maintaining aspects of the traditional classroom experience. To maximize in-class time, we needed students to read their textbook. watch videos, and subsequently try to do their assigned homework problems before class. During the 30-minute block, instructors encouraged discussion about the mathematical concepts they read/watched the night before and-with any remaining time,-solved an example problem or two. Supplemental videos provided in this Read-Watch-Do-Discuss format were meant to replace in-class instruction with online mathematical instructional videos covering lesson concepts. Instructors expected their students to execute self-learning and come to class prepared to ask questions about the lesson material.

The combination of the Read-Watch-Do-Discuss format and WC platforms meant students were always able to participate in class and seldom fell behind.

Instructors spent a considerable amount of energy boiling down their classes to 30 minutes. While many students appreciated the succinct classes and additional liberty to work autonomously, about half commented that it was not enough instruction or lecture time. We should acknowledge both that it is critical to keep staff, faculty, and students safe during the COVID-19 global pandemic, but also that it is important to continue to facilitate the FTF interaction between instructors and students in an intimate class setting that has played a critical role in accomplishing USMA's mission for over 200 years.

6. Defining Success

An audience of students will certainly define success in the classroom differently than an instructor, just as a strategic definition of success at an institutional level will differ from both. Given the chance to assess the effectiveness of each approach during the Fall 2020 semester, we focused on-performance based outcomes. Hodges *et al.* [8] best explain what unique criteria fit each stakeholder group; for the purpose of brevity, here we address student and teacher success.

> For students, issues such as interest, motivation, and engagement are directly connected to learner success and so would be possible evaluation foci. From the faculty point of view, student learning outcomes would be of primary interest. [8]

7. MA205's Measures of Effectiveness (MOEs)

In these unprecedented times, the course experienced a dynamic change from FTF classroom instruction to ERT in little over a week during the spring semester. Typically the "summer period affords [Departmental] and Course leadership more time and cognitive power to develop a deliberate approach to capture trends in student and instructor performance" [15]. The quick pivot resulted in a roller coaster ride of performance highs and lows which were skillfully quantified by Dr. Diana Thomas from the Department and her team

in their *Remote Teaching Distance Education Working Group (RTDEWG) Report* [15]. While the report covers a broad range of topics, capitalizing on learning/teaching feedback from students and faculty was imperative to our planning effort for the Fall 2020 semester.

It is important to note that the student population in MA205 consists of mainly second semester freshman and third semester sophomores who according to Nakayama, Yamamoto and Santiago [10], are likely to have immature learning strategies and lower self-efficacy. With this in mind, the MA205 course leadership made modifications to material delivery and performance feedback methods. Material delivery and performance feedback were top focus areas to monitor during the 2020 fall term. As mentioned before, our FTF model was limited to two 30-minute sessions so that half of the assigned class was physically interacting in class for 30 minutes per lesson before departing for the remaining 40 minutes of the allotted class period.

To ease the demand on the students, we provided students with a comprehensive course guide, explicitly directing students to read the text and watch the online video covering the lesson's learning objectives; we also gave them skeleton lesson notes to fill out on their own while preparing for each lesson. The intent was for students to take more responsibility as self-regulated learners while providing clear directions and expectations to optimize lesson preparation time (no more than one hour). During the 30 minutes of FTF class, students had the opportunity to ask questions and receive immediate feedback while working board problems. Immediate feedback sessions will reinforce learning objectives and identify concepts that may need additional review.

Based on feedback from the spring semester of ERT, the RTDEWG Report [15] suggested that students felt they had more time to prepare for class away from West Point. Students also mentioned they had more time to reflect on material. However, student feedback trended negatively to "instructors encourage students to be responsible for their own learning." In brief, when compared to USMA's time-constrained environment, students had more time to prepare and absorb class material. The report recommended that synchronous meetings should be deliberately designed to form authentic student engagement. Based on research and feedback, we concluded that the remote classroom environment had a negative impact on students' ability to learn, and, as a result, students mentioned their intellectual growth suffered.

8. MA205's Measures of Performance (MOPs)

To qualitatively measure course success, we solicited student and instructor feedback that focused on the effects of the shorter class period. To quantitatively assess course performance, we measured (1) student assessment scores (2) impact of student's daily (lesson) preparation note checks on assessment scores (3) impact daily (lesson) homework completion on assessment scores and (4) impact of repeated exposure to assessed material on final exam.

9. Results and Analysis

We set out to establish a "new normal" for MA205 amid uncertainty of the virus's impact to classroom environment and daily life at West Point. For the most part, we stuck to our plan. In response to a schedule change, the team compressed the 40-lesson schedule into 38 lessons, but the associated impact was minimal. With a collective effort to maintain non-pharmaceutical intervention discipline and 'clean-in clean-out' standards before and after each 30-minute block of instruction, students and instructors kept virus transmission out of the classroom. Fortunately, the model we planned to execute and executed in the beginning of this semester was the exact model with which we ended the semester. What a testament to coming together as a unit to rise to the challenge!

9.1. Qualitative Results and Analysis

Throughout the semester, USMA leadership implemented many COVID-19 testing and contact tracing procedures in an attempt to curb the viral spread. Web conferencing allowed instructors to virtually bring quarantined students into the classroom. While the virtual classes were not preferred by instructors or students, their use had a reasonable amount of efficacy and will likely have a lasting impact beyond the COVID-19 period. Allowing a virtual mode of instruction can allow instructors to teach from home on snow days and can be used by students who are on quarters or on athletic or academic trips. While we maintain that virtual classes are not as effective as in-person instruction, the occasional use of virtual instruction is a viable alternative to executing a coverage plan or having students miss class altogether.

Although it is easy to point out the negatives, it is refreshing to highlight the positive impact from this semester as well. Perhaps we found a silver

lining given the condensed classroom time and health restrictions which a few students highlighted in surveys or in passing conversations with instructors. Students were offered an undiluted serving of calculus without frills. When presented with the other options such as 100% remote, or a hybrid version, where half of the class would be remote, students preferred the model with 30 minutes in class. The 30-minute classes provided a self-reflection opportunity to focus on our core competencies of what we teach, how we deliver the material, and how we assess the students.

The most obvious feedback captured from students included their thoughts and opinions on the 30-minute sessions throughout the semester. To address this topic, middle- and end-of-course surveys asked for feedback. For example, a statement on the end-of-course survey solicited the following, "Describe a particularly UNHELPFUL classroom experience that you had this semester in this math course." Over half of the responses strongly addressed the shortened amount of in-class time. Almost equally as telling were the responses from the question in the end-of-course survey, "If you could change one aspect of MA205, what would it be and why would you make that change?" Again, students felt like 30 minutes was an insufficient amount of time to ask questions and work an example or two to grasp an understanding of the lesson's learning objectives.

Surprisingly, however, while students felt the 30 minutes was not enough, our quantitative analysis points out it may have been just right. Amid all the changes students and instructors had to endure during the Fall 2020 semester, the sentiment seems justified. But, anecdotally, the number of requests for additional office hours never seemed to increase. Perhaps ill-prepared students never lost too much ground when faced with half the classroom time.

Instructors also felt the impact of 30-minute blocks of instruction. On one hand, a new instructor spent more time lesson prepping for two reasons: learning the material and selecting appropriate problems to discuss during class. On another hand, based on feedback from previous semesters, a seasoned instructor spent most of the 30 minutes executing problem solving at the chalk boards instead of lecturing. Ironically, based on feedback after the Fall 2021 term, students wanted more lecturing and less opportunity to perform board problems during class. Three of the five instructors taught back-to-back 30 minute sessions, three times every 70 minutes for each lesson. The inter-30-minute period of six to ten minutes was devoted to cleaning and

resetting the classroom while the time between schedule periods was devoted to more cleaning and a small three minute "break" before the next period began. While manageable, the 30-minute rotation proved less desirable to instructors as well.

9.2. Quantitative Results and Analysis

To draw results from this atypical semester, course leadership compared results from only fall semesters. From our MOPs above, we accomplished consistency and fairness between semesters in several ways. While comparing averages is subjective and does not tell the whole story, each test included keeping one question relatively the same, our "benchmark question", from fall semester to fall semester with similar or exact grading rubrics. Next, we kept test difficulty levels consistent by using previous grading rubrics and the assessing the exact learning objectives year to year. Finally, the final exam questions were relatively similar, from one fall semester to fall semester, and scored using the same grading rubric.

Results comparing test and final exam performance this past term (Fall 2021) to previous terms highlight the cost of academics during this pandemic; see Figure 1. From fall 2019 to fall 2020, students' differentiation test scores decreased 6.75%. The average test score rose from fall 2020 to fall 2021 by 5.15%. A method of Lagrange multipliers question served as the benchmark question from semester of semester. From 2019 to 2020 a similar benchmark question increased 3.53%, and this past semester, 2021 students averaged a score of 4.63% higher on the exact same Lagrange multiplier question as 2020. We used the same comparison metrics to evaluate course and student performance after completion of the integration block of instruction. From fall 2019 to fall 2020, students' integration test scores decreased by 16.75% and fell again by 3.58% from 2020 to 2021.

A volume estimation question replaced the method of Lagrange multiplier as the integration block benchmark question. In the fall of 2020, students averaged a 7.59% lower than the volume estimation question compared to the year before. Most recently, on average, students scored 3.72% lower on the exact same volume estimation question from the previous fall term. In the moment, the drop in performance surprised leadership. But, after reflecting on the different ways the pandemic has affected life and academics in general, the most recent decrease is expected.

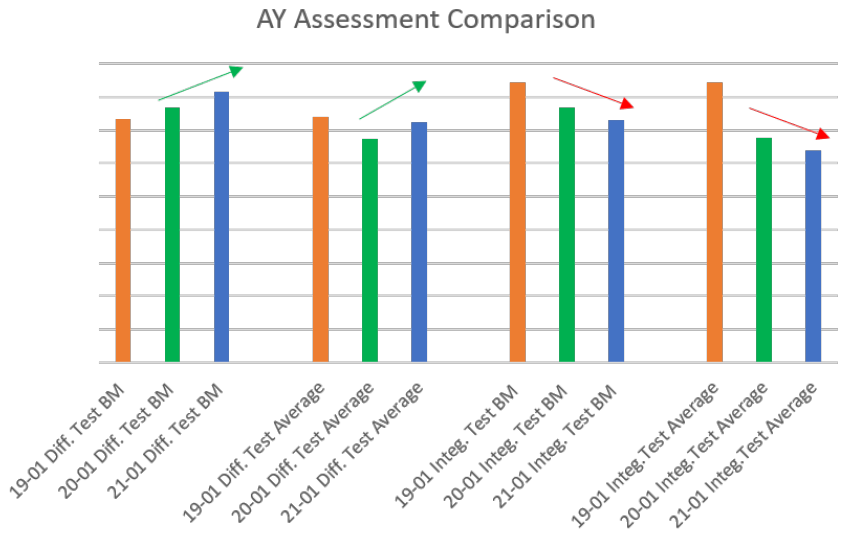

Figure 1: Comparison of test scores over a three academic year (AY) period.

We acknowledge that there are many possible reasons for the drop in performance; indeed we addressed many of these reasons throughout the paper. In short, we believe the overarching reason for the drop in performance is the product of a different learning environment and multiple COVID related distractions. The different learning environment and distractions began the previous spring, especially when COVID reached pandemic levels. Before the start of spring break in March 2020, MA205's single variable calculus prerequisite course, MA104, finished its differentiation block in a normal classroom setting. Students departed on spring break at the end of that week and spent the rest of the semester receiving instruction via remote modalities. Students received all but a couple integration lessons in an ERT environment. The timing of this chain of events may contribute to the overall performance in the differentiation block and the regression of integration performance assessed in the integration block in MA205. Similar performance trends occurred on the course final discussed later in the section, but based on this evidence, there is no dire cause for concern.

Students have undoubtedly spent more time preparing for MA205 in the fall of 2021 as compared to two years ago (see Figure 2), but assessing the effectiveness of the daily preparation assignments is difficult. Qualitatively, students generally provided feedback that they did not like the notes checks

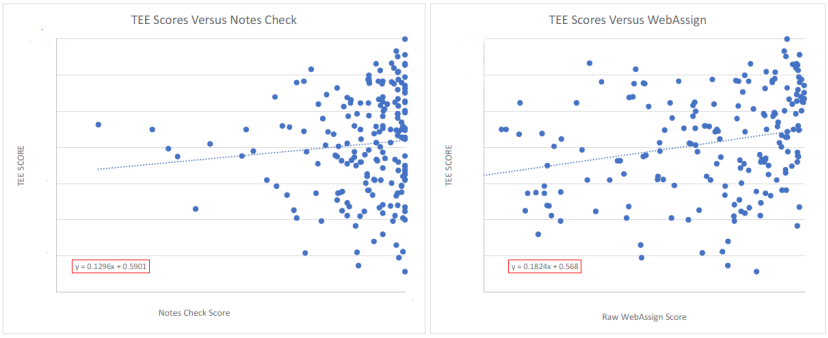

Figure 2: Comparison of final exam scores to note checks and WebAssign grades.

at the beginning of the semester, but once they got used to taking notes every night, it became more routine. Both graphs above compare final exam scores to lesson preparation, notes checks and homework, scores that MA205 uses as a proxy for student comprehension. The WebAssign homework scores are a better predictor of final scores, but we believe this is due to the fact that students can take notes without truly understanding the material, whereas homework forces students to show their understanding of the material. Websites that assist students on textbook homework assignments can be used as ways around this for homework, since assigned problems are from the textbook, but we have used a setting that alters the numbers in the problem for each student. At a minimum, students would need to look at the solution and determine how to modify each step for their particular problem, adding a layer that can lead to learning.

The most recent 2021 final exam was shortened to 2.5 hours in the last month of the fall semester so we took the two most time-consuming problems from the final exam and tested them on a separate assessment. This allowed us a consistent basis for comparison for evaluating student performance in terms of concepts and level of difficulty in order to gauge the students body of knowledge at course completion. Students scored an average of 3.5% lower on the final in 2021 compared to 2020 and 4% lower in 2020 compared to 2019. We believe this is a direct result of the restrictions placed on students and instructors during the COVID-19 period. Students generally scored lower on each question compared to previous years; see Figure 3. One alarming statistic is the number of students who failed the final exam. In 2021, 33% of the students failed the course final, and 9% failed the course (despite the fact that we had approximately 35 fewer students than Fall 2020).

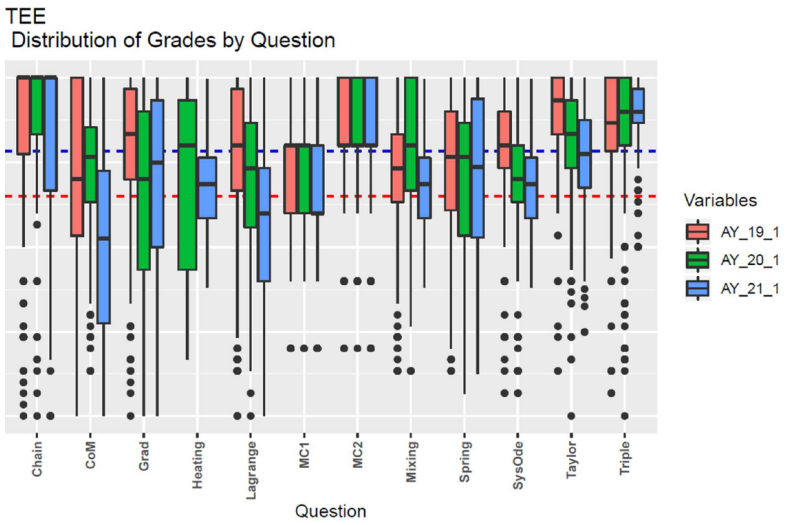

Figure 3: Comparison of final exam question scores the past three years.

Because of this, we will be teaching in classrooms that can accommodate full in-person classes for the spring term of 2021. Again this trend comes as no surprise; given all distractions and continual COVID adjustments, we expected to see a decrease in student performance. Conversely, imagine if performance increased. One can ponder the possible questions if students feedback and performance trended upward!

10. Final Thoughts

Looking back over the past ten months, we feel that we made the right decision to conduct a shortened class in-person. Though things admittedly got trying and even frustrating at times, we have no regrets trying something different to maximize student learning in the face of adversity and an ever-growing list of health precautions. As academia shares its experiences during the pandemic, we are confident that more situations will arise which support in-person over alternative teaching modalities, when possible. That is not to say alternative modalities should be discarded. There are countless useful applications of WC that may aid pedagogy for years to come; as we have witnessed, different teaching modalities inspired innovative teaching ideas never considered before the pandemic.

Although the amount of evidence from MA205 to support this claim is small, student performance in the spring semester of 2021 was on par with Fall 2020.

This trend may suggest that courses, at some point, need to teach/reteach basic concepts before layering new complex concepts and applications. This also may suggest that performance normalized to pre-pandemic levels is just around the corner. Until then, we'll continue to seek out ways to build the most supportive and productive academic environment for both our students and teachers alike.

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