

COVID-19 SEAS Education Task Force Report

University at Buffalo, School of Engineering and Applied Sciences

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Executive Summary

The COVID-19 SEAS Education Task Force was asked to

Develop and evaluate possible options for SEAS course delivery in the Fall 2020 semester; consider impact on academic continuity, retention, and degree completion; recommend best practices for SEAS departments for likely Fall 2020 scenarios.

University-level task forces focused on education were formed shortly after the SEAS initiative was launched. The SEAS task force closely followed developments at the university level in an effort to maximize consistency. This report was written at a time of considerable uncertainty regarding course delivery for the Fall 2020 semester. University-level decisions regarding the academic calendar, availability and prioritization of classroom space, expectations regarding student participation in scheduled in-person activities, and minimum technology requirements were pending. Moreover, the ability of individual faculty to control their level of in-person engagement with students and set the delivery mode for the classes they teach are unknown. Given these factors, the COVID-19 SEAS Education Task Force focused on the identification of general best practices in areas relevant to engineering and applied sciences coursework. The group recognized the need to formulate flexible strategies that faculty can modify to align with their teaching style and strengths.

Best practices were developed for (1) delivery of lecture courses, (2) administering multi-section courses, (3) design of lab-based courses, and (4) administering exams. The group also reflected on lessons learned from the transition to distance education at the midpoint of the Spring 2020 semester. Two models for delivering courses in a manner that accommodates remote, on-campus and in-class, and on-campus but not in-class learners are highlighted in the Delivery of Lecture Courses section. Three potential modes of organizing tasks and resources are discussed within the Multi-Section Courses section. Strategies for remotely delivering laboratory experiences and well as substitutions for traditional laboratory experiences are outlined within the Lab-Based Courses section. Considerations for designing and administering exams in a remote learning format are discussed within the Administering Exams section. The report concludes with a collection of initial lessons learned from the Spring 2020 semester, as informed by various surveys administered during the semester as well as end-of-semester course evaluations.

Delivery of Lecture Courses

Essential Elements

- The semester will start with 3 student cohorts: remote, on-campus and in-class, on-campus but not in-class
 - They should not be treated as if they are all remote (least-common denominator)
- At any time during the semester a rapid transition to fully remote must be possible
- The learning outcomes should not change from the pre-COVID learning outcomes
- To the greatest possible extent, the educational experience should be the same for all three cohorts

Best Practices

- Protect your ownership of original material
 - Include a copyright notice in/on each original item
 - At the time/point of distribution of each item
 - Declare the item to be copyrighted
 - Put a statement that the item may not be shared, published or redistributed in any form and by any means
 - Put a statement that students are allowed to make one copy for their personal use during the time that they are enrolled in the class
- Video conferencing software
 - If at all possible, use a single platform (Zoom, Webex or whatever) for all video interactions, throughout the semester, in the course
 - This includes in-class, office hours, TAs, etc.
- Office hours
 - Should be scheduled at different times on different days
 - If using conferencing software, a means for students to request a private meeting should be provided
- Assessment
 - If practical and possible, consider forms of assessment that are better suited than exams for hybrid course delivery
 - Homework, papers, presentations, projects, reports, reflections, portfolios
 - Written, submitted audio/video, interactive via conferencing software
 - Self-grading, peer-grading, TA-grading, instructor grading
- Group activities should be designed so group members do not need to meet physically
- Provide slides and/or notes that the instructor will use in-class prior to the scheduled class meeting time
 - Encourage students to use them to prepare for class and take notes directly on them during class

- Optionally provide redacted slides prior to the class meeting and complete slides after the class has met
 - Slides containing polls, quizzes, etc. can be redacted
 - Key information can be redacted from all slides with students encouraged to add it as it is presented in class

Models

Two customizable models (*vide infra*) for the class-time component of teaching the course are suggested:

- The Traditional Lecture Model requires little additional effort by the instructor beyond that required for a fully seated (pre-COVID-19) course
- The Interactive Lecture Model provides greater flexibility in terms of student-instructor interaction during the scheduled class time
- Other features of both models
 - can be used in cases where the instructor is not in the class because it would be a health risk
 - can be implemented with technology currently available in classrooms
- A listing of possible customizations and variations is provided below

Model Details

Customizable models for the class-time component of the course

Traditional Lecture Model. Prior to each class meeting, a Ublearns blog post is created for in-class questions. The instructor presents the lecture live to the in-person cohort in ~10 min segments. (If lecturing in the classroom poses a health risk, the instructor presents a live lecture that is streamed from their office or video studio to the classroom, again in ~10 min segments. An in-class teaching assistant sets up and operates the classroom end of this live stream.) During the live segment, students write any questions they have on the blog in real time. An in-class teaching assistant monitors the blog, and when the instructor pauses for questions, the in-class assistant reads the questions (or selected questions if there are too many) to the instructor who answers. The in-class teaching assistant types the instructor's response in the blog. This process is repeated for all lecture segments. The classroom session is captured as a video and also streamed live to the not in-person and remote cohorts so they have equal opportunity to post questions to the blog during the lecture. The captured classroom video is posted on Ublearns following the class meeting and remains available for the remainder of the semester. After class, the blog is updated so it provides answers for all questions. The blog then remains available for student reference (and for additional comments) for the remainder of the semester. If a rapid transition to fully remote delivery is required, the way the course is offered does not change; the on-campus cohorts are simply merged with the remote cohort.

Interactive Lecture Model. At least 2 days prior to each class meeting the instructor records their lecture as a video and posts it on Ublearns (where it remains available for the rest of the

semester). At the same time, a UBlerns blog post is created for in-class questions. All cohorts are instructed to view the video and post questions on the blog *prior to the scheduled class meeting time*.

If a traditional lecture-like format is desired, the remainder of the Interactive Lecture Model is identical to the Traditional Lecture Model except that the instructor plays back the pre-recorded video in ~10 min segments instead of delivering the lecture live. (Again, if being present with the in-person cohort poses a health risk, an in-class teaching assistant can operate the video. The instructor is live-streamed from their office or video studio for the purpose of answering questions.)

If increased instructor-student interaction is desired, the instructor may simply summarize the entire lecture briefly or fast-forward through the video in segments and increase the time devoted to answering questions. *If a flipped-classroom format is desired*, the instructor may simply summarize the entire lecture briefly, answer questions as before, and then initiate a learning activity live with the blog being used at regular intervals to interact with the students regarding the learning activity. In this case, depending on the nature of the learning activity, the blog might be replaced or supplemented by a Zoom-like meeting hosted by the in-class teaching assistant who can then relay questions to the instructor or set up side rooms where the instructor can interact with one or more students.

As in the Traditional Lecture Model, the classroom session is captured as a video at the time it is being streamed live to the not in-person and remote cohorts; the captured classroom video is posted and remains available for the remainder of the semester; the blog is updated after class so it provides answers for all questions and the blog remaining available for the remainder of the semester. If a rapid transition to fully remote delivery is required, the way the course is offered does not change; the on-campus cohorts are simply merged with the remote cohort.

Variations on the Models

- Depending upon the technology available in the classroom, the UBlerns blog could be replaced with some form of video conferencing. If this is done, the educational experience should still be as close to the same for all three cohorts as possible.
- If the instructor typically hand-writes most of their lecture, the Interactive Lecture Model can be used with the hand-writing pre-recorded. Modification of the model may be possible depending upon the nature of the technology available in the classroom. Use of video cameras, tablets that can be captured or electronic whiteboards are possibilities if the classroom technology supports their use.

Multi-Section Courses

Overview

The Task Force was asked to develop and evaluate possible options for course delivery in Fall 2020 and to recommend best practices for course delivery for a range of likely scenarios, from fully seated to fully online classes and including hybrid intermediate models. Multi-section courses were identified as a special case and this section addresses considerations that apply to that case.

Multiple sections of a class are set up for various reasons, including (1) course material is better presented in smaller sections than in a single large classroom, (2) multiple sections allow for different versions of a course to be presented (e.g., according to different expertise, presentation style, emphasis on individual topics of the instructor), and (3) logistics – sufficiently large classrooms may not be available, more scheduling options are available to students, etc. For non-required classes, where some variation between sections can be allowed, different sections can be considered more like individual courses. This would be the situation for upper division technical electives, for example. For required classes, however, there is a need to maintain uniform learning objectives and outcomes across sections. It is this latter case that is considered here.

Administering multi-section courses

The availability of multiple delivery options anticipated in the fall can work well for multi-section courses. Depending on policy and guidelines of the university, it may be possible to designate different sections for different modes of delivery, spanning the entire range from fully seated to fully online. Different sections could be taught using different delivery modes, with consideration of individual faculty skills and strengths, and preference, including health issues. Some administrative oversight may be useful to ensure (if possible, depending on faculty) that a variety of options might be available to students. For example, if different modes are allowed (i.e., we are not fully online), it would be preferable if students could be presented with a variety of options. A means would have to be developed to make information on delivery method for different sections available to students, who may register for a particular section on the basis of their preferred delivery mode.

Independent of type of delivery mode at the beginning of the semester, considerations for transitioning to fully online would have to be built in to the teaching plan, as described previously. The transition plan does not have to be modified for multi-section courses, as each instructor would adapt to fully online mode depending on the initial mode chosen for that section.

There are inherent efficiencies possible with multi-section courses, although care must be taken to insure to a reasonable degree a consistent workload among faculty teaching the different sections. The degree to which any framework can work with multiple instructors also depends

on the personalities of faculty involved, as some faculty are more comfortable than others with sharing and collaborating.

Possible modes of organization include the following:

- Each instructor presents and administers her/his section of the course more or less according to personal preference, while maintaining consistency with overall course objectives.
 - Each individual would choose the delivery mode and manage all aspects of course administration for that section. This is similar to common current practice, with the additional variable of online vs seated options.
 - This approach provides individual instructors flexibility and reduces the need to coordinate with other instructors of the course, which is the case in other options below.
 - The delivery mode initially chosen would determine the nature of transition actions needed if the university were to move to fully online during the semester.

- Faculty efforts are specialized and course workload tasks are distributed according to relative interest, skill set, or other. For example, one instructor could be designated to develop a common set of recorded lectures for all sections, which would be available for all sections.
 - The recordings would be available at given class times, and other faculty would conduct recitations or follow-up question-and-answer periods with their sections. These follow-up meetings could be conducted in a fully seated, fully online, or hybrid setup, according to faculty preference.
 - Other faculty would be responsible for all other aspects of the course, for all sections, including recitations, holding office hours (online or remote), developing and grading homework assignments, projects, exams, etc.
 - This arrangement may lead to an inequitable faculty workload distribution, as the time to develop and record lectures is likely much greater than the time for other aspects of the course. One way to mitigate potential inequities would be to involve all faculty in contributing to the development of material to be included in the recordings.
 - This approach also eliminates direct interaction between the lecturer, whose only presences would be on video, from the class, although feedback could be provided by other instructors.
 - Significant coordination would be required among instructors, who will need to watch the video prior to presentation to the class, and who would be developing assessment tools on the basis of those videos.
 - Such coordination may be an advantage, in terms of ensuring a common set of course learning outcomes.

- An alternative way of distributing teaching tasks would be to divide the course content into a series of modules, and teaching tasks would rotate among instructors for each module.
 - For each module, instructional tasks would be distributed differently among the instructors. For example, each instructor would have responsibility for developing video recordings for one of the modules.
 - This arrangement may be cumbersome and introduce additional work for instructors, as they would have to adjust to different modes of operation several times during the semester; it also may be distracting for students, who would have to adjust their sense of interaction with faculty several times.
 - On the other hand, the diversity this approach provides may be beneficial in the overall learning experience, and it has the additional benefit of better distributing the work load for instructors, assuming modules can be defined appropriately. In many ways, this option would “look” like a single team-taught course.
- Designate different sections with different delivery modes.
 - To take full advantage of this approach, there should ideally be at least one section of each type, fully seated, fully online, and hybrid, assuming all options are allowed.
 - The main advantage of this approach is to provide a full array of options for both instructors and students. Students should be aware of delivery mode for each section when they are registering.
 - Transition to fully online, if needed, would apply differently to each of these sections, and would follow appropriate guidelines listed in other sections of this report.
 - Given experience from Spring 2020, care must be taken to ensure expectations of student work load are consistent across different sections (i.e., many students felt there was a greater workload with online delivery). This constraint could add to other issues involved in maintaining consistency across different sections.
 - From a chair’s perspective, different sections may need different levels of TA or SA support, even if the number of students is similar.

Other considerations

The ideal solution is likely to depend on the specific faculty involved in teaching a particular course. Chairs and/or the Associate Dean for Undergraduate Education will be available to assist individual teams with any issues relating to the implementation of their particular course. Collaboratory decision making should be encouraged, in terms of deciding which approach will be taken for the multi-section course, and in distributing the workload in an efficient and equitable manner.

Lab-Based Courses

Overview: The Spectrum of Lab Experiences

The widely varying disciplinary needs of the different departments within SEAS make identification of a single strategy for management of lab-based classes challenging, if not impossible. In recommending a set of best practices for lab-based classes across SEAS, we have nonetheless identified a broad set of scenarios that these classes can involve:

- Access to centrally managed computer labs on which specialized software is hosted. These projects are typically assigned to either individual students, or to small groups that work together collaboratively.
- “Tinkering”, based on the use of inexpensive kits, purchased separately (often from third parties) by individual students/student groups. Many of these projects would traditionally, in a pre-COVID scenario, involve intense interactions among team members within individual groups.
- On-campus labs offering students unique experiences, which can only be realized/completed through their physical presence at some specific campus location. Just two examples involve chemistry-based labs that require access to fume hoods and toxic chemicals, and electrical labs that rely upon access to dedicated, high-voltage equipment. While meeting traditional (pre-COVID) EH&S constraints, many of these labs may not be well adapted to current social-distancing norms.

Constraints

As we plan for lab-based offerings for the fall, we need to recognize that:

- We are likely to be operating in a highly unstable environment, in which local, regional, or global health considerations may require us (see below) to undertake rapid transitions in our operating model (much as was the case for the past spring semester).
- Even in the most optimistic of projections, it is highly unlikely that we will be operating under “standard” conditions in the fall. Rather, it is likely that strict social-distancing standards will need to be met in order to ensure student, faculty and staff safety.
- We should encourage students to work remotely as much as is reasonably possible, even under conditions in which the university remains open and subject to normal (or near-normal) operation.
- We should anticipate that members of each of our constituent groups (students, faculty and staff) are likely to express unease at being forced into activities involving significant social engagement.
- Any revised lab-based class should continue to conform to ABET standards.

Transitioning Between Models

Unfortunately, in the foreseeable future, it would seem that the only certainty for which we can prepare is continued uncertainty in the face of the ongoing spread of the novel coronavirus. Consequently, design of lab classes for fall should reflect the possibility we may be required, at any particular point in time, to move between different modes of delivery. In the one scenario

that is possibly most widely envisaged, for example, instruction for fall may begin with a significant on-campus presence, only to be required to move to fully remote delivery at some later date in the semester. An alternative scenario is one in which the semester initially begins with fully remote educational delivery, before a return to campus becomes permitted as the local/regional health situation improves. It must be emphasized, however, that these are just two potential scenarios, and that we may equally face some more challenging circumstances, which require us to revert back and forth between these two extremes. Given this uncertainty, which does not seem likely to abate by the fall, it seems clear that planning for lab courses should build in maximum flexibility from the outset, allowing instruction to continue uninterrupted throughout the semester. With these considerations in mind, in what follows we seek to identify some best practices for the delivery of lab-based classes.

Some Suggested Practices

- Where possible, design your course from the perspective of remote delivery.
 - If required, this should enable you to move smoothly to this mode while guaranteeing uninterrupted delivery.
 - Bear in mind that any restructuring of the course should maintain ABET standards (establish “*an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions*”).
- For computer labs, notify Jason Lasker (lasker@buffalo.edu) of SENS, as soon as possible, of any specialized software needs.
 - Explore the possibility of providing students with remote access to this software/lab, if called for by a sudden closure of the University facilities.
 - When remote access cannot be provided, can assignments be redesigned without too much difficulty, to utilize different (ideally cost-free) software?
- Where possible, consider implementing lab assignments using third-party kits or modules that can be purchased by students to enable them to work remotely.
 - This will not be feasible for all disciplines.
 - Should be done in a manner that limits the financial burden on our students.
 - Added benefit can be derived if these kits can be utilized across multiple courses.
- In cases where access to specific labs on campus is absolutely required, strategies must be put in place to ensure proper social distancing is met.
 - Consider staggering lab sessions, allowing labs to be operated at only partial occupancy.
 - Arrangements should be made to ensure thorough cleaning of the lab space between sessions, and students should be required to make use of university-supplied personal protective equipment when working in any communal space.
- Encourage students working in small groups to implement a division of labor that allows specific tasks to be undertaken by individuals, without the need for extensive multi-person interaction.
 - Such interactions should instead be encouraged via remote means, such as Zoom or WebEx.
 - Consider asking student groups to submit recordings of their team meetings, and allocating a specific portion of class credit for this activity.

- In certain cases, where access to specific large-scale items of equipment is absolutely required for lab assignments, the workarounds outlined above will simply be insufficient.
 - o You might consider moving the impacted course to spring 2021? When exploring such an option, attention should be paid to any possible impact of the move on post-requisite courses that rely upon existing course scheduling.
 - o Can the lab course be designed with a mix of on-campus and remote assignments, providing scheduling flexibility during the semester? This would allow labs to be assigned “dynamically” during the semester, as greater clarity emerges with regards to the status of the pandemic.
- Where postponement of courses is not possible, and social-distancing requirements cannot be met, consider asking students to design experiments that might be verified/implemented independently by a TA. Students could then be invited to reflect on the reasons for success/failure of their designs. Consider, even, capturing the actions of the TA on video as he/she completes the various steps in this process.
 - o This approach was used in the spring 2020 semester, for example, to allow students to complete required design work in the EE cleanroom class.
 - o Due to the potential demands on TA time, this approach is likely not suitable for large classes but may work for ones involving a small number of limited-size teams.
 - o Another option is to provide students with experimental data or output that they can then analyze.
- Consideration should be given to accommodating remote students in different time zones, with clear communication on scheduling provided.

Administering Exams

Overview

Exams are a commonly-used instrument to assess the extent to which students have attained the learning outcomes associated with a course. Administering exams in a distance learning format presents a number of challenges. In what follows below, we highlight established best practices for assessing students within an online framework, discuss proctoring of traditional engineering and applied sciences exams from a distance, and note some of the related tools supported by the University at Buffalo. Finally, a detailed list of online resources is provided.

Best Practices

Inspired by [Fourteen Simple Strategies to Reduce Cheating on Online Examinations](#) and [Exams and quizzes when teaching remotely](#).

- Change the nature of the assessment: Consider if you can assess attainment of the learning outcomes for a course via other means. In some cases, a project or series of short quizzes can be just as effective as a high-stakes exam.
- Focus on assessments that require higher order thinking: Develop open-ended, complex questions that prioritize the thinking you want students to do. For traditional partial-credit technical problems, require students to provide a rationale for the approach they employed to solve the problem, i.e., something more than just numbers and formulas. Develop questions that are not easy to search for online.
- Reduce stress and anxiety: Decrease reliance on high stakes exams by using multiple assessments with lower weights instead of one or two high stakes exams.
- Clear instructions before/during exam: Clearly articulate your expectations regarding how students will access/upload an exam, the materials they can use during an exam, and how to seek help/clarifications during an exam, should they be needed.
- Integrity pledge: Consider asking students to certify before and/or after an exam that they will/have complete/completed the exam in a manner consistent with the academic integrity policies of the class. Faculty might also consider asking students to sign a document at the beginning of the semester attesting that they understand academic integrity policies associated with the class.
- Integrity discussions: Convey to students why academic integrity is important to you, to the class, and to the profession. Consider reminding them of the [SEAS Code of Professional Conduct](#).
- Set time limit: Limit the exam time to what is needed for students to download exam materials, address questions at a reasonable pace, and upload responses. Additional time provides unprepared students the opportunity to search for answers.
- Question banks: Consider creating banks of equivalent questions. A simple approach is to modify the data associated with a given problem.
- Question sequence: Consider randomizing the order with which students are required to respond to questions.

- Prohibit backtracking: Require students to address one question at a time, so as to reduce the time students have to search for the answers to questions.
- Proctoring exams: Faculty at multiple universities have reported success using Zoom to proctor traditional pencil-and-paper engineering and applied sciences exams (see descriptions from [NYU](#), [Penn State](#), [Texas A&M](#), the [University of Iowa](#), and [email from the UB Office of Academic Integrity](#)). We encourage faculty to consider this option.

Proctoring Exams

Administering traditional engineering and applied sciences exams within a distance learning format represents a significant challenge. A key concern is maintaining academic integrity. Multiple tools have been introduced to proctor exams in an online format (see below). Given the resources currently supported by UB, perhaps the simplest and most effective strategy is to use Zoom as a proctoring tool. This approach was highlighted in an [email communication from the UB Office of Academic Integrity](#). The NYU Tandon School of Engineering has also developed a [nice description of this approach](#). In short, students open Zoom on either their computer or smartphone and arrange the video to show their workspace. Faculty and/or TAs then monitor the Zoom session during the exam. The gallery view option provides a convenient means to monitor multiple students at one time. The session can also be recorded for later analysis. For traditional hand-written exams, students scan their solutions using an app like Adobe Scan and upload the resulting pdf document(s) to UBlerns.

There are some limitations to be aware of. First, the gallery view in Zoom is restricted to 49 participants. Therefore, we recommend dividing the class into a series of smaller groups, with each group assigned a specific Zoom meeting ID and monitored by a different faculty/TA. Second, the virtual background option in Zoom masks the testing environment. Faculty should therefore require students to deactivate this feature. Third, some students may not feel comfortable being recorded in their home environment. Finally, internet disruptions are likely to occur for a subset of students. Faculty should consider and articulate to students a plan for how they will handle both short- and long-term internet disruptions. Students should also be encouraged to consider how best to obtain reliable access during exams.

Lessons Learned from Spring 2020

- For a variety of reasons (limitations accessing technology, internet disruptions, students located across the globe), accommodations should be provided for reasonable requests for make-up exams. Therefore, we recommend that faculty enter the exam design process with the expectation that they will need to offer a standard and make-up exam.
 - For proof, you might ask the student to provide a time-stamped screenshot of “speed test” showing no internet connectivity
- Unfortunately, we received multiple reports of students engaging in academically dishonest behavior, particularly during exams. One of the primary mechanisms was for students to post exam problems to Chegg, wherein they were quickly solved by “experts”, and the solutions were made available to students in near real time. As a result, we recommend that faculty or their TA check to see if exam problems from their

class are posted and solved on Chegg. If solutions are found, please consult with the UB Office of Academic Integrity. This office can work with Chegg to obtain a list of people who accessed the solutions. The SEAS Office of Undergraduate Education can help map personal email addresses to UB students.

Recommendations for UB

- The strategies recommended above require students to have (1) a laptop and webcam and (2) reliable access to the internet. To that end, we recommend that UB mandate the [UB Student Computer Standards](#) for the 2020-21 academic year. Alternatively, students must be provided the opportunity to borrow such equipment from UB. We also recommend clearly articulating an expectation that students are able to regularly obtain reliable access to the internet.

Tools Available at UB

- [SafeAssign](#) provides a means to check for plagiarism and student-to-student copying within a class. Integrated into UBlearns.
- [Respondus Lockdown Browser](#) is a custom browser that locks down the testing environment in UB Learns. When students use LockDown Browser to take a test, they are unable to print, copy, go to other websites, access other applications or close a test until it is submitted for grading.
- [Respondus Monitor](#) uses video analytics and a student's webcam to deter cheating during non-proctored exams.
- [TopHat](#) is a web-based software tool teachers can use to take attendance, administer polls and quizzes, play games and share notes.

Other Tools not Supported by UB

- [Gradescope](#) helps faculty seamlessly administer and grade assessments, whether online or in-class. Used by the UB Mathematics Department.
- [Examity](#) is a proctoring service for online exams.
- [ProctorU](#) is a proctoring service for online exams.
- [SmarterProctoring](#) is a proctoring service for online exams.

References

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 - Designing for Integrity Online, <https://academicintegrity.buffalo.edu/files/designingForIntegrity.pdf>
- UB Center for Educational Innovation

- Assess student learning, https://www.buffalo.edu/ubcei/teachingbeyond/build.html#title_1638433793
- NYU
 - Remote Assessment Methods and Practices, <https://www.nyu.edu/faculty/teaching-and-learning-resources/remote-instruction-support/remote-assessment-methods-and-practices.html>
 - Guidance for Tandon Faculty and Assessment Options for Exams, Projects, and Research Papers, <https://docs.google.com/document/d/1DRlwJxE5MGNxL3mXyXad8FyTob7hhnV6DsXftxixLzU/edit#heading=h.9hgnzgu84lqs>
- Iowa State University, Engineering Online
 - Best Practices for Faculty, <https://www.elo.iastate.edu/best-practices-for-faculty/>
- UPenn
 - Exams and quizzes when teaching remotely, <https://wwwctl.upenn.edu/exams-and-quizzes-when-teaching-remotely>
- George Washington University
 - Guidelines to Reduce the Risk of Cheating in Online Examinations, https://smhs.gwu.edu/impact/sites/impact/files/Firmani_OCEPs.pdf
- Rice University
 - Guide to Administering Final Exams Online, <https://oit.rice.edu/sites/g/files/bxs1571/f/Guide%20to%20Administering%20Final%20Exams%20Online.pdf>
- Carnegie Mellon University
 - Administering Exams Online, <https://www.cmu.edu/teaching/online/exams.html>
- Faculty Focus
 - Fourteen Simple Strategies to Reduce Cheating on Online Examinations, <https://www.facultyfocus.com/articles/educational-assessment/fourteen-simple-strategies-to-reduce-cheating-on-online-examinations/>
- University of Washington
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 - Proctoring with Zoom, https://docs.google.com/document/d/e/2PACX-1vTFbGFRu15EPcEoJf8flhWu2zk8qxWUZy6ROLMVbcBLTBi_mQOGsVtyZj8hi0hIWw/pub
- Texas A&M
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<https://www.chronicle.com/article/What-Do-Final-Exams-Mean/248644?cid=wcontentlist>
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https://docs.google.com/document/d/1oM6hviX9B8JrU1jjBAEaLaR3Vvd_EyHUH8dJtLHQeqM/edit#heading=h.yaosxob5a0br
 - Open Book Exams, https://www.youtube.com/watch?v=K-Mm8Y_j0Yg

Initial Lessons Learned

In response to the transition to remote instruction, the Office of Educational Effectiveness (OEE) administered a survey to both faculty and students after the first and third week of online instruction. (Week 1 and Week 3). The questions were designed to understand areas of need. Survey results and tip sheets, which provide overall findings, can be found on the [OEE website](#). Students also completed the end of semester courses evaluations, with questions modified to focus on course delivery. While it will take time to analyze all the course evaluation results, initial findings from the surveys are summarized below.

- Comfort with online instruction: Professional and graduate students adjusted significantly better to online instruction than undergraduate students. The comfort level of graduate students increased slightly further from Week 1 to Week 3, while the comfort level of undergraduate students actually decreased. Being very clear with your expectations and consistent with your approach will help undergraduate students adjust to online learning. URM students tended to have the lowest levels of comfort and confidence that they would succeed in their courses.
- Workload: More than half of the students surveyed reported they were studying more. In general, students felt that everything took longer: lectures took more time to review, assignments took longer to complete. Consequently, faculty should be cognizant of the additional time required to learn the course material when designing course assessments.
- Creating Community: More than anything, students missed the social interactions on campus. Creating intentional opportunities for students to interact with each other can reduce feelings of isolation, keep students more engaged, and make them feel part of a learning community.
- Motivation: Towards the end of the semester, students reported reduced motivation. Some faculty removed lecture content from UBlerns soon after posting in an effort to force students to keep up with the course material. This approach was problematic for many students who needed greater flexibility. An alternative approach is to incentivize students to keep up with the course material by assigning a short quiz based upon the lecture content. This approach has the added advantage of allowing you to learn how much your students actually understood.
- Communication: Without direct contact between students and faculty, good, consistent communication is key. Be explicit about how you want the students to interact with you, then reinforce these guidelines by responding in a timely manner. To reduce the number of individual emails, many faculty used the UBlerns Discussion Board or Piazza to monitor and respond to student questions. One faculty member reported recording short videos to answer common questions. These were posted on UBlerns and were much appreciated by the students.

Another best practice is to record a video at the beginning of the week to provide an overview of what will be covered, what will be assigned and when it is due. Students also

suggested making better use of the Ublearns calendar so that all their assignments could be viewed in one place.

- Lecture Delivery: In the course evaluations, students rated highly both courses that were mostly asynchronous and those that were synchronous. While personal preference and circumstance play a part in which method works best for an individual student, what appeared to be more important was the course organization and interactions between faculty and students. Another common characteristic highly rated by students was the availability of well-prepared class notes ahead of the lecture.

For synchronous instruction, students particularly liked the live chat feature of zoom and other platforms, especially if the chat was monitored by a TA to provide immediate feedback for questions a student would feel uncomfortable asking in a live class setting. More widespread use of zoom breakout rooms for group discussion was also suggested.

- Exams: High stakes exams can cause additional stress for students who do not have a quiet study space or for those worried about their internet connection, etc. As recommended in the earlier section on administering exams, one solution is to use several smaller tests. Alternatively, assignments such as papers, presentations, projects, reports, reflections, portfolios can be used.

When scheduling exams, be mindful of students in different time zones. For example, if you schedule an exam from 7 pm to 10 pm, students in Greece, Turkey, and some parts of the Middle East would have to take the exam from 2 am to 5 am. Perhaps to provide needed flexibility, a number of faculty assigned lengthy 24 hour take-home exams this Spring in place of the shorter, more traditional, 2-to-3 hour exam. While certainly fairer for students, regardless of time zone, these lengthy assessments can interfere with the students' ability to keep up with work in other courses unless carefully planned and coordinated.

- Use of technology: Both faculty and students noted the difficulty of learning/keeping up with so many different platforms, especially for undergraduate students who are taking 15 to 18 credits per semester. Faculty should certainly minimize the different technology used within a given class, making consistent use of a fixed platform throughout the semester. Ideally, it would be preferable to identify preferred technology for a given department, or a given set of classes. This may not be viable, however, given the short timeline leading into the fall semester.
- Virtual labs: Depending on the nature of the lab, some faculty were able to pivot to use simulation software, while others recorded themselves, or their TAs, conducting the experiment. When recording experiments, videos showing the entire lab set up, providing detailed explanations of the process, and incorporating several takes to highlight all the measurements being taken were the most highly rated by students. Students reported that in general this gave them with a good understanding of the lab before completing the analysis and evaluation on data provided by the instructor.

- Flexibility: Given the circumstances caused by the COVID-19 pandemic this semester, flexibility was also key. Students appreciated faculty who took a caring, empathetic approach, while still setting clear expectations.