Recommendations for Teaching in a remote/on-Campus Environment

The CAS Class Guidance Documents for Fall 2020 were produced by CU Boulder faculty in June 2020 with the intent of providing recommendations, ideas, and observations about teaching in a remote on-campus environment. Three committees drawn from all divisions in the College of Arts & Sciences were asked to provide ideas and recommendations in four areas: Lab Classes, Field Classes, Large Lecture Classes, and Remote/Online Teaching. While there is no lack for information in all of these areas, this is an attempt to aggregate information collectively authored by the rank and file faculty who are currently teaching at CU.

Guiding Principles of These Documents:

1. The teaching documents do not serve the same purpose as the implementation guidance issued by Campus committees. Instead, these documents simply provide faculty and departments with ideas and recommendations regarding how they might address the challenges associated with teaching at a University during a pandemic. The recommendations and ideas are nothing more than suggestions on how to meet the criteria and constraints set forth by the Campus Administration.
2. Faculty, staff, and student safety is paramount. The recommendations offered assume that safe conditions have been established by the Campus. These documents are agnostic about Campus policy designed to offer an 'in-class' experience in the Fall 2020. They do, however, reiterate the importance of assigning teaching responsibilities equitably especially in light of the extra contractual pressures faced by instructors, lecturers, and graduate students.
3. The students coming to campus for the first time or those returning currently experience a world with many unknowns and tremendous upheaval. As faculty, we should embrace those concerns openly. Open discussion in any format is an important tool we can use to both help our students learn and chart a path forward once they leave the hallways and Zoom channels of CU.

Goals for the Committee on Large Classes

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The following sections on teaching large classes are designed to provide departments and faculty a list of best practices for designing large lecture classes and their recitation sections for Fall 2020 and beyond. The section on large classes is organized by the components of a class: **lecture**, **assessment**, **attendance**, **recitation sections**, and **on-line activities**. Each component includes a list of guiding principles, a list of recommendations, and in some cases a section on what went right and wrong during the Spring 2020 semester. Organized this way we hope to allow a very diverse set of departments and instructors to mix and match practices they find most helpful and appropriate for their class. We also hope that some of our guidance will benefit those teaching smaller classes as well. Below are the over-arching goals of this exercise.

1. **Enhance the safety of students and faculty** as the campus adapts to public health risks and to new constraints on its teaching mission. Any advice in this document or recommendations come with the caveat that the safety and wellbeing of members of our community are the top priority.

2. **Offer pedagogically sound advice to prepare large class instruction for Fall 2020 and beyond.** The ideas articulated below are not only meant to help for the special circumstances in the Fall because of the pandemic, but also are meant to carry forward well after AY 20-21.

3. **Provide concrete tools for assessing students in a remote learning environment on campus.** Many units have already spent over a decade perfecting on-line exams that adhere to pedagogical best practices. Their guidance is included here.

4. **Communicate the benefits of remote on-campus learning.** The authors offer these ideas not in the spirit of finding second-best substitutes to in-person instruction but as ideas to enhance all teaching in any modality.

5. **Offers suggestions for making the large impersonal class personal.** The present circumstances provide an opportunity to learn about new ways of using available technologies and new strategies for enhancing students' experience in a large lecture. The remote format will require extra effort to create forms of community in an otherwise potentially impersonal setting. The goal will be to integrate aspects of the 'college experience' with the large class taught remotely on campus.

6. **Identify key resources to support course design and technology needs.** Make faculty aware of the existing support resources for teaching online and for syllabus design. The staff of ASSETT offer a wealth of expertise for helping people

understand how most effectively to use technology to enhance teaching. The Center for Teaching and Learning is also a valuable resource, as is the Office of Information Technology, especially for working with Canvas.

Lectures

All lectures for large classes in the fall of 2020 will be given remotely or online. A simultaneous in-person component for a subset of students with rotating attendance may be possible, depending on the size of the room and class enrollment. It is possible that many faculty members will be in a position of teaching in a mode they have never considered adopting or which they have actively resisted. Designing classes online imposes unexpected constraints on many, though the available technologies for teaching online create new opportunities for developing pedagogically effective courses. This section identifies some key principles and practical suggestions to help faculty members adapt to our new reality.

PRIMARY RECOMMENDATIONS:

As we've learned from last semester's experience, in most instances it is not possible simply to move material online and maintain strong student engagement. The mandate for all large lectures to be online will require some redesign of your course.

- Especially important for asynchronous material, identify and reinforce course learning objectives prominently and frequently.
- Be cognizant of the diverse circumstances of remote students. More than the usual flexibility in assignments, deadlines, may be appropriate.
- Build into your lectures strong incentives for timely participation. Lecture participation credit should have a time limit (24 or 48 hours) to discourage student procrastination.
- Lectures should be as interactive as possible with activities like clicker questions (iClicker Cloud), discussion prompts drawing on the lecture, or short tutorials to engage students. Such activities will break the main lecture into smaller, more digestible chunks.
- Redundancy is important. Provide access to the same material in a number of different forms (lectures, documents, screencasts, discussions, etc.).
- Be attentive to student physical and emotional health. Non-attendance may be related to challenges they are facing because of the global pandemic. Do not hesitate to draw on the resources of the Students Support and Case Management (SSCM) team or of Counseling and Psychiatric Services (CAPS).

- Provide multiple pathways in the course for students to succeed. Recognize that our students all learn differently. Toward that end, design exams, lectures, examples, and assignments accordingly.

FORMATS

There is no one model for online education that will work for all disciplines and all faculty. In most general terms, there are two primary options for moving a large lecture course online, each of which can incorporate a variety of additional activities. Here are pros and cons for each mode:

ASYNCHRONOUS (WITH LECTURES POSTED ONLINE AHEAD OF TIME):

Pros:

- Students like the flexibility and convenience of viewing lectures as their schedule permits.
- Much more robust technically, not as reliant on a high-quality internet connection.
- Works for any size lecture.
- Several production modes possible (smart classrooms, home webcams, voice-over narrated ppt, any production software).
- Clicker questions easily embedded with PlayPosit software, which is integrated into Canvas grades, supported by OIT.
- All students have the same experience, so there can be a single Canvas procedure for tracking participation credit.
- Only single recording session needed for large multiple-lecture-section courses.

Cons:

- More time-consuming for faculty to produce.
- Less engaging than remote lecture, no possibility of real-time question/answer, very unlikely that students will collaborate with each other during lecture.
- Attempts by faculty during Spring 2020 to provide parallel, optional Q/A zoom sessions were unsuccessful. Students largely ignore optional activities.

SYNCHRONOUS (LECTURES IN REAL TIME):

Pros:

- Intrinsically more engaging, compared to online. Real-time Q/A possible, though awkward compared to in-person classes.
- Many students appreciate the strict, predictable schedule.

- Clicker question responses can be collected through iClicker REEF (free, integrated into Canvas grades).
- Less time-consuming to produce, compared to online. Workflow is similar to in-person classes. Strict schedule simplifies the professor's life.

Cons:

- More technically fragile. Reliant on Internet of both professor and students. Does not scale well beyond about 100 students. Fewer options for production (Zoom or nothing).
- Requires support staff such as TAs to monitor/answer questions, support discussion during live session.
- Multiple recording sessions needed if class has multiple-lecture sections.
- Session must be recorded for students who are unable/unwilling to watch live. Dual format (remote for some students, online for others) complicates collection and grade-keeping of clicker points.
- Widespread student dissatisfaction with this mode during Spring 2020.

RESOURCES AND ADVICE:

- Reach out to people in your department, in cognate departments, and across campus, who have experience teaching online and who can assist with the redesign process.
- Draw on available expertise and resources:
    - Arts and Sciences Support of Education Through Technology (ASSETT) offers (virtual) in-person consultation on course design and information about universal design principles. They also have developed a set of Resources for Preparing Remote Instruction.
    - The Office of Information Technology (OIT) also provides extensive support for Canvas. In addition, they offer Academic Technology Resources for Teaching Continuity
    - Center for Teaching and Learning https://www.colorado.edu/center/teaching-learning/
    - OIT supported technologies: https://oit.colorado.edu/services/teaching-learning-applications
- OIT information about accessibility: https://www.colorado.edu/accessible-technology
- Enroll in a MOOC or watch several online lectures to learn about what works and what doesn't, about things you like and don't like about the online environment. Becoming an online student will help you better understand the challenges of teaching online.
- Start the planning process for Fall 2020 as soon as you possibly can.

Assessment

Principles of Assessment

- Set expectations for assessments the first day of class and in the course syllabus.
- Design assessments that build trust between faculty and students and between students. Toward that end, provide clear and detailed rubrics and use them consistently in assessing work (especially with research papers and projects).
- Tie assessment directly to the learning goals of the course.
- Assessments are opportunities for students to demonstrate connections between what they have been learning and the real world.
- Exams should be of a uniform format throughout the semester.
- Provide a practice assignment in the same format (platform, timed, etc.) in preparation for the actual assignments.

Exams

1. General Comments
   - Make requirements and expectations clear. Plainly state what students are allowed to access and not allowed to access while taking the assessment.
   - Write questions that assess the students' ability to apply concepts rather than simply recall or Google search facts.

2. Open vs Closed-note Exams

   Open-note Exams

   Pros:
   - Easier to enforce
   - Partially relieves temptation to use unauthorized materials

   Cons:
   - Not appropriate for all courses
   - Questions can be more difficult to create
   - Questions might be more difficult for the students

   Closed-note Exams

   Pros:
   - Encourages students to prepare for the exam
   - Exams are generally easier to prepare

Cons:

- Greater temptation to use unauthorized materials

3. Timed vs Untimed Exams

Timed

Pros:

- Proctoring services are available (Proctorio, Zoom sessions)
- Simplifies student schedules
- Faculty help available during exams

Cons:

- Requires reliable internet/Technical issues can occur
- Additional stress for the students
- Requires special scheduling for student accommodations

Untimed

Pros:

- Lower perceived stress for students

Cons:

- Complicates student schedules
- No access to proctoring service
- No active assistance during exam

4. Randomize Questions on Exams

Options: Can randomize the order of the questions (and possibly only release one question at a time) or pull each question from a pool of questions

Pros:

- Decreases the efficacy of students working together on the exam

Cons:

- Additional work to generate additional versions of the questions
- Difficult to produce questions of equal difficulty
- More difficult to answer student questions because the question numbers vary

5. Offer assessments often covering less content.

   Pros:

   - This should decrease student stress and anxiety about the implications of their performance on each exam.
   - The logistics of online assessment is easier than in person (no room reservations, copying, answer sheets, etc.), giving assessments more often should be easier to implement in the remote environment.

   Cons:

   - A possible problem with frequent exams in large classes is scheduling. Traditionally, large classes have evening exams. The Chancellor's Roadmap includes evening classes scheduled until 9 pm, which will conflict with evening exams. Evening exam times for large classes are already scheduled and are in the class notes for Fall classes. (Class notes can still be edited.) More frequent assessments (if in the evening) will produce even more conflicts.
     - A possible solution can be to allow students to begin an exam over a window of time to avoid conflicts with other commitments (classes, work schedule, etc).
     - Another solution to avoid conflicts would be to give the exams during the assigned class period.

6. Papers/Projects:

   - Tie the paper or project to an explicit learning goal of the course.
   - Be very explicit of expectations and provide a rubric in advance that outlines how an assignment will be evaluated.
   - When class assignments are graded by more than one person, such as with teaching assistants, instructors and TAs should practice reviewing assignments to maintain consistent assessment of student work.
   - Scaffold assignments into discrete activities to help students develop and practice skills that they will combine for subsequent assignments. For example, one early assignment might focus on research skills and another may focus on analysis skills, before a later assignment requires students to combine both these skills. If a large project will require specific technical skills (such as coding or curating materials from other sources), design earlier, low-stakes assignments for students to learn and practice these activities. Dividing up papers or projects into discrete steps will allow faculty to provide immediate feedback on each step and to identify students who need additional support.

Attendance

Goal: To design tips and principles for class attendance policies when social distancing is important, but also to develop policies and best practices to deal with absences if illness occurs.

Principles

- Attendance isn't enough; engagement from the students is necessary.
- Accommodate multiple ways of "participating".
- Be flexible with disparate student circumstances. Anyone with symptoms of any kind should stay home without penalty.
- Consistency in expectations and technological tools across DIFFERENT courses and colleges will be essential for keeping students organized and informed. At a bare minimum, consistency should be maintained across all sections of a course. Ideally, students will experience consistency across different courses.
- Getting students to show up for any kind of class in its available format(s) is more important than the class being perfect.
- Here we focus on methods that are easily scalable by a single instructor.
- Recognize and consider feasibility in light of accommodations students have, such as needs for extra time on quizzes or medical conditions that interfere with various formats

Recommendations

1. General Practices
    - Express your expectations about attendance in the clearest, most explicit, specific terms on day one of class and in your course syllabus.
    - By default, offer multiple alternative options for participation so that those who are self-isolating for any reason have ways to earn credit without asking for accommodations.
    - Reduce student requests by forgiving a certain number of absences automatically for ALL students without needing any excuse.
    - In this way, "attendance" and "participation" can be mandatory for all, with the clear idea that no one should attend in person if they have any symptoms of illness.
    - Structure activities and points earned to keep students accountable for regularly "showing up."
    - Choose activities and ways of grading that are transparent for the students but NOT labor intensive for faculty.

- Use technologies and tools that are vetted and approved and supported by OIT.
    - Use Canvas for as much as possible.
    - Do *not* use unsupported software/tools unless they offer essential functionality for supporting your class's learning goals.
    - Information about supported technologies and accessibility is available on several CU Websites, including:
        1. https://www.colorado.edu/accessible-technology
        2. https://oit.colorado.edu/services/teaching-learning-applications

2. Practices for the **"lecture" component of large classes**.
    - ALL lecture periods will be 100% remote for large classes.
    - If ***teaching synchronously***, the following methods could allow for attendance and participation credit:
        - Give a reading quiz at beginning of class period, delivered on Canvas, available only during class time (make time during class for this).
        - Give a brief quiz during the last 5-10 minutes of class, delivered on Canvas.
        - Use Canvas's Graded Discussions and give students points for posing questions/answering questions during a specific time window (e.g., during the 24 hours after a lecture). Use a rubric to clarify expectations and to facilitate consistency in grading. This likely needs to be moderated by a TA.
        - Use iClicker Cloud to poll students or ask questions during the lecture period. Encourage and take follow up questions.

    - If ***teaching asynchronously***, the following methods could be considered to allow for attendance and participation credit:
        - Reading questions assigned on Canvas (specific due dates and times).
        - Post-lecture video viewing questions assigned on Canvas (specific due dates and times).
        - Use PlayPosit to have students answer questions during their viewing of a pre-recorded lecture video.
        - Use Canvas's Graded Discussions and give students points for posing questions/answering questions during a specific time window. Use a rubric to clarify expectations and to facilitate

consistency in grading. This likely needs to be moderated by a TA.

3. Practices for Encouraging Attendance and Participation in Recitations or **Small Section Meetings of Larger Classes**.
    - For ***synchronous, in-person*** offerings
        - Offer a "hyflex" (hybrid-flexible) format all semester.
            - Offer every meeting by Zoom.
            - Record every meeting with Zoom's functionality and post afterwards.
            - Count in-person and remote attendance equally.
        - Choose activities and discussions that do not require shoulder-to-shoulder work.
            - Use Canvas Collaborations (More on Canvas Collaborations) and Groups to create working groups (whole enrollment of small group or break into smaller groups) and share documents, spreadsheets or presentations.
            - Set up Canvas Group Assignments where shared documents, spreadsheets or presentations can be uploaded or follow up questions can be answered for group credit.
        - Keep remote attendees in the loop.
            - Use two devices, one for yourself to project content, and one to show remote attendees the room.
            - Keep an eye on the chat and "raised hand" features of Zoom.
            - Restate comments made by participants from either format.
        - Assign students to complete journal entries or responses on Canvas by the end of the day.
    - For ***synchronous, fully remote*** offerings
        - Use Zoom's breakout rooms and call on each "Room's" participants to share out after breakout rooms are "closed".
    - For ***asynchronous*** offerings
        - Many of the recommendations above might apply.
        - Have students sign up for required 1-on-1 zoom meetings on a regular basis for "checking in".

- Well-scaffolded independent projects based upon students' passions, combined with regular check-ins. This likely needs to be moderated by a TA.
- Use Canvas Collaborations/Groups but allow student groups to schedule their own time for group work with a deadline for completion. Use Canvas Individual Assignments or Group assignments to assign credit.
- Use Canvas's Group Discussions. To assign participation credit, use Canvas's Graded Discussions and give students points for posing questions/answering questions during a specific time window. Use a rubric to clarify expectations and to facilitate consistency in grading. This likely needs to be moderated by a TA.

Lessons Learned from spring 2020

- A general "Attendance and Participation Policy" is not effective in the remote environment. In the spring, credit for based soely on attendance and participation in group worked before going remote. In-person it was easy to give students who weren't participating a nudge and a warning about participating. But once going remote, if a student was muted with their camera off, it was impossible to tell if they were engaged or even present! In the rush to finish spring, specifically calling on students for questions seemed to work ok. For fall 2020 consider having each group turn in a group document afterwards for credit. Google docs make it easy to collaborate synchronously and in "suggesting" mode, it is easy to tell who contributed to the document.
- Many students would appear to behave as if "online attendance" is optional. Actually, many of us made it this way in Spring 2020 as we tried to be extra flexible given the very difficult circumstances. We will have to change this expectation and perception.
- Some students really dislike "online participation." It feels useless and impersonal to them. How do we give them a more human experience that keeps them motivated?

Recitation Sections

Principles

- Provide a safe working environment for faculty, TAs, LAs, and staff, recognizing the unique pressures on contingent faculty and graduate students.
- In addition to all the obvious things sections should do, section leaders also will be a vital resource for checking in with students, monitoring their well-being as well as their level of engagement. TAs and LAs should be given extra support for understanding the available resources for students in distress—CAPS, OVA, Students of Concern Team, and the like.
- Design lessons that are not reliant on in-class lecture (flipped classes, online activities) so lessons can quickly and easily be shifted from in-person to digital platforms, as needed, and provide fully-digital options for students.
- Provide a sense of community within the class, and a sense of connection to the campus. Create interactive experiences for students through both in-person and online activities.
- Tie learning to events outside the classroom and to how students understand their feelings. Allow students a voice and agency to use in the world.

Recommendations

- Sections should offer ways for self-isolating students to participate, not as an accommodation if students ask for it, but as a matter of standard practice so that it is clear that everyone has to participate.
- Provide clear lesson plans and instructions for TAs and LAs who facilitate section discussion groups. Hold weekly planning meetings and take time to hear and discuss TA/LA feedback on what's working well and what needs improvement or revision.
- Have clear learning goals for each section meeting. Articulate what students should achieve/learn during section meetings, and explain why.
- Build in ways for students to express their ideas, questions, challenges. Solicit student input on what they want to focus on to advance their understanding of the course materials.
- Provide a mix of synchronous and asynchronous activities/assignments as part of section work. For example, break classes into smaller, rotating groups who meet two out of every three weeks. Use section to build project teams, who document and share their work online. Group freshmen together in one or two sections.

- Frontload course assignments earlier in semester (e.g., ten percent of course assignments due after break). Do not have assignments due the week of Thanksgiving. Plan for totally remote activities after Thanksgiving Break (per CU's official plan).
- Design section activities and assignments that develop specific skills and concepts that directly link to course learning goals. Provide opportunities for formative assessment throughout semester, not only large-stake summative assessments.

Lessons learned from 2020

- Set expectations early on how participation is defined for course, in various modes.
- We recommend not offering remote and in-person sections simultaneously because it dilutes the advantages of in-person and online pedagogy. … Making sure those who have illness symptoms know they have a way to obtain credit and do NOT come to class. …
- Live Zoom sessions with 4-student breakout rooms work well. Students can share whiteboard. TAs/LAs circulate to keep students on task. (Writing on the whiteboard can be difficult if students don't have right equipment. Try sharing a group google doc instead of a whiteboard.)
- Discussion sections can build upon video lectures with embedded quiz questions, as part of students' preparation for synchronous discussion group activities. Note, reusing/retooling classroom capture lectures from previous semesters may be a useful option for some faculty to provide video lecture materials.
- When students develop strong relations early and in-person, they stay connected more effectively when they move to remote activities.

OLA (On-Line Activities)

Create on-line or remotely designed activities to enhance the experience students have in the large, remote on-campus classes.

Principles

- Provide experiences that enhance campus life while doing so safely. Use on-line activities with smaller groups of students to build camaraderie and teamwork.
- Large classes should be more than a large lecture and in-class exams, they should touch on themes that envelop the student's experience during the semester. They should reach into activities that go beyond the 2-3 hours a week spent in lectures. Seize opportunities to incorporate developments outside the classroom into the class.
- Large classes should serve as anchors that orient intellectual life during the semester. Look for ways for students to engage socially with each other based on their interest or experience in the class.
- To the greatest extent possible, instructors should use online activities in ways that are consistent across campus. This means using technologies/software/platforms supported and vetted by OIT (specific examples and links to information are given below).

Recommendations

- Develop an Intro to class/syllabus quiz and/or homework that students take within the first several days of the term.
    - This quiz can be an opportunity for students to tell you about themselves, their major, interests, reasons for taking this class, etc. Depending on the number of students and TAs, you might opt for a mix of multiple choice and written responses.
    - Ask students to describe or identify key course policies, such as penalties for late assignments, honor code violations, the basic logistics of the course itself, and the logistics of using the platforms/software that will be required.
    - Ask students to confirm who their TA is (if applicable) and whether they have access to the course textbook yet.
    - Ask students to describe their prior experience with the course subject matter and readings, and to explain their learning goals for the course.
    - This quiz is also a good place to ask what questions students have about the class.

    - Use this quiz/homework or a separate survey to identify, as early in the semester as possible, students who feel they don't have sufficient resources to participate in online activities, such as a good WiFi connection, a proper device(s), a safe and private place to work, etc.
- Find ways to get students using the TECH early and often so that they're comfortable with it; and instructor comfort too!
- Leverage the benefits of the online format. For example, students can do independent research and gather certain kinds of data when online. They can collaborate on Google Docs or explore with Google Earth.
- Don't try to make an online activity be just like a physical classroom. Explore possibilities that online offers that aren't feasible for in-person class time, such as having students (individually or in small groups) work on different texts/assignments/problems (but see notes above and below about supported platforms).
- Set clear expectations, provide clear instructions in redundant information paths, and hold students accountable for work. Always provide information through same delivery methods so that students have the greatest chance of "knowing where to go" to get critical information. Communicate with students regularly and frequently, e.g., weekly updates on upcoming lessons, assignments and due dates.
- Design online assignments that help students develop specific skills and explain how each assignment helps them to achieve these learning objectives. Provide students with opportunities to assess their understanding of course material with low stakes assignments (formative assessments).
- Scaffold assignments to build skills needed to complete final projects/papers (summative assessments).
- Use Canvas, Zoom, and other technologies officially supported by OIT whenever possible to minimize students' need to create new logins, learn new platforms, etc. This will give students a more coherent experience and minimize difficulties and time wasted for everyone. Examples:
    - Use Zoom for all online meetings and real-time discussions
    - Use Canvas for all listing of assignments, all announcements, all submissions of work and grading
- Information about supported technologies and accessibility is available on several CU Websites, including:
    - https://www.colorado.edu/accessible-technology
    - https://oit.colorado.edu/services/teaching-learning-applications

- For any required online activities, especially those that require students' participation at a specific time, have a backup plan for those students who don't have adequate access to necessary infrastructure (such as reliable WiFi, a private place to work).
- Keep track of who doesn't complete or "show up" for online activities; reach out to them individually within the first two weeks of the term.
- Check student performance midway through semester and reach out to students who are likely to fail the course. Solicit student feedback at specific points during semester (after completing a unit of study and/or midterm). Ask what's working well in the course and what alterations would help improve their learning experience. Follow up with message/discussion that signals to students that you're listening to their ideas and concerns.

Lessons Learned in Spring 2020

- TAs and LAs were instrumental in developing discussion board prompts that engaged students interests and concerns. They helped to make the course material more relevant to current-day issues from the undergraduates' perspectives. We worked together to design opportunities for students to express their thoughts about the pandemic while also discussing Shakespeare's plays.
- Serving students effectively required a delicate balance of clear, consistent procedures and flexibility on the instructor's part.

Suggested Approaches to Laboratory Courses during the Pandemic

University of Colorado Boulder College of Arts & Sciences Laboratory Teaching Subcommittee

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Disclaimer: The following should not be considered an endorsement of any decisions made by the University of Colorado administration regarding the timing and nature of on-site instruction of courses offered on the Boulder campus during the COVID-19 pandemic. This document was prepared on Friday, June 5, 2020 and does not reflect public health information or direction from the University made available after this date.

PURPOSE

The aim of this document is to provide structure and resources for faculty who are teaching laboratory courses while faced with safety considerations during the current pandemic. It was prepared with life and physical science laboratories in mind and may require adaptation for performance arts and clinical lab settings. Departments should use this document as a guide to adopt safety requirements to best serve their students' needs. Two main categories of considerations have been identified: the decision to move curriculum online and the safety of students and teaching staff. The College of Arts & Sciences convened a group of faculty members from six different departments to provide resources for safely offering in-person laboratory experiences for undergraduates. Below are questions faculty members may ask themselves to prepare for this transition with resources for achieving curricular flexibility.

ONLINE, REMOTE, OR IN-PERSON INSTRUCTION?

The decision to teach laboratory courses in-person will require consideration of recommendations made by the College of Arts & Sciences and of the needs of students in your course. Individual departments and faculty will likely be responsible for making these decisions on a case-by-case basis. Those teaching performance-based lab courses that involve group singing, vocal projection, or breath work are encouraged to consider offering these classes remotely or outside, with students appropriately distanced and facing one direction.

1. Is the course required for students to complete their degree?

The College has recommended that courses that allow students to progress toward degree conferral should be prioritized. When considering lecture and lab-based courses, lab courses could be prioritized for in-person instruction over lecture courses, especially for lab courses that

are difficult to teach remotely If the laboratory course is required for the degree, all efforts should be made to offer a version of the course that achieves the original learning goals.

2. Can co-requisite lectures be unlinked from laboratory courses?

Many laboratory courses throughout Arts & Sciences are co-requisites with lecture-based courses. Some departments are unlinking these courses so students have more flexibility in terms of when to register for the laboratory component. Individual departments should be consulted about this option.

3. Can any of the curriculum be moved remote or online (synchronous or asynchronous delivery)?

A significant factor in determining whether a laboratory course can be taught remotely is how adaptable the curriculum is while also maintaining the learning objectives of the course. Making some or all curriculum available online may be necessary to reduce the amount of time students spend in the lab,for students who test positive for COVID-19, or for those who choose a remote experience. Some content for your course may be amenable to remote teaching. Tutorials are an example of a content component that could be recorded and viewed by students before they attend lab. Advice on how to efficiently move lab curriculum online can be found here.

- **Online resources.** Many online and software-based resources are available for recording lectures and lab tutorials (links below). Short ten-minute tutorials may be an effective approach for teaching lab techniques that are specific to the lab course.
    - Zoom
    - Kaltura
    - Quicktime
    - Screencast
    - Slidecast App
    - Apple Screen Record
    - PlayPosit

    A resource created for teachers of performance-based classes to optimize Zoom audio quality for remote instruction can be found here.

    Virtual labs are another resource for moving portions of the laboratory curriculum online. Students can watch experimental techniques and some resources have embedded assessments.

    Freely available or University of Colorado subscription-based online virtual lab resources:

Multiple Disciplines	Labster
	MERLOT
	Pivot Interactives
	JoVE
	LabX
Biology	BioInteractive
	PhET Biology
Chemistry	Chem Collective
Physics	My Physics Lab
	PhET Physics
Geosciences	Collaborative Resource

- **Creating a sense of community with remote teaching**. A large factor in student dissatisfaction with online and remote courses is the loss of a sense of community. Teaching staff should seek resources for developing and maintaining the class community or social presence with both synchronous and asynchronous teaching. Resources for doing so can be found here.

4. When a student chooses to take the course remotely, what changes will be made to the curriculum so course goals can still be achieved?

Students may opt into a remote version of all courses including laboratory courses. Faculty should spend time outlining how the course can be delivered most effectively in online format when this occurs. This exercise will also help with the transition to completely online teaching in the event that the current public health situation worsens. This Inside Higher Ed article can help with modifying lab courses to incorporate remote teaching.

5. How will teaching assistants be affected by moving content online?

Graduate student stipends are often earned through teaching assistant positions in laboratory courses. Moving content online may require examination of how graduate student involvement

can be maintained in these courses. Changes should not require an increase in workload for teaching assistants.

6. How will information be clearly conveyed to students about changes to the course and expectations?

Creating clear statements on the syllabus about the structure of the course, possible modifications to the course in the event that the public or personal health situation changes, and expectations for students will be critical to the success of laboratory courses during the COVID-19 pandemic.

- **Attendance.** Attendance policies should be explicitly stated and flexible in the event that a student feels that they may be ill. Students who test positive for COVID-19 will be asked to self-quarantine, and attendance policies should accommodate this. According to current State of Colorado requirements, no individual should enter a public space if they are exhibiting symptoms of illness. The faculty should convey clear expectations regarding student-faculty communication throughout the course, but under no circumstances should a student feel pressured to appear in class if said student exhibits signs of illness.

- **Contingency plans.** Given their experience in the spring, students may appreciate clear information about what will happen if the course needs to be suddenly taught remotely. Assurance that the course will not be cancelled and that learning goals will be achieved in the best possible or approximate manner should be included. At least one scenario for remote instruction can be provided to help ease the transition if this is required. Faculty should be prepared for remote teaching for single lab sections where a student has tested positive for COVID-19. In the event that a student tests positive, all students and teaching assistants in that section may be asked to quarantine and seek testing according to current guidelines.

- **Acknowledgement of limitations of remote teaching in a lab setting.** Faculty should consider emphasizing that remote learning may not be able to fully replicate the in-lab experience. For example, lab practicals may be not completed in a remote teaching situation. Students who are not comfortable with this flexibility should be encouraged to enroll in the course during a semester when remote teaching is not as large a component of the course.

LABORATORY SAFETY

Laboratory courses require unique consideration of both student-to-student and student-to-teaching staff interactions. The hands-on and collaborative nature of laboratory science may require creative restructuring and curricular flexibility to maintain the safety of all involved and control of the laboratory environment to minimize transmission of the virus.

1. *What barriers to infection can be implemented to limit student-to-student transmission of COVID-19?*

Minimum requirements for most labs will include face masks and possibly gloves. The US Centers for Disease Control and Prevention has provided interim guidelines for biosafety during the COVID-19 pandemic (see also Safer at Home Guidelines for Higher Education put out by the State of Colorado). In addition to students wearing masks and possibly disposable gloves, suggested approaches include:

- **Personal protective equipment.** Where possible, replacing objects that might be touched by students without PPE. For example, a door handle used by students entering the lab could be replaced by a toe pull or install touchless soap and paper towel dispensers. Maximum PPE should be provided to teaching staff (Faculty, TAs, lab staff), including effective N95 masks and possibly face shields. TAs will likely have the most interaction time with the most individual students, and it is incumbent on the University to do what it can to protect them. PPE should not be shared at any time. However, if PPE is in limited quantity, strategies are available for maximizing or re-using these resources.

- **Movement in the lab.** If possible, students should enter and exit the laboratory space through different doors (one door for entry, one door for exit). When two doors are not available, student movement should be managed by teaching staff to maintain distance between students. No congregating outside of the lab should be allowed before the class begins. It may be useful to provide a syllabus statement about arriving at the lab no earlier than ten minutes before the class starts to prevent congregating. Students should be encouraged to move directly to their work space upon entry into the lab.

- **Airflow.** Maximizing airflow (or minimizing bad airflow) in the lab class can reduce aerosol virus transmission. Determining whether this can be done by opening windows or leaving fume hoods on will likely require input from Facilities Management.

- **Work stations.** Spacing of student stations and minimizing circulation of students in the classroom (e.g., by providing needed materials at every station) can minimize close student interactions. Where multiple copies of identical instruments are used, consider alternating them on the benches with other instrumentation that would not be used at the same time. For example, if all students in the lab need to weigh materials at the start of the class, the weighing scales should be spaced around the lab and interspersed with other equipment. Waiting positions for these instruments should be marked on the floor with tape, and where possible, sample drop-off points (with an associated sample data input form) should be made available to minimize wait time for heavily-used instruments.

- **Physical barriers.** Where appropriate, physical barriers between lab stations could minimize possible transmission. Plexiglass shields or plastic film could be installed

between students who are facing each other at benches. These physical barriers should also be considered for students who are sitting next to each other.

2. How can student and teaching staff interactions be limited?

A primary approach to reducing student transmission is to reduce the number of students in a lab classroom at one time. The upper limit of the number of students in a given lab classroom will depend on the size of the classroom, the physical arrangement of the lab class, and airflow in the classroom. Facilities Management should be consulted for information specific to each teaching lab space. A way to cover multiple outcomes might be to plan out how labs would run with class sizes of both half the normal capacity, and one quarter the normal capacity, so that one of these can be adapted to whatever the final limit is determined to be.

- **Limit hands-on work.** In-person lab classwork should be limited to hands-on work that can only be done in person. Introductory presentations, exams, assembling lab reports, etc. should be done remotely.

- **Create smaller class cohorts.** If remote teaching can substitute for aspects of a laboratory class, lab classes can be split into cohorts, such that on a given week a fraction of the class is in the lab doing hands-on work, and other students are doing a remote component of the class. This can be achieved by, e.g., having an experiment schedule that alternates between in-person and remote experiments, and then having half the students start one week later, so that both cohorts still perform experiments in the same order.

- **Modify lab protocols.** Lab class protocols can be revised to minimize "dead time", where students are waiting for things like incubations, etc. Reducing the time to physically undertake lab experiments, combined with eliminating non-hands-on aspects of the lab class, may allow multiple (non-overlapping) cohorts to use a lab classroom in a class period previously used by a single lab class.

- **Distance between faculty and students.** Employing separation zones (e.g., a line indicating 10 ft from a lab class lectern) can help maintain social distancing between faculty and students. Departments should also provide students the minimum amount of space required by the State of Colorado Public Health & Executive Orders. Current requirements are six feet distancing and no more than ten individuals in one gathering space. The University or Department may modify these requirements.

- **Online office hours.** One-on-one meetings between faculty/TAs and students are going to be challenging when they are held in-person, given the degree to which masks impair non-verbal communication. Scheduling and promoting online (e.g., Zoom) office hours specifically for one-on-one meetings may be the best approach for maintaining good communication with students in lab classes.

3. Can equipment be safely controlled and maintained?

When shared equipment is used and multiple sections are offered in a single laboratory space, the space should be meticulously sanitized with 70% ethanol, 10% bleach, or equivalent. Recommendations for cleaning and maintaining equipment can be found here and here.

- **Frequent sanitizing.** Rigorous disinfection of equipment used by multiple students even when gloves and masks are used. This should include protocols where every student cleans the equipment they are using before and after use. Routine cleaning of lab surfaces, door handles, sink handles, paper towel dispensers, and any other surfaces that are touched should be performed before and after every class session. Computer keyboard skins should be considered for quick and safe sanitization.

- **Limit sharing of equipment between labs.** Equipment used in individual teaching labs should remain in place during the semester. Sharing equipment between labs should be restricted to prevent cross-contamination of lab spaces.

- **Limit the number of students using equipment.** Consider staggering lab responsibilities so all students get experience with equipment, but not necessarily on the same day to prevent compromises in sanitization.

Observations About and Suggested Approaches to Field Teaching During the Pandemic

University of Colorado Boulder College of Arts & Sciences Field Teaching Subcommittee

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Disclaimer: The following should not be considered an endorsement of any decisions made by the University administration regarding the timing and nature of on-site instruction at the University of Colorado during the COVID-19 pandemic. This document was prepared on Friday, June 5, 2020 and does not reflect public health information or direction from the University made available after this date.

PURPOSE

Our sub-committee was asked to provide suggestions on how to safely return to in-person field teaching during the age of COVID-19, regardless of how long the pandemic might last. Understandably, ever since Chancellor DeStefano released his Road Map to Fall 2020, attention has focused on what Fall 2020 in-person teaching will look like. The Chancellor's Road Map and the subsequent guidance we received from the Academic Instruction Implementation Team on June 1, 2020 both outline the goals and guiding principles that underpin CU Boulder's partial return in the fall to in-person teaching, if and when local, state, and national conditions permit such a return. The Road Map acknowledges the dynamic tension that exists between the paramount value of keeping all members of our community healthy and safe, which is most easily accomplished by emphasizing online instruction, and the need to carry out our mission as a comprehensive teaching and research institution that serves the public good, which is best served when at least some instruction occurs in person.

The Implementation Team highlighted the critical importance to student success of in-person instruction for field classes. In recognition of the vital role in-person instruction plays in Arts and Science's field curriculum, A&S Dean James White and Associate Dean Lang Farmer asked our subcommittee to:
1) provide suggestions for ways to successfully approach field teaching in the time of coronavirus
2) highlight particular challenges that field instructors face in these circumstances
3) identify critical information and resources we need to receive from campus administrators in order to safely and effectively carry out our field teaching mission.

All of our suggestions below assume, as the Chancellor's Road Map makes clear, that in-person instruction will occur in strict accordance with local, state, and national health regulations and guidelines. We recognize that field situations vary; each field class has different objectives and faces unique challenges. The suggestions that follow are in no way intended to be

comprehensive or meant as prescriptions. They are offered as one vehicle to stimulate creative thinking by individual instructors and foster dialog between practitioners, which is where great ideas are born. The challenges and demands of field teaching bear a strong resemblance to those of field research; we have thus borrowed from the work of the Return To Research Committee chaired by Waleed Abdalati. That committee explored many of the issues discussed here long before our committee was even constituted. We direct interested readers to their report for more detailed discussions of several topics. It and many other resources are listed in the 'Resources' section at the end of this report.

ORGANIZATION

There are many different ways to organize the types of issues one must consider in order to safely teach in the field during the pandemic. We have chosen as an organizational theme the duration and the distance from campus of a given field experience because the number and complexity of considerations increase as duration, distance, and volume of human interactions increase.

Figure 1 illustrates this organizational structure. The text begins with discussions of universal considerations that apply to all field classes and progressively broadens its scope to touch on issues faced only by classes that operate in more complex field situations. Our hope is that this structure will allow a given instructor to efficiently find the portion of this document that addresses the subset of issues most relevant to her or his specific field course. Those issues that cannot be adequately addressed without information and/or resources provided by campus administrators are highlighted in red.

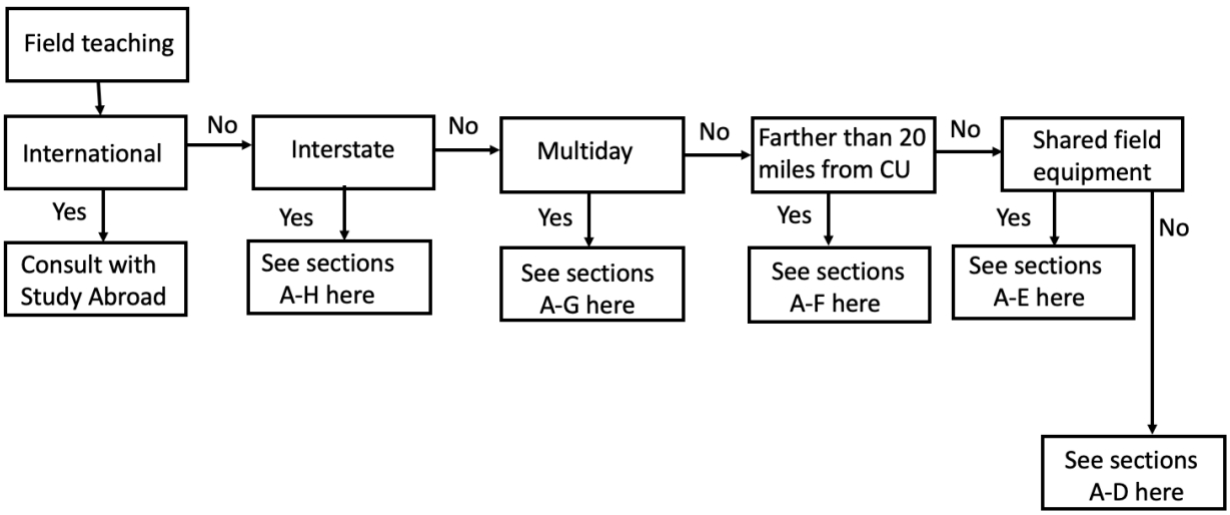

Figure 1

SUGGESTIONS

A. **Setting group expectations for adhering to all safety guidelines and rules**

a. Different individuals perceive the risk posed by the novel coronavirus in starkly different ways. The college-age population contains particularly large numbers of people who perceive the risk to be comparatively low. Many faculty have expressed concern that students with whom they will interact will disregard social distancing guidelines, thereby increasing the risk of an outbreak within the class cohort. None of us can control what our students do outside of class. But we suggest that you clearly list all of your expected class norms on the syllabus and engage your students prior to the first day of class in a frank and respectful dialog about the risks posed by the virus to the health of everyone in the class community (and those they come in contact with) and to the accomplishment of your shared educational mission. This includes, for field courses that require travel, recommending to students that they practice strict social distancing measures for numerous days prior to initiation of the course. Further outline your own concerns and facilitate development of a written consensus on shared community values and an agreed code of conduct. Students are much more likely to follow that code if they have participated actively in its creation.

b. Teaching and taking classes in the midst of the uncertainty we face this fall semester is going to take lots of work, thought, and courage. Your students may well experience fatigue, anxiety, and uncertainty at some point during the semester. We recommend that you become familiar with the mental health resources available on campus and include a description of those resources in your syllabus. Encourage your students to seek this assistance as needed.

c. Ensure that all participants wear proper protective gear (e.g. masks and gloves), you have sound communication and evacuation plans, carry a first aid kit, and have appropriate first aid training.

d. Participation in any in-person class experience inevitably presents some infection risk no matter how thoroughly the instructor has planned and how extensive the precautions they have taken. It is important to remind students that this risk exists and equally important for the campus to shield instructors and community collaborators from liability. Will the campus develop an expanded liability waiver that students and collaborators will be expected to sign prior to participating in any field class? If the campus develops such forms, be sure to get all of your students to sign one. Otherwise, it would be prudent to have students sign the standard liability forms that currently exist.

B. **Recognition of the campus requirement to provide remote alternatives for students who can't participate in in-person field instruction**

a. We, of course, always seek to ensure equity for all of our students. In this vein, campus guidelines emphasize the importance of providing remote alternatives for students who are unable to participate physically in your field course (for example, international students who are unable to return to the US or immuno-compromised students for whom field participation poses an unacceptable risk).

There is also an ever-present possibility that one or more of your students (or you) becomes ill or has to self-quarantine in the middle of the term, which would necessitate a pivot to some form of remote or online teaching. It is best to be prepared for that eventuality from the beginning of class. Establish a list of online resources/activities that you consider acceptable alternatives for course modules. Some disciplines have extensive catalogs of online resources, others have few. See the resource list at the end of this report for some ideas.

b. The extensive reworking of course content and delivery that will be required to develop high quality field experiences in the age of coronavirus, in addition to the need to develop separate online contingencies, will require considerable additional instructor and TA time and effort. It will be wise to plan your class modifications well in advance. It is important for departments to recognize the personal cost in time and money that many field instructors and TAs will incur in the service of producing the highest quality student experience possible; recognition of this investment should be made in the merit review process for instructors and TA efforts should be recognized in some tangible way. This is another place where the timely provision of additional campus resources will likely pay big dividends (to facilitate course planning and development).

C. **Handling interactions between class members and with people outside the class**

a. All participants should wear appropriate protective gear (e.g. masks, gloves) and maintain 2 meters of distance between one another. One additional precaution to minimize the risk of virus spread within the group is to organize your students into cohorts. These smaller working groups can be transported into the field together and work in only those groups for the duration of the course. In some cases it might be necessary or advantageous to assign a leader (possibly an instructor, TA, or PA) for each small group. Campus administrators have mentioned that additional TA/PA resources to facilitate such class organization *might* be forthcoming; instructors will be better able to plan such strategies once detailed information on available support is announced.

b. When it comes to interactions with people outside of your class group, there are two different situations instructors face:

i. Unplanned interactions - These interactions, while often pleasant, present an additional infection risk. For example, a class focused on analyzing plants, animals, or rocks on public lands will likely encounter other park users. We suggest that you discuss with your students how to handle such interactions when you develop the class code of conduct discussed in part A (above). Students who have thought about such encounters ahead of time will be prepared to politely describe their activities to curious onlookers and explain the need to maintain their social distance.

ii. Planned interactions - Some classes go to the field specifically to interact with other people - It is, of course, imperative that instructors consult with the communities they plan to visit in advance to ensure that those communities welcome the planned interaction. Special care and

consideration must be paid to the risk posed to especially vulnerable communities; it is quite possible that such classes are simply not appropriate to conduct until the risk from the novel coronavirus subsides.

D. **Transporting students safely to the field**

a. Field activities that can be conducted on campus: encourage consideration of this option if possible. Although this is the least logistically complex field setting, it is worth keeping in mind that even here the cohort is still vulnerable to the spread of infection from participant exposure outside of class, even from activities as innocuous as commuting to class on a public bus. Social distancing and the use of PPE are both key components of any field teaching strategy.

b. For simple day trips within a few miles of Boulder, the most challenging new aspect of field teaching during the pandemic will likely be how to get your students to the field venue while maintaining social distance. An example can illustrate the point. One committee member teaches a field geology class of 19 students that meets for six hours each Tuesday and Thursday, visiting local destinations like Flagstaff and Eldorado Springs. He normally transports students in two rented Suburbans or vans, one driven by the TA and the other by the instructor. We have not yet received campus guidelines on how many students can be transported in such vehicles; we need those guidelines to plan transport for field classes. In the absence of CU guidelines, the instructor has based preliminary logistical calculations on a first-cut modification of the transportation occupancy guidelines published by other organizations, such as the Boulder Valley School District. The result was not encouraging - he estimates that no more than two students at a time can be transported in each vehicle. That means it will require five round trips to get all the students into the field. Given the minimum 45 minute round trip travel time to Eldorado, it would take us 7.5 hours just to get all the students into the field and back to campus. Clearly, this is not viable; the kind of creative thinking the administration is urging us to engage in is required. Here are four ideas:

i. If additional campus resources are provided to departments, they could hire drivers (likely eligible graduate or undergraduate students). That way field instructors can concentrate on teaching rather than chauffeuring. This is another example of how indispensable the infusion of even comparatively modest additional campus resources will be for the execution of field classes and the importance of timely announcement of the magnitude of those resources, which will facilitate necessary planning.

ii. We could hire a larger vehicle that can accommodate the whole class in a socially distanced way. The cost of this option is prohibitive for departments given current budgets; additional campus funds will be necessary. This option will likely be higher than would solution i. above.

iii. It might be possible to split the class into smaller cohorts and take one cohort into the field on one day while the rest of the class works on an in-

class activity on campus. Then repeat the field trip, swapping the cohort activities, during a subsequent class period. This is another approach that might require additional campus resources to support the hiring of a TA or PA who could supervise one or several cohorts while the instructor is leading the field exercise (or vice versa).

iv. If the destination is extremely close, students can walk or ride their bike, rendezvousing at the field site. Such a rendezvous is also potentially viable for destinations within driving distance, but with two important caveats. The first is that arrangements must be made for transporting students who aren't able to transport themselves. In the example presented above, if 11 of the 19 students drove themselves, transport of the remaining eight students would entail only two shuttles with the vehicles normally used for the class, thus making the proposition viable. Our own past experiences tell us that many students who own cars prefer to drive themselves to field trips, so this could be an excellent solution to the transportation issue for some field classes. However, there is inherent risk involved when students drive themselves. We need clarification of the CU liability policy for student self-transport for the purpose of participating in a CU class, including any special caveats due to the virus. Some other institutions have established policies that treat a class meeting within, say, a 20-mile radius of campus as equivalent to meeting in the classroom (acknowledging the commutes that many students engage in daily to attend class). If CU has or can adopt such a policy, student self-transport for local (or possibly even more distant) field trips is a possibility. Without clear guidance regarding liability, this is not an option.

c. There are a few things that you can do to reduce the risk of transmission while traveling in vehicles. Good air circulation is crucial. A local fire department on which one committee member serves requires all trucks to travel with windows down to enhance circulation. That seems a good idea to us, with the obvious drawbacks on rainy or chilly days outweighed by the reduced transmission risk. On warm days it seems clear that traveling with the windows down is much safer than using the air conditioner, which recirculates the vehicle's internal air. Epidemiological studies have shown that more virus particles are injected into the air when yelling and laughing; consider instituting a policy of keeping conversations to a minimum and voices low for the duration of transport.

E. **The sharing of field equipment**

a. Some classes require the use of shared equipment. It is necessary to either sanitize the equipment between users or designate one “hands-on” student user for each piece of equipment, with no other students touching it during the field session. The hands-on student would need to sanitize the equipment after use.

b. Exposure to contaminated surfaces also comes from touching equipment during transport to the field, such as gas pumps or restroom facilities. Considerations suggested by the Return to Research Committee include wiping down any gas pump handles with 70% ethyl alcohol before filling tanks and sterilizing your

hands after using the pump. Wear gloves when using gas pumps. Try to bring your own food and water during field work and keep them in sealed containers within your vehicle, touched only by the person who brought them.

F. Field trips farther than approximately 20 miles from campus

a. Most of the issues presented by day trips farther afield are the same as those already mentioned, but these longer trips are more likely to entail restroom or gas stops during which group members may interact with people outside the group and/or use equipment (such as gas pumps or restroom facilities), contact with which presents a risk of virus exposure. It is thus important to remind students to maintain social distance from other patrons, wash their hands thoroughly, and avoid touching public and potentially contaminated surfaces with bare hands.

G. Multi-day field trips

a. The logistical challenges expand exponentially for multi-day field trips. Although we are confident that, with enough determination, you can surmount each one, the obstacles are such that we advise that you give serious thought to restructuring the class with more short trips in lieu of one long trip if that is practical and will meet the course's educational goals.
b. For all multi-day trips, whether in-state or out-of-state, students, instructors, and TAs should be COVID-19 tested with sufficient lead time for receiving results of this test; following COVID-19 testing, all field trip participants are asked to engage in strict social isolation and self-quarantine, up until the trip start. We need guidance from CU as to whether the university will be able to provide and facilitate COVID-19 tests for all participants, within the appropriate time frame.
c. In addition, all class participants should undergo daily assessments for COVID-19 symptoms, especially body temperature. If symptoms arise, one complication is that not all communities have access to COVID-19 tests, and if they do, they may prioritize testing for groups that do not include field classes from outside of their area or out of state.
d. Faculty must have plans in place for how to deal with participants who contract COVID-19 while in the field. Will you be able to quarantine the individual in the short or long-term? Medical facilities in many rural communities are classified as Critical Access Facilities, which means, in part, that they expect to keep patients for no more than 96 hours. The alternative to quarantine is to send a sick student home. This requires a plan to transport that student. If they cannot drive themselves, who will? We've thought of two possibilities:
    i. One approach is to designate at least one participant (2nd instructor, TA, PA, or student) as a “safety watch”; that individual could double as the designated driver for a return to Boulder. This might require an extra vehicle, which leads yet again to the question of available financial resources. But even if such a person is designated and a vehicle is available, hurdles still remain. Given that this evacuation is happening in the context of a multi-day field trip, the designated driver will be unable to

participate in the remaining field content, which is a significant problem whether that person is an instructor, TA, PA, or student. The risk of virus transmission on a long trip in a sealed car with an ill person increases. Is it possible to obtain antibody tests for all class participants prior to departure? If so, the designated evacuation driver would ideally be a person who has previously been exposed.

ii. Another idea is to ask that all students who participate in field courses have health insurance plans or special fieldwork insurance that includes evacuation coverage. We recognize that few standard insurance policies provide such coverage. Is it possible for CU to provide evacuation insurance for such a class?

e. Assess the status of medical facilities available at or near the field location. It can be difficult to obtain accurate community-specific information about rates and impacts of COVID-19 infections. Consulting with local medical personnel may provide essential information about local conditions and resources.

f. Food planning is a major issue for multi-day field trips. We strongly advise that instructors ask all students on day trips to bring their own food in sealed containers that only they access (see the treatment of food in the Return to Research document in the list of resources). This strategy may also prove viable on a one or two night trip, although implementation might prove more challenging. Longer duration trips will necessarily require careful thought about the extra measures necessary to safely share food stocks and food preparation equipment. For example, the buffet-style meals that are common features of many field classes are problematic unless it can be ensured that all individuals are COVID-19 free and remain so throughout the course. If it is necessary to shop for groceries, consider designating a single individual, such as the instructor or course TA, to do all the shopping. All purchased items should be immediately wiped down with EtOH wipes prior to further handling.

g. Housing is an equally challenging issue. Shared rooms (or tents), bathrooms, showers, and cooking facilities greatly increase the likelihood of virus transmission. The measures necessary to ensure student accommodation safety are highly individualized and depend on your class' particular circumstances. See the CDC guidelines for camps in the resource section for more details on housing and dining.

h. Determine how the class will travel to daily field locations if they are separate from the lodging. In the case of classes that move from place to place, how will you travel between locations? How will the class move locally from their housing to the specific field site? All of the considerations listed above in section D apply to the transport modes you use.

i. Faculty teaching field classes should have plans for maintaining physical distancing during the class. Can students work on their own or do they need to be close together? Can each student have their own designated equipment or do tools and materials need to be shared? What procedures will be in place to

sanitize equipment? All these issues, which are covered in more detail earlier in this document, are equally relevant for these longer-duration trips.

j. The multi-day trips we teach are fundamentally very different in their degree of planned interactions with other humans/non-course members (e.g. anthropology vs. field biology). Courses that emphasize or require additional contact with the community must incorporate extra preparedness. Taking students on an extended field class has potential health implications for the students and for the communities hosting the class (if human interactions are inherent to the course). Considerations include: What are the learning goals of the class? Is interaction with the local community incidental to that purpose, and thus possibly controllable, or is it essential? In either case, will the class be in a rural or an urban setting? Rural communities are generally under-served medically and often have an aging population that is at high risk for COVID-19. Potentially introducing the virus into such a community is unacceptable. We need to carefully consider the organization and purpose of the class to assess the risks involved in teaching it. Classes that are isolated from the larger community around them may be more viable than classes that cannot avoid those communities.

H. Interstate field trips

Interstate field classes are inherently multi-day and often run over multiple weeks. Optimally, all participants in such trips would be tested and known to be virus-free prior to the beginning of the class and will have self-isolated from the date of their test to the beginning of the class (see Section G(a) above). Regardless, faculty teaching interstate field classes need to consider the following:

a. Different states may have in place different regulations regarding COVID-19, and faculty teaching field classes need to be aware of all state and local regulations. CU students are also not all Colorado residents; faculty need to know what documentation they might need to ensure that non-resident students can return to Colorado if state lines become difficult to cross.

b. Faculty teaching out of state classes should determine ahead of time if it will be possible to test class participants locally and quickly, given local/community resources available, or lack thereof. The trip viability may hinge on the answer.

I. International field trips

a. All CU international field classes are coordinated by the CU Study Abroad Office. They have well-established safety protocols and instructor training requirements. Therefore, the special considerations needed for international field classes during the pandemic are beyond the scope of this committee's charge. Consult with Study Abroad for guidance.

Links to additional resources

1. CU has a dedicated website where you can find the latest campus information and guidance regarding the virus: https://covid19.colorado.gov/

2. The first place to check for the current status of COVID-19 in Colorado is the official state website: https://covid19.colorado.gov/
3. The CU Boulder Return to Research Plan is loaded with thoughtful advice that expands on issues covered here. The section that deals with field research begins on p. 24. https://www.colorado.edu/researchinnovation/sites/default/files/attached-files/rtr_guidance_full_0.pdf
4. The Mountain Research Station is the destination for many CU field classes. If that's your destination, their 2020 Field Safety Guidance/Covid 19 document is essential reading. Even if not, the considerations for the safe execution of field research it describes are extremely helpful. You can download a copy of the guidance at: https://www.colorado.edu/mrs/research-natural-history/research-application-form
5. The CDC has published specific guidance about shared living situations designed for summer camps. Although our needs aren't identical, the siteís still useful: https://www.cdc.gov/coronavirus/2019-ncov/community/schools-childcare/summer-camps.html
6. Committee member Erin Tripp had to quickly retool her Spring 2020 field lichenology course to be delivered fully online. It was formerly a field-only course. We will all have to plan online contingencies; her site specifically attempts to bring a series of “Virtual Hikes” to her students, and we include it here as one idea on how to approach this daunting task: https://www.youtube.com/channel/UCAI8L-EGLN7-W1IJmcALoZA/videos
7. Another site that is loaded with ideas for how to design remote "field" activities, in this case specific to geology, is: https://nagt.org/nagt/teaching_resources/field/designing_remote_field_experie.html
8. The Rocky Mountain Biological Laboratory near Crested Butte hosts researchers for months at a time. Here's a link to their COVID-19 operational plan: https://www.rmbl.org/communication-on-covid-19/
9. Here are the University of California at Berkeley field safety guidelines: https://ehs.berkeley.edu/news-alerts/covid-19-precautions-and-considerations-travel-or-fieldwork
10. And the University of California at Davis guidelines (a quick Google search will get you to the guidelines of many other schools as well): https://safetyservices.ucdavis.edu/news/note-covid-19-and-field-operations

Best Practices for Remote and Online Teaching

The goal of the best practices for remote and online teaching committee was to identify principles that lead to effective pedagogy, make concrete recommendations to enact those principles, and point out both resources that are already available and those that should be provided. Our aim was not only to provide ideas about teaching in the particular circumstances of Fall 2020, but also, more broadly, to establish a basis for ongoing improvements in pedagogy regardless of modality.

Two caveats: First, these recommendations do not constitute an endorsement of any particular plan for returning to teaching in Fall 2020, but rather are intended to support all instructors. Faculty rightly have differing perspectives on how pedagogy should be delivered in the current social context. Second, we have provided recommendations for best practices in teaching. While they should not be construed as A&S policies or requirements, they are designed to support our faculty in meeting the expectations of quality practices in our college.

Principles for Effective Remote and Online Teaching

I. **Quality:** Commit to quality education practices
   A. Maximize opportunities for interaction, engagement, communication, and community with and among students for all modalities.
   B. Provide timely, regular feedback to students.
   C. Establish structure and consistency to support student success.
   D. Utilize known evidence-based, effective practices (see Practices).

II. **Accountability**: Commit to quality and supportive assessment (of student learning, and faculty practices)
   A. Document work (of faculty, and students) that is often hidden, e.g., designing new curricula, spending more time on office hour, making student flexibility plans.
   B. Support continuous improvement (for students and faculty).
   C. Maintain academic integrity and learning goals.
   D. Hold students and faculty accountable (see Required Practices).

III. **Support:** Attend to the needs of faculty and students and their well-being:
   A. Ensure reasonable workload for instructors and students.
   B. Recognize lived experiences of faculty and students (e.g., family, work, health).
   C. Foster a positive course community in which both student and faculty can thrive.
   D. Proactively provide mechanisms to connect individual or groups of faculty to specific instructional resources and support.
   E. Develop departmental communication plans to ensure that all instructors are aware of guidelines, practices, and resources and can share expertise and efforts.

IV. **Flexibility:** Build adaptability into all teaching plans
   A. Plan to adapt to changing circumstances (e.g., when an instructor becomes ill or when students are quarantined).

B. Define requirements at the department level (e.g., curriculum, teaching assignments).

C. Be prepared to shift modalities based on campus-level directives.

Essential Practices

The expectation is that, at minimum, all faculty should commit to the following essential educational practices for remote and online teaching:

1. Use a consistent central platform for the course (e.g. communication, materials, assignments, grades and class meetings); for the sake of cross-campus consistency for students, this should be Canvas and Zoom in almost all instances, knowing that Canvas can also serve as a portal to external tools.
2. Hold remote office hours on a regular and consistent basis and ensure that students know how to contact instructors for consultation.
3. Provide regular opportunities for synchronous and/or asynchronous engagement among students and between instructors and students; instructors should go beyond posting written materials, assigning assessments, and holding office hours.
4. Communicate with students often; provide feedback in a timely way.
5. Set specific expectations for student engagement; clearly define course attendance and participation policies.
6. Make course materials accessible and maintain academic integrity, particularly for assessments.

A&S faculty are proud to provide high quality pedagogy to all of our students. The next section specifies a set of detailed recommendations and suggestions that beyond basic Essential Practices and further address the principles above.

Recommendations

The following section offers recommendations to implement each principle, identifies resources, and provides things to consider when designing and teaching hybrid courses. In each "Recommendations" box, entries are numbered to correspond with the entries in the "Available Resources" and "Needed Resources" boxes.

Recommendations	Available Resources	Needed Resources	Considerations for Hybrid Courses
I. Quality A. Maximize opportunities for engagement			
1. Hold office hours on different days and varied times. 2. Provide discussion forums to establish asynchronous communication options. 3. Consider adding "coffee talk" Zoom sessions, or online discussions for informal opportunities to connect with instructor and peers. 4. Use Groups feature in Canvas to facilitate collaborative assignments and manageable discussion forums	Canvas tools: 1 - Announcements 2,4 - Groups 2,3 - Discussion forums 1 - Calendar (can be used to sign up for office hours). 2 - Canvas extensions like Perusall. 2- Virtual clickers/ polls iClicker Reef and others (OIT). 6 - Setup class contract with students. 1,5,8 - Zoom (including breakout rooms).		Use in-person meetings to emphasize engagement, community building, and sense-making vs. content delivery. 8 - Consider organizing in-person attendance and participation around semester-long working groups.

5. Use breakout rooms in Zoom to facilitate small-group discussion. 6. Establish "community norms" (e.g., netiquette) for course communication. 7. Share your course communication plan with students (e.g., when will course announcements be made and how?), with contingencies for a rapid shift to remote delivery. 8. Create semester long student working and study groups and encourage them to meet in-person (if campus policies allow it) and switch to online if necessary. 9. Provide *regular* opportunities for engagement among students and between students and faculty (beyond posting written materials).	8 - Microsoft Teams. 8 - CATME Team-Maker 2 - Email lists. 9 - Take advantage of the Google Suite for collaborative document, speadsheet, and presentation authoring. 9 - Use NameCoach (Canvas integration) to help students and instructors learn how to pronounce everyone's name.		

B. Provide timely and regular feedback

1. Grade assignments within a short and specified timeframe that students can anticipate. Feedback can be provided in rubrics, writing, annotation, or voice recording. 2. Feedback should also include comments on netiquette and overall structure and format. 3. Solicit feedback from students to improve course delivery. 4. Use self- and peer-assessment to supplement instructor feedback. 5. Emphasize formative feedback and mastery-based assignments.	Canvas tools: 1,2 – SpeedGrader (includes integrated feedback tools) 3 – Graded and ungraded surveys (for collecting feedback). 3 - Qualtrics (for collecting feedback). 3 - Zoom polls (for collecting feedback and formative assessment). 1-5 - Voicethread (Canvas integration) allows faculty and students to comment on rich media assignments.	1 - Grader or Learning Assistant support may be needed in some classes	1 - Remote office hours could be used to provide timely and regular feedback to students.

C. Establish consistency

1. Require students to submit all assignments via Canvas for consistency when transitioning modalities (as well as consistency across classes).	Canvas tools: 2 - Gradebook 5 - CidiLabs Design Tools (Canvas integration) 5 - Modules.	Campus or departments could provide a common Canvas template and encourage all courses to adopt this template.	6,7 - Establish a consistent schedule for alternating between in-person and remote meetings or asynchronous classes. Clarify your expectations for student

2. Use Canvas for students to access materials, assignments, grades, and feedback. Any other sites used should have a link to them from within Canvas. 3. Provide practice opportunities for any new technology introduced. For example, hold a practice quiz when first using test proctoring software. 4. Provide course navigation videos and documents, accessibility information, netiquette, and Zoom information, etc. 5. Use formatting consistently in Canvas to improve accessibility and ease of navigation. 6. Provide students with a guide to how class will function (as part of your syllabus), as well as links to tutorials for things like uploading assignments.		Campus or college should create some boilerplate Canvas pages on the following topics, for faculty to easily import into their courses: - University policies - Student support services (including COVID-19 guidance) - Academic support services - Technical requirements and support - Tips for online learning (including links to Canvas tutorials on essential student functions) - In addition to saving some time and effort, this will also ensure that any late-breaking information and changes in response to COVID-19 are included and communicated accurately.	attendance in each forum (attending to the potential individual needs to go all-remote). Apply Step 6 of ASSETT's Preparing for Remote Instruction in Eight Simple Steps guide.

7. Simplify the number of platforms and tools you use, and stick with a consistent set of tools, rotation of tools, and a schedule for them. 8. Have each instructor provide a short welcome video for each course that introduces the course topic and structure. Launch this on August 1st so all students know what their courses will look like during the fall semester.			

D. Utilize evidence-based practices

1. Employ discipline-specific practices to foster student learning and engagement, and consider how to adapt for remote and online modalities 2. Identify and use unique capabilities of relevant technologies and the remote and online modalities to improve and enhance learning.	Supplement discipline-specific approaches with adhering to guidelines, such as the QualityMatters rubric and Universal Design for Learning (UDL). 1,2 - Many professional societies have been developing guides for remote teaching during COVID – for example, the American Historical Association has	The University should create a guide or short video on evidenced-based practices for faculty. The University should create a guide or short video on principles and best practices of UDL.	Consider what practices to prioritize in-person vs. which will be better suited to remote or online platforms.

	developed a whole resource area meant to support instruction in our field. 1,2 - See American Association of Colleges and Universities' High Impact Practices.		

II. Accountability

A. Document work of faculty and students

1. Explicitly address work of remote and online teaching in tenure, promotion, and annual merit processes at the unit level - i.e. develop modified plans for regular teaching evaluation processes, such as peer observation, instructor's self-reflection, student voices. These will document the increased work and innovative efforts.	1 - Consult the CU Boulder-led Teaching Quality Framework initiative. 1 - See forthcoming A&S document on teaching quality.	1 - Provide a guide to where and how to report these activities in FRPA.	Seek to have consistent "contact" hours whether online, in person, or hybrid.

B. Support continuous improvement

1. Include an informal student feedback survey toward the end of the course for suggestions or recommendations that can be incorporated as you design the	1,2 - Canvas surveys (can be anonymous) 1,2 - Also could use Google Apps for Education Suite.		

course for the following term. 2. Incorporate frequent (e.g. weekly) student reflections into courses to incorporate any changes within the current term. 3. Provide guidance to students on best practices for learning online and remotely. 4. Engage in professional development opportunities to develop your capacity and confidence to teach remotely. 5. Pay careful attention to ensure you accommodate students with disabilities.	Google Forms and Google Docs could be helpful 3 - Campus guides on remote learning for students from the Academic Advising Center, Disability Services, and ASSETT 3 - Disability Services guide to Accommodations for Remote Learning.		

C. Maintain academic integrity and learning goals

1. Include course learning outcomes and academic policies in the course syllabus. 2. Have students acknowledge the honor code at the start of each assessment. 3. Redesign assessments that	3 - Use Canvas quiz settings (e.g. question randomization, question pools) 4 - Tools include Proctorio (for remote proctoring) and TurnItIn (for plagiarism detection)	3 - The University should fund graders and funds to support these graders to assist faculty in assessments. 3 - The University should provide guidelines on redesigning assessments.	

meet learning goals while maintaining academic integrity (provide opportunities for open book, research based exams). 4. Use available academic honesty tools.			

D. Hold students and faculty accountable

1. Ensure accessibility of instructional materials. 2. Clearly define course attendance and participation policies (consider counting participation as substantial fraction of credit). 3. Departments to communicate the essential minimum requirements for remote teaching, developing processes to both support and expect faculty to achieve them.	1 - SensusAccess (accessible PDFs). 1 - Auto-captions in Zoom/Kaltura. 1 - Disability Services and Digital Accessibility Office staff. 2 - Canvas syllabus and gradebook.	1 - Funding and staff to support accessibility remediation.	

III. Support

A. Ensure reasonable workload for instructors and students

1. Establish clear expectations regarding communication at		Additional TA and LA support for remote learning (e.g., to	Seek to have consistent contact hours whether online,

the start of the term (availability via email, response time, etc.). 2. Encourage department chairs to communicate early and clearly with each faculty member about any changes in teaching or workloads. 3. Encourage students to reflect and to include an estimate of their weekly workload with the general formula of ~ 2 hours of work for each contact hour (e.g. 3 credit class = ~ 6 out of class hours a week). 4. Plan for absences and illnesses (for students allowing makeup work, for faculty with backup instructors and contingency plans).		co-facilitate Zoom sessions, assist with lecture capture, and other essential technologies, assist with live questions in the chat during lecture). External microphones and speakers, and conferencing webcams and systems (such as document webcams, and WiFi-enabled on-screen pointers) to better capture remote recording or streaming of in-person sessions. This should include allowing questions from both audiences in hybrid and remote mode.	in person or in the hybrid mode. Minimize redundancy of work in different modalities. Leverage technology to ensure access in different modalities (e.g. lecture capture or Zoom capture a live lecture for later access asynchronously). There are significant challenges to think about in the delivery of hybrid synchronous courses- such as being able to answer questions from both the in-room audience and the online audience. Make sure their questions are captured and addressed in real time. Invest in hardware and teaching support that can accommodate the hybrid modality.

B. Recognize lived experiences of faculty and students

1. Support faculty by providing necessary grading and TA resources.	3 - Students can be assigned different due dates (or even assignments) in Canvas to	1 - Additional TA and LA support for course management and student	Consider telling students when they have the option of missing the synchronous class

2. Encourage chairs to identify any special accommodations that faculty and instructors may need to carry out their online or remote teaching responsibilities. 3. Account for needs of faculty and students beyond medical necessity (with flex time, etc.). 4. Refer students and faculty to mental health and wellbeing resources.	provide additional flexibility and for contingency planning. 4 - CAPS for students, FSAP for faculty.	interaction, such as grading and feedback, communicating with students, virtual office hours, and help sessions.	time and allow them an asynchronous mode of interacting and submitting their work.

C. Foster positive course community

1. Increase instructor presence in Canvas course sites (e.g., add a profile picture, record the pronunciation of your name in NameCoach) 2. Encourage semester-long student working groups who can meet in person or online. 3. Encourage faculty and instructors to attend more to the social and emotional	2 - Microsoft teams 2 - Canvas groups 3 - Canvas assignments and quizzes. 3 – Faculty enter pronounciation of name in NameCoach .	3 - Training video on tending to the social and emotional development of our students.	Keep student groups consistent across media and platforms of engagement.

development of our students. 4. Be flexible in allowing for submitting assignments. Allow a reasonable time window for students to submit either timed or untimed assignments to address issues related to conflicts and time zones. 5. From the beginning of the semester have students introduce themselves in the online space. If you have a large class, make use of recitation divisions so that there is a smaller community that is available to the students. 6. Depending on the availability of outdoor spaces, encourage courses with < 50 students to meet outside at least once in the first two weeks of class. 7. Use in-person sessions to build community, which can be leveraged in remote or online sessions.			

D. Provide mechanism to connect individual or groups of faculty to resources and support

1. Departments should designate a faculty member (as part of their teaching or service assignment) or a TA or grad student to serve as a liaison and concierge to address both tech and instructional issues.	The Center for Teaching and Learning is acting as the hub for pedagogical support Languages have the Anderson Language Technology Center (ALTEC) for support.	1 - Technology TA for each unit to offer one-on-one and group assistance during the progression of the semester. 1 - CTL or OIT, and ASSETT could provide training and support for department liaisons.	

E. Develop departmental communication plans

1. Create departmental methods for information sharing, e.g., through a Canvas course, a shared Google Drive folder, or a team in Microsoft Teams. Create ongoing departmental processes or procedures that the technologies can support.	For the sharing of expertise and efforts, the Discipline Based Education Research (DBER) group and ASSETT could be helpful.		

IV. Flexibility

A. Plan for adapting to changing circumstances

1. Designate backup instructors for each course in case the assigned instructor falls ill. Inform them about course policies and procedures	1 - Existing instructors within the department, if some courses are cancelled.	1 - The University should allow course banking or future teaching relief for backup instructors that must take	Consider how in-person experiences will go online (at least by, but likely prior to, Fall Break shift).

at the beginning of the semester. Consider introducing them to students once early in the semester. 2. Create contingency plans for in-person and synchronous course activities. 3. Accessibility: Where possible, use offer an option for electronic textbook resources and Open Educational Resources. 4. Know that all classes will be remote or online after Thanksgiving break. Plan for final exam to be administered before break or given remotely or online.	1 - Plan to give a backup instructor shared access to your course in Canvas.	over a course under overload conditions.	

B. Define requirements at the departmental level

1. Develop plans for required courses and degree requirements that take into account how course offerings may have to be adjusted for Fall 2020. 2. Consider how to adapt	Use Cidilabs (Canvas integration) to create a course template in Canvas that your department can use.	1 - Engage with OIT and ASSETT for unit-specific remote teaching and learning technology training based on the faculty needs and interests within a unit.	Consider how quickly (and how) you will pivot between face-to-face and remote or online modes. Walk the students through those changes on the first day so they know what to expect.

faculty teaching and service assignments to support the unique requirements of the current context, e.g. the University could consolidate courses, provide faculty and TAs serving as back-ups in various capacities/courses, or serving department support roles.			

C. Be prepared to shift modalities

1. Design syllabi with multiple modalities in mind, so that fewer changes (e.g. in assignment structure) are needed when modalities shift. 2. Inform students of what changes they can expect if the modality shifts suddenly.	1 - Universal Design for Learning training and support is offered by ASSETT and Academic Technology Design Team. 2 - Quality Matters Emergency Remote Instruction checklist is a helpful resource.		

Recommended Guidelines and Resources

- ASSETT guide to Planning for Remote Instruction in Eight Simple Steps (by Joy Adams)
- Center for Teaching and Learning guide to Remote and Online Teaching
- Quality Matters Emergency Remote Instruction Checklist.

Best Practices for Remote and Online Teaching Committee Members

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