The goal of these notes is to provide a brief primer intended to facilitate the time-sensitive migration of your course to an on-line setting. The emphasis is on sharing some hard earned advice on how to make your transition to online teaching next quarter as effective and painless as possible.

The final section contains links to additional information and resources, organized by topic.

**KEY DESIGN QUESTIONS**

The most important thing to realize is that the major challenge in moving to on-line teaching is conceptual, not technological. You will have to struggle with some technical issues in setting and deploying the course, but the most important aspect in making this transition feasible and effective has to do with instructional design choices that happen before you start interacting with specific technologies.

This section provides an introduction to some of the key course design questions that you might want to consider.

*Start with the end in mind: What are your learning goals and what are the learning activities used to accomplish each of them?*

- Given the tight deadline, you might be tempted to focus on how to recreate on-line an instructional setting that is as close as possible to what you normally do in the classroom.
- We urge you to fight this tendency and instead begin by answering the following three questions:
  - What are your specific learning outcomes?
  - What are the range of learning activities that you could use in an online setting to accomplish those learning outcomes?
  - What are the activities that you could use to assess those learning outcomes?
• Ideally, you should be able to outline specific learning outcomes for each section/week of the course.

• An example of a bad learning outcome is “I will teach a lecture on consumer surplus”

• A better example of a learning outcome would be “Students will be able to provide a definition of consumer surplus, they should be able to identify problems that can be solved using this concept, should be able to understand the relationship between the area and integral definitions of consumer surplus, and should be able to compute the change in consumer surplus of market and/or policy changes in markets with one good.”

• The output of this exercise would result in a table that could be part of your syllabus and tells students the specific learning goals associated with each class and activity.

• Most learning goals can be achieved with a range of different learning activities. Thus, although lectures and class discussions are often synonymous with college teaching, there are many other ways of accomplishing the same learning goals, and many of them are more effective in an on-line setting, and more efficient.

• Thus, we urge you to overcome the “I must deliver live lectures” default, and instead consider other activities that you might use to better accomplish the same learning goals.

• Here are some examples of alternatives to live lectures.

  ○ Record non-live lecture videos that students can watch and study asynchronously, at their own time and pace.

  ○ Write high-quality lecture notes of some of the material.

  ○ Assign detailed reading for a book and supplement the assignment students with a checklist of key concepts and questions that students should ponder as part of their reading.

  ○ Provide simple conceptual exercises that students can use to deepen their understanding of the material, and return them as a low stakes graded material (note that this is different from a problem set, and is designed more as a way of enhancing learning during the lecture).

  ○ Enhance off-line readings with a structured and moderated discussion of the assigned material.

  ○ Assign reading material before a live meeting, and then use the live class time to run a “flipped discussion session” in which you post questions to the students, give them some time to ponder, and then guide a discussion on the right answer, or describe it yourself.

• Ideally, you should also be thinking about how to use graded work to assess the success of your specific learning goals and activities, and about how these assessments can incentivize and motivate engagement and participation in all aspects of the course.
In an on-line setting, asynchronous learning is often better than synchronous learning.

- Many highly effective courses are taught using a fully asynchronous model. In this model, the instructor provides a set of learning tasks and materials, a set of deadlines, and some form of discussion board that is monitored by the course team. Students complete the material at their own pace.
- This pure asynchronous model has several advantages in an on-line setting, especially during unpredictable times:
  - It eliminates coordination problems when students span multiple time zones
  - It reduces problems due to technical difficulties either for the course team or for a subset of students.
  - It allows students to accommodate other demands on their time and emergencies (e.g., getting sick or taking care of relatives)
  - Discussion boards provide an efficient way to answer questions and discuss issues that might be relevant to multiple students, and to do it in a way that accommodates instructors’ time constraints and emergencies.
- One disadvantage of purely asynchronous courses is that they reduce face contact with and between students, and thus lose valuable social components available in a classroom setting.
- To address this, you might consider a mixed model in which some of the class activities are asynchronous, but there is also a synchronous component (e.g., class discussions or OHs in smaller groups, or the type of flipped classes discussed above).
- In addition, the asynchronous model is not ideal for seminar style courses that rely heavily on live class discussion.
- If you decide to have a significant live course component, please keep the following in mind:
  - If feasible, record your live sessions and make them available for students who cannot attend the live session (this is easily done in Zoom)
  - Can you minimize the impact that missing some of these live sessions can have on students’ learning and grades?

Divide and conquer

- There is a wide consensus among those experienced in on-line teaching that it is useful to divide learning activities into small chunks.
- For example, instead of posting a 90 min lecture video, it is recommended that you divide video content into 4-8 smaller self-contained chunks.
- Note that the chunks need not be videos; they can be any learning activity.
- There are several reasons for this:
  - Chunks accommodate better the needs and context of students engaged in on-line learning
They provides some “course gamefication” which increases motivation (students get to complete successfully smaller tasks, which is reinforcing)

- It enhances learning by respecting most people’s attention spans.

- There is also a practical advantage: it also makes the problem of putting together your course more tractable by dividing its construction into a series of more tractable steps.

**Expect and plan for problems: What can you do to make your course robust to “technical and human” difficulties?**

- One humbling aspect of on-line teaching is that logistical and technical problems occur more frequently and can be harder to resolve effectively.

- One reason for this is that asynchronous on-line communication lacks immediate social feedback (e.g., puzzled faces), which means that misunderstandings happen often and need to be resolved using limited bandwidth channels. Another reason is that technology fails and the probability of issues scales linearly with the number of students.

- Here is some advice on how to deal with this:
  - Minimize synchronous learning activities as much as possible. It is easier to catch and fix issues in asynchronous mode.
  - Record your live sessions and make them available for students who cannot attend the live session (this is easily done in Zoom)
  - Have someone carefully proofread your syllabus, problem sets, assignments, ... anything that describes course expectations, instructions, logistics. Don’t trust yourself -- someone else needs to read it!
  - Do a live test run of all of your systems. You don’t want to be the faculty member that prompted this Stanford Facebook post.

*Pin down your two-way communication channels*
• Frequent, consistent, and clear communication channels are critical in a successful on-line course, because this is the only way that your students will communicate with you and with each other.
• Thus, careful planning for how to do this is critical.
• Note that there are several communication channels to think about

• Initial communication from course team to students:
  o How are you going to carry out your initial communication with students to explain the course logistics and expectations?
  o How are you going to do the same for students that join the course after it starts?
  o Are you going to use email for this?
  o How are you going to build and update the list and email list for students? (Note that, historically, REGIS is not be up-to-date in real time)

• Ongoing communication from course team to students:
  o It is recommended that you set a regular routine for sending communications and instructions to students (e.g., every Monday morning, or Tu and Th at 4 pm) in order to keep them connected to the course.
  o It is recommended that you try to capture them by at least two different channels (e.g., Moodle course page Announcement and email).
  o Are you going to send regular communications to students? When? Who is responsible for doing so?

• Questions from students to course team:
  o It is recommended that you spell out in detail the policies and expectations for how students should communicate with course staff.
  o It is also recommended that you rely as much as possible on the course management system discussion board (e.g., Moodle) instead of email. This decreases the amount of redundant effort by the course team and allows many students to benefit from individual exchanges, since students often have similar questions. In addition, it allows students to help each other which, in its own, is a good learning activity.
  o What are your policies?
  o Who will be responsible for implementing them? When? How? (Ex: Who will monitor discussion boards and when?)

• Within course team communication:
  o If your course involves a multi-person team, you might want to also worry about communication protocols within the team, in order to minimize errors and decrease cognitive load.
  o One frequently used tool is Slack, which is free and very useful to use: https://slack.com/
But the most important is to have clarity on the responsibilities and expectations regarding within-team communication.

**Think about the social component: What can you do to maintain a sense of connection and continuity in the course?**

- Social connections are an important motivational and learning component of instruction.
- Since students are likely to feel isolated and disconnected during the upcoming quarter, efforts to help them remain connected with Caltech and their regular activities might have beneficial effects for their learning and mental health.
- The key question here is to look for small choices in course design that can help maintain this sense of connection and continuity.
- Here are some examples/ideas:
  - Communicate frequently, consistently and warmly with the students through emails and announcements.
  - Schedule open OHs/hang-outs in Zoom by setting up an event and inviting anyone who wants to join at that time.
  - Make mandatory 10 min OHs with someone in the course team (instructor and/or TAs) every week to touch base.

**Pin down your “technology” choices: software and hardware**

- We are finally ready to talk about the technology choices that you will need to make to implement your course.
- The emphasis here is on components/choices that are applicable to most courses, and will not cover the specific needs of some courses (e.g., language instruction).
- You need a **good course management system** that will serve as the home base for all course activity and communication.
- Ideally, the system should host a home page, provide a natural way to organize and distribute materials, have an announcement feature to post and broadcast them, and have a solid discussion board.
- Moodle has all of these features, it is a widely used platform at Caltech, it is supported by IMSS, and will be also supported by HSS.
- All courses are required to at least have a Moodle page as a landing page for the spring quarter (the basic course site has already been created for you by IMSS). You can link to another site from there, but Moodle will be the landing site / initial for all students to get information about each course.
- Link to intro tutorials for Moodle: [https://teach.caltech.edu/tech-tools/moodle](https://teach.caltech.edu/tech-tools/moodle)
● Piazza is another free and relatively easy to use course management system that is widely used in Caltech courses. Piazza can now be integrated into Moodle. (Add Piazza to your moodle page just like you add other course elements.)

● Some of you will need a way to broadcast lectures/videos asynchronously
● IMSS is working on a platform solution to broadcast pre-recorded videos, which should be announced shortly.
● Pre-recorded videos will be shared with students by uploading them to the platforms and sharing the links with the students in the course management system (Moodle or Piazza).
● For the meantime, you can upload your pre-recorded videos to Box as storage for yourself or for your TAs to view. (Note, however, that IMSS does not recommend this as a way to share pre-recorded videos to Box for your students, as they would have to download large files to be able to do so, which might involve substantial bandwidth problems)
● Link to Box tutorial: https://teach.caltech.edu/tech-tools/box-guide

● Some of you will need a way to record and edit lectures/videos for asynchronous broadcasting
● There are many ways to do this, but CTLO is currently recommending to use Zoom video-conferencing to pre-record lecture style videos.
● The basic idea is to record yourself using the video-conferencing tool and save the video. You can record yourself, your screen (e.g., while showing slides or a web-page), or flip back and forth.
● Link to general Zoom video-conferencing tutorials: http://imss.caltech.edu/services/voice-mobile-conference-calls/zoom
● 44 min comprehensive video tutorial by Zoom on how to use the tool in the context of education: https://livetraining.zoom.us/rec/play/vJR5d-j5q283HNGcsqSDV_5wW9Tpe_qs0CVM_PIEmkVnAAVVGiZuMaZ7NAORKJB_fFeWJ9L4d5ilrn?continueMode=true

● Most of you will need a video-conferencing platform that allows you to hold live lectures, discussions and OHs. This is especially relevant for those instructors teaching discussion-focused seminars.
● Zoom is a solid platform to do this. Caltech has enhanced licenses available for this purpose, and IMSS and HSS will support the platform.
● Synchronous events are organized by setting up a meeting and sharing the event link with students.
● See next section for some tips on best practices using tools like Zoom.
● Link to video-conferencing tutorials: 
  http://imss.caltech.edu/services/voice-mobile-conference-calls/zoom

● All of you will need a **system to collect assignments, problem sets and exams from students, and ways to return graded materials to students.**
● Importantly, FERPA imposes regulatory and legal constraints on how to do this.
● The easiest way is to have students scan or convert their work to a pdf file and to email it to a pre-specified contact in the course team.
● Graded materials can be returned to students individually in a similar fashion.
● **IMPORTANT:**
  ○ Caltech email is FERPA compliant, non-Caltech email is not.
  ○ If you need to store and share course materials within the course team (e.g., so that different people can grade different questions), Caltech Box services are FERPA compliant, but other cloud services are not.
● Again, see this very useful link from CTLO for more details and tips for best practices in collecting, grading and returning student work: 

● The **equipment** demands of most of these systems are not unusual, unless you have a very old computer.
● But you will need access to a good internet connection to engage in any form of live video streaming.
● For those of you recording yourself in video to be broadcasted, you might want to get:
  ○ A good microphone for recording sound in your computer
  ○ A good video-camera for recording video
● For those of you engaged in video conferencing it would be good to get a good headset with an attached microphone to broadcast good sound and avoid resonance problems,

● Finally, we emphasize that the **suggestions described above are just a handful of many possible choices** that you could make, since there are many other outstanding alternative products out there
● However, in making these choices we urge you to keep the following in mind:
  ○ Given that students will have to learn the systems for several different courses during a highly stressful time, it would be good to adhere to a small set of technologies by adopting as many of the defaults recommended by CTLO as possible.
  ○ The defaults described here are chosen to make the transition as user friendly as possible, they will be supported by CTLO and HSS, whereas others might not, and they have been successfully field tested.
OTHER ADVICE

This section describes some additional advice based on the cumulative experiences, struggles and learning-by-doing of dozens of on-line instructors. They emphasize micro-tips that have been found to be useful in improving on-line learning.

Think minimal feasible prototype, not dream course

- Teaching on-line can be very rewarding, but getting it right can be very time consuming and require a lot of trial and error.
- The difficulty increases dramatically if you need to learn several new technologies from scratch.
- For this reason, we urge you to embrace the following mindset: What does the minimal prototype of a complete course look like? What is the minimum set of technologies that I have to adopt to make it a reality?
- You can always add bells-and-whistles once you have a complete prototype, based on what you learn from the initial interactions with students.
- See here for some prototype outlines: https://teach.caltech.edu/online-teaching/basics

Focus your efforts on activities that have the maximum value added in student learning.

- Preparing good course materials and responding to a large number of discussion boards and/or emails can be very time consuming.
- Thus, you might want to think carefully about what actions can be delegated to others in the course team and about which are the ways in which you can have maximum value in students learning and focus on those?
- For example, can TAs run some of the discussion sessions? Can you teach some of the material through existing readings so you can prepare less (but higher quality) video lectures?

Use asynchronous learning activities as much as possible. Pre-load your course materials in case of emergencies on your side.

- We cannot emphasize this enough.
- In addition, some of us are likely to get sick in the upcoming weeks, and it would be much easier for someone else to take over the course temporarily if it is designed in an asynchronous format, and if most materials are ready to go.
Real field testing of course systems and materials is critical
- Again, we cannot emphasize this enough, as we have embarrassingly discovered over the years.
- The only way to know that each component of your course systems and procedures are working is to test it.
- Thus, we urge you to run a live test of your systems the week before classes start, by preparing the equivalent of the first week of classes and delivering it to a test audience.
- If you need additional motivation, this Facebook post describe another embarrassing “Oops” moment that could have been avoided w/ some field testing.
- HSS will be coordinating these tests for those who want to do it. For more details, see the emails from the division chair.

Work hard on your syllabus and make sure that students read it carefully at the start of the course
- In an online course it is critical that you spell out in detail all of the rules and expectations for the course at the outset.
- You will need to describe in detail logistical procedures that you can often take for granted in a regular class.
- You might want to add a FAQs section with instructions about how students can accomplish different actions (e.g., How do I ask questions about problem sets? How often does the course team monitor the discussion board? ….)
- During your initial communication, emphasize and reinforce that students **MUST** read the syllabus carefully and make sure that they understand all of the logistics and expectations.
- Even then, be prepared for many questions in the beginning of the course about rules and procedures. Reinforce the importance of the syllabus during initial communications with the language, “as stated in syllabus, …. “
- This link includes a very useful syllabus template from CTLO: https://teach.caltech.edu/online-teaching/course-components
Outline detailed expectations for discussion boards, and model them early on to shape the course culture.

- Describe what is the role for your discussion board, how do you want students to use it, and what is acceptable and unacceptable use. Do so in detail.
- More importantly, lead by example by monitoring and participating early on.
- This is important because on-line communication leads to disinhibitions that are undesirable in an academic setting.

Spend extra time on your team logistics and training: it is much more important than in a regular course

- In an online course, the course systems are the bloodline of the experience. Since students don’t have much face contact with you or the TAs, problems with communications (e.g., unanswered discussion board posts) get amplified.
- Clarify what needs to be done, when, and who will do it.
- Embrace the power of checklists and enjoy checking off items.

Consider the following best practices for running seminar-style live discussions using a tool like Zoom.

- When gathering in Zoom for a whole-class meeting, set defaults to microphones muted and video off.
- Decide whether or not you will record the meeting. The recordings could be useful to students who cannot make it to a synchronous meeting. If you are recording, you should clearly announce that to students.
- When you enter the room, turn your own microphone and video on. Open the chat and participants windows. The former lets you see communications from students who don’t have a mic. The latter lets you see other indications from students. Spend time with students in early meetings showing these features to them and asking them to test them out.
- Consider asking students to turn their videos on for discussion. Being able to see one another for discussion-oriented meetings helps keep students engaged and humanizes the experience. However, if a student is unable or unwilling to turn on their video, they can still participate using audio only.
- While you may be used to a more organic form of discussion in class, online, structure is needed.
  - Announce a question or task for students. Give them a set amount of time to consider it individually, and let them know you will be calling on them. Then, call on individuals to contribute.
  - Alternately, you might incorporate the “raise hand” feature in the participants window so that students can volunteer to speak.
  - Even if you don’t normally use slides to structure discussion, it could be useful online. Having questions, topics, or tasks on slides helps keep things organized.
You can share your powerpoint screen with students during a synchronous meeting.

- For more natural conversations, you can use breakout groups of 5 or fewer students. With this smaller number, it is easier to talk in a conversational manner. You should be able to move between these groups, or you can allow them to talk privately.

**LEARNING MORE**

**Caltech campus-wide guidance**

- [http://teach.caltech.edu/](http://teach.caltech.edu/)
  - Campus-wide Caltech guidance for teaching online.

**General advice about on-line teaching**

- [Going Online in a Hurry: What to Do and Where to Start](https://www.teachonline.northwestern.edu/page/going-online-in-a-hurry)
  - Useful six-step approach for thinking about the design of your own-line course.
- [How to Make Smart Choices About Tech for Your Course](https://www.teachonline.northwestern.edu/page/how-to-make-smart-choices-about-tech-for-your-course)
  - More advice on course design and tech choices for your on-line course
- [Practical advice for instructors faced with an abrupt move to online teaching (opinion)](https://www.teachonline.northwestern.edu/page/practical-advice-for-instructors-faced-with-an-abrupt-move-to-online-teaching)
  - Humorous and very useful practical advice for how to avoid being the source of embarrassing Facebook posts
  - Advice on how to provide better student feedback in on-line courses
- [The Philosophers’ Cocoon](https://www.chronicle.com/interactives/20191108-Advice-Feedback)
  - Written by a philosopher with years of experience teaching on-line
  - Useful discussion of the advantages of asynchronous on-line learning
  - Useful discussion on how to set-up course logistics and expectations properly, and why it is so important in an on-line learning setting
- [Teaching Effectively During Times of Disruption](https://www.teachonline.northwestern.edu/page/teaching-effectively-during-times-of-disruption)
  - A primer on on-line teaching from Stanford
  - Covers general advice and some useful introductory tutorials to various tech components
  - Note that Caltech does not have a Canvas license, so that material is not relevant for us

**Advice geared to humanities courses**

- [Suddenly trying to teach humanities courses online?](https://www.teachonline.northwestern.edu/page/suddenly-trying-to-teach-humanities-courses-online)
This article covers the switch to online teaching with a humanist slant, particularly considering questions of how to maintain the connection and discussion that characterizes humanities courses.

- **Perusal**
  - An online teaching tool which calls itself a “social e-reader”
  - Now may not be the time to try to learn how to use one more completely new tech platform, but if you’re looking for a way to replace/supplement synchronous discussion, you may want to ask students to annotate a common text. This platform is designed for that purpose.