A few years ago, I was working with professors who were planning on starting an online version of their face-to-face classes. I’ll never forget the professor who said, “Just come to my lectures and videotape me. We’ll put them online. That’s all we need to do, right?” Unfortunately, that’s the typical idea of what you need for an online class. However, just as straight lecturing in a face-to-face course is one of the most ineffective methods of teaching anyone anything, it is equally ineffective in an online course. While there are some specific challenges to teaching in an online environment, the structure of a course is most effective if you use techniques to maximize student engagement.

Right now (April 2020), we’re living through unprecedented times. You and your students are living with daily stress and uncertainty. Everyone who is trying to move their instruction to an online environment has little time to follow best practices in developing online instruction. Give yourself permission to accept a less-than-perfect instructional situation, especially when you and your students are new to online education.
Strategies for Becoming an Engaging Instructor

There are different problems to face when teaching online students. What follows is a description of the characteristics of the most successful learners, and specific steps you can take to help those who lack them.

**Effective technology access and skills**

- Successful students have full access to modern technology and know how to use it.
- Millions of American students do not have internet access at home.
- Many are students of color, first-generation college students, and students from low income families.
- Even many of those with computers lack basic technology skills.

In the past, students who signed up for online courses had to first confirm that they had the proper equipment and knowledge to effectively complete their coursework. But with a huge push to move to online teaching for most universities across the world, students are thrust into a learning environment they never anticipated using, and few have the knowledge or skills to immediately adapt to this situation.

Many students will use a cell phone to access every element in a course instead of a laptop, tablet, or desktop computer. Or they may have to share a computer with their family. Or they don’t have a wi-fi connection and have to use a data plan to watch videos, attend live sessions, and read articles or online resources.
Even students who have the appropriate technology still lack basic knowledge of formatting documents, uploading them to a server, sending and receiving emails in a format that is appropriate for a professional setting, or even just naming documents and saving them where they can easily retrieve them later.

Every moment you can spend instructing students on how to access your course, communicate effectively with you, and find the proper resources and directions will result in less frustration overall for both you and your students. You are still helping them learn skills necessary for success in the adult world where there are expectations that they will try to solve their own problems first before asking for someone to intervene.

Assume that students will access your course using a cell phone. They may or may not have wi-fi where they live, particularly in rural or low-income areas. Students do not need to access a live lecture to learn everything you want to teach them. Record your lectures on your own laptop (see https://www.panopto.com/blog/the-best-way-to-record-a-powerpoint-presentation/ for instructions on recording lectures with PowerPoint) and upload them to your learning management program.

Write out what you want to say for each slide. Add it as notes under each slide. Print out your slides and notes for students to reference. See https://support.office.com/en-us/article/print-slides-with-or-without-speaker-notes-02952fc2-2921-4305-b8b2-e98644a93e06 for details.
Strategies for Becoming an Engaging Instructor

Millions of American students do not have internet access or computers at home.

◎ Provide transcripts of your video lectures.
◎ To meet legal requirements for access for disabled Americans, you need to provide either captions for video lectures or a transcript that can be read by a screen reader.

Once you have a text document with the notes, read your transcript as you record your lecture. Upload the transcript and notes to your course website.

Tips for successful recorded lectures

◎ Check your background.
◎ Be yourself!
◎ Keep your voice warm and personal.
◎ Don’t listen to your own recording.
◎ Title each one simply:
  ○ Lesson One, Notes for Lesson One

Check your background. Clear away distracting photos or personal items you don’t want your students to see. Try to keep pets, children, and family or friends away while you’re recording. If you have a way to add in a virtual background, this will help eliminate inanimate distractions.

Be yourself! If you tell jokes or use humor in a regular class, do it with your recorded talks. If you don’t have every hair in place when teaching, don’t try to look model-ready on camera.

Keep your voice warm and personal. Pretend you’re talking one-on-one with a favorite person. When students can’t see your face, they pick up cues from your voice. If you smile while speaking, you’ll sound friendlier.

Don’t listen to your own recording! You’ll want to go back and fix things. Let your students know you’re human, too, and you make mistakes.

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Title each lecture and the accompanying notes with a simple description: e.g. “Lesson One, Notes for Lesson One.” Then students can download each short video and each set of notes in a short period of time, and watch/listen/read them offline. Provide links to additional information about the topic you’re teaching. Use Khan Academy videos (https://www.khanacademy.org/) for basic content knowledge for students who need more instruction on foundational topics.

If you don’t use PowerPoint slides, then record yourself lecturing while reading off a transcript, and upload both the recorded lecture and transcript. Don’t worry about stumbling over your words. You don’t have to look perfect, either.

I’ll deal with discussion-based classes later on in this presentation.

Just because our students know how to upload or access a photo or short video, or how to send messages and texts, it does not follow that they can trouble-shoot their own problems when accessing a course or saving a written assignment in a specific format. Most of them rarely check email sent to their college or university’s email address.

• Be sure to emphasize, over and over again, that they should check their institutional email account several times a week.
• Have them send you an email from their college’s email address with the proper headings: Class Name_Last Name_First Initial_Subject in the subject header. Either require this as the first assignment or give extra credit for students who follow the directions. Do not reply to emails that don’t follow your email directions, but make an announcement to the whole class giving the number of students who sent it properly at the end of one week.
• Do a similar thing for the first written assignment. Specify that it MUST be uploaded and MUST be in the proper format with the proper name to earn credit.
Provide all directions for accessing, viewing, participating in discussion areas, and uploading assignments in more than one place in the class. Have it available under a sub-heading like “Accessing the class” or “Participating in this class”.

You could also put all of your directions in a single document, and require students to download it, read it, and send you a statement that they’ve read and understood your directions.

This will free you up from needing to repeat the directions over and over again. You can just send a link to the proper document when students fail to follow the directions or ask you how they’re supposed to save a document in the proper format or submit an assignment.

The simpler and more basic you can make your instructions, the better for both you and your students. If the format of a paper is important, create a template they can download with the margins and font size already set.

Don’t underestimate how poorly some students understand basic computer technology, such as setting a font size, creating a header or footer, putting page numbers on a document, or even saving it in a readable file. Refuse to accept assignments that are emailed to you instead of uploaded to the course website. Some learning management systems do not allow the professor to upload a document into a student account.

Refuse to accept images of papers – this is how students try to get around using a plagiarism checker. You may need to accept images if you’re asking students to complete calculations and show their work, though, but ask students to convert the image into a pdf file.
Strategies for Becoming an Engaging Instructor

Every teacher struggles with students who lack effective time management skills. Many people have the misconception that online learning is “easier” than face-to-face learning, because students can attend classes or view lectures at their convenience, but it is well-established that students need to be self-motivated and have good time management skills to finish an online class in the allotted time and not fall behind.

Some students think that, if they’re five weeks behind in a 15-week class, they have plenty of time to catch up in the end. This rarely happens. The same problems the student has completing the lessons as scheduled are still interfering with his/her ability to do more than his or her peers who are on track to finish on time.
Besides having a well-organized syllabus and course calendar, with prominent due dates, send out reminders to students even if they are as little as a week behind early in the class. I usually don’t recommend repeated reminders, because you may end up spending too much time composing emails every week. Send a group email, but put all recipients in the BCC field. This way, students have some semblance of privacy. No one knows who else may have missed the latest assignment.

If you don’t receive either the assignment or a reply, send a message to the student directly asking him or her to explain why the assignment was not submitted. If you have specific consequences for missed or late assignments, mention them or point the student to a link where she or he can read about them.

When working with adult students, or providing a class where many of your students are not taking a full load of college courses, be flexible about your first deadlines if need be. When a student has a valid reason for falling behind (e.g., illness, childbirth or pregnancy, job obligations, mental health issues) see if you can reach some compromise and get a commitment about a firm date by which the student will complete the work.

Every time you communicate with the class as a whole, or with an individual student, you are sending the message that you care whether they’re successful. Students need to know that you really want them to learn what you’re teaching them.

<table>
<thead>
<tr>
<th>Virtual office hours to support students</th>
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<tbody>
<tr>
<td>◎ Schedule 60, 90, or 120 minutes of “office hours” per week, at different times of the day.</td>
</tr>
<tr>
<td>◎ Be available online in at least 30 min. periods.</td>
</tr>
<tr>
<td>◎ You could have a live video feed or live chat.</td>
</tr>
<tr>
<td>◎ Take this time to answer student emails or notify students who have fallen behind.</td>
</tr>
<tr>
<td>◎ Grade papers while waiting for students to show up.</td>
</tr>
</tbody>
</table>

Set aside a specific time each week to talk to your students – whether it’s through an announcement or a short, live discussion. It’s important to let them know you are paying attention to your class. Think of your time spent answering emails and contacting students as part of your virtual office hours.

I don’t mean that it should be your top priority at all times, but it is important enough to schedule a specific time to focus on your students. You would be doing this on a routine
schedule if you were teaching face-to-face, and your online students deserve no less than your real time students. But be kind to yourself; you don’t need to be available 24/7. Set aside time each day and all weekend where you simply do not look at your class or read and answer emails. Let your students know when you definitely are and are not available.

You may wish to have a live video feed for office hours, too. One, two, or three half-hour video sessions per week is usually sufficient. Try to schedule them at different times of the day, because you’ll never know who has to take care of children, go to work, or have other commitments if you hold it the same time on the same day each week. If you’re willing, offer your students one-on-one video conferences if they’re really struggling and want individual attention. Let them schedule this with you instead of telling them when you will speak with them.

I’ve held video conferences on Sunday evenings, Friday afternoons, and at other times during the week because it’s been more convenient for the student. It’s rare that a student will request this, but if you signal your availability, it helps them see you as a supportive, caring instructor.

Self-motivated students are the most successful online learners. However, students who depend on someone else to remind them to keep on track, or students who need repeated feedback to know if they are performing to the expected standard, need more support.

Frequent feedback is essential for all students, but it especially helps those who are unsure if they truly understand the content. It’s always been my mantra that if I assign it, I read it. I don’t just skim submitted assignments, but read them carefully to see if the student has really understood the content I am assessing. Formative feedback lets you know if you need to adjust your instruction, but it also lets the student know if s/he has learned the content. I try to provide constructive criticism: “[This part] is well done, and [that part] could be improved by doing [this], or it might help if you access [this resource]”. If they've misunderstood the assignment, I tell them to go back and read the directions again.

If students tell you they didn’t complete an assignment or exam because they didn’t understand the directions, require them to tell you what part they didn’t understand and where they found
the directions for the assignment **FIRST** before repeating your directions. Or send them a link to where they can find the directions without any additional information. Students will practice “learned helplessness”, especially if they’re recently out of high school and expect to be spoon fed information when they can find it, and **should have found it** by themselves. This is where it becomes useful for you to have directions for assignments or taking exams in more than one place within your course:

- In a weekly announcement
- On the top of the assignment or exam itself
- On an assignment page or on the first page of a folder of information
- In a reminder email that X assignment or exam is on date Y, and where to find details

Sending out weekly progress reports helps remind students who are falling behind where they should be at this point, and lets those who are on track know that their work has been recognized and is appropriate. It can be as simple as a group message to everyone who has completed the latest lesson telling them that they’re on track to complete the class, and another to those who are behind saying they need to log in more often and spend more time working on the class. Some learning management systems can automatically choose students who have completed an assignment or students who have not submitted or who have scored below a certain threshold to send a group email.

**If at all possible, try to reply to messages from students within 24 hours, except on weekends.**

If you have a large class, assign your teaching assistants to monitor and reply to routine email questions. If it is in regard to missing an assignment or exam, or needing an extension, have them flag the message for your attention.

However, don’t give up your time with your family, for holidays, or scheduled time off. You shouldn’t be wedded to your phone or computer and answer messages as quickly as they come in. Some of your students may be several time zones away, and if you reply to a message at 3 AM you are setting a bad precedent. You are **not** available 24/7. You are teaching; not saving lives. An immediate response is not critical.
Some students are reluctant to ask for help. Perhaps they are afraid the instructor will refuse to help them if they don’t understand the directions for an assignment, or cannot access the resources. I have had students suffering from major life problems (a death in the immediate family; a life-threatening illness; loss of a job; divorce) who have not come forward to ask for support and understanding for not attending to class. Successful students will do what it takes to get the help they need; struggling students will suffer in silence.

Help the struggling students by providing additional resources for your most difficult topics. You could use online resources developed for middle school or high school students to teach basic concepts if need be. Let your students know, clearly and decisively, that they should contact you immediately if they are having personal or academic problems. This is where it also helps to be somewhat flexible on due dates. Do you really need to punish a parent who has spent the last several hours in an emergency room with a sick child for not handing in an assignment by an arbitrary deadline?

Keep the lines of communication open. It’s easy to forget to post general announcements, check up on who hasn’t logged in lately, or send a message to that student who seems to be struggling when you are immersed in your other work and life obligations. Don’t let them get lost in a virtual setting. If they know you are checking up on them, they are more likely to stay engaged in the class.

I read multiple discussion boards for professors, and many of them are seeing increasing numbers of student emails about mental health issues. If a student reaches out to you to talk or write about mental health, sexual harassment or assault, financial problems, or other issues, send them a link to the appropriate office of your institution. If they’re threatening suicide or self-harm, personally call the appropriate office to tell them as soon as you can, and urge the student to call a suicide hotline. In the US, the number is 1-800-273-8255.
If your student simply won’t cooperate …

Before it becomes too late for the student, provide a stern warning that s/he is in danger (or is already) failing, and will not have time to change this if s/he does not start working ASAP. Send this message to both the course email AND a personal email (if you have it).

If nothing changes, give up. Spend time on your students who are working and learning.

KEEP ALL COMMUNICATIONS to provide a record of your actions.

Finally, when it seems like no matter what you do to reach out to a student who is not keeping up with the class, take steps before it is too late for the student to pass the class.

• Send a stern warning that the student is in danger of failing if nothing changes immediately.
• Give the student a hard deadline to respond or start engaging in the class.
• Send it to both the course email and a personal email (if it is available).
• If nothing changes, or the student does not respond by the deadline, give up. Spend your efforts on students who are willing to work.
• KEEP ALL COPIES OF ALL COMMUNICATIONS. This will protect you in the event the student claims “he didn’t know” he might be failing.

Student discipline

This refers to getting students to:

○ Log-in on a regular basis
○ Complete the lessons and assignments on time
○ Not cheat on exams and assignments
○ Respond to instructor communications

Student discipline means their ability to keep on track even through distractions and other responsibilities. With the current ongoing disruption to daily life, this is even more important than usual in virtual classes.
How do you address this issue?

- The relationship you build with every single student helps improve student discipline, retention, and completion rates.
- Cheating is minimized when assignments and exams are not based on rote learning, and you check for plagiarism on written assignments.

It’s so easy to pay less attention to the students as individuals when you never see or hear them in an online class. A different kind of effort is needed for you to reach out to them and make them feel like you know them as an individual. You have to build a positive student/teacher relationship to improve student discipline.

Whether you are teaching in a face-to-face, blended, or completely online class, you can reduce the incidence of cheating if your assignments and exams are not based on rote memorization or simple topics for written work.

Building student/teacher relationships

- First and foremost, you have to decide whether this is worth your time and effort. If you have >100 students, it can become rather time-consuming to monitor every student throughout the course.
- Don’t let an online class consume all your time.

Building those personal relationships takes time. Lots of time. I have some classes with 130 students. Even though I read everything each person writes (I really do – every single sentence, every email, every post, everything), it is hard for me to keep straight in my mind who has written what. And I teach online almost full time! If I had a class of 30 or less, it would be far easier for me to get to know each person.

So, keep these next suggestions in mind as something you may or may not be able to do, depending on your own circumstances. If you are pursuing tenure, writing grant applications,
publishing, and conducting research, your time will be limited. If you are teaching full or part-time, but teaching is your primary occupation, you will have more time to incorporate some of these suggestions into your course.

**Tips to improve student/teacher relationships**

- Record a short video introducing yourself and require students to view it. It can be just a minute long.
- Hold weekly or biweekly online meetings to just chat or answer student questions or concerns. These can be just your office hours or a short, thought-provoking question to prompt discussion. Require students to attend 1 or more meetings over the semester.
- Ask students to post pictures of themselves to their accounts (if possible). It helps you to see each one as a person.

Here are simple tips that won’t take too much time but will help your students get to know you better and start building those relationships. I ask people to include a photo of themselves as an avatar in my class, and I have found that I like to look at them if I have a particularly interesting or outstanding participant, or one who is struggling. This is me, taken in September 2018.

**Building student/teacher relationships**

- Comment in the discussion boards or on the blogs. No need to reply to every post, but look for questions and effective comments.
- Have your TA or GA help you answer questions, too.

Let your students know you are paying attention to the class by making comments in the blogs or discussions. While your teaching or graduate assistants can be directed to read and reply to most of the posts, take time to see who is only writing “Good comment!” or who is actually providing effective feedback. Your replies don’t need to be extensive, but it helps keep your students on track when they know you are checking the posts regularly. If you commute to and from work using mass transit, this is a simple way to pass the time, since you should be able to access your course on your phone.
Building student/teacher relationships

- Let go of the idea that YOU are controlling the entire class and are the sole source of information.
- Provide meaningful and/or interesting learning activities.
  - A bored student is more likely to drop out.
  - Active learning works in online education, too.
- Encourage students to share resources, ideas, or videos.
  - Allow students to create discussion questions or new pages, or add to existing ones.
  - This increases their sense of ownership of the content, and increases the chances they will continue and complete the class.

Great teaching means letting the students take the lead at times. Whether it’s a face-to-face or online class, letting your students learn something from each other helps them feel like they are collaborators in the search for knowledge, not just passive recipients.

Just like face-to-face learning, online learning is boring if it’s nothing more than passively watching and listening or reading. Give students something to DO. This is where an instructional designer can help you bring your course to life. If you don’t have an instructional designer to help you, find a couple of small videos, simulations, or animations to break up your presentations. I have several resources listed near the end of this presentation.

Encouraging students to share resources, ideas, or videos, and starting their own discussions or creating new pages helps increase their sense of ownership. When students are more personally invested in a class, they are more likely to remain and complete it.

Building student/teacher relationships

- Provide multiple resources for most concepts.
- Audio, video, text, and multiple web-based sources if at all possible.
- Remember to use accessible sites for students with disabilities (audio and visual).
  - Reduce reliance on Flash and Java applets.
  - All web-based videos must have a transcript.
  - All text must be able to be read by a screen-reader (most .doc .docx. and .pdf files are appropriate).

Provide multiple resources for most concepts. But “stand on the shoulders of giants!” If you are not teaching a highly unique course, use what others have created. Many professional educators don’t mind sharing their work. It would be a professional courtesy if you asked the
author if you could use it, but many videos posted to You Tube and other resources are free of copyright issues or fall under the “educational use” category of copyrighted information.

Reducing cheating – quizzes and exams

○ Have assessments with a proper mix of different levels of difficulty.
○ Vary the placement of questions AND ANSWERS for multiple choice questions.
  ○ There are free and for-fee online test maker programs that will do this for you and automatically grade your assessments: http://www.classmarker.com/
  ○ Compare and contrast student responses to look for identical written responses or patterns of right and wrong answers on multiple choice questions.

Some institutions require online students to take an exam by being monitored by a proctor while on a webcam. But no matter what your institution does, no matter how hard you try to use technological fixes to reduce cheating, chances are that some of your students will find a way around it.

If your exams are a proper mix of different levels of rigor and difficulty, it won’t matter what kinds of notes or resources students are using to cheat, they won’t be able to answer all the questions by looking them up. You can also use one of the numerous free test-maker programs that will vary the placement of your questions and their answers, so even if students are trying to share information they won’t be able to say that question #1 is answer C, question #2 is answer A, and so forth. You can use an test maker program to help you randomize your questions and answers (see http://www.classmarker.com/).

For short answer and essay written responses, compare and contrast student work to look for identical phrasing (or spelling mistakes). Look for patterns of right and wrong answers on multiple choice tests (if, for example, five students all had questions 1 – 6 correct and 7 & 8 incorrect if your test did not vary the placement of questions and answers).

You will never be able to stay ahead of the technology that allows students to cheat. Cheating is not confined to undergraduates, and it is your responsibility as a teacher to watch for it, verify it, and impose the consequences dictated by your institution.
Reducing cheating – problem sets

◎ Assignments should never be so simple students can copy & paste information from notes or online resources (think Bloom’s Taxonomy).
◎ For problem sets, have students submit their answers AND a scanned copy of their hand-written solutions that INCLUDE A WRITTEN EXPLANATION OF HOW THEY CHOSE A SOLUTION.
◎ Compare scanned copies from different students who have the same answers to see if their documents are identical or the solutions are identical, down to the last decimal point.

Trust, but Verify

Students cheat; accept this and use these tips to reduce its occurrence.

Don’t make your assignments so simple that students can simply copy & paste information for an answer. Think about how using Bloom’s Taxonomy (https://cft.vanderbilt.edu/guides-sub-pages/blooms-taxonomy/) for objectives and assessments can require students to do more than give rote answers.

For problem sets, you can require students to submit their answers as a scanned copy of their hand-written work, plus provide a written explanation of how they arrived at their solution. Don’t just use the materials that come with your textbook. Students have already posted answer keys to these all over the internet. Chegg.com https://www.chegg.com/homework-help/textbook-solutions has posted solutions to questions and problem sets found in over 22,000 textbooks, along with answer keys to exams that accompany many of these textbooks. Students will also take photos of exam questions, upload them, and have people solve them in real time so they can use them on an exam.

Trust, but verify. Compare student answers that seem very similar. Compare scanned copies from students whom you suspect of cheating, or just ones you have randomly chosen. Look for similarities of word choice or answers that come out to the same decimal point. I can open a document a student has submitted and see whose name is on the word processing program or the assigned computer. Check to make sure that this name isn’t someone else. When students pay another person to write an essay for them, often this writer will not change the properties of the document, and you can clearly see that it was written on another person’s computer or under their log-in.
Online group work is usually difficult to manage well. Many students LOATHE it, and I am highly sympathetic with this point of view. If, however, you want to use group projects, it is simple to monitor who has done the work and who hasn’t by using a few strategies.

- Have students work in a collaborative space that records each interaction, iteration, and comment by the participants, and date- and time-stamps it. Google Docs, a wiki space, or other virtual collaborative space will do this.
- Require each group to submit a progress report and link to their work half-way through the project timeline.
- Hold virtual meetings with each group and require that all group members be present. Give points or credit to those who show up, and deduct points for those who don’t.
- Include test questions based on the projects’ results on exams. Students who actually worked on their projects will be able to answer, while students who did not will usually have to guess. When you have several projects for a class, give a quiz with one question per project, and hold every student accountable for understanding the major point or conclusion of each project.
Strategies for Becoming an Engaging Instructor

Make it more interactive

- Videos
- Simulations
- Virtual labs
- Games
- Creating wiki pages
- Creating discussion questions
- Quizzes based on readings or lectures

There are thousands of resources on just about any topic you might need to teach. Finding appropriate ones might be difficult, but the time spent finding and linking to them gives you time off from creating lectures. If you work at a public university, you’ll have to have the videos captioned. Your institution may provide this service to you. If you upload your videos to YouTube yourself, you can use the automatic captioning feature.

Video resources

- Crash Course – multiple topics, high school – undergraduate level
- Amoeba Sisters – biology
- Neuroscientifically Challenged – basic neuroscience
- Algebra at Khan Academy – beginning through advanced
- 90 Free Online courses to Improve Writing Skills
- iBiology

Crash Course: https://thecrashcourse.com/courses
Amoeba Sisters: https://www.youtube.com/user/AmoebaSisters
Neuroscientifically Challenged: https://www.neuroscientificallychallenged.com/2-minute-neuroscience-videos
Algebra at Khan Academy: https://www.khanacademy.org/math/algebra
90 Free Online Courses to Improve Your Writing Skills: https://www.classcentral.com/report/writing-free-online-courses/
iBiology: https://www.ibiology.org/educators/
Using simulations provides multiple benefits:

- Allows students to explore “what-if” scenarios before making real-world decisions. First responders, pilots, surgeons, the military, and other professionals often use simulations to help learners deal with complex information in a safe environment.
- Provides a “game-based” feeling to learning.
- Engages students in changing variables to see what happens in real time.

### Simulations

**Chemistry:**
- PhET: [https://phet.colorado.edu/en/simulations/category/chemistry](https://phet.colorado.edu/en/simulations/category/chemistry)
- ChemCollective: [http://chemcollective.org/sims](http://chemcollective.org/sims)
- Web Elements: [https://www.webelements.com/](https://www.webelements.com/)
- General Chemistry Interactive Simulations: [http://employees.oneonta.edu/viningwj/sims/](http://employees.oneonta.edu/viningwj/sims/)

**Public Health:**
- Outbreak at Waters Edge: [http://www.mclph.umn.edu/watersedge/](http://www.mclph.umn.edu/watersedge/)

**Biology:**
- Learn Genetics: [http://learn.genetics.utah.edu/](http://learn.genetics.utah.edu/)
- PhET biology: [https://phet.colorado.edu/en/simulations/category/biology](https://phet.colorado.edu/en/simulations/category/biology)

**Neuroscience:**
- Learn Genetics: [http://learn.genetics.utah.edu/](http://learn.genetics.utah.edu/)
- Backyard Brains: [https://backyardbrains.com/](https://backyardbrains.com/)

**Physics:**
Virtual Labs: Of course, it’s terribly difficult to replicate lab activities in a virtual environment. Luckily, many universities and professional associations are designing virtual labs to help students who don’t have access to materials and equipment. Here are several resources for science-based virtual labs:

- **Chemistry:**
  - ChemReaX: [https://chem.libretexts.org/Visualizations_and_Simulations/ChemReaX:_Chemical_Reaction_Simulator](https://chem.libretexts.org/Visualizations_and_Simulations/ChemReaX:_Chemical_Reaction_Simulator)

- **Biology:**
  - Learn Genetics: [http://learn.genetics.utah.edu/content/labs/](http://learn.genetics.utah.edu/content/labs/)

- **Physics:**
  - PhET: [https://phet.colorado.edu/en/simulations/category/physics](https://phet.colorado.edu/en/simulations/category/physics)
  - Physics Interactives: [http://www.physicsclassroom.com/Physics-Interactives](http://www.physicsclassroom.com/Physics-Interactives)

- **Immunology:**
  - Immunology Virtual Lab I: [http://vlab.amrita.edu/?sub=3&brch=69](http://vlab.amrita.edu/?sub=3&brch=69)
  - Immunology Virtual Lab II: [http://vlab.amrita.edu/?sub=3&brch=70](http://vlab.amrita.edu/?sub=3&brch=70)

- **Various topics:**
  - iLabStudio – remote online labs with professional equipment: [http://www.ilabstudio.org/labjournal/overview](http://www.ilabstudio.org/labjournal/overview)
Games

- Search for "games for teaching [my subject]"
- Play it yourself to see if it meets your needs
- Games can be used for:
  1. Intervention
  2. Enrichment
  3. Reinforcement
- Be sure to have students complete an assessment after a game
  - Quiz
  - Discussion question
  - Summary of understanding

Games can increase your student’s enjoyment of the class, improve understanding of the content, and give you data about student achievement. They can be to reinforce basic ideas that students need to understand more complex topics (intervention), provide enrichment for high achievers or students who move quickly through the regular lessons, or reinforce what you’ve already taught.


It’s important to monitor how much and how well students have learned the concepts being taught by playing the game. You can have a quiz based on the content, create a discussion question or several, require students to summarize their understanding of the content, or have them take a screenshot of their final score to send to you. Either way, you don’t just have students play the game and then move forward in the class.

Examples of instructional games

- Immune Attack! — introductory level instruction on the immune system
- Cell Explorer — learn about organelles
- ACS ChemQub — games for students of all ages (choose college level)
Some games are well designed for reinforcing basic concepts for students who lack the necessary background information to understand your topic. While games may seem like a childish way to learn, they are really a very effective teaching tool. The less time you have to put into teaching topics that students should have mastered before entering your class, the more time you can devote to making the topics you must teach more engaging. Many research studies have shown that students learn concepts just as well, or even better, when it’s part of a game instead of a formal, didactic learning experience.

Creating or Editing Wiki Pages

- It’s easy to track which students have participated and how much.
- Students are required to cite their sources.
- It can improve their ability to communicate with the general public.
- It helps them practice writing skills.

There are several advantages to creating or editing wiki pages. Students can build wiki pages in a learning management system to describe concepts, processes, or to illustrate ideas from simple to complex. A wiki page will also show you who has logged in to it, when they logged in, and what changes they may have made. It’s an easy way to keep track of student participation.

You can also have students edit pages in the real Wikipedia. Many of the pages dealing with scientific topics look like they’ve been copied and pasted from textbooks. One of the ways to improve your students’ communication skills in writing is to have them explain complex topics in simple, everyday terms. An encyclopedia is supposed to be understandable by any reasonably literate lay person, not just an expert in the topic. You could assign students to read and review a page and point out errors or places where it is too complex.

I once had a professor who had her students create their own textbook through creating wiki pages, since a textbook in her field of expertise was not available. They could also produce training manuals for someone completing a basic lab activity or find illustrations that better fit the subject than what is available on the page in question.

Best of all, when students create these materials, you will have more resources to use the next time you teach the class.
Creating Discussion Board Questions

- Students can learn the rudiments of professional discussion and interaction.
- You can break students into discussion groups.
- You can make it a requirement of a lesson and lock student access to the next lesson in sequence to force participation.
- Have a deadline by which students must participate to earn full credit.

Most of your students will be familiar with online discussions. But this is the time to teach them how to communicate in a more professional setting than what they’re used to with social media.

- Start with laying down ground rules for participating: no harassment, name-calling, or text-speak, write in complete sentences using proper grammar, and address the major question plus respond to at least one other person with feedback about their response.
- Give students a minimum length for a response (e.g. at least 300 words, at least one paragraph, more than 5 sentences, etc.).
- You can use a rubric to guide you on grading student responses. (See https://www.utica.edu/academic/Assessment/new/rubrics%20for%20discussion.pdf for examples of multiple rubrics to use.)
- When creating the question, link to the relevant article or section of the notes or text to reinforce the topic under discussion.
- Create questions that go beyond rote memorization or a shallow understanding of the concept.
- Have only one or two questions per discussion.
- Encourage students to create their own discussions on related topics to promote ownership of their learning.

Avoid “how does this work?” and “what’s the name of this thing?” kinds of questions, and focus on ones that require more critical thinking skills. Yes, you can have live discussions, but understand that when you’re listening to one person speak, most of your other students have mentally checked out, particularly in a video session. You could use break-out rooms to encourage discussion in smaller groups, but many students will allow one person in their group to dominate and still not really engage in the topic.
Quizzes based on readings

Many students won’t complete the readings unless there’s a negative consequence involved (a lowered grade).

Have a 4 or 5-question quiz to take after each reading.

3 questions should be factual.

1 or 2 questions should be more advanced and inferred or extrapolated from the reading.

This is where it’s easy for students to cheat if one person takes the quiz first and shares the questions & answers with others in the class. Use a quiz-maker program to randomize the questions and order of answers for multiple choice questions.

Have 3 of the questions be very simple with either multiple choice, true/false, or short answer questions to enable you to grade them very quickly or have a program grade them. This is just a check to ensure that students have opened the article, at the very least.

Have 1 or 2 of the questions be more advanced; require them to answer a much more complex multiple-choice question or answer a question about how this topic relates to a real-world issue or other concepts already taught in the class.

Final bits of advice

◎ Improve your course one step at a time, one topic at a time.
◎ Constantly check your links. Many learning management programs will do this for you.
◎ Change what doesn’t work and try something new the next time.

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A very effective online course requires time and expert advice to create. Most instructional technology specialists will tell you it will take at least 3 months to create a course based on effective learning objectives, valid assessments, and including engaging, interactive elements. In reality, few courses meet these criteria. If you are creating your own online course, or teaching one that has already been developed, chances are that it’s not as engaging as it could be.

But you won’t have that time for the 2020-2021 academic year. So, give yourself permission to accept a less-than-perfect instructional situation, especially when you and your students are new to online education. You will both improve with experience.

Regardless of when you view this webinar, feel free to reach out to me if you have any questions about your own situation. I can be reached at Barbara.houtz@gmail.com