WAKE FOREST UNIVERSITY

Remote Teaching Updates & Resources

1 message

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To:

WAKE FOREST UNIVERSITY

Center for the Advancement of Teaching

Adapting Labs and Studios for Remote Learning

By Anita McCauley on Mar 20, 2020 08:25 pm

Transitioning any course mid-semester to a remote setting is hard (understatement of the year!). It may seem especially daunting if the class you are teaching is hands-on, procedural, or performative in nature or if the learning experiences rely on equipment or technology only available in the physical classroom space. Though they might not look like what you'd envisioned back in January, there are options to meet your course learning outcomes and provide students with a meaningful learning experience for the rest of the semester. Start by focusing on the big picture. Identify the learning most worthy of enduring and make it your foundation so that pedagogy will drive technology rather than the other way around!

What matters the most?

In a situation like this, some triage may be necessary. Start by imagining a year in the future…what do you hope students will still remember or be able to do because of your class? ***What are the most essential, highest priority learning outcomes?*** In laboratory courses, these often include experimentation, instrumentation, trouble-shooting, modeling, creativity, responsibility, communication, teamwork, and ethical awareness.[1] Thankfully, much of this can still be done in virtual and remote settings.

Remember, students have been in this class with you for half the semester already. Assess what they should have already learned and prioritize the essential learning that remains. For those highest priority outcomes, what knowledge, skills, or attitudes do students need to develop? What experiences do they need in order to achieve this learning? What about practice and feedback opportunities? Can any of these experiences be replicated remotely? Do these experiences need to be synchronous or asynchronous? If students can't safely or reasonably be expected to do performative activities (i.e. work with hazardous chemicals or build a theater set), can you shift your emphasis to higher-level cognitive activities related to those performative outcomes, such as analyzing, evaluating, predicting, or designing?

Much of the learning in laboratory and studio classes can be clustered within the big ideas of design, technique, and interpretation. So, we'll use these ideas as a framework to explore pedagogical and technological strategies to adapt your laboratory and studio teaching for remote learning.

When Design is your highest priority

Give students a research question or a set of design requirements and have them create an experimental protocol, step-by-step process, a potential solution, or an artistic product. Ask them to share that draft, accompanied by annotations or commentary in which they detail the options they considered, the choices they made, the reasons for their choices, and the places where they have concerns. This associated commentary is a great way for them to articulate the creativity they applied to the design requirement, especially in the areas of visual arts, music, and theater. Then, create opportunities for students to receive feedback– from you, a TA, or classmates — and revise and resubmit their design. For laboratory courses, if it's feasible, you could carry out their procedure and share the results, which they could use to guide more revision. As part of their reflection and analysis, ask them to identify potential pitfalls and the development of design alternatives. If a design has already been developed, ask students to focus on predicting the outcome and then designing the next steps based upon that outcome. Or, give them an outcome and have them brainstorm what to do next.

To build-up their confidence and sophistication for creating designs, give them opportunities to analyze existing designs or protocols. Give them a protocol with the steps out of order and have them fix it. Leave a step blank and ask students to determine what is missing. Give them two different protocols or designs and ask them to determine which one will work for the situation and explain why. Challenge them to explain the reasons for the choice of specific materials or chemicals, the sequence of steps, or the situations for when one design or protocol would be favored over others.

You could ask students to mentally follow the steps of a process or protocol, written by you, other students, or available from an outside source. Provide them with pictures of the laboratory, studio, or specific equipment involved. Ask them to create a Word file or Google Doc in which they describe the steps for following the protocol or process, annotate the pictures with what they would do to operate the equipment as well as safety steps, key tips, and the result of that step. If images are available of the entire lab or studio, students could annotate the image with the number for each step and tips for operation, questions, safety concerns, and the expected product of that step.

When Techniques are your highest priority

Remember that there are two key phases of learning a technique: performing the technique and critical evaluating others performing the technique. If the procedure and resources are simple and safe, consider if they could do it wherever they are and then submit evidence of their work. Could you mail the needed supplies to the students along with step-by-step instructions, or a video of you demonstrating the technique? Could the students video themselves performing the technique? Take a picture of their result? Email or physically mail back any physical artifact they created? Students could submit documentation of both the product they create and their performance of the process.

There are many opportunities for critically evaluating the performance of a technique. If students are able to do the technique, they could also write a reflection on what they did, a critical analysis of their result, and consideration of what they would do differently next time. If receiving feedback and revising their work is important, you, or other students in the class, could comment on the first submission using established criteria and then students could resubmit the artifact along with a commentary on the changes they made and why. Scenarios where these options might work well include writing code; singing or playing an instrument; performing a dance; or creating a model.

When doing the technique remotely is not an option, use videos, images, or drawings and ask students to evaluate or compare between examples. Look for any online simulations or videos of the technique or an entire procedure. Make a video of yourself doing the procedure or performing the skill. A selection of resources to support lab or studio style courses, in STEM and the arts, can be found at the end of this post. Ask the students to watch the videos or simulations and respond to questions that ask them to analyze, predict, or explain based upon what they saw. For a theater class, students could evaluate elements of set construction or lighting, identify what was done well and suggest opportunities for improvement.

When Interpretation is your

highest priority

Interpretation and analysis of data, images, products, and performances are well-suited to digital environments. Many sources of data are available, including open-source data sets, from published literature, data from your research program, or even data sets from previous iterations of your course. Since half the semester is under our belts, the students may even already have data they collected. With this data, you could generate problem sets that require different analysis and interpretation skills. Students could work on their own data, or they could use data collected by a different group and then compare their results and interpretations. If analysis software is limited, consider whether there are options to make it temporarily available for all students; whether you can run their datasets for them, and then give them the results; or if you can adapt so that programs such as Excel can provide the tools needed.

If a significant aspect of the course is completing a project, consider shifting the focus of the rest of the semester to interpreting and presenting the data already collected in an authentic professional format, which could include a manuscript, a grant application, or a media production. Based upon the components of that format, divide up the rest of the semester into rounds of drafting, giving and receiving formative feedback, and revising. In Art and Music studio classes, students can use established criteria to interpret and critique each other’s work, provide suggestions for improvement, and resubmit.

Conclusion

Students might not be able to pour gels, run extractions, swing a hammer, or physically operate expensive equipment. We may have to shift our focus away from motor or procedural skills. But, we can still provide challenging and authentic experiences that produce deep learning.[2,3]

Resources

In the STEM fields, there are many free resources available. These include LabXchange, MERLOT Virtual Labs, PHET, and many video journal resources from JoVE. For Chemistry, ChemCollective has made their resources freely available . Textbook and journal publishers may have simulations and videos available as well. JoVE has made their Core Biology textbook and introductory biology lab manual available for free until June 2020. A crowdsourced and exhaustive compilation of online resources for STEM disciplines is also available. Videos and data sets are available from the National Science Digital Library. Check out these Facebook groups for resources and ideas for Online Art & Design Studio Instruction, Teaching Visual Art, Shifting Film, Media, Screenwriting & Production Online, and Math. There are also excellent resources for Music and Media and Production.

1: Fiesel and Rosa, 2005; summarized in Teaching and Learning STEM: A Practical Guide by R. M. Felder and R. Felder, pp. 84-85.

2: Special thanks to the POD and POD STEM-SIG listserv for many of the ideas and resources that were included in this post.

3: Many studies in Physics, Chemistry, and Engineering, summarized in Teaching Undergraduate Science: A Guide to Overcoming Obstacles to Student Learning, by Linda Hodges, pp. 139-140, have shown that students can learn as much, and sometimes more, from virtual labs than from hands-on labs alone.

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