Suggestions of technologies to use to facilitate communication in an online CURE

- GroupMe: group messaging platform
- Slack: group and project management and communications platform. It is good for sharing files as well. It is social to some degree, but it is a bit more directed toward productivity. It can also be linked with WebEx or Zoom for video conferencing.
- Asana: group and project management and communications platform
- Benchling: electronic lab notebook / notetaking platform, free for educational users
- Perusall: “social e-reading” and manuscript, paper, textbook annotation platform. This is a free tool if you are uploading your own documents. Perusall.com
- Zoom: video conferencing platform
- Web-based, freely available analysis tools: Google suite, R or R Studio, Python. A helpful resource for students to learn R remotely: https://swirlstats.com

Questions and responses that referenced specific programs, tools, or resources:

1. **Question:** Do you have an external method you use pre- and post-summative assessment for your V&C learning goals? **Response from Katey Cooper:** I have been talking with Alexa Clemmons from UW who was part of the team to create the BioSkills Guide, she is interested in developing some of these assessments, but as far as I know none are finished or published yet.

2. **Question:** For someone with NO experience on CURES, how do we get started? **Response:** This is a great resource. https://serc.carleton.edu/curenet/index.html Plus consider join an existing CURE network like Tiny Earth, Prevalence of Antibiotic Resistance in the Environment, SEA Phages, or Genomics Education Partnership (GEP). It’s definitely easier to join a developed CURE (existing curriculum, faculty community support and training, sharing of resources). GEP is doing four online professional development sessions for new faculty – to teach online CURE annotating eukaryotic genes http://gep.wustl.edu/ For Biochemistry CURE – BASIL group is working this summer to adapt to completely online CURE – focusing on computational tools to predict function of proteins with known structures and sharing data sets collected previously. https://basiliuse.blogspot.com/2020/03/moving-to-online-labs.html DNA Subway [https://dnasubway.cyverse.org] is useful for DNA Barcoding (from sequence up to phylogeny) and more genomics tools. In our CURE consortium we have been working to adapt using electronic, web based resources to do authentic research on student developed research questions with any protein: https://mdh-cures-community.squarespace.com/virtual-cures-and-ures

3. **Question:** Did any of the panelists figure out who to actually adapt their CURE to do lab at home or NOT in a lab? **Response:** UnPAK is mailing kits home to students: http://arabidopsisonpak.org/ and UFERN is working to develop virtual field experiences: http://ufern.net/
4. **Question:** I would like ideas on how to adapt field sampling and lab activities in a remote learning environment. **Response:** UFERN is working to develop virtual field experiences: [http://ufern.net/](http://ufern.net/)

5. **Question:** can you share your cleaning protocols for the students. **Response from Lauren DePue:** Here is a link to our working document: [https://rb.gy/0vstkd](https://rb.gy/0vstkd)

6. **Question:** Can you give an example of using an existing dataset for Microbiology? **Response from Enid Gonzalez-Orta:** I can give the example of the Tiny Earth Database, which is available to the public. You can look at where students isolated bacteria, types of bacteria isolated, what they kill, etc. There are a lot of facets in there that one can talk about, like ecology, physiological characteristics, etc. Here is the link: [https://data.tinyearth.wisc.edu/public_database](https://data.tinyearth.wisc.edu/public_database)

7. **Question:** What solutions exist for digital option that is (1) sufficiently flexible yet still robust and structured (2) inexpensive or free, and (3) can be assessed readily (best if students can "spot-check" their peers)? **Response from Lauren DePue:** I have been disappointed with online lab notebook systems and I keep returning to a google document that I create (and own) and share with them. My peer mentors and I routinely access students’ “lab notebook google doc” and provide feedback and grade them on it.

8. **Question:** How to promote a sense of community as well as engagement and equity in an online CURE? **Responses:** We did a lot of group work in Zoom using the breakout rooms, using the think-pair-share method. I also used the zoom poll to get student feedback in real time, which often informed how we moved forward. Finally, because I had a relatively small class at time we could do a “whip” where all students were able to contribute their thoughts to a question that I posed with multiple possible responses. We also use a lot of instructor talk – see work from Kimberly Tanner and colleagues:

9. **Question:** How can I help students navigate the challenging aspects of data analysis? **Response:** I held office hour sessions so that they could work silently on their computer and pop in if they got stuck to ask questions.

10. **Question:** How can I be sure my students have the technical infrastructure to engage in the CURE online / at a distance? **Response:** Surveying students at the beginning of the pivot to find out what they have access to helped me very much. I could get students access to our IT department right away to get hotspots, laptops, etc.