

# Enhancing online laboratory experiences: Insights from organic, inorganic, and physical chemistry courses

ACS Webinar, July 22, 2020

## Panel Resources

Visit these websites and read these articles for more information about the courses, approaches, and assessments presented during this ACS Webinar.

### **Maria Gallardo-Williams, Teaching Professor and Director, Organic Teaching Laboratories, North Carolina State University**

North Carolina State University Virtual Reality Organic Chemistry Labs: [go.ncsu.edu/vrlabs-orgchem](http://go.ncsu.edu/vrlabs-orgchem)

Dunnagan, C. L.; Dannenberg, D. A.; Cuares, M. P.; Earnest, A. D.; Gurnsey, R. M.; Gallardo-Williams, M. T. [Production and evaluation of a realistic immersive virtual reality organic chemistry laboratory experience: Infrared spectroscopy](#). *J. Chem. Educ.* **2020**, *97*(1), 258–262. DOI: 10.1021/acs.jchemed.9b00705

Dunnagan, C. L.; Gallardo-Williams, M. T. [Overcoming Physical Separation During COVID-19 Using Virtual Reality in Organic Chemistry Laboratories](#), *Journal of Chemical Education*, **Article ASAP**. DOI: 10.1021/acs.jchemed.0c00548

### **Kyle Grice, Associate Professor of Inorganic Chemistry, DePaul University**

[July 7, 2020 Supporting Learning with Interactive Teaching: a Hosted Engaging Roundtable](#) (SLiThEr): hosted by the Interactive Online Network of Inorganic Chemists (IONiC): <https://www.ionicviper.org/>

Nataro, C; Johnson, A. R. [A community springs to action to enable virtual laboratory instruction](#), *Journal of Chemical Education*, **Article ASAP**. DOI: 10.1021/acs.jchemed.0c00526

### **Michael Seery, Professor of Chemistry Education, University of Edinburgh**

Videos for lots of (phys chem) labs at: [youtube.com/mkseery](https://youtube.com/mkseery)

Seery, M. K. [Establishing the laboratory as the place to learn how to do chemistry](#). *Journal of Chemical Education*, **2020**, *97*(6), 1511–1514. DOI: 10.1021/acs.jchemed.9b00764

Agustian, H. Y.; Seery, M. K. [Reasserting the role of pre-laboratory activities in chemistry education: a proposed framework for their design](#). *Chemistry Education Research and Practice*, **2017**, *18*(4), 518-532. DOI: 10.1039/C7RP00140A

Seery, M. K.; Jones, A. B.; Kew, W.; Mein, T. [Unfinished recipes: Structuring upper-division laboratory work to scaffold experimental design skills](#). *Journal of Chemical Education*, **2018**, *96*(1), 53-59. DOI: 10.1021/acs.jchemed.8b00511

*These resources are provided for informational use only. Inclusion on this list does **not** constitute an endorsement by ACS.*

## Attendee Tips and Resources

*Read these comments and visit these websites for more tips and resources shared by the attendees during this ACS Webinar.*

### Related discussions

- July 9 CHAS Chat: [Options for "Laboratory" Learning](#)

### General collections/repositories

- For the repository question, I would recommend checking out the Facebook group, "[Strategies for teaching chemistry online](#)". There is lots of helpful info there!
- Here is a link to a [google sheet](#) [Online Resources for Science Laboratories from POD] where you can freely share resources.
- [Merlot](#) is another rich site.
- The [National Science Digital Library](#) is one more.
- [The OpenScience Laboratory](#)
- [Resource list](#) from the June 30 ACS Webinar Teaching remotely together: Lessons learned

*See also analytical chemistry resources, inorganic chemistry resources, organic chemistry resources, and physical chemistry resources (below)*

### Technology tips

#### ***Data storage and processing***

- [osf.io](#) can be a great place to share data if your LMS is limited.
- I use YouTube instead of the LMS for videos because of limits. Also, YouTube automatically captions videos. On YouTube I set as "unlisted".
- We have had students download [TopSpin](#) for data processing. Lot's of trouble shooting computer issues, so I wouldn't do it with a large group of students!

#### ***Molecular visualization and modeling***

- [Wavefunction](#) was very generous with complimentary licenses when our spring semester was interrupted. We use Spartan on campus with our lab instruction.

### Use of library resources

- My colleagues were impressed by the extent of [JoVE](#) materials
- Training in [SciFinder](#) and search
- Training in [Endnote](#) and citation

### Use of remote instrumentation

- We are looking at remote instrumentation at the Open University [The OpenSTEM Labs](#)
- [Athabasca University](#) does remote online instrument access. A lab tech onsite sets up the instrument. Students then set up and run online. Download data afterward.

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### Analytical chemistry resources

- [Analytical Sciences Digital Library remote labs and simulations](#)
- [Canadian Society of Chemistry \(CSC\) repository of online analytical resources](#)
- A [curated list of analytical videos](#) that are included in the 10<sup>th</sup> edition of Harris and Lucy's [Quantitative Chemical Analysis](#)
- [Sharing Ideas on Virtual Labs](#)
- [CHIMACTIV](#) has some nice analytical online resources
- [Agilent Teaching Tools](#)
- [CHROMacademy](#) is good for analytical materials. Also comes with an assessment which you can ask students to complete.
- The [Royal Society of Chemistry](#) has very nice presentations too, but was more expensive than [CHROMacademy](#).
- [Pine Research Knowledgebase](#)
- [Cyclic voltammetry simulation](#)
- Look for an overview of free chromatography and electrophoresis simulators which will appear in the August issue of [LCGC North America](#).

### Inorganic chemistry resources

- [Virtual Inorganic Pedagogical Electronic Resource \(VIPeR\)](#)
- [Mercury](#) – crystal structure visualization and analysis

### Organic chemistry resources

- [OrganicERs](#) is a resource for organic chemistry. We have a [resource page](#) and a [Facebook group](#).
- MIT also has a very good page on [lab techniques with videos](#).
- [Chemistry Class Advantage](#) lessons are free from CAS for organic chemistry - could be used for both lectures and labs; students will use Scifinder searches via these lessons.

### Physical chemistry resources

- [Pchem Inspired Pedagogical Electronic Resource \(PIPER\)](#)