

**TOPIC:** Benchling: Molecular Biology tools for online teaching**TAGS:** Molecular biology, electronic lab books, cloud-based software.**BRIEF DESCRIPTION**

**Benchling** is a free, cloud-based software platform for academics. Originating as a research tool it incorporates an Electronic Lab Notebook (ELN) and a suite of molecular biology analysis tools. It can be readily adapted to work as a virtual learning tool, helping to emulate a variety of scientific processes without being in the lab. Project level organisation allows instructors to develop protocols and worksheets which can be easily disseminated to students, lab reports and analyses can be easily viewed, shared and exported.

**Skills**

The Molecular Biology suite has a range of functions and analyses which can be readily adopted for lab teaching

1. Plasmid cloning – Classic cloning, Type IIS, Gibson
2. Primer design
3. Sequence annotation & translation
4. Primer design
5. NCBI BLAST
6. Sequence alignment
7. CRISPR tools – sgRNA and Homology arm design

All analyses can be attached to Lab Notebooks.

**Examples**

Worksheets	Flipped Labs
<p>Designed to run synchronously or asynchronously entirely online. Students can be tasked with filling out worksheets designed in the lab notebooks section.</p> <p><b>EXAMPLE</b></p> <p>With multiple sequences of the SARS-COV-2 genome loaded into Benchling – students have to annotate genes and add as much information as they can using the NCBI BLAST function.</p> <p>Align viral genomes from different patient isolates and discuss mutations</p> <p>Look at primer design for PCR diagnostic testing</p>	<p>In this approach, you are looking to complement in person lab time, by making students write protocols or plan out experiments that they will run in the lab.</p> <p><b>EXAMPLE</b></p> <p>Students run a lab-based plasmid cloning experiment.</p> <p>Pre-lab they analyse plasmids and determine the restriction enzymes needed to produce the correct fragments for the cloning experiment.</p> <p>Run 'in-silico' digests report fragment sizes and check assemblies</p> <p>They can enter the lab with notebooks that detail the correct enzymes, expected fragment sizes, and protocol steps</p>

**Requirements**

No installation of software is needed, students have individual accounts that can join instructor administrated classes. Cloud-based and operates most effectively with Google Chrome.

Simple tutorials are available [here](#). A github repository of classes I have under development is [here](#)

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