

# **What to expect when you're expanding: Thoughts and tips from SEA-PHAGES faculty who are running multiple sections**

Many schools begin their SEA-PHAGES experience with a single section of the course. For some schools, remaining at just one section is a perfect fit for their needs, but others may find that the success of their first foray leads to the desire to implement more sections. This document is an attempt to collect the experience and suggestions of some members who have expanded the program at their schools.

## **Some Example Schools Who Have Expanded**

Bill Davis at Washington State University began with a traditional SEA-PHAGES 2-semester sequence with *M smegmatis*. Now WSU's Molecular and Cellular Bio course does SEA PHAGES in every section, which is about 40 sections of 3 hours once a week. Students come from 55-60 different majors. Their lab and lecture are disconnected so that the same lab experience can be associated with each lecture section. There follows one spring section of in silico as an elective.

Caroline Breitenberger from Ohio State started with one section during the autumn quarter, and now has 8-9 wet lab sections per autumn *and* spring semesters. Each one meets for 2.75 hours, once a week, and is associated with the molecular and cell bio semester of introductory biology for science majors. (There are still traditional labs associated with parallel lecture sections of this course.) Ohio State is considering further expansion, but lab prep and space are limitations. Two or three sections of in silico are offered during spring semester as an elective.

## **Considerations and Challenges When Adding Sections**

### **Displacement of faculty (in favor of TAs)**

It may be necessary to use Undergraduate Teaching Assistants (UTAs) and Graduate Teaching Assistants (GTAs) when expanding your SEA-PHAGES implementation. This may lead to more peer or near-peer mentoring of students, BUT sometimes engender less discussion of science and leads to less faculty interaction. It seems there is lower student perception that this is real science, and students after expansion are coming out feeling more like technicians, losing that aspect of "feeling like a scientist." (On the other hand, SEA-PHAGES can be a transformational experience for graduate students.)

### **Undergraduate TA Training**

A large number of UTAs may be required, and finding timing (can't count on summer on-campus; can't find one time to get them all together for training, etc.) to train them all efficiently can be difficult.

### **Graduate TA Training**

There is a unique set of techniques they have to demonstrate in class, unique pedagogical approaches in SEA lab, and they must learn to deal with students or student groups who are working asynchronously. This requires more flexibility than TAing a traditional course.

### **Lab Space**

You will need to be able to schedule labs in the same or nearby space because of prep needs. You generally can't have 2 meetings per week because you lose one day of the 5-day week, i.e. lab meeting once a week allows max utilization of space.

### **Lab Prep**

This requires a large availability of trained personnel, as there is a huge workload (e.g., pouring plates) during certain times of semester.

### **Electron Microscopy**

The time and effort required may increase beyond the capacity of your EM center.

### **Supplies Costs**

Overall expenses go up.

### **Storage Issues**

Expanding means needing more places to keep supplies (e.g. boxes of plates), students' plates, students' lab notebooks, etc.

### **Other Problems**

There can be a disconnect between wet lab and in silico, depending on how you expand. This can lead to students who don't get full benefit of the complete SEA-PHAGES experience.

## **Ideas and Suggested Solutions for Addressing Expansion Challenges**

### **Displacement of faculty (in favor of TAs)**

WSU is trying a "pro-social" intervention in half of its labs this coming year. From lab week 3-12, students will be arranged into groups of 4. They will be encouraged to do more peer learning and group learning about science, and to connect their project into the bigger picture of phage biology. Cameras will be used to capture interactions and videos will be analyzed.

Social media in the classroom. For example, the Baylor University maintains a yearly blog called [Bears in the SEA](#) where students respond to prompts. This can connect students in different sections to one another.

Students at the University of the Sciences write a weekly reflection. This is intended to keep students thinking about the science. For example, you can use participation points for pre-lab which requires them to think through a decision tree and plan what they are going to do that week. And/Or give additional participation points for a metacognitive reflection piece post-lab.

### **UTA and GTA Training**

WSU and OSU run a “**SEA Camp**” which takes place during one week in summer, or right before classes start, or during the first week of classes but before labs start. Lab techniques are reviewed, data about the SEA-PHAGES program’s strengths are presented, specific examples of effective pedagogy and active learning are provided, and common problems that students may have are discussed to facilitate troubleshooting.

### **Lab Prep**

Having dedicated people helps. The lab prep director at WSU also helps with TA training so they can work together more efficiently. Between labs, you may need to have lab prep people ready to spring in and replenish supplies, as a 10-15 minute turnover between labs is sometimes tight.

### **Supplies Costs**

Students can work in pairs, rather than individually. You can also often negotiate with companies for some supplies. For example, you can acquire restriction enzymes for free or nearly free by driving a hard bargain with the manufacturer.

### **Storage Issues**

Make sure you have room to store large quantities of supplies at the start of semester. And make sure you have plenty of cold room storage to store one box of plates per lab section. Large rectangular plastic storage bins (from Walmart or Rubbermaid, one per section) are a useful way to store and move student plates. Be strict about discarding anything beyond initial isolation plate and latest purification plate(s).

Using an Electronic notebook system can eliminate the need for storing lab notebooks. Students can type in real-time or upload documents, images etc. Give points and feedback for the online lab notebook on a regular basis, and for extra incentive you can tell students they lose ALL participation points if the lab notebook is not complete before the final exam.

### **Electron Microscopy**

Modified Phage Olympics - objective is to pick one sample per lab section to submit for EM. Require scientific criteria for decision of who gets to submit their sample for EM.

## **Other Suggestions for Expanding Your SEA-PHAGES Implementation**

You can run large agarose gels behind the scenes, using student restriction digests - one gel for most enzymes, one higher percentage gel with just HaeIII digests - running them all side-by-side helps students see similarities and differences.

If you have specific questions about adding sections, please contact the SEA-PHAGES leadership at [info@seaphages.org](mailto:info@seaphages.org).