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2021 SEA Faculty Meeting Abstract

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Faculty Resources for Teaching and Annotating Common Phage Protein Functions

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With the COVID-19 pandemic, the shift to remote instruction prompted an increase in schools offering the Phage Genomics and Bioinformatics component of the SEA PHAGE program, as it is computer-friendly and more amenable to online instruction than the Phage Discovery “wet lab” portion. This created an urgent need for various teaching resources to support the Bioinformatics component. During the summer of 2020, several SEA faculty met virtually to pool their resources and curate, develop, and create teaching materials centered on core teaching themes of the SEA-PHAGES Bioinformatics course. These materials were then published to QUBES, an online open access community for sharing quantitative classroom materials that are freely accessible to both SEA faculty and STEM educators.   
A topic of the Bioinformatics course identified as needing additional resources was the common phage protein functions. While students taking the course learn how to annotate phage genes with possible functions based on the bioinformatics data that they collect, they do not always associate the purpose of the phage gene with the virus structure or replication cycle. The intent of the seven faculty members working on the function module was to create teaching materials to help make this connection for students. A result of the virtual meetings was the creation of the module “Faculty Resources for Teaching Common Phage Protein Functions” available at: https://qubeshub.org/community/groups/hhmi\_sea/resources. The materials include six learning objectives matched with various activities that can be adapted for in-person or online use, and can be used as a set or singly as standalone activities. The learning objectives include developing a list of common phage functions found in phage genomes; relating phage genes to their roles in structure, replication, or regulation; and evaluating functions required by phage with varying morphotypes and life cycles.  
The module is separated into three major parts, which build upon one another in skill-level and comprehension. Examples of the paired activities include a “Choose Your Own Phage Adventure” online game that guides students through the phage replication cycle, a function-related crossword puzzle, and a “Required Function or Not” activity. The online content includes an instructor’s guide as well as suggestions for how to use the materials for assessment purposes. All materials were available in “editable” forms, so that instructors were able to modify them as needed.  
The developed materials were then used in the classroom over the course of the fall 2020 and spring 2021 semesters by SEA faculty. Observations and notes from faculty members were collected and used to modify and update the next version of the QUBES resource. Peer-reviewed, accessible, and modifiable resources such as these are invaluable tools for educators, with the added benefit of having a citable, published account for the educational tools developed.