COVID-19 Learning Objectives

## About the Curriculum

This curriculum was written by high school teachers and educators from Rutgers University, NJ, in Summer 2020, during the COVID-19 pandemic. The main focus in this curriculum is to introduce students to the life cycle of SARS-CoV-2 and help explore the sequence, structure, function and evolution of key proteins in the virus. The curriculum covers several independent topics that discuss various aspects of biology - *e.g.,* enzymes, evolution, viral life cycle, immunology, disease, treatment, vaccine development. Teachers may select one or more of these topics to teach with examples related to the SARS-CoV-2 virus and/or COVID-19 pandemic. All lessons engage students in visualizing and exploring data from the Protein Data Bank (PDB), scientific literature (from PubMed) and various other free bioinformatics resources such as UniProt, DrugBank etc.

## Learning Objectives

* Content Knowledge:
  + Interactions between molecules affect their structure and function
  + Subcomponents of biological molecules and their sequence determine the properties of that molecule
  + Molecular interactions affect structure and function
  + Changes in the subcomponents of a biological polymer affect the functionality of the molecule
* Skills:
  + Learn to explore, and learn from public data resources in Biology.
  + Analyze data to identify how molecular interactions affect structure and function.
  + Use models to predict and justify that changes in the subcomponents of a biological polymer affect the functionality of the molecule.
  + Use models to design and engineer new properties and functions in proteins.
  + Use representations and models to communicate scientific phenomena and solve scientific problems.
* Attitudes:
  + Justify the selection of the kind of data needed to answer scientific questions about the relevant mechanism that organisms use to respond to changes in their external environment.
  + Make informed choices about health based on scientific evidence.

## Suggestions for Teachers

* Each topic in the curriculum includes some learning materials (slides, videos etc.), an exercise, and related resources.
* You may wish to go over the video/image/ and slides for the topic that you have selected first.
  + To facilitate teaching online, the slides include key points and explanations in the notes section of each slide. If you wish you can ask your students to review this material prior to class.
* The lessons and activities engage students in visualizing one or more structures of protein molecules either alone or in complex with their partner proteins or pieces of nucleic acids. The goal here is to introduce students to public data resources and related tools to explore and learn about a topic of interest.
  + If your students are new to exploring the shapes and structures of proteins they can review some of the introductory materials from the learn section of PDB-101 (<http://pdb101.rcsb.org/learn/videos>)
  + You may wish to explore other curricular modules to learn about foundations of immunology (<http://pdb101.rcsb.org/teach/molecular-immunology>) and about biological molecules in general (<http://pdb101.rcsb.org/teach/biomolecular-structures-and-models>).
* Teachers can access answer keys, teaching notes, and assessment questions (with answers) by logging in using a PDB101 Teacher Log In ID. To request a Log In ID, please contact [Shuchismita Dutta](mailto:sdutta@rcsb.rutgers.edu) (sdutta@rcsb.rutgers.edu), giving your name and the name of your school/institution.

**Additional Resources**:

* American Society of Virology is dedicated to communicating current, evidence-based information about the current coronavirus pandemic to the public. Over 300 member scientists and educators have volunteered to speak with educational organizations (schools and classes, community organizations, museums, etc…) about virology in a virtual setting. Want to learn more? See <https://asv.org/2020/07/29/virologychat/>