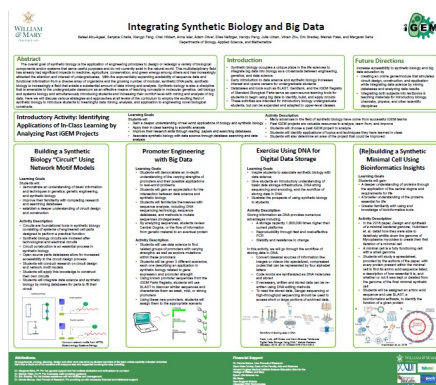Community Spotlight

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Using Synthetic Biology to Teach Data Science

By Margaret S Saha, Beteel Abu-Ageel, Sanjana Challa, Xiangyi Fang, Chai Hibbert, Anna Isler, Elias Nafziger, Adam Oliver, Hanqiu Peng, Julia Urban, and Vivian Zhu

Module Description:

This resource is a poster on using synthetic biology to introduce students to meaningful data mining, analysis, and application to engineering novel biological constructs, which was presented at the 2019 QUBES/BioQUEST Summer Workshop. This resource also includes supporting material for 4 activities described in the poster. The poster abstract is below.

The overall goal of synthetic biology is the application of engineering principles to design or redesign a variety of biological components and/or systems that serve useful purposes and do not currently exist in the natural world. This multidisciplinary field has already had significant impacts in medicine, agriculture, conservation, and green energy among others and has increasingly attracted the attention and interest of undergraduates. With the exponentially expanding availability of sequence data and functional information from a diverse array of organisms and the growing number of modular, synthetic DNA parts, synthetic biology is increasingly a field that entails a substantial amount of data mining and analysis. Synthetic biology is also a discipline that is amenable to the undergraduate classroom as an effective means of teaching concepts in molecular genetics, cell biology and systems biology and simultaneously introducing students and increasing their comfort level with mining and analysis of big data. Here we will discuss various strategies and approaches at all levels of the curriculum to employ the exciting field of synthetic biology to introduce students to meaningful data mining, analysis, and application to engineering novel biological constructs.

Teaching Setting:

The activities described in this resource are appropriate for implementation in high school and both lower and upper level undergraduate courses.

Citation:

Margaret S Saha, Beteel Abu-Ageel, Sanjana Challa, Xiangyi Fang, Chai Hibbert, Anna Isler, Elias Nafziger, Adam Oliver, Hanqiu Peng, Julia Urban, Vivian Zhu (2019). Using Synthetic Biology to Teach Data Science. Evolution of Data in the Classroom: From Data to Data Science (SW 2019), (Version 3.0). QUBES Educational Resources. doi:10.25334/B01R-P620

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Related Materials and Opportunities:

This poster was presented at the 2019 QUBES/BioQUEST Summer Workshop, Evolution of Data in the Classroom: From Data to Data Science, which was held at the College of William and Mary in Williamsburg, VA on July 14-19, 2019. This workshop primarily focused on how data science practices can enhance biology education. Presentations and workshop sessions introduced participants to resources and strategies for incorporating data science into the undergraduate curriculum and addressed topics including open science and open education, data acumen, and inclusive teaching. Infused with fresh ideas, participants worked with colleagues to develop and adapt teaching materials that use data and quantitative skills to engage students with meaningful biological problems.

You can find posters and session materials presented at the 2019 QUBES/BioQUEST workshop along with presentation abstracts on the workshop website. Also, if you haven't done so already, you can subscribe to receive upcoming QUBES Newsletters where we will be sharing highlights from the summer workshop.

Other recent QUBES/BioQUEST Summer Workshops include Wicked Problems: Investigating real world problems in the biology classroom (2018), Making Meaning through Modeling: Problem solving in Biology (2017), and Lowering the Activation Energy: Making Quantitative Biology more Accessible (2016).

The QUBES/BioQUEST team is already actively planning the 2020 QUBES/BioQUEST Summer Workshop, which will be held in Pittsburgh, PA. If you are interested in receiving information about this workshop as plans continue to develop, please subscribe to receive updates.

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