



Community Spotlight

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Quantifying and Visualizing Campus Tree Phenology

By Nathan Emery, Caleb Trujillo, Andrew Jarosz, and Tammy Long



Module Description:

In this semester-long exercise, students collect, quantify, and analyze data on patterns in campus tree phenology. Phenology refers to the timing of bud burst, flowering, and leaf senescence that plants experience. Using smartphone technology, students capture data on changes in tree phenology on a weekly basis. Students spend time in and outside of class researching the tree species and have several opportunities to practice developing questions about changes in fall phenology across different species. Ultimately, student groups narrow their research questions to a single hypothesis that can be tested using their phenology data and campus climate data. To test their hypotheses, students visualize the class phenology data using the Radiant web app on QUBES Hub. This module emphasizes good scientific practices, such as replicate sampling design, data integrity, and null hypothesis testing.

Teaching Setting:

This module was developed and used in a large enrollment (~200 students) introductory biology course at Michigan State University. The class met twice weekly for 80-minute periods in an auditorium-style classroom. However the

authors note that the module can be adapted for different course levels, course sizes, and college campuses.

Citation:

This resource was recently published in the journal [CourseSource](#), an open-access journal of peer-reviewed teaching resources for undergraduate biological sciences. See the resource's *CourseSource* citation below.

Emery, N.C., Trujillo, C.M., Jarosz, A., and Long, T. 2019. Quantifying and Visualizing Campus Tree Phenology. *CourseSource*.
<https://doi.org/10.24918/cs.2019.8>

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Related Materials and Opportunities:

The Radiant web app featured in this resource makes it easy for students to work with and visualize their data. It is a Shiny app that acts as an intermediate between simple graphical user interfaces and full blown R programming. The key advantages to using a web app like Radiant over traditional analytical software is that it can be run in any web browser, eliminating the need for software installation and management in the classroom. In Radiant, students can clean data, manipulate it and select appropriate visualization tools to address their specific question. [Learn more about Radiant](#) or [launch Radiant](#) on QUBES now.

Conversations about this resource and analytical tools to pair with it began two years ago at the [2017 QUBES/BioQUEST summer workshop](#). If you have datasets for students or other teaching resources but are looking for the right approach to help students work through them in a meaningful way, consider attending the [2019 QUBES/BioQUEST summer workshop - Evolution of Data in the Classroom: From Data to Data Science](#). The workshop will be held on July 14-19, 2019 at the College of William & Mary in Williamsburg, VA. [Learn more about the summer workshop](#) and [view a complete list of speakers](#) on the workshop website. [Apply now](#), the application deadline is May 5!

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