# Derek Sollberger

## EDDIE Module

## Module name: Hypoxia and Coastal Marine Ecosystems

## Expected dates of Implementation: April 19 and 21, 2022

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## **Course/Course Format**:

Number and length of sessions per week (e.g. Three 50 minute lecture sessions and one 3-hour lab per week)

* Two, 75-minute active learning lectures
* One, 110-minute discussion section

**Course Description** (From course catalog):

This semester’s adventures will take us through analytical and computational methods for statistical analysis of data. Descriptive statistics, graphical representations of data, correlation, regression, causation, experiment design, introductory probability, random variables, sampling distributions, inference, and significance.

**Course Context:** Describe student and/or course level, e.g., lower or upper division, major course, etc. (e.g. "An introductory course for non-majors")**:**

* Lower-division (mostly sophomores)
* Meets probability requirement for biology majors
* About 95% of the students are biology majors

**Course Goals and Topics** (If available, extended version of learning goals and topics covered)

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## As aligned with the mission of the biological sciences department, Bio 18 meets the following PLOs:

## (not covered)

## An ability to develop and critique hypotheses and to design experiments, models, and/or calculations to address these hypotheses.

## The ability to use appropriate instrumentation and computational tools to collect, analyze, and interpret data.

## The ability to read, evaluate, interpret, and apply numerical and general scientific information.

## (not covered)

## An ability to communicate biological science topics in written, oral, and visual formats.

## An understanding of the relationship of biological sciences to society.

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**What learning objective(s) (content) are you planning to address in your course using the selected module materials?**

Since this implementation of the Project EDDIE materials was intended as a culminating case study for the course, its goals encompassed all of the Program Learning Outcomes listed above (namely, PLOs 2, 3, 4, 6, and 7)

**Quantitative learning objective**

Students will have practiced their data analysis techniques (sample statistics, regression and correlation, probability distribution, confidence intervals, and hypothesis testing) in this guided case study.

**Working with data learning objective**

The data set, as delivered by Doctors Brickley, Browne, and Smalley; is already “clean” —the students will barely need to wrangle with the data to achieve the computational goals. This implementation retains all of the columns of information (i.e. all of the measurement types) to allow a division of labor in a rather large lecture section.

## Briefly describe the pedagogical techniques/strategies you plan to use to facilitate the module and reinforce the learning objectives you identified above.

Implemented toward the end of the semester, students will be tackling most of the materials independently from the lecture slides with their peer groups in the form of in-class lab sessions. This environment promotes a lot of communication among the students.

## Are you planning on making any adaptations to the materials? If yes, please describe them here. If no, please indicate why. (*This will be important for the end when you make your final product, you will need to distinguish the modifications you made relative to the original*)

In addition to switching the computer processes from Excel to R, I have rearranged the materials to be more modular. Students encounter the introduction and definitions on their own in pre-lecture assignments. After the in-class labs with the coding and calculations, students synthesize their findings in brief writing tasks to finish the week.

## Do you think you will need to incorporate any supplemental materials with this module? If yes, please either describe what you are planning or include any materials you have already found.

I did not add materials at the time of this implementation (April 2022). However, inspired by peers in our Faculty Mentoring Network group, I have found YouTube videos that elegantly augment contextual understanding of the hypoxia events.

## What assessments are you planning on using to measure student progress? If possible, describe, attach, or provide a link here.

* The pre-lecture quizzes are auto-graded
* The in-class labs produce deliverables (HTML files) that are checked for completion
* The writing tasks are graded afterward to judge for effort in thought and conceptualization

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# **Reflection Questions for after your Implementation**

Introductory Statement: The summary should start with one line that captures the context in which the module was used. This should be followed by 2-5 sentences that highlight what was particularly interesting about this particular implementation. This could include the setting, schedule, student group, an exceptional success or unusual adaptation of materials

This hypoxia case study was implemented toward the end of the semester in my Data Analysis for Life Sciences course. As such, I wanted this to simultaneously be an in-depth exploration and a practice run for how the students were then shifted to their own semester-end projects. In addition to modifying the materials to run in an R programming environment, I split the material by ecological themes—Day 1: physical factors, Day 2: chemical factors—to encourage synthesis of concepts.

## How did it go? (What went well and why? What adjustments did you need make in real time and why?)

At this point in the semester, the students handled the R programming well and were able to debug their errors among their peer groups. However, these sophomores had little interest in connecting the data and evidence with their general knowledge of biology. Perhaps spending more time on introducing concepts and definitions (such as the location of the Chesapeake Bay) could prove fruitful.

## Student Outcomes (What did students take away? Where did students struggle the most?)

Perhaps due to the bulk of math and programming exercises in my course, students struggle with reading assignments and connecting the ideas with the data visualizations that we build in class.

## Future Use (Would you do this activity again? What suggestions do you have? What would you change?)

I am looking forward to running this case study again in the Fall semester where, by the time I submit these adapted materials, I will have reordered the examples and exercises so that

* Day 1 (physical causes): students encounter the temperature data on their own and hopefully think about global warming
* Day 2 (chemical causes): students encounter the nitrates data on their own and hopefully think about usage of fertilizers