Coding Curriculum Development

UF Env Sci Field Trip

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Outline ideas for the coding curriculum. If you’re interested in helping out with this aspect, some tasks include:

* Editing the outline with additional ideas and modifications
* Writing R markdown scripts for sections
* Testing lessons on your computer or in the computer lab

## Learning Goals

1. Understand how data collected from experiments leads to conclusions
2. Gain confidence in ability to code
3. Learn about uncertainty/variation/the limits of scientific inference

**Work backwards from data they will work with to skills for visualization**

## Overview

1. Time: 1:15 pm – 4:pm
2. Location: Architecture 116
3. Lessons
   1. Introduction to R
   2. Analyzing data: Invasive species and infectious disease
   3. Analyzing data: Biodiversity and its benefits
   4. If time: Using publicly available data to answer your own questions
4. Refer to the Science Curriculum document for experiment details relevant to b and c
5. Lessons will involve walking through concepts while students follow along on their computers and then an opportunity for them to try concepts on their own.

## Introduction to R

1. Overview of what R is
2. R Studio set up
3. Basic concepts that will be needed for the next sections
   1. Variable naming - NOSPACES
      1. Commonly used: variablename, variable\_name, variable.name, variableName, VariableName
      2. Recommend: variable\_name
   2. Commenting code: e.g., #this is a comment, so won’t be read by R
   3. Calculations
      1. Add/subtract, multiply/divide. Use vectors?
      2. Intro to functions: mean, median, sqrt
   4. Dataframe
      1. Data types? numeric, character, factor
   5. Plots
   6. Packages?
      1. ggplot
      2. dplyr? magrittr? depending on data manipulations

## Analyzing data: Biodiversity and its benefits

1. Import data
   1. read.csv, readr::read\_csv, readxl::read\_excel
2. Plot biomass vs. species richness
   1. Point plots
3. On their own: plots of pollinators or infection severity vs. species richness
4. Not sure how far into the stats to go. Options:
   1. Mini lesson on linear regression
   2. ggplot linear regressions: ‘lm’ vs. ‘lowess’ method
   3. lm function
5. Translate into a verbal conclusion, talk about variation and next steps

## Analyzing data: Invasive species and infectious disease

1. Import data
2. Make new variables:
   1. LMA = weight / leaf area
   2. Infection severity = area infected / leaf area
   3. Add to a data frame: data\_frame$LMA = weight / leaf\_area
3. 3-D plot of plant traits with points colored by species and shapes by origin
4. On their own: change the color palette or shapes
5. Plots of infection severity vs. leaf traits and origin
   1. Point plots
   2. Bar graphs or boxplots
6. Build upon stats concepts from last lesson because there are multiple predictor variables
7. On their own: write their conclusions in words following the model from the last lesson

### Using publicly available data to answer your own questions

1. Given some dataset options that could include similar analyses to those above
2. In groups of 2-3, write their own question and use the methods they learned to answer it

## Potentially useful resources

### Introduction to R

* <https://www.rforcats.net/>
* <http://stat545.com/topics.html>
* <https://datacarpentry.org/R-ecology-lesson/01-intro-to-r.html>
* Hour of code Python: <https://www.sololearn.com/Play/Python/hoc>
  + This doesn’t seem super helpful, but I like that it asks questions and gives feedback
* <https://swirlstats.com/students.html>
  + Interactive (is within R), but not as visually appealing as the Hour of Code programs
* <https://www.datacamp.com/courses/free-introduction-to-r>
  + Easy and interactive, but requires personal information to log on

### Public datasets

* <https://github.com/awesomedata/awesome-public-datasets>
* <https://www.kaggle.com/datasets> (non-ecology)
  + <https://www.kaggle.com/nadintamer/top-spotify-tracks-of-2018>
  + <https://www.kaggle.com/city-of-seattle/seattle-library-collection-inventory>
  + <https://www.kaggle.com/aaronschlegel/austin-animal-center-shelter-intakes-and-outcomes#aac_intakes.csv>
  + <https://www.kaggle.com/cityofLA/la-restaurant-market-health-data>
* <https://datadryad.org/> (FL ecology?)
  + <https://datadryad.org/resource/doi:10.5061/dryad.2ck58>