MEED Module 2018: Testing for adaptation in threespine stickleback

a. Background
    i. Learning Goals & PLOs
        - Introduce a local study system in ecology and evolution
        - Explore adaptation in natural systems
        - Practice and increase understanding of experimental design
    ii. Topic: Adaptation and experimental design
    iii. Why is this module interesting? It uses a study system in a location students are familiar with, namely coastal BC ocean and streams. It also requires students to think about what they would personally be interested in testing and understanding further in this system.
    iv. References
b. Materials
    i. List of materials
        - Projector
        - Pen and paper
c. Procedure
    i. **Pre-Assessment**
        - Introduction to how science works (asking questions, stating hypotheses, etc.)
        - Background in evolution and adaptation
            - Presentation and question/answer with class
            - Define terms
            - Go over example with guppy adaptation to killifish and cichlids
            - Introduce stickleback system, and adaptation to freshwater
    ii. **Participatory Learning**
        - Overview: Introduce components of experimental design and give an example using guppies (via presentation), and then have students apply these ideas to stickleback
        1. Trait - students in groups identify a potentially interesting trait that differs between marine and freshwater stickleback
        2. Hypothesis - students formulate a hypothesis explaining the trait as an adaptation
        3. Experiment - students design a possible experiment (including variable manipulated, control(s), measurements, and predictions) to test their hypothesis, and pitch it to the class
    iii. **Post-Test**
        - Discussion of proposed experiments
        - Short presentation of one of my own experiments
    iv. **Summary**
        - In this module, students learned about the concept of adaptation, and practiced designing experiments to test whether or not a particular trait was an adaptation to two different BC environments. This was relevant to helping them understand their local environment. The experimental design component was relevant to students planning to start university

soon, which was most of the class, as several are interested in working in labs and doing research.

d. Adapting the module
    1. Advance the module by going into more detail about treatments, controls, etc. or by using a more complex study system.
    2. Simplify the module by focusing on identify traits and asking general questions.