APPLYING SCIENTIFIC METHOD (Thomson)

Adapted from the tutorial Biology Active Learner, Thomson Learning, Inc 2002
http://w3.dwm.ks.edu.tw/bio/activelearner/01/ch1intro.html

In the discipline of biology, life and living organisms are studied using the scientific method. The scientific method is a systematic approach to examining a situation or problem. In the following task, the main features of the scientific method are reviewed and applied to a specific example.

1) Put the basic steps of the scientific method in the correct order:

ask critical questions make observations experiment
make prediction draw conclusions
analyze results create hypothesis

2) Label the statements with appropriate headings (A-H):

A. make observations
B. experiment
C. create hypothesis
D. analyze results
E. make prediction
F. draw conclusions
G. ask critical questions
H. analysis

1. The shrimp is associated with the algae.
   The shrimp seems to be eating the algae.
   The algae are green.
   The shrimp is green.
   The shrimp and the algae are similar in color.

2. Why are the algae green?
   Why is the shrimp green?
   Is the shrimp eating the algae?
   Is shrimp color related to algae color?

3. The color of the shrimp is not related to the color of the algae.
   Shrimp color is derived from the color of the algae.
   The color of the algae is derived from the color of the shrimp.

4. *If* shrimp color is derived from the color of the algae, *then*:
   ...shrimp will change color when their diet changes.
   ...shrimp will change color when placed in a tank with algae of a different color.
   ...shrimp will change color when they can see algae of a different color.

5. Shrimps are fed different color algae.
   (One hundred adult shrimp are divided at random into two equally sized groups and maintained under identical conditions except for their food.
   The **control** group is fed the same green algae that led to the original observation.
   The **experimental** group is fed algae of a different color.
   The shrimp in the two groups are observed periodically for several months, and detailed records of shrimp color are maintained for both groups.)

6. A: Control shrimp are green and experimental shrimp are brown.
   B: Control shrimp are green and experimental shrimp are also green.

7. Did shrimp color change based on food color?

8. Result A
   In this case, the experimental shrimp changed color. Further, they assumed a color similar to the color of the algae they ingested. The hypothesis is supported by these experimental result.
   Result B
   In this case, the experimental shrimp did not change color. The hypothesis is not supported by these experimental results.

3) Put the stages in correct order

Shrimp and algae are similar in color.
Is shrimp color related to algae color?
Shrimp color is derived from algae color
Shrimp will change color when diet changes.
Shrimp are fed different color algae.
Did shrimp color change based on food color?
Hypothesis holds up (or not).

4) Apply the scientific method to your own specific example. Prepare a poster and present it to your colleagues-biologists.