Appendix 3. Immediate feedback questions used in class as formative assessment and discussion of paired versus independent t-tests.

Instructions: I'll provide three research examples, and you get to decide whether or not the dependent variables should be compared with independent or paired t-tests – by placing your red sticker next to the paired examples, and your green sticker next to the independent examples. (*Write these instructions on board*.) You can discuss this with others; move around the room to read each of the three experiments (in any order). Do not peak under the paper to reveal what other students voted.

A. Alysa tested whether dragonfly larvae in lakes are more susceptible to fish predation in weed beds or in open sand. She placed larvae in one weed bed and one sandy site per lake in 10 lakes. She recorded the proportion of larvae still alive after leaving them for 4 hours.

Independent variable: weedy site or open sand site
Dependent variable: proportion of larvae alive at each site
Why do you think the 2 sites within each lake should be considered paired?

B. A physical therapist compares patients' knee pain ratings (on a scale of 1-10) before and after applying a heat treatment to 90 randomly selected patients.

Independent variable: before or after heat treatment
Dependent variable: pain ratings

C. A veterinary researcher tests whether electronic no-bark dog collars are associated with increased skin infections. She compares the area of infected skin under the no-bark collar of 15 dogs with the area of infected skin (of the same size) from the same dogs' shoulder.

Independent variable: under-collar skin vs. shoulder skin
Dependent variable: area of infected skin

D. The UW medical school tests whether the number of enrolled females differs among 5 ethnic groups by comparing survey results from 40 randomly selected students.

Independent variable: 5 ethnic groups
Dependent variable: number of enrolled females

Discuss the answers together as a class. Which was hardest; why? [paired: A-C, but not D] Replicates can be paired in time, space, by individual, or other factors. The idea of pairing is to reduce all other variation aside from your independent variable.