

INTERACTIVE RESEARCH PLANNING FORM 2

(for rigorously designed experiments)

Name _____ Date _____

1. What question do you plan to investigate?

Example: "Will a new horse paddock adjacent to the stream near our school have an effect on streamwater quality and/or benthic macroinvertebrate communities?"

2. Why is this question important or relevant to environmental issues?

Example: Riparian habitat can have significant effects on streams. Therefore, changing the land use practices in these areas may have consequences for streamwater quality and macroinvertebrate populations. Removing trees to build a horse paddock is a change in riparian land use.

3. Can you find reports by other students or professional scientists on this topic? If so, what can you learn from what has already been done?

4. What is your **hypothesis** (the prediction of what you think will happen, stated in a way that can be tested by doing an experiment)? Why did you choose this prediction?

Example: Our hypothesis is that the macroinvertebrate population downstream of the proposed paddock will shift from one that is indicative of "excellent" water quality to "good" water quality, and that streamwater nitrate, phosphate, and turbidity levels will increase and dissolved oxygen levels will decrease.

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5. What is your **independent variable** (the factor that that you will change to make one treatment different from another)?

Example: The independent variable is the construction of the paddock, including how much time has passed since construction began. We will sample upstream and downstream of the paddock before it is built and after construction begins. We will sample again after horses begin using it.

6. What is your **dependent variable**? (This is the factor you will measure to determine the results of the experiment—it is called “dependent” because the results depend on changes in the independent variable from one treatment to the next.)

Example: The dependent variables are the water chemistry and invertebrate populations of the stream above and below the paddock.

If you are confused about the independent and dependent variables, it may help to think back to your research question and then think about how you might want to present the results of your experiment.

On the x-axis is your independent variable. These are the numbers that you decide in advance, to create your various treatments.

On the y-axis is your dependent variable. This is the factor you will be measuring in your experiment.



INTERACTIVE RESEARCH PLANNING FORM 2 (*continued*)

7. What **treatments** do you plan? (Each level of your independent variable is a treatment. You should plan to change only the independent variable from one treatment to the next, keeping all other conditions constant.)

Example: Our only treatment is the construction and subsequent occupation of the horse paddock. Owners suggest it will take about a month to build, and horses will be using it in about a month after it is finished.

8. How many **replicates** will you have for each treatment? (The more replicates you can manage, the better, but you will have to figure out how many are feasible for your experiment.)

Example: We will sample from the stream two times before and two times after the paddock is built and occupied. Each time we will collect samples from three upstream and three downstream locations.

9. What is your **control** (the untreated group that serves as a standard of comparison)?

Example: Our control is the upstream sampling area.

10. What factors will you keep **constant** for all treatments? (The constants in an experiment are all the factors that do not change.)

Example: Except for possible runoff from the horse paddock, all conditions will be the same for upstream and downstream sampling locations. As far as we know, there are no other proposed construction projects scheduled nearby.

INTERACTIVE RESEARCH PLANNING FORM 2 (*continued*)

11. What equipment and supplies will you need?

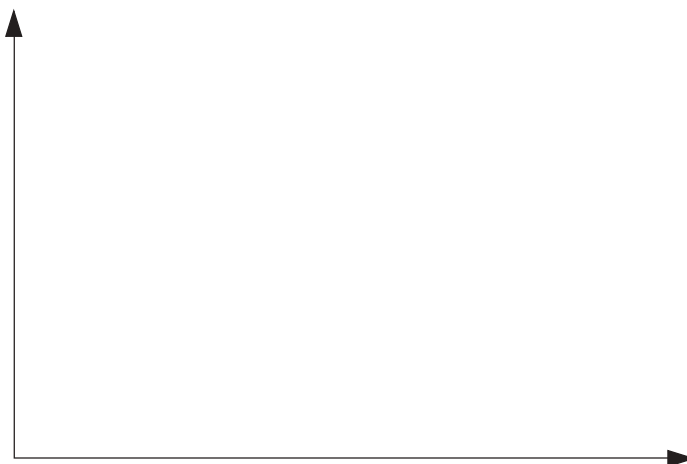
Example: We will need test kits necessary to measure nitrate, phosphate, turbidity, and dissolved oxygen, as well as equipment listed in Protocol 5.

12. What schedule will you follow?

Example: We will sample on four days—twice before the paddock construction begins, and twice after. We will need a double class period to sample, and another class period to analyze results.

13. What will you measure, and how will you display your data? Sketch an empty data table here, with the appropriate headings. (Think about what kind of table you will need to record the data from your experiment.)

On this graph, add labels for the x-axis and y-axis and sketch your expected results.



INTERACTIVE RESEARCH PLANNING FORM 2 (*continued*)**A Final Check: Evaluate Your Experimental Design**

1. Does your planned experiment actually test your *hypothesis*?
2. Are you changing only one *variable* at a time? Which one?
3. Will your *control* be exposed to exactly the same conditions as your *treatments* (except for the *independent variable*)?
4. How many *replicates* will you have for each *treatment*?
5. Meet with another student or group to discuss these plans using the **Experimental Design Peer Review Form**. Then describe any changes you've decided to make based on this discussion.