Materials and Methods in a Research Proposal

QuikSCience Challenge
Research Proposal Writing Workshop
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Purpose

- To explain *what you are going to do* in order to prove your hypothesis correct
  - *Where* are you going to do your work?
  - *How* are you going to do it?
  - *What* materials are you going to use?
Basic Research Concepts

• Variables
  – Dependent variable
    • What you are trying to explain or learn about
  – Independent variable
    • The factor that might hypothetically influence or cause the behavior of interest
Basic Research Concepts

• Research Categories
  – Observational
    • Non-experimental research
    • Study method in which the researcher observes and records ongoing behavior but does not try to change it
  – Experimental
    • Manipulate variables
    • Attempt to control extraneous factors
    • Sometimes attempt to change behavior
Let’s Work on Examples…

• The Impact of Ocean Noise on Fishing in Southern California
  – Hypothesis:
    • The noise from shipping activities in the Los Angeles/Long Beach Harbor area negatively impacts local fish populations.

Observational or Experimental Approach???
Questions to Address:

- **Where** will this work be conducted?
- **How** will you be assess fish populations?
- **What** will you need to perform this work?
Location, Location, Location!
Assessing Populations

- **Fish Transects**
  - Requires certified divers
  - Usually performed multiple times

- **Quadrats**
  - Same concept as above
  - Can be performed on land or in water
More Examples…

• Influence of Ocean Health on Human Health
  – Hypothesis:
    • Areas with high amounts of anthropogenic (human) activities will stimulate phytoplankton populations and increase the incidence of Harmful Algal Blooms (HABs).

Observational or Experimental Approach???
Questions to Address

- **Where** will this work be conducted? “Natural” versus “Anthropogenic” location

- **How** will you assess the phytoplankton population?

- **What** will you need to perform this work?
Location, Location, Location
Assessing Populations

• Satellites
  – MODIS, SeaWiFs
  – Detect chlorophyll from ocean surface waters

• Sensors
  – Detect chlorophyll from any depth they are placed
One Last Example…

• Impact on Increased pH on Local Crab Populations
  – Hypothesis:
    • Crab populations subjected to conditions of increased pH will have higher mortality rates than populations exposed to current oceanic pH levels.

Observational or Experimental Approach???
Questions to Address

- **Where** will this work be conducted?
- **Where** are you getting the crabs?
- **What** will you need to conduct these experiments?
Location, Location, Location

• A laboratory!
  – What will you need in your lab to conduct experiments?
    • Where will the crabs live – BEFORE, DURING and AFTER experiments?
  – How are the crabs going to get there?
    • Are you buying them, having them delivered, collecting them yourself?
Methods

• Measuring Crabs
  – Size, Weight
  – Mortality

• Measuring experimental conditions
  – pH

• Changing experimental conditions
  – Raising pH
Things to Remember… That are Easily Forgotten…

• How are you going to get to your location?
  – Boat, Car etc…

• How are you going to bring things back to the laboratory with you?
  – Do they need to be kept alive?

• How are you going to analyze your data?
  – Do you need a computer?
  – Do you need a special computer program?

• HOW MUCH WILL IT COST! $$$$$$$
Questions??
Helpful Ocean Websites

- Southern California Coastal Ocean Observing System [www.sccoos.org](http://www.sccoos.org)
- Central & Northern California Ocean Observing System [www.cencoos.org](http://www.cencoos.org)
- Monterey Bay Aquarium Research Institute [www.mbari.org](http://www.mbari.org)
- Southern California Coastal Water Research Project [www.sccwrp.org](http://www.sccwrp.org)
- National Oceanographic and Atmospheric Association [www.noaa.gov](http://www.noaa.gov)
- Discovery of Sound in the Sea [www.dosits.org](http://www.dosits.org)
- Center for Dark Biosphere Investigations [www.darkenergybiosphere.org](http://www.darkenergybiosphere.org)

- West Basin Municipal Water District [www.westbasin.org](http://www.westbasin.org)
- CA Department of Health Shellfish Monitoring [www.cdph.ca.gov/healthinfo/environhealth/water/Pages/Shellfish.aspx](http://www.cdph.ca.gov/healthinfo/environhealth/water/Pages/Shellfish.aspx)
- NOAA’s Ocean and Human Health Initiative [www.eol.ucar.edu/projects/ohhi/](http://www.eol.ucar.edu/projects/ohhi/)
- CA Cooperative Oceanic Fisheries Investigations [www.calcofi.org](http://www.calcofi.org)
- CA SeaGrant [www-csgc.ucsd.edu](http://www-csgc.ucsd.edu/)