Guidelines

The primary purpose of a research proposal is to help you organize your ideas about a potential research project.

A well-written proposal enables reviewers and others to fully understand:

- What you want to do
- How you will do it
- Why is it important
- What you expect to find
QuikSCience Guidelines

• Any ocean/environmental science question or topic that interests your team.

• The research proposal should relate to the topic!
  • Ex. Plastics- what effects does photodegradation have on ... species of animals.
Proposals should be a total of 5-7 pages in length.

Remember, you do NOT actually have to do the project, just propose it as part of QS competition requirements.
First thing to do once you have picked a topic is a LITERATURE REVIEW

- A literature review provides the background and context to proposal
- What is already known from previous research
- Seek the outstanding questions about the subject and find the “holes” in what is known
- TAKE NOTES
  - index cards, post-its
  - electronically
Format for the proposal

The structure should include the following components using the standard format as follows:

- Title
- Abstract
- Introduction
- Hypothesis / Objectives
- Methods / Materials
- Literature Cited / References
- Supporting documentation
Title

Give your project a precise, innovative working title.

Bold and centered

Catches the readers attention … gives details on topic

Less than 20 words

Think: WHO (common/scientific) or WHAT, WHERE, WHY
This is an incorrect format:

Research Proposal
SGAR High School QuilSCience Team 2011

Effects of Oxytetracycline on Marine Environments

Abstract

Fish have become the second most largely consumed meat in the world today. As a result, fish farming has become one of the biggest industries in the world. Over the last 30 years, the number of farms has risen, as the demand for fish has increased in the world. Fish farms are starting to far surpass the capture and consumption of wild fish (see Figure 1).

• Title - bolded and centered, usually size 14 or 16 font

• Then name of the authors, (all student names- bolded)

• Name of your school

Effects of Oxytetracycline on Marine Environments

Tommy Trojan, Tirebiter Dog, Traveler

University of Southern California
Abstract

• This is usually written **LAST**
• It is a short, concise summary

• Your abstract is:
  • one paragraph
  • Single-spaced
  • 250- 500 words
  • on first page
  • centered

• **Addresses:**
  • *why the research is important* and
  • *the broader impacts* (benefits to society)
Phytoremediation of Kāneʻohe Stream and Kāneʻohe Bay using *Bacopa monnieri* (ʻAe ‘Ae)

Lilia Nakakura and Hunter Rapoza

Kamehamaha School

**Abstract:**
Sewage pollution continues to be a growing problem and threaten marine ecosystems. Many areas in Hawaiʻi have been affected by this epidemic such as Kāneʻohe Bay, Oʻahu, which has been a victim of several sewage spills for the past 30 years. Due to enhancements of nutrients from sewage spills and fertilizers that flow into the bay, algae growth has increased while water quality and clarity decreased. In addition, excessive algae growth reduced light to coral resulting in coral bleaching, a collapse of the reef ecosystem, and threatening biodiversity (Pastorok, 1985). Recent studies have showed that phytoremediation as a possible ……
Introduction

• Significance of the Study

• Provide readers with sufficient background to understand the proposal

• State what the research topic is and why it is important

• Briefly review what has already been done (covering previous research) and summarize the rationale for the intended study

• Include references to allow additional research and review by interested parties
Introduction

In an introduction, the writer should:

1. create reader interest in the topic
2. lay the broad foundation for the problem that leads to the study
3. place the study within the larger context of the scholarly literature
4. reach out to a specific audience

• It is important in a proposal that the problem stands out

• Outline the objectives of your paper
Goals and Objectives

What do you want to accomplish/ or have the project succeed in doing?

**Goals** are the large statements of what you hope to accomplish but usually aren't very measurable. They create the setting for what you are proposing.

**Example:**
Our goal is to create better marine environmental stewardship among students.

**Objectives** are operational, tell specific things you will be accomplishing in your project, and are very measurable. Include a short but descriptive statement of what the project hopes to accomplish.

**Example:**
Our objective is to conduct school wide beach clean up to educate students.
YOUR TURN!

- Goal
- Objective
Glossary & Key Concepts

**Hypothesis** - A supposition that appears to explain a group of phenomena and is advanced as a basis for further investigation, a proposition that is subject to proof or to an experimental or statistical test.

**Research Question v/s Hypothesis** –
- A *research question* - relationship between two or more variables, phrases the relationship as a question;
- A *hypothesis* - declarative statement of the relations between two or more variables.

**Variable** - Something that takes on different values that can be measured or counted. If one variable can be controlled exactly (such as the selling price of apples) then it is called an *independent variable*, while the remaining variable (in this case the number of apples bought) is called a *dependent variable*.

**Goal** - big picture ideas, large statements/ideas of what you hope to accomplish. Usually are not very measurable.

**Objective** - specific things you will be accomplishing in your project, and are very measurable. Accomplishing these will help achieve the goals.
Brainstorming

Ports/Boats Ex. LA Harbor

Fishing

Boat Traffic

Contamination

Pollution

Air

Water

Trucking Carbon footprint

Ballast Water

Invasive Species

Lifestyle of People in San Pedro
Brainstorm

The project can be on any aquatic science question or topic that interests your team.

Interest #1 _______________________

Interest #2 _______________________

Interest #3 _______________________

Think about and describe your research project. What is the heart of it? What results could it produce? What do you want to achieve?

TEAM BRAINSTORMING TIME! Use the worksheet provided. Take a few minutes to discuss the issue & related environmental challenges.
Research Question

• overall idea of what you want to know
  • broad and big picture
Example Research Question:

“How does the invasive species *Gracilaria salicornia* (Gorilla Ogo) affect the coral reef ecosystem?”

Even this is not specific enough because it does not mention the location of the coral reef ecosystem in question, or what the species being mentioned is.

How does the algal invasive species *Gracilaria salicornia* (Gorilla Ogo) affect the coral reef ecosystem in Oahu, Hawaii?
Example Research Question:

“How does sunlight affect plastics?

Very general, no location, no specifics. Not a very detailed research question.

How does extensive UV radiation from the sun affect the copepod species that interact with photodegraded plastic particles in the North Pacific Trash Gyre?
Hypothesis / Objectives

• Include a short but descriptive statement
  • project hopes to accomplish
  • what hypothesis is to be tested

• When proposing a hypothesis, you should indicate what variables your hypothesis will address

Hypothesis:
• A hypothesis is something that can explain an event. It can propose or suggest how two events relate to each other.

• The scientific method requires that a scientific hypothesis can be tested. Scientists sometimes create hypotheses on events that explain scientific theories.
Hypothesis

• Hypothesis is a testable statement which may include a prediction

• Often based on previous observations or trends

• if and then are necessary in a formalized hypothesis
Hypothesis

Example:

If leaf color change is related to temperature, then exposing plants to low temperatures will result in changes in leaf color.

• Formalized hypotheses contain two variables.

• One is "independent" and the other is "dependent." The independent variable is the one you, the "scientist" control and the dependent variable is the one that you observe and/or measure the results. In the statements above the dependent variable is blue and the independent variable is red.
Example:

- If an invasive algae increase is related to temperature, then exposing invasive algae to high temperatures the population will increase and native species will decrease.

Your Turn!!!
Hypothesis

• The ultimate value of a formalized hypothesis is it forces us to think about what results we should look for in an experiment.

• Remember the hypothesis is an outcome of your research question.

Example:

Research Question: How does the invasive species *Gracilaria salicornia* (Gorilla Ogo) affect the coral reef ecosystem?

Hypothesis: If *Gracilaria salicornia* (Gorilla Ogo) grows indefinitely, then it will change the levels of nutrients and abiotic factors in the coral reef ecosystem.
Team Writing Break

Take the next few minutes and draft ideas:

Hypothesis / issues

Literature Review - Topic
Goals and Objectives

Use worksheet provided!
Methods & Materials

How?

When?

Why?

Is it realistic financially, technologically, etc?

Where?

What will you need to perform this work??
Methods & Materials

• Be specific and describe how the research will be carried out

• Describe the experimental design

• Describe the methods of collection and list the required materials & instruments

• Include the location of the proposed research and why this specific location was chosen. Are there other sites to compare? Do you need permits / permission to access the site?
Materials and Methods:

A. Area of Study:
   The area of study was the coral reef area outside the walls of He’eia fishpond located in Kaneohe, O’ahu. This area was chosen due to the abundance of Gracilaria salicornia (Gorilla ogo) and due to past removal projects. In addition, this beach was relatively easy to access and a wonderful location to snorkel for student research and community service projects to eradicate the invasive seaweed. This area was also chosen because it was not an Environmental Protected area, unlike the first location chosen near Waikiki Aquarium Beach on south shore O’ahu.

B. Transect Study
   A 20-meter transect rope with intervals of 1 meter will be used to determine the abundance of Gracilaria salicornia and other organisms within the coral reef habitat. The rope will start from the beach and measure to the ocean’s coral reef for 20 meters. Data and photographs of each transect will be noted, recorded, and compared with the other four other transect areas. The four transect study areas will run parallel from the original site and will be 5 meters apart from each site. So, a total of five transect sites will be recorded, parallel from each other, and will cover the same distance.

C. Quadrat Study
   A quadrat survey will be taken every 1 meter of the transect line to determine the percent (%) species and biodiversity of each quadrant study. Note that the quadrant will be 2 ft by 2 ft made of PVC pipe. With this, the density of Gracilaria salicornia can be determined from the beach to the Intertidal zone of the area of study.

D. Experiment Set-up:
   1. Three samples of 500 mL of salt water will be collected in a glass jar in the study area where Gracilaria salicornia is abundantly found. Using portable Vernier equipment and Logger Pro with computer, the following nutrient reading will be collected: pH, salinity, nitrate, chloride, ammonium, turbidity, temperature, carbon dioxide levels, dissolved oxygen levels, and phosphate. The average number of three sets of data will be determined, recorded, and used as the pre-experiment values of the study area.
Glossary & Key Concepts

**Quantitative** - numerically based data of, or pertaining to, the describing or measuring of quantity.

Ex. Surveys, numerical information, data sets

**Qualitative** - Referring only to the characteristics of something being described, rather than exact numerical measurement.

Ex. If using quotes or information from an interview

**Sampling** - the key word in sampling is *representative*. One must ask “How representative is the sample of the survey population (the group from which the sample is selected) and how representative is the survey population of the target population (the larger group to which we wish to generalize)?”
Supporting Documentation

• If available and appropriate, include tables and figures. If you use tables and/or figures, **reference must be made to them in your research proposal**

• Use figures and tables with an explanation of what they are describing

• Underneath figures and above tables, write a caption

• Number them chronologically
The Gorilla Ogo or *Gracilaria salicornia* (figure 1) is seaweed from the *Gracilariaceae* family that has become one of the most destructive invasive species in the Hawaiian Islands. This seaweed or *limu* was originally introduced eastern shore of the island of O‘ahu before 1946 possibly from ships originating from the Philippines (Abbott, 1999). Because of the warm waters of the Pacific, the seaweed has established itself rapidly, as well as densely around the south shores of various Hawaiian Islands. In 1970s, the thalli of this seaweed were

Figure 1: Gorilla Ogo

Figure 1 World map showing existing coastal areas (in bold) significantly impacted by human activities. Note coastlines bordering heavily populated, industrialized nations of the northern hemisphere exhibit more extensive impacts than those of the southern hemisphere. Escalating coastal impacts during the 21st century are expected to shift to developing nations of the tropics, where population growth and attendant urbanization are rapidly increasing (after Alongi 1998).
### Tables

#### Table 1: Nutrients being measured in this study and their effects

<table>
<thead>
<tr>
<th>Type of Nutrient</th>
<th>Source/Effect</th>
<th>Other notes...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrates</td>
<td>Sewage, livestock, manure, feed stocks, agricultural and lawn fertilizers, sewage spills/leaks, runoff animal waste, and green waste. When too much nitrate is present, it causes an accumulation of nutrients that support a dense growth of plant and animal life, the decay of which depletes the shallower waters of oxygen.</td>
<td>Algae are able to use this form of nitrate and convert it into forms of nitrogen that plants take up through their roots and use for their growth (i.e. ammonia). Normal drinking water levels of nitrate are between 5 and 10 PPM.</td>
</tr>
<tr>
<td>Chloride</td>
<td>Household disinfectants, swimming pool disinfectants, algaeicides, wastewater treatment plants, insecticides, and other consumer products. When it enters water, it chemically enters organic matter. Bi-products of this effect include tri halo methanes chloroforms, which is a cancer-causing agent.</td>
<td>Chloride is only found in nature with sodium as salt. A high level of chlorine is 250 mg/l.</td>
</tr>
</tbody>
</table>
Sources

- Books
- Scientific Journals
- Scientific articles
- Interviews
- Scientifically valid web sources

****Need at least five different sources***
Books, Articles, journals Oh my!

• For books, articles, and the like, be sure to include:
  • Author, date of publication, title, source, name of journal (if applicable), page number(s).

• Digital books, journals, and articles are different than websites.
Internet Sources

- For web resources, double check the scientific validity of your sources
- Reference info is the same as before, but websites also need to have the
  - date of access and web address
  - Sorry folks! Wikipedia is not a valid scientific source
  - Check out Beware of Science and Resources!
- Also, checkout:
  - http://www.usc.edu/org/cosee-west/
  Aug1-5_2011/teach_judging_science.pdf
Mentor Resources

- Your mentors have access to scientific journals, and your mentor maybe able to send some papers your way for the research proposal.
- Helpful hint: Look at the reference section on papers given, and expand upon them for your proposal, if pertinent use them in your paper.
Citations in the Paper

- Citations will go in almost every section of your paper, the introduction, the materials and methods.
- Citations in a paper include: main authors name and the year it was published. Ex. (Name 2001)
- If one sentence is paraphrasing two idea, both papers must be cited.

Figure 1: Gorilla Ogo

The Gorilla Ogo or *Gracilaria salicornia* (figure 1) is seaweed from the *Gracilariaceae* family that has become one of most destructive invasive species in the Hawaiian Islands. This seaweed or *limu* was originally introduced eastern shore of the island of O’ahu before 1946 possibly from ships originating from the Philippines (Abbott, 1999). Because of the warm waters of the Pacific, the seaweed has established itself rapidly, as well as densely around the south shores of various Hawaiian Islands. In 1970s, the thalli of this seaweed were introduced to Waikiki and Kaneohe to help further develop aquaculture. Sometime in 1990,
Format for citing an INTERVIEW

- Person Interviewed (Last name, First name)
  - Type of interview (personal or telephone)
  - Date of interview
    - day ______ month ______ year______
References:


Author (alpha), date of publication, title, source, name of journal (if applicable), volume #, page #
Suggestions

ORGANIZE!
work as a team
distribute duties
schedule activities
work on short, regular writing times
going through several drafts & revisions
Consider one person writing the final document
to assure consistency

Think, Talk, Record, Research, then just do it. Commit to get it done and move on it!

Remember:
In your Portfolio Summary, submit a brief summary of your proposal (abbreviated Abstract)
Helpful Ocean Websites

• COSEE-WEST-
• 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)

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)

• West Basin Municipal Water District [www.westbasin.org](http://www.westbasin.org)
• JPL Our Ocean Portal [ourocean.jpl.nasa.gov](http://ourocean.jpl.nasa.gov)
• 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/)
Thank you for joining us!

Terri Bidle, QS program manager
DJ Kast, QS program specialist

USC Mentors:
Emily Kopania, Emily Alder, Colleen Hoffman, Patrick Sun, Becky Sawyer, Kristan Culbert, Rachel Jones, Cathy Ji