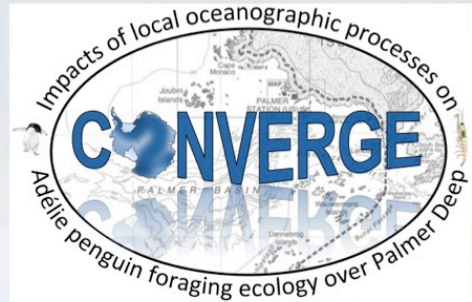


# Project CONVERGE

Bring Antarctic science & scientists into your classroom!



## Sample Mini-Proposal for Science Investigation (Control/Treatment Experiment)

**Title:** The Effects of Different Amounts of Light on Total and Rate of Grass Growth

### Introduction

The topic area that we are interested in understanding more about is how light effects plants. To understand how the amount of light effects how much and how quickly or slowly plants grow we will use 3 different light situations with sprouted grass for 3 weeks in our classroom. To make sure we have good data, we will have 2 replicates grass patches in each of the light situations. The light situations will be a control of full light, a treatment of 2/3<sup>rd</sup> light, and a treatment of 1/3<sup>rd</sup> light. This will provide a range of light amounts for the grass to be exposed to. To determine if the grass are impacted by the different light situations, we will measure their total height from the soil to the top of the highest blade in each grass patch each day of the investigation.

### Testable Question & Hypothesis

Our testable question is: How can changing the amount of light change how much and how quickly grass grows?

Our hypotheses are:

1. Grass will grow more in total height in situations with more light.
2. Grass will grow more quickly over time in situations with more light.

### Materials

- Grass seed
- Soil
- Watering can
- Water
- Six light bulbs with stands
- Six 4x4 inch containers to grow grass
- Black paper to cover some of light
- Counter space in dark room
- Three rulers
- Data table
- Pencils

### Planned Procedure – Description of Data Collection

- How will data be collected? – Data will be collected once a day for three weeks total. Before data are collected 1 Tbls of grass seed will be spread out over each grass container and watered each day until the soil is moist. Once the grass seeds have sprouted and are taller than ½ inch then data collection will start.

- How will measurements be taken? – The total height of the tallest grass blade per container will be measured from the soil to the top of the grass blade using the ruler. The day of the investigation and the calendar date will also be recorded with each height measurement, as well as any other comments worth noting about the investigation set-up and conditions.
- What tools and methods will be used to collect the data? – Rulers will be used to measure the total height of the grass blades.
- How often will data be collected and recorded? – The data will be collected and recorded every school day once the investigation starts for three weeks.
- How long will the investigation last? – The investigation will last three weeks after the start of the first data collection.

### Planned Procedure – Investigation Design Table

<i>Independent Variable</i> –		<i>Background Questions</i> –	
<ul style="list-style-type: none"> <li>• Amount of light</li> </ul>		<ul style="list-style-type: none"> <li>• How do plants use light to grow?</li> <li>• What does grass need to grow well inside?</li> <li>• What kind of light bulbs are good for helping plants grow inside?</li> </ul>	
<i>Dependent Variable</i> –		<i>Constants</i> –	
<ul style="list-style-type: none"> <li>• Change in total height of grass blades.</li> <li>• Rate of change of growth in total height of grass blades.</li> </ul>		<ul style="list-style-type: none"> <li>• Amount of soil in containers.</li> <li>• Size of containers.</li> <li>• Amount of time light is on the plants each school day.</li> <li>• Amount of water given to the plants each day.</li> <li>• Amount of grass seeds originally planted in each container.</li> <li>• Time of day height is measured.</li> </ul>	
<i>Control Group</i> –		<i>Treatment Group #1</i> –	<i>Treatment Group #2</i> –
Grass growing with full light.		Grass growing with 2/3 <sup>rd</sup> light	Grass growing with 1/3 <sup>rd</sup> light

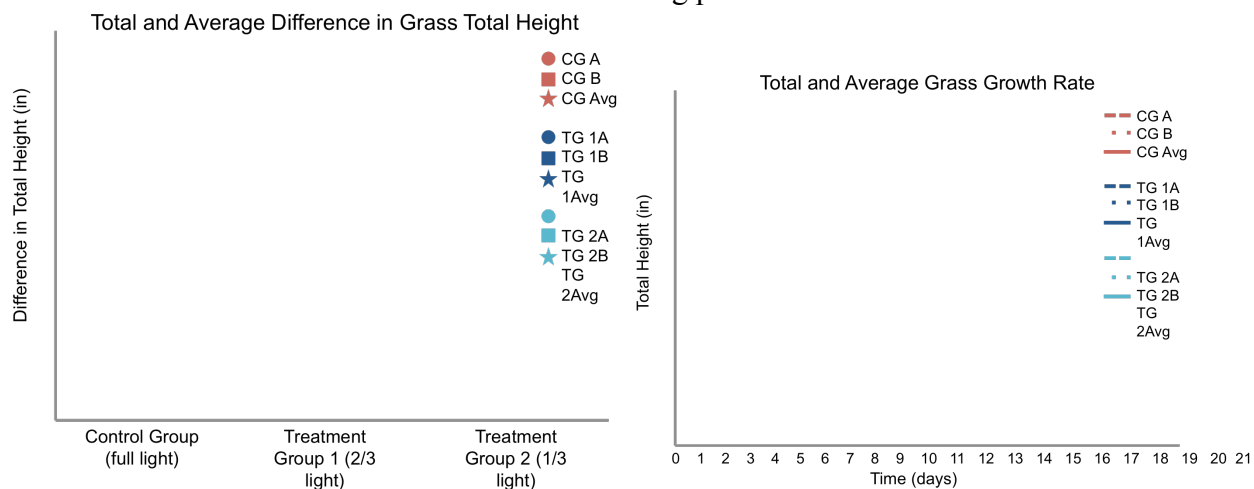
### Planned Procedure – Description of Data Analysis

- What kind of data table will be used? – This is what the data table will look like with a line in the table for every day of the investigation (CG = Control Group, TG = Treatment Group, A = first replicate, B = second replicate for each light situation):

Day	Date	CG A	CG B	TG 1A	TG 1B	TG 2A	TG2B	Other Observations
1								

- How will the data be reviewed for outliers? – Before analyzing the data, we will look through the recorded data values and compare them against any notes that we included in the “Other Observation” column. If there are data points that seem very different and an observation listed that could explain the different data value then that container will not be used for further analyses. If there are no observations made in the “Other Observation” column that could explain the different data point then the data will be used in the analyses.

- What tools will be used to interpret the data? –
  - To determine if there is a difference in the total height growth of grass across the three light situations, we will calculate and plot the total difference in total height of the grass blades for each container and then average it for each light situation. We will then visually compare the differences in difference in total height among the light situations.
  - To determine if there is a difference in the rate of growth of grass across the three light situations, we will plot the height per day of investigation for each of the containers and the calculated average per light situation. We will then visually compare the differences in the growth rate (slope) of the lines among the light situations.
- What type(s) of figure(s) will be used to show the data?
  - The difference in total height for each container and the average difference per light situation will be plotted on a scatterplot using different colors and shapes to mark the different data being plotted.
  - The differences in growth rate for each container and the average difference per light situation will be plotted on a marked line graph using different colors and line hash marks to mark the different data being plotted.



- What type(s) of math or statistics will be used to interpret the data? –
  - The difference in total height for each container will be calculated by subtracting the first total height from the final total height.
  - The average difference in total height for each light situation will be calculated by averaging the difference in total height values for each container within a light situation.
  - The average growth rate of the grass in each light situation will be calculated by calculating the average total height per day of the investigation for each light situation.