# Assignment Summary

For this assignment, you will investigate whether a fungus is sensitive to light and if this affects growth. You will create a graph of a data set and accompanying calculations. Using this information, you will answer some questions as it relates to the statistical significance of your findings and design a plan to extend the experiment.

Background Information

Scientists use data as a form of information to help answer scientific questions and understand scientific observations. Statistical testing is important during any part of data analysis as it provides a robust way to determine your level of confidence in the findings discovered. In this project, you will analyze data about the effect of fungus on crop growth. Scientists are aware that certain fungi can infect certain plant species and destroy the crops. With one study in particular, scientists have hypothesized that the growth of a particular fungus is light dependent. You will study the data collected, and use this to evaluate whether the differences in findings is statistically significant. This investigation will also give you the opportunity to practice using the scientific method to design a future experiment.

Materials

* Sample data
* Computer with word-processing software
* Calculator

# Assignment Instructions

For this project, you are expected to submit four items.

1. Calculations showing how the mean length, standard deviation, and standard error of the mean was determined
2. A graph that shows the medium length of fungus grown in the dark versus the light
3. Answers to discussion questions describing conclusions from the experiment
4. A one-page design plan describing a future study that can be performed in relation to the conclusions from this experiment

**Step 1: Prepare for the project.**

1. Read through the guide before you begin so you know the expectations for this project.
2. If anything is unclear to you, be sure to ask your teacher.

**Step 2: Study the data collected on fungal growth.**

1. Analyze the data provided, which shows fungal growth (in millimeters).
2. Identify any patterns or trends you observe and make notes in a science journal.

**Step 3: Calculate mean length and standard deviation.**

1. Determine the mean length for both dark and light categories.
2. Find the standard deviation for both dark and light categories.
3. Calculate the standard error of mean for both dark and light categories.

**Step 4: Create a graph showing the difference in mean length between dark and light treatments.**

1. Create a graph using the mean length for growing in the dark versus light.
2. Label the *x*-axis and *y*-axis, and include units.
3. Include an accurate title.
4. Create error bars based on the standard error of the mean provided.

**Step 5: Answer discussion questions in the written analysis to draw conclusions.**

**Step 6: Write a one-page design plan for one future study that can be completed after this experiment.**

1. Write a clear scientific question. Note that this current experiment was conducted for one week.
2. Include the null and alternative hypotheses that will be used to answer this question.
3. Describe how you will collect the data and what type is needed.
4. Describe your plan to analyze the data, and include any type of statistical testing needed.

**Step 7: Evaluate your project using this checklist.**

If you can check each box below, you are ready to submit your project.

* Did you use computer software to create a graph?
* Does your graph indicate a difference in fungal growth when grown in the dark versus the light?
* Did you calculate the mean length and use that to create your graph?
* Did you calculate the standard error and use that to find the error bars?
* Did you answer the discussion questions?
* Did you develop your design plan for a future study?
* Does your design plan include a scientific question, hypothesis statement, and method to collect data?

**Step 8: Revise and submit your project.**

1. If you were unable to check off all of the requirements on the checklist, go back and make sure that your project is complete. Save your project before submitting it.
2. Turn in your graph, discussion questions, and one-page design plan to your teacher. Be sure that your name is on it.
3. Congratulations! You have completed your project.

# Data on Fungal Growth Calculation and Bar Graph

Study the data on fungal growth.

**Fungal Growth over a One-Week Period**

|  |  |  |
| --- | --- | --- |
| Fungal Species | Dark Exposure (mm) | Light Exposure (mm) |
| 1 | 12 | 18 |
| 2 | 8 | 22 |
| 3 | 15 | 17 |
| 4 | 13 | 23 |
| 5 | 6 | 16 |
| 6 | 4 | 18 |
| 7 | 13 | 22 |
| 8 | 14 | 12 |
| 9 | 5 | 19 |
| 10 | 6 | 17 |

1. Calculate the mean lengths of the dark and light treatments.
2. Calculate the standard deviation of the dark and light treatments.
3. Calculate the standard error of the dark and light treatments.
4. Create a graph of mean growth that shows the standard error bars. The graph should visually show the differences in growth between dark and light.

# Written Analysis

Answer the following questions using the bar graph as supportive evidence.

1. What do the graphs indicate about light sensitivity for the fungi?
2. Are the differences statistically significant? Use evidence from the data to support your answer.
3. What does the standard error of mean indicate?

# Design Plan for a Future Study

Write a design plan for a future study of the fungus or another species based on the results of this experiment. Include a scientific question, hypothesis, and the steps that will be taken to collect/analyze the data. Specific types of statistical tests used should be mentioned.

**Scientific Question:**

**Hypothesis:**

* **Null:**
* **Alternative:**

**Data Collection Method:**

**Data Analysis Plan:**