Activity 4

Analysis of Worm Growth

Rationale: The data collected are important for the success of the Habitat. The analysis of these data will help determine how to modify the environmental conditions, if necessary.

Objectives

1) Analyze the worm growth data by hand.
2) Perform a one-variable statistic on the data.
3) Compare the hand derived values to the calculated values.
4) Determine the mean (average), maximum, minimum, range, variance, and standard deviation.
5) Determine which of the above analyses are best for determining the optimum Habitat conditions.

PDE Standards

Environment and Ecology

4.1.7. A,B,C
4.2.7. A,C
4.3.7. B
4.6.7. A,B,C

Math

2.1.8. A,B,D,G
2.2.8. A,B,F
2.3.8. A,B,D
2.4.8. A,B,D,F
2.5.8. A,B,C,D
2.6.8. A,B,C,E,F
2.7.8. B,C,D
2.8.8. F,G,H,I,J
2.11.8. A,B

Materials

Graphing calculator
Computer
Graphical Analysis (software)
Data from Worm Growth Activity

Introduction

This activity will familiarize the students with the statistics applications on the graphing calculator as well as the meaning and use of several common statistical analyses. The mean or average is the sum of the data collected divided by the number of data points. The range is the difference between the maximum value and the minimum value. The variance is the average of the differences between the measurement and the mean squared.

$$\text{variance} = \frac{\text{sum of the (measurement} - \text{average*)}^2}{\text{number of measurements}}$$

The standard deviation is the square root of the variance, $^2\sqrt{}$variance.
* This is the average of each group's values.

Strategies

Ideally the students should play a large role in determining the analysis of the data. However, they will need to begin at a fundamental level. The average of the measurements will help them become familiar with analysis of data and the power of a graphing calculator. Have the students calculate the average by hand on the calculator by averaging the mass measurements from Data Table 1 of Worm Growth Activity. These data can be then entered into the appropriate calculator list. Students should complete Data Table 1 for this activity. One variable statistics (1-Var Stats) will give them the calculated mean or average. The students should complete the calculation for the variance and standard deviation. Then they should compare the range to the variance and standard deviation. Have students describe what they observed by writing a short essay. If time permits have them explain and or present their findings.

Procedure

1) Enter the change in mass measurements into the calculator and find the average. Record the data in Table 1.
2) Enter the same data into List 1. Select STAT, EDIT, "1-var Stats," and then press ENTER. The value after $\bar{x}$ is the average. Compare the average to the measured mass. If different by more than a tenth, consult the teacher.
3) Complete the columns in Data Table 1 for variance.
4) Take the square root of the variance, √variance.
5) Compare to the standard deviation, Sx (found in 1-var Stats).

Expectations

The student should be able to**:**

1) determine the average, range, max and min by hand and compare to the STAT values.
2) determine the differences between average measurements, square the values, and find the average - variance.
3) take the $^2\sqrt{}$ variance - square root of the variance.
4) complete Data Table 1 and determine the standard deviation.
5) develop an understanding of how the change in mass is a result of the conditions of the Habitat.

Data Table 1

Mass	Ave	Mass – Ave	(Mass – Ave)^2
		XXXXXX	XXXXX

Show all work (in journal)

1) Average of changes in mass _____

2) Maximum_____, Minimum _____, Range _____

3) Sum of the [differences squared] _____

4) Number of measurements _____

5) Variance _____, Range _____, Difference _____

6) Standard deviation _____, Range _____,Difference _____

Extensions

1) What observations were made?
2) What explanations support the observations?