

Graphing Genes and Proteins: A real dataset

General Background

Proteins are responsible for a wide range of tasks, including:

1. carrying oxygen in your blood (a protein called hemoglobin),
2. digesting your food (enzymes like amylase, pepsin, and lactase),
3. defending your body from invading microorganisms (antibodies),
4. and speeding up chemical reactions inside your body (enzymes again—they're not all for digesting food).

Specially designed proteins even give elasticity to your skin (elastin) and strength to your hair and fingernails (keratin).

Protein production starts in the cell's command center, the nucleus. Your genes, which are made of DNA, contain the instructions for making proteins in your body, although many other factors—such as your diet, activity level, and environment—also can affect when and how your body will use these genes.

NIH Reference:

<http://publications.nigms.nih.gov/insidethecell/index.html>

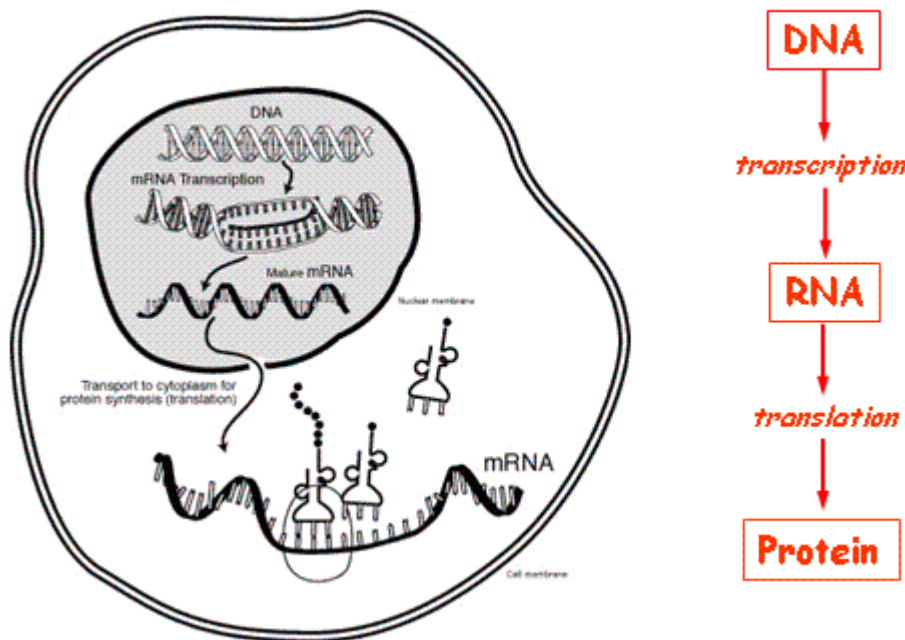


Image Source: <http://scripts.mit.edu/~aidanc/popgen/images/dogma.jpg>

Authors:

Fellow: Wandaliz Torres-Garcia, Arizona State University, wandaliz@asu.edu

Teacher: Joseph Corbett – Parkridge Elementary School, JCorbett@peoriaud.k12.az.us

Keywords: genes, proteins, DNA, data tables, graphs, relationship

Objectives

The students will experience working with a dataset currently used for research. This lesson focuses on tables and graphs its main components and how to build a scientific scatter plot in Microsoft Excel. Also, this activity aims to have group discussion on how to “read” results from graphs and to relate them to its source.

AZ State Standards

S1: Inquiry Process; Concept 1: Observations, Questions, and Hypotheses; PO1

S1: Inquiry Process; Concept 3: Analysis and Conclusions; PO1, PO2, PO3

S1: Inquiry Process; Concept 4: Communication; PO1, PO2, PO3

S2: History and Nature of Science; Concept 2: Nature of Scientific Knowledge; PO1.

Grade Level: 9th-12th grade (lowered to 8th grade)

Time: Two class periods

Lesson: Graphing Genes and Proteins: A real dataset

Topic: Math Biology and Technology

Lab Activity:

From Genes to Proteins: A Graphing and Discussion Experience

General Information

- 1) We will have a brief discussion on prior knowledge on genes and proteins and how they affect us. It’s important to let the students know the complexity of genetics and proteomics. It can be seen by the uniqueness of each one of us!
- 2) Give each student a handout which is included with this lesson plan.
- 3) Relate the discussion to some of the points discussed here.
- 4) Have the students work in pairs to their computer stations. They will discuss the information prior to plot the graphs in Excel.
- 5) They will troubleshoot together on how to graph the scatter plot in their computers.
- 6) They will make sure their graphs contain all parts of a good scientific scatter plot: axis labels, title, legend, etc.
- 7) Lastly, we will have a discussion on the plots behaviors and what kind of results they tell.

Some Discussion Questions you could use with the students:

- 1) What is observed in the metabolic process graph? How are these genes and proteins values related?
- 2) What is observed in the synthesis process graph? How are these genes and proteins values related?
- 3) What can you say about variability?