Students had the opportunity to be engaged in a variety of research projects. The projects centered around the following topics: ***Fly Longevity, Spiders, Bootstrap/Clustering,*** *and the* ***Cancer Cells/Cell Culture, Activity, Binomial, Hypergeometric, and Poisson Distributuions.***

In each project, model building and data analysis played a critical role and was interwoven in a statistical and biological context. Listed below is a brief description of each project as well as the names of students involved in the research. The students reported their research findings to their parents and university faculty on the last day of the Governor's School.

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2012 Governor's School for Scientific Models & Data Analysis

Hosted by:
The Center of Excellence in Mathematics & Science Education

PROJECT PRESENTATION

Warf-Pickel Hall
Room #315
9:30am-11:30am

PROJECT PRESENTATION

Dr. Joplin: (Fly Longevity)

1. Zach Tucker
2. Kelsey Henderson
3. Hershey Aggarwal

The life history of organisms demonstrates that different factors influence their life span. A mortality study was conducted showing the different survivorship curves that male and female flesh flies, *Sarcophaga crassipalpis*, exhibit during their life span. The hypothesis is that they will show a similar rate of mortality during their life span. The data suggests that females have a very different 'S' curve than males. Data collection and statistical analysis were performed by the students.

Dr. Hugh Miller : (Cancer Cells/Cell Culture)

1. Purnima Patel
2. Daisy Cheng
3. Chad Nieri
4. Eric Qualkenbush
5. Greg Logsdon

A lymphoma cell line called U937 appears to have heterogeneous sizes. The students tried to answer the question; does the size of U937 cells change as the cells age in culture? Cells that had been cultured for various times were applied to microscope slides and images of random fields were captured. Cell areas were analyzed using the Image J software.

Dr. (TJ) Jones: (Spiders)

1. Jessica Barbee
2. Princess Nwoke
3. Caleb Ignace
4. Leona Peters
5. Destiny Roberts
6. Daniel Brown

The distribution of the variably social spider, *Anelosimus studiosis*, may have a bearing on the distribution of sociality. Students conducted a transect survey of a shoreline habitat at Warriors State Park in Kingsport, Tennessee. Distances between webs and the volume of each web were recorded. The data were analyzed by nearest neighbor analysis, correlations between web volume and distance and sociality.

Dr. Price: (Bootstrapping/Clustering)

1. Ethan Hall
2. Christian Harris
3. Knox Kelley

When data is not distributed according to a bell curve or any other known distribution, then the data itself can be used to suggest an empirical distribution. The process for doing this is called bootstrapping, and in this presentation, it is applied to some non-bell shaped curve data in anthropology.

Dr. Price: (Binomial, Hypergeometric, and Poisson Distributions)

1. Matt McConnell
2. Summer Chambers
3. Jamie Afghani

No description available

Dr. Joplin: (Activity)

1. Morgan Miller
2. Justin Scobey
3. Luisa Chavez
4. Noah Clabo
5. Edwin Tsay

The activity of organisms is influenced by many factors in the environment, both internal and external. The students test the hypothesis that stress has an effect on activity by comparing stressed and unstressed flies. Students separated flies into male and females cages and measured the activity of individual flies for 18 days using an automatic activity monitor. Half the males and half the females were stressed at 40^{o}C for an hour before monitoring activity. Data collection and statistical analysis were performed by the students.

Dr. Price (Probability)

1. Alex Grubb
2. Anna Fox
3. Rachael Cummings
4. Grace Choi
5. Alora Gregory

One of the most pressing societal needs in our country is the improvement of our transportation systems. In particular, especially in larger metropolitan statistical areas, traffic jams and extended commute times are common. In 2009, the math department at MIT showed that often such traffic jams are due to soliton wave propagation – a phenomenon they call a *jamiton*. To counteract the always unnecessary jamitons, it is becoming apparent that our roads and highways themselves will need to become much smarter than they are now. Computational models of smart roadways will be essential to this activity.