

Students had the opportunity to be engaged in a variety of research projects. The projects centered around the following topics:

1. **Effects of Music on the Ability to Concentrate;**
2. **The Birthday Problem & Coincidences;**
3. **Capture Recapture & Related Methods;**
4. **Vitamin K2 & D3 Affect on Cell Proliferation & Cell Size in U937 Lymphoma Cells;**
5. **Differential Gene Expression in the Diapause Life Stage,**
6. **Microbiome of Stream Samples.**

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



Tennessee Governor's School for
Scientific Models and Data Analysis



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EAST TENNESSEE STATE
UNIVERSITY

Governor's School in
Integration of Biological
& Statistical Sciences

2018 Student Project
Presentation

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



Dr. Anant P. Godbole, Director
Ms. Angela Haga, Assistant Director

Dr. Karl Joplin, Biological Sciences Instructor
Dr. Nicole Lewis, Mathematics Instructor
Dr. Hugh Miller, Biological Lab Instructor



Warf-Pickel Hall
Room #315
9:30am-11:30am
Friday, June 29th, 2018

Project Presentation

Dr. Karl Joplin (Differential Gene Expression in the Diapause Life Stage)

1. Jithin Manikonda
2. Meghan Johns
3. Sai Mummareddy
4. Jerod Fetters
5. Rachel Watermeier
6. Kurt Cantrell

How does gene expression change during developmental changes between two different life stages? Looking at insect diapause (similar to hibernation) to examine the differences between non-diapause states. Comparison of specific sequences using RT-PCR amplification of mRNA.

Dr. Hugh Miller (Vitamin K2 & D3 Affect on Cell Proliferation & Cell Size in U937 Lymphoma Cells)

1. Madison Hoskins
2. Adelaide Damrau
3. Amy Pender
4. Ruchi Patel
5. Angela Jo
6. Olivia Sharp

Using a lymphoma cell line, we examined the effects of Vitamin K2 and D3 on the survival and cell size of the cells after a 48 hr exposure. Both Vitamin K2 and D3 have been shown in other cell lines to induce programmed cell death, called Apoptosis. We wanted to see if there was a synergistic effect with both vitamins.

Dr. Karl Joplin (Microbiome of Stream Samples)

1. Natasha Messier
2. Natalie Grove
3. Ethan Hurst
4. Alison Crawford
5. Lexis Khetsavanh
6. George Sullins

What is the microbiome diversity of environmental samples? The microbiome encompasses 95-99% of the biome in any sample (including humans). We will explore the microbiome of aquatic streams by collecting samples, extracting DNA, selecting PCR primers for specific bacteria from a sequencing run, and looking if they are present in another stream.

Dr. Nicole Lewis (Effects of Music on the Ability to Concentrate)

1. Shrita Reddy
2. Abigail Allen
3. Josie Fuller
4. Carloline Ferrell

When you walk around campus, you notice the majority of students are listening to music. Even while studying, many students are listening to music. But what are the effects of music on the ability to concentrate? Does it improve or impair concentration? These are typical research questions in the field of psychology. There are numerous studies on the various effects of music on different aspects of life. Experimental design and statistical analysis play a key role in these types of studies.

- (a) Conduct an experiment to test this hypothesis.
- (b) Understand the concept and purpose of ANOVA.
- (c) Analyze data using ANOVA methods



Dr. Anant P. Godbole ("The Birthday Problem & Coincidences")

1. Patrick Bidros
2. Julianna Forbess
3. Ryan Gladwell
4. Megan Wisniewski

Students researched the birthday problem; the birthday problem on Mars; the probability of inhaling one or more molecules of famous persons' last breaths; and a handcrafted Red Dye #40 Coincidence problem.

Dr. Anant P. Godbole ("Capture Recapture & Related Methods")

1. Natalie Bolinger
2. Shriya Karam
3. Michelle Engel
4. Cheryll Rodriguez

Students researched the basic method of capture and recapture for estimating animal abundance. They used simulations and studied the effect of the capture and recapture sizes on the accuracy of the estimate. They studied the mean and variance of the Lincoln Petersen version of the estimate. They also studied line transect and lunar sighting methods (e.g. ET and Elliott riding their bike – and seen in the moon.)



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