

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. Bayesian Statistics; 3. Spearman's Rank; 4. Vitamin K2 & D3 Affect on Cell Proliferation & Cell Size in U937 Lymphoma Cells; 5. Fly in a Dish; 6. Microbiome of Stream Samples; 7. Transcriptome.

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.



Tennessee Governor's School in Integration of Biological & Statistical Sciences



E T S U C e n t e r o f
E x c e l l e n c e i n
M a t h e m a t i c s a n d
S c i e n c e E d u c a t i o n

128 David Collins Way
PO Box 70301
Johnson City, TN 37614

Phone: (423) 439-7592

Fax: (423) 439-7530

E-mail: haga@etsu.edu

<http://www.etsu.edu/cas/math/mathexcellence/>

<http://www.etsu.edu/cas/math/mathexcellence/govschool/default.aspx>

<http://www.netstemhub.com/>

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



EAST TENNESSEE STATE
UNIVERSITY

Governor's School in
Integration of Biological
& Statistical Sciences

2019 Student Project Presentation

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



Warf-Pickel Hall
Room #315
9:30am-11:30am
Friday, June 28th, 2019

Project Presentation

Dr. Karl Joplin (“Transcriptome”)

1. Nithya Chilukuri
2. Arnab Dey
3. Jacqueline Lee
4. Lauren Russell
5. Anna Yates

Examining a transcriptional sequence database for sequences differentially expressed during diapause vs. non-diapause life stages using brain dissection, DNA isolation, BLASTx, primer design and database analysis.

Dr. Karl Joplin (“Fly in a Dish”)

1. Erin Rath
2. Samuel Sefers
3. Phoebe Stewart
4. Raymond Wysmierski

Determining the aggressive behavior of flies raised in high density and low density environments. Insect behavior observations, and statistics including ANOVA and T-tests.

Dr. Karl Joplin (“Microbiome of Stream Samples”)

1. Telak Brahmhatt
2. Chandler Ford
3. Audrey Richards
4. Mae Wallace

Analyzing a stream sample for microbes from low and high impact sites using DNA isolation, database selection, primer design and PCR.

Dr. Anant Godbole (“An Exploration of Spearman’s Rank Correlation”)

1. Nina Chong
2. Amber Cui
3. Parth Patel
3. Anna Sherwood
4. Taylor Swann
6. Reagan Traylor

The Pearson correlation coefficient reduces to a mysterious form when the X- and Y-values both consist of the ranks, between 1 and n, of two individuals. In other words, both the x and Y “columns” consist of permutations of {1, 2, ..., n}. We explore various aspects of the Spearman correlation when the permutations in question are considered to be random.

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

1. Charles Hopper
2. Alexander Huang
3. Neleah Nugent
4. Nilabh Saksena
5. Ambalavan Saravanakumar
6. Emily Welsh

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

1. Shilpa Chowbey
2. John Clapp
3. Laura Millsaps
4. Madeline Reagan

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.

Dr. Nicole Lewis (“Bayesian Statistics”)

1. Aiden Longley

Consider the following experiment. Spin a penny on a table. Let p denote the probability that it lands on heads. We want to estimate this probability starting with prior beliefs about p .

- (a) Use a histogram to model the prior belief.
- (b) Use different priors for the beliefs about p .
- (c) Compare the posterior distributions using the priors and compare the results.
- (d) Suppose one is interested in predicting the number of heads y in a future sample of size 25. Compute the predictive probabilities of y using the different priors. Compare the results.
- (e) Discuss the applications and uses of Bayesian Statistics.