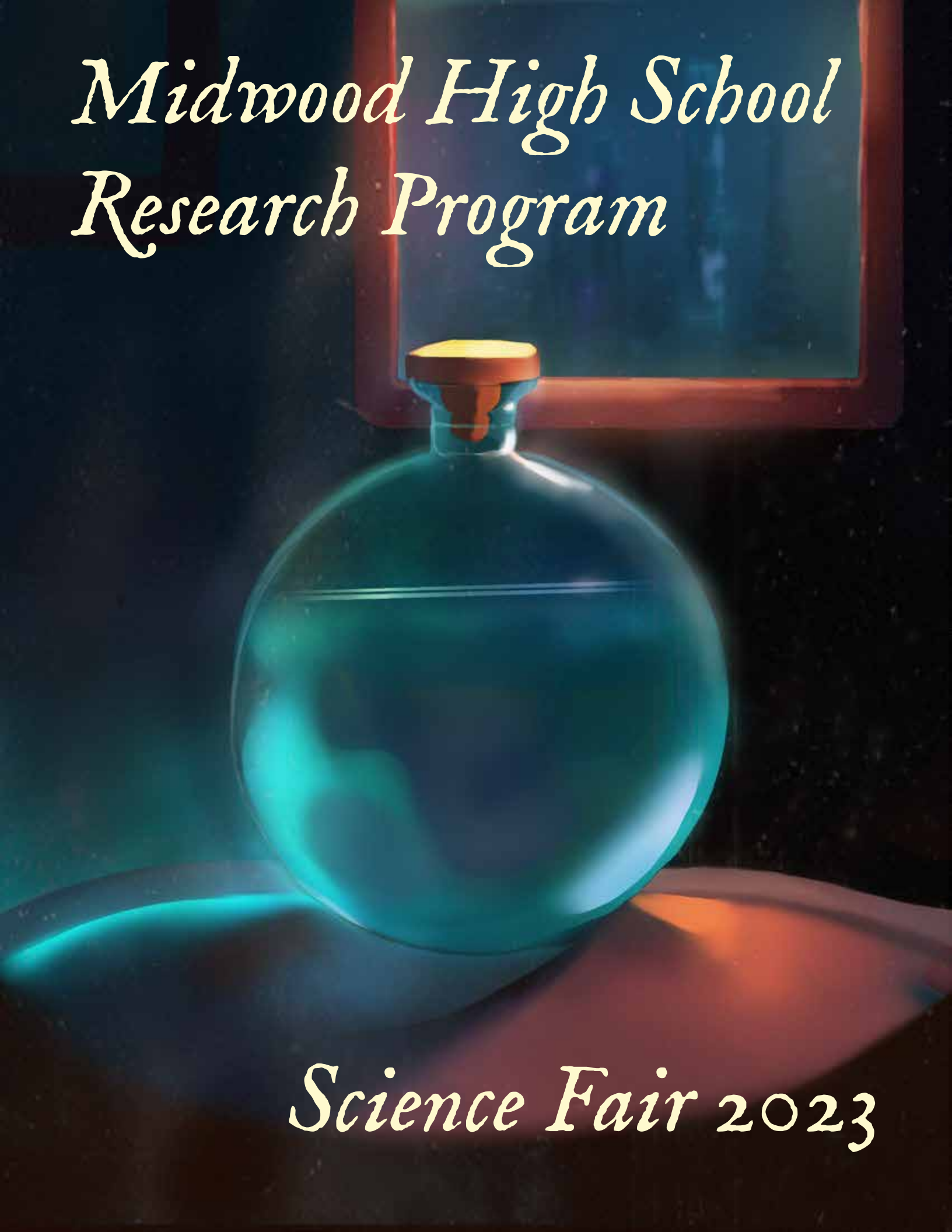
Midwood High School Research Program



Science Fair 2023

2023 Midwood High School Science Fair
25 May 2023 — 2:00 to 6:00 PM

Robert Quinlan — Principal
Jenessa Kornaker — Assistant Principal
Tovia Rosenfeld — Assistant Principal
Glenn Elert — Research Coordinator
Stacy Goldstein — Research Teacher
Avanel Cunningham — Research Teacher

Timeline

2:00–2:45 PM (Period 9)

- Junior and senior judges meet in the library
- Junior and senior judging packets distributed (time to read abstracts)
- Junior and senior tasks explained
- Senior group photo

2:45–3:30 PM (Period 10)

- Scheduled classes on 3rd floor annex moved to main building
- Junior and senior judges set up rooms
- Guest judges arrive and pick up judging packets in A214 (Research Room)

3:30–4:45 PM

- Sophomores move to assigned rooms, boards already in position
- Sophomores given time to complete setting up
- Judging begins ~3:45 PM

4:45~5:00 PM

- Judges return to A214 (Research Room) with completed packets (calculators available)
- Judges given color-coded food tickets
- Sophomore teachers provide students with color-coded food tickets
- Sophomores return boards to A214 (Research Room)

5:00~6:00 PM

- Food self-service in A215 (Living Environment Lab) in groups by ticket color
- Use overflow rooms A219 and A319 as needed
- Juniors and Seniors assist with clean up

6:00 PM

- The 2023 Midwood High School Science Fair has ended
- See you in 2024

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Alumni

Mie Abouelkheir, Enaya Ahmad, Rabiah Aziz, Yasmine Brown-Williams, Rafaella Bruzual, Farhan Chowdhury, Michael Dabrowski, Jennifer Duong, Caroline Ellis, Nitu Farhin, Sammy Feng-Xie, Nafisa Haque, Mohammed Hasan, Zanib Ishfaq, Jasleen Kaur, Bintia Keita, Jessica Khaimova, Benjamin Nguyen, Allan Nosoff, Anthony Nosoff, Bolanle Orioke, Camelot Pham, Marzana Rafa, Nathan Reder, Benjamin Rudshteyn, Almas Shafiq, Christine Truong, Annabel Xie

Seniors

Sameer Ali, Anne Barshay, Simoni Basnet, Meerab Cheema, Jiaen Chen, Joyce Chen, Edward Min Yau Chok, Mykhaelia Clarke, Samia Farid, Mariam Hassan, Nazokat Ibrohimova, Adriena Jiang, Sacha Laine Keenan, Ameemah Khan, Noor Khawaja, Altin Kukic, Ingrid Lok, Alexis Mai, Kaitlynn Mau, Wilhelmina Morehead, Anna Obertos, Christina Obertos, Lucas Paschke, Daria Pozhoga, Sara Qureshi, Shefa Sharafa, Ethan Shek, Aleena Sklyar, Chloe Tse, Archana Vaithilingam, Nia Williams, Angel Wu, Aaron Xu, Leheng Yu, Mingfeng Zhong

Juniors

Brandy Antoine, Sanbina Babar, Justin Bailey, Maria Bazilevich, Anna Bukhman, Ashley Castillo Mendez, Ariane Charles, Elana Chen, Huiying Chen, Vienna Chen, Xinwei Chen, Diana Chen Feng, Ayesha Chowdhury, Joshua Coleman, Kassidy Donald, Jennifer-Runling Fan, Rikza Fatima, Ava Ference, Zehra Girgin, Lucy Guo, Sabrina Henry, Humayrah Hossain, Jessica Hu, Shirley Huang, Ling Xin Jiang, Batool Kamal, Hamood Khan, Ava Khlopin, Max Kogan, Hailey Lau, Cindy Li, Jaimie Ling, Shan Shan Luo, Lena Maad, Eda Maqellara, Katelyn Martinez, Magaly Mendoza, Areeba Mubarik, Emely Rivas, Victoria Ronan, Yanhe Rong, Eman Shabbir, Victoria Sukhova, Meheri Syeda, Hai Li (Vivian) Sze, Nuzhat Tabassum, Elana Toyber, Julia Vargas, Alejandro Velasquez, Eliana Velednitskiy, Sonya Wang, Chloe Wu, Linda Xiao, Jinyu Xu, Rebecca Yakobovich, Oleg Zaika, Christina Zhang, Eric Zhang, Fiona Zhao, Vicky Zheng, Joanne Zhu, Joey Zhu, Elizabeth Zlobinsky

Teachers

Mie Abouelkheir, Princessa Dominique, Wing Tong Lung, Howard Spergel, Jennifer Sullivan, Elizabeth Fenamore (retired)

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Sophomores

314-09 Tomiriz Abdulkhamidova & Jene Chen
Kool-er Way to Dye Fabric

314-01 Afzal Akhtar & Christian Gabelman
From Pollution to Purification: Investigating Excess Phosphorus Remediation Strategies

316-18 Cayla Alba & Lubaba Labiba
The Effect of Music on the Time Perception of Midwood Students

316-01 Sarvinoz Arolova
Surface area effect on reaction rate

316-12 Sabrine Benabdallah
Bread Mold Relations

318-01 Briana Calin & Alexandra Watson
Holy Cow! The Truth Behind Lactose Free Advertisements

318-12 Cholco Chan & Whaley Lin
Bot or Not: Unveiling AI's Mirror to Human Traits

320-09 Ashley Chen
An experiment to remember

314-14 Joey Chen
Effect of electricity on the pH of various aqueous solutions

318-07 Qing Ying Chen & Rachel Huang
The Effectiveness of Mouthwash on Bacteria Growth

320-01 Shahzeen Chowdhury
How does caffeine affect one's cognition?

320-07 Anthony Dai & Whisty Chan
UV Defense

316-14 Alison Danilovich & Stephanie Kalam
Effect of varying acne medications on the growth of Escherichia coli

314-02 Zoe Dean
Impact of Compound Bilingualism on Automaticity

316-04 Aaron Deng
From Trash to Treasure: Harnessing Energy from Tomato Waste

318-10 Jiajun Dong & Uzair Khan
Reinventing Steam Engines

314-07 Isabel Eppel
How effective and cost efficient is homemade gel electrophoresis?

318-04 Kira Fedonyuk
The Environmental Impact of Packaging Materials for Food Products: A Comparative Analysis of Carbon Footprint, Water Usage, and Waste Generation

320-14 Dana Flores-Zeledon & Weiyee Mock
The effect of calcium citrate, potassium citrate and zinc citrate on the heart rate of Daphnia magna

314-16 Heidi Gao
Effect of Emotions on Performance in Math and Science

316-09 Sara Grezda & Shaymaa Elrashidi
Effect of Cleaning Method on Bacterial Growth of Grapes

320-02 Jodi Guan & Sierra Kelly
Effect of Relationship Status on GPA

318-09 Yahya Hussain
Night Glow Clarity

316-15 Leah Josephson
Career Time vs. School Time

318-15 Ahlam Judeh
The Impact of Light on Daphnia Heart Rate

314-04 Sukhdeep Kaur
The Speedy Relief

320-12 Denys Kolomiiets & Tiffany Chan
Determination of Total Water Hardness of Tap Water Among Different US States

320-15 Raine Kong
Thawing Techniques on Bacteria Colony Count in Chicken Breast

314-15 Eric Lau & Bradley Chen
How does the Size of a Balloon affect the Distance a Balloon Powered Car can Travel?

316-02 Gianetta Lazebnik & Serena Li
The Coolest Way to Make Ice Cream

318-14 Zachary Lee & Samirkhon Bakaev
Are playgrounds safe for kids?

314-10 Jaina Leung
The Nutritional Value of School Food Compared to Store-bought Food

320-04 Whitney Li & Breniece Ng
How does additional lactase affect the rate of glucose production in cows milk?

314-05 Becky Lin & Sophia Luo
Permanent Markers to the Test.

316-11 Yiting Lin & Cathy Chen
The Effect Music Has on Food Choice

316-16 Jennifer Lin & Sophie Chen
Gastro-Busting Gut Meds: Fighting E. coli and Gastroenteritis Takes a Whopping Left

318-02 Jeffrey Ling
What is the Effect of the Different Music Genres on how Many Repetitions of a Specified Exercise that one can do?

318-16 Zhuolin Liu & Philip Kong
The tiny but mighty pollution war: The effects of polystyrene microplastics on the quantity of colony forming units of Escherichia coli

316-05 Daisy Meza Veliz & Jenny Chen
The Impact of pH on the Enzymatic Browning Process of Apples

318-05 Tehreem Noor & Kelly Ng
Casein Plastic and pH Levels

320-05 Emily Oliner
Which Method Takes the Cake

320-16 Shamsad Rahman & Vivien Jiang
Best Brand For Less Waste

314-20 Ravital Reingold
Print vs. Pixels

316-07 Gavin Rice
Decision Paralysis and Freedom of Choice

320-11 Yaritza Rivera
Artificial Pancreas Simulation

320-18 Joel Rodriguez & Mohammad Ahmad Sabri
Screw E. coli: The effect of quorum sensing inhibitors on quorum sensing and the formation of biofilm

314-06 Evelyn Giselle Serrano Flores & Anayeli Bermeo
Heart Rate Increase through Dance

316-06 Amy Tang & Yi Tong Huang
Dissolving Rate vs the Liquid

318-06 Firza Tariq
How does the amount of screen time affect a student's overall average in chemistry?

314-18 Denny Ting & Evin Gursoy
Effects of potassium electrolytes on E. coli growth

316-20 Rachel Troman
Effectiveness of Different Materials in Blocking Out Sound Frequencies

320-06 Sienna Veseli & Adreinne Mercado
Sunscreen and SPF revealing UV with color changing beads

320-10 Tiffany Wen & Elise Guan
Germs Roaming the City

318-20 Wan Wu
Feedback Style on Memory Retention

314-11 Zongle Yang & Benjamin Brinzensky
The Impact of Nitrogen Concentration on Chlorophyll Concentration in Basil Plants

316-10 Janetta Yanova
The Secrets of Digestion: How pH Levels Affect Enzyme Activity

318-11 Kaiyue Yuan
Memories Over Time

318-18 Feiyang Zhang & Faiza Soha
Effect of Extroversion and Introversion on Reaction Times

314-12 Sylvia Zheng
Aging Yogurt

320-20 Sunnie Zhong & Nina You
How do extracurricular activities affect academic performance?

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Abstracts

314-09 Kool-er Way to Dye Fabric

Tomiriz Abdulkhamidova & Jene Chen (Ms. Goldstein – Chemistry)

Dyes are carelessly released into the environment and the textile industry is responsible for 54% of the dyes found in nature. The dyes accumulate over time due to difficult removal which harms aquatic life while also contaminating clean drinking water. This issue sparked the idea of finding the optimal pH of a dye to achieve the best adsorption into fabric and end up with the brightest color. Thus, decreasing pollution by wasting less dye and lessening the environmental impact. Kool-Aid cherry powder was used as an acidic dye and its pH was changed using baking soda. After the experiment was performed, photos of the dyed fabric were taken, using RGB values (red, green and blue) on the Photos app, the numerical concentrations of colors were recorded. Based on the ANOVA test of the red, there was a significant difference between the adsorption of dye of different pH levels. It was determined that fabric placed in a lower pH dye solution adsorbed more of the Red 40 dye found in Kool-Aid.

314-01 From Pollution to Purification: Investigating Excess Phosphorus Remediation Strategies

Afzal Akhtar & Christian Gabelman(Ms. Cunningham – Earth & Environmental Science)

Excess phosphorus (P) in ponds is extremely harmful, causing an increase in algae, which blocks other plants' sunlight and dominates oxygen, resulting in the suffering of local biota and, in turn, animals. Numerous treatments have been conducted to remove excess P, notably biochar and alum. However, there is limited scientific research comparing which would be better in ponds. To conduct this experiment, two filters will be used, one with biochar and the other with alum. Pond water is poured into the filters and the P and pH will be tested before and after filtration. Alum reduced the P content from 20 ppm to 15 ppm and decreased the pH from 6 to 4, while biochar reduced the P by an average of 18.3 ppm and increased the pH to 8. Through a t-test, it was found that there is no significant difference between biochar and alum. However, biochar would be the most useful for real-world applications due to its effectiveness at reducing P content and maintaining a safe pH for ponds.

316-18 The Effect of Music on the Time Perception of Midwood Students

Cayla Alba & Lubaba Labiba (Ms. Goldstein – Behavior & Social Science)

Do you ever wonder why time passes by so fast when you're doing something continuous, mindlessly fun, or productive but seems like an eternity when you're fully aware of the task you're doing? Have you ever heard “time flies when you’re having fun” and the origins of that saying? This experiment sought to discover how and why music affected the time perceived by Midwood High School students. The subjects were tested using a set up where they had to complete a mindless task, in this case being drawing, with and without the same background music. The data collected was the seconds the subjects thought had passed and the difference between music and no music. The

technique used to analyze this data was a t-test and comparing results with charts. These results are significant in everyday life because it answers questions people ponder about how time is spent, and how the environment alters those patterns in time.

316-01 Surface area effect on reaction rate

Sarvinoz Arolova (Ms. Cunningham – Biochemistry)

Through this project I want to understand the relationship between the catalase of a potato with hydrogen peroxide and surface area. I will use the findings from this project to expand my knowledge on catalase and how several factors such as differences in surface area can affect the reaction rate of the potato. I conducted the experiment by using 4 cylinders in total to conduct my experiment. I inputted sliced potato cubes with varying surface areas into 3 of the cylinders, and kept one cylinder constant meaning I left the 1 cm potato cube unsliced. Then, I poured the same amount of hydrogen peroxide into all 4 cylinders, I used a timer to wait a specific amount of time before I analyzed the cylinders to measure the height at which the reaction rate rose in each test tube. Thus, the experiment I conducted supported my original hypothesis as increasing the surface area also increased the catalase reaction.

316-12 Bread Mold Relations

Sabrine Benabdallah (Ms. Goldstein – Microbiology)

The goal of this study is to identify the mold and the rate of growth on each variety of bread. The goal of this project is to identify the variations and causes of how each type of bread responds. In order to measure and analyze the mold on each type of bread, the project's procedures involved variety of bread types and storing them in the same environment while keeping the moisture levels high inducing the fungus growth. The objective is to determine how the type of bread's ingredients affect how the bread reflects itself after the data has been collected. Photos were taken after each time water is sprayed on the bread. Data was used to compare the elements to see the potential for mold development should be different or similar. The main conclusions were the amount of moisture that each form of bread can hold and react to causes varied growth rates. The significance is the demonstration of how mold development differs in each variety of bread and that it is important to inform.

318-01 Holy Cow! The Truth Behind Lactose Free Advertisements

Briana Calin & Alexandra Watson (Ms. Cunningham – Product Testing)

In this experiment lactase enzymes were added to Lactaid 2% lactose-free milk, Horizon 2% lactose-free milk, Fairlife 2% ultra filtered lactose-free milk and Farmland Organic 2% whole milk to observe the glucose levels that determine the lactose concentrations of each milk. This experiment was performed to uncover the truth behind lactose-free milks and find out if brands are falsely advertising to consumers about lactase contents. By measuring the glucose levels of each milk using glucose analysis strips before and after alterations, data was gathered and a consensus was reached. Prior to adding lactase, regular milk had an absence of glucose and the lactose free milks all had glucose present. As additional lactase was added, glucose levels of each milk varied, increasing for most milks. Based on the findings of this experiment, the best brand for lactose intolerant individuals is Horizon 2% Lactose Free Milk.

318-12 Bot or Not: Unveiling AI's Mirror to Human Traits

Cholco Chan & Whaley Lin (Ms. Goldstein – Computer Science)

The 21st century marked the growing use of advanced artificial intelligence which poses threats to the perception of human qualities. This calls for a review using a Turing Test

to establish whether human reviewers could differentiate between AI responses and responses from human participants. A Turing Test composed of various questions compiled responses from human participants and ChatGPT, which was compared and given ratings from a scale of 1-10 (least to most humanlike) by reviewers. A t-test analysis of the sample data revealed the lack of a statistically significant difference between the ChatGPT and human responses, of which the use of emotional responses contributed most to ChatGPT replication of human emotions, language, and logic. Thus, this experiment implicates the progression of human qualities in ChatGPT, allowing it to deceive sophomore research students at Midwood High School.

320-09 An experiment to remember

Ashley Chen (Ms. Goldstein – Behavior & Social Science)

Have you ever wondered why you remember only certain fragments of a certain event or why you only obtain the most information after you learn something and it starts to deteriorate with time? Short term and long term memory has always been a major part of each individual's life, making up the memories each person remembers. This experiment tests the accuracy of short term and long term memory of individuals' brains. Testing if there is a significant difference between the correlation of both in this experiment, learning about how the human brain obtains short term and long term memory was necessary. Using ANOVA tests, the data showed that there was a significant difference between the accuracy of an event and the memorization of short term memory and long term. Understanding how the human brain can help humans understand why people remember only certain events accurately within time. This can further help people in the workforce, students, how certain factors affect memorization, etc.

314-14 Effect of electricity on the pH of various aqueous solutions

Joey Chen (Ms. Goldstein – Chemistry)

Did you know electricity is often used by farmers to improve plant growth? Farmers often use electricity to change the pH level of the plants water to provide healthier hydroponic plant growth. This project mainly focused on how electricity would affect the pH level of these solutions. Parts of electrolysis and voltaic cell experiment were used. When experimenting, a battery connected to a 9-V snap connecter was used to conduct the electricity into a solution. A pH meter was then used to collect data on the pH level of the solutions, after coming into contact with electricity for a designated amount of time. Graphs, ANOVA, and t-tests were used to analyze the data. The results showed that electricity decreased the pH levels of basic solutions and increased pH levels in acidic and neutral solutions. This makes electricity a potential substitute for the usage of acids and bases when changing the pH level of various liquids.

318-07 The Effectiveness of Mouthwash on Bacteria Growth

Qing Ying Chen & Rachel Huang (Ms. Goldstein – Microbiology)

Have you ever been concerned about the effectiveness of mouthwash that was recommended by your dentist or the mouthwash that is labeled "#1 dentist recommended mouthwash?" According to a Statista Research Department survey, over 199.56 million Americans (60.5% of the population) now use dental rinse or mouthwash. However, is it necessary for the 60.5% of the population to use mouthwash or is it just a waste of money, time and effort? The experiment was conducted by serial dilution, data collection by the use of Colony Count, and applied ANOVA test for analyzing data. Based on the experimental results, the presence of mouthwash was proven to be more effective than the control group. However, there is no major correlation between the different brands of mouthwash. The purpose of this study is to determine whether the different brands of mouthwash have different effects and if the presence of mouthwash actually reduces the amount of bacteria compared to only water.

320-01 How does caffeine affect one's cognition?

Shahzeen Chowdhury (Ms. Cunningham – Behavior & Social Science)

This project aimed to investigate the relationship between caffeine consumption and cognitive performance among high school students. The motivation stemmed from the widespread use of caffeine within teenagers and its potential impact on academic success.The study measured cognitive ability using the Montreal Cognitive Assessment and compared average scores out of 25 points, between regular and non-regular caffeine consumers at different grade levels. The data analysis revealed a consistent pattern of higher average grades among regular caffeine consumers, suggesting a correlation between caffeine consumption and cognition. The findings highlight the potential benefits of caffeine on attention, concentration, and processing information. This study is significant as it contributes to our understanding of the effects of caffeine on academic performance, informing individuals and educators in making informed decisions regarding caffeine consumption.

320-07 UV Defense

Anthony Dai & Whisty Chan (Ms. Goldstein – Product Testing)

It has been taught that the sun is beneficial as it provides vitamin D. However, too much sunlight causes millions of people to suffer skin damage to excessive exposure to UV rays. Skin damage can be tanning, sunburns, and cancer which affects roughly every 1 in 5 people. A common product used to prevent this damage is sunscreen, but with so many options available, it can be hard to pick just one. This experiment tests various sunscreens to determine whether the level of protection depends on the brand. Equal amounts of sunscreen had been individually applied on a silicone hand, placed under the sun, and the inserted UV test card measured the UV exposure over 10 minutes. An ANOVA test was used to determine if the data between the sunscreens were significantly different. The test had determined there was no significant difference which meant that all brands worked equally well. This means that no matter what brand of sunscreen is chosen, the protection from excessive UV rays is equal.

316-14 Effect of varying acne medications on the growth of Escherichia coli

Alison Danilovich & Stephanie Kalam (Ms. Goldstein – Product Testing)

Acne affects up to 50 million Americans annually. From experience as teenagers with acne, many dermatologists prescribe acne medication without explaining their effectiveness or function. We have a lack of knowledge of what we are putting on our skin, and specifically its effect on bacteria, which is crucial to know. There are many types of acne disorders, but gram-negative folliculitis acne is one that is not commonly talked about. Various acne medicines were incubated with E. coli for 48 hours. It was found that Benzoyl Peroxide 5% had the greatest zone of inhibition with an average area of 2.09 cm, followed by salicylic acid 2% with 1.13 cm area inhibition. Tretinoin and clindamycin phosphate both exhibited an average area of 0 cm. According to the ANOVA exam, an f-value of 144.0007 and a p-value of 0.0001573 were calculated. This shows that Benzoyl Peroxide was the most effective treatment for gram-negative folliculitis and there is a significant difference in effectiveness of treatments.

314-02 Impact of Compound Bilingualism on Automaticity

Zoe Dean (Ms. Cunningham – Behavior & Social Science)

There has been much debate between psychologists and cognitive scientists as to whether or not there are benefits to being bilingual. However, the one thing that all these professionals seem to agree on is that bilingual individuals perform well in controlled cognitive tasks. The motivation for this experiment was to uncover whether or not this is

true. Through the use of a Google form and Stroop Tests, students were identified as either monolingual or compound bilingual, and their Stroop Interference scores were collected. Average Stroop Interference scores of monolingual teenagers were compared with those of compound bilingual teenagers. A t-test was conducted which showed that at df=9, t=2.26; the calculated t of 0.12<2.26 and is not significant at a 0.05 level of significance. Thus, the null hypothesis is not rejected meaning that, this experiment is not enough to confirm whether or not compound bilingual individuals perform better at controlled tasks rather than automatic tasks.

316-04 From Trash to Treasure: Harnessing Energy from Tomato Waste

Aaron Deng (Ms. Cunningham – Earth & Environmental Science)

Tomato waste conversion into a renewable energy source has been a hot topic. Tomato waste causes major greenhouse gas emissions when dumped in a landfill. So, tomato waste energy conversion could be a helpful energy source in the near future. However, tomatoes of bigger size have more waste, so they could produce more energy. The method used to conduct this experiment was to leave tomatoes out for organic matter-eating bacteria to come in contact with the tomato to oxidize its flesh and measuring the volts with a voltmeter. This assumption was wrong. The tomato waste from smaller or bigger tomatoes did not affect the amount of volts produced. The average volts for the data were around 0.85~. Which were relatively the same with a variance of less than 0.0002. This shows no significant difference. An ANOVA: Single Factor was used to find this info. The size of a tomato doesn't affect voltage and that any tomato used for conversion into an renewable energy source would be fine.

318-10 Reinventing Steam Engines

Jiajun Dong & Uzair Khan (Ms. Cunningham – Engineering)

The modern method of obtaining electricity is non-lasting and detrimental to the environment; allowing a renewable resource to supplement the current manners would increase the planet's longevity and our species'. The Hero's steam engine can spin at astonishing speeds, 2000 rpm, from the vaporization of water, so converting the mechanical energy to electricity, volts, would be a renewable method of electricity production, and using a different type of material, dry ice, could increase the electricity generation because it could vaporize into a larger volume of gas. The test concluded: water generate more electricity than dry ice. Despite dry ice releasing more steam than water, the engine didn't spin faster than it would with water, which eliminates the relevancy of the amount of gas in future experiments relating to boosting the rotational speed of a steam engine, allowing for other variables like pressure to be recognized and tested in the future.

314-07 How effective and cost efficient is homemade gel electrophoresis?

Isabel Eppel (Ms. Goldstein – Cellular & Molecular Biology)

The project being done is homemade gel electrophoresis. This idea was formulated because I wanted to see if there is a way to make gel electrophoresis in a cheaper and more efficient setting. This data was analyzed with the use of different-priced batteries, on the same gel with the first trial running at different times, and the second trial running for the same amount of time. The batteries helped execute the data because they connected to the wires that allowed the bands to move. I measured how far each band traveled under multiple conditions, to see if the same type of batteries (9V) but at different prices could alter the result. The data was analyzed by letting the gels sit for a certain amount of time and then measuring in inches how far the bands traveled. It was found that the most expensive battery made the bands travel the furthest. It allowed us to see that the battery was the biggest factor in determining how far it traveled rather than time.

318-04 The Environmental Impact of Packaging Materials for Food Products: A Comparative Analysis of Carbon Footprint, Water Usage, and Waste Generation

Kira Fedonyuk (Ms. Goldstein – Earth & Environmental Science)

This project aimed to assess the environmental impact of packaging materials used for food products by comparing the analysis of carbon footprint, water use, and waste generation. The motivation behind this study stems from the increasing concern for sustainable practices and the need to identify packaging materials with lower environmental impacts. To execute the project, combining data collection, statistical analysis, and life cycle assessments were performed. Different packaging materials were then analyzed using ANOVA and t-tests and the findings showed significant variations, with certain materials having lower environmental impacts. Selecting sustainable packaging can mitigate environmental harm and by promoting the adoption of packaging materials with lower environmental impacts, this research contributes to the broader goal of achieving a more sustainable and eco-friendly food industry.

320-14 The effect of calcium citrate, potassium citrate and zinc citrate on the heart rate of Daphnia magna

Dana Flores-Zeledon & Weiyee Mock(Ms. Goldstein – Earth & Environmental Science)

As a result of industrialization, the pollution it exerts through contaminants such as fertilizers, wastewater, automobile exhaust, and animal waste is causing bodies of water to become less sustainable for aquatic life. This experiment's purpose is to see if increased rates of calcium citrate, potassium citrate, and zinc citrate in water affect the heart rate of Daphnia magna. Daphnia magna are "sea fleas" found in lake waters that can analyze these stress factors and their impact on other marine organisms. In the experiment, the heart rate of Daphnia magna was recorded in regular spring water and recorded again after exposure to spring water containing higher levels of mineral content. An ANOVA test was used to determine that there was a statistically significant difference between mineral usage on the heart rate of Daphnia magna, with potassium causing the greatest decrease in heart rate. These findings help to promote the importance of lower potassium consumption in daily life.

314-16 Effect of Emotions on Performance in Math and Science

Heidi Gao (Ms. Goldstein – Behavior & Social Science)

Given the variability of emotions in adolescence, it's natural to wonder: Does variability in daily emotions affect academic performance? The domains of math and science heavily rely on logical reasoning and intellectual thinking, both within and outside of school. This emphasizes the importance of investigating this relationship. This research was conducted to explore the connection between one's emotion and their performance on an exam. This experiment involved a sample of 32 students who selected their emotions/feelings and completed a set of math and science questions. Their test scores were then categorized into negative and positive emotions. The ANOVA test was used to compare the differences across the different emotions. The findings indicated that there is no significant difference in math and science scores. Overall, it was discovered that there is no direct correlation between the emotions/feelings and academic performance.

316-09 Effect of Cleaning Method on Bacterial Growth of Grapes

Sara Grezda & Shaymaa Elrashidi (Ms. Goldstein – Microbiology)

Thousands of potentially dangerous bacteria enter your body on a daily basis. A large portion of this exposure can be accredited to the produce you consume. Adequately cleaning your produce could help eliminate this bacteria considerably. In this experiment, we tested 4 different cleaning methods on grapes using household items. First by soaking

grapes in water, and water mixtures containing salt, vinegar, or baking soda, then swabbing the "cleaned" grape into petri dishes. Utilizing agar plates and an incubator, we were able to measure bacterial growth to find which method eliminated the most bacteria. Using the program ImageJ to calculate the percentage of area that bacteria grew, it was found that the vinegar and water soak had the least bacterial growth. It can be concluded that vinegar is the most adequate disinfectant for produce. Further, vinegar's acidic properties show to have effective antibacterial abilities.

320-02 Effect of Relationship Status on GPA

Jodi Guan & Sierra Kelly (Ms. Cunningham – Behavior & Social Science)

It is said that being involved in a romantic relationship negatively affects one's academic performance. In the early stages of love, the brain experiences an overdose of the chemical, dopamine, which causes people to act blindly and overly happy. However, in the later stage of love, the chemical oxytocin is released which calms and builds the relationship. To obtain more evidence to back up this theory, we made a survey, asking for a student's relationship status and cumulative average. Single students averaged a GPA of 95.31% with a variance of 24.4 while romantically involved students averaged a GPA of 94.55% with a variance of 27.4. A t-test was conducted, and it showed that since the observed t-value of 0.404 is less than the p-value of 2.131 at 0.05% significance for 15 degrees of freedom, we can accept the null hypothesis. Ultimately, our data has shown that relationship status has no correlation with one's GPA.

318-09 Night Glow Clarity

Yahya Hussain (Ms. Goldstein – Physics & Space Science)

In urban areas, artificial lighting produced from street lamps is prevalent. These street lamps produce excess amounts of lighting that disperse through the sky, which causes light pollution. Excess light disrupts the circadian rhythms in humans, making it harder to fall asleep. Light pollution has also become a problem for astronomers by making fainter astronomical objects in the night sky harder to see. This leads to the question of how distance from street lamps impacts the clarity of the night sky. To measure the clarity of the night sky, a device called a sky quality meter was used to give a rating. Images of the night sky were also taken. This process was performed at 5 and 10 feet away from street lamps. The data collected showed a higher rating for 10 feet away from street lamps compared to 5. When a t-test was performed, the p-value was about 5.3 x 10-6, proving that the difference is statistically significant. For astronomical purposes, it's better to be away from artificial lighting.

316-15 Career Time vs. School Time

Leah Josephson (Ms. Goldstein – Behavior & Social Science)

The purpose of this experiment was to test if a correlation was present between the amount of time a student spends at school and the time commitment of the student's career choice. Questions sent to Sophomores at Midwood included the number of hours spent at school each week, and the career to which students aspired, the latter of which was converted to numerical value via the U.S. Bureau of Labor Statistics' data on career time commitments. It was hypothesized that there is a correlation between the amount of time a student spends in school and the time commitment of the student's career goal. Self Regulation Theory supports this with careers holding a place as a goal, and time spent in school holding a place as the self regulation. A t-test was used to analyze the data. It indicated that the null hypothesis was rejected. Key findings in this experiment proved the validity of Self Regulation Theory pertaining to career development amongst students.

318-15 The Impact of Light on Daphnia Heart Rate

Ahlam Judeh (Ms. Goldstein – Animal Science)

Human-made artificial light outside in natural freshwater habitats impact Daphnia heart rates. As Daphnia have fundamental biological responses similar to those of a human, they make good animal models for cardiovascular research. Moreover, they are keystone organisms so they play an essential role in a habitat's food chains, an impact on them would impact other organisms. Utilizing different lighting, I separated the Daphnia into four groups (red, white, blue, and UV light) and divided them into three trials. Collecting three Daphnia from each group per trial I placed them under a microscope to record their heart rate. The data revealed that, compared to the control UV light group, blue and white light decreases heart rate and red light increases it. ANOVA conveys a significant difference between the types of light and its effects on heart rate as the p-value was less than 0.05. Therefore, this data can prove that types of light impact Daphnia, the food chains they're in, and humans.

314-04 The Speedy Relief

Sukhdeep Kaur (Ms. Cunningham – Medicine & Health Science)

At the time I received the covid-19 vaccine on the news various medications were recommended promising to work faster. At that time I was very confused so when deciding on a topic I chose to test which over-the-counter medication provides the fastest relief. Studies have shown medications that are sugar-coated easily travel through the digestive system and are water-soluble making the dissolution rate faster. Before performing the experiment I did background research regarding pH levels to best stimulate a stomach environment. My experiment found that the tablets dissolve faster than the gels-caps. To analyze the data I used a t-test and bar graphs. These findings conclude that Tylenol tablets provide the quickest relief. Unnecessary stress of discomforting symptoms can also critically impact the quality of a person's life. Quick relief can prevent further complications thus knowing which medication provides the fastest relief is important.

320-12 Determination of Total Water Hardness of Tap Water Among Different US States

Denys Kolomiiets & Tiffany Chan (Ms. Goldstein – Product Testing)

Despite water being a basic necessity, people rarely pay attention to the water they use. Water hardness is crucial to daily life, industrial processes, and health, directly acting as a major source of minerals for the human body and implicating the effectiveness and operating ability of both industrial machines and pipes, depending on calcium and magnesium concentration. This is especially true with tap water, with a third of the U.S. consuming it as their main drinking source. This experiment measures the water hardness of tap water samples from different states through conductivity. The data was measured using the Vernier Conductivity Probe. Said data was then plugged into an ANOVA Test to see whether a significant difference was present. The evidence showed a significant difference, with New York having the lowest total water hardness and West Virginia having the highest, with a range of 144.4 ppm. Thus, there is a difference in water hardness of tap water between US states.

320-15 Thawing Techniques on Bacteria Colony Count in Chicken Breast

Raine Kong (Ms. Goldstein – Microbiology)

Chicken makes up 43% of all meat consumed in the U.S. Improper food handling can cause bacterial contamination and food borne illnesses in consumers. This experiment aims to find the most efficient thawing technique to minimize bacterial colony count in chicken breast. To execute this project, frozen chicken breasts were obtained from a local

supermarket and divided into two groups: Group A (thawed on the counter) and Group B(thawed in the refrigerator). Each group consisted of four equally sized chicken breast portions and tested under their respective thawing methods. The samples were then serially diluted, plated on agar plates, incubated and examined for bacteria colony count. The results showed the refrigerator thawing had a lower bacterial count compared to thawing on the counter. The t-test showed there was a statistical significant difference in bacterial colony count between the two variables. These findings highlight the importance of practicing food safety when preparing food.

314-15 How does the Size of a Balloon affect the Distance a Balloon Powered Car can Travel?

Eric Lau & Bradley Chen (Ms. Goldstein – Engineering)

As travel advances in the world, new methods for it begin to arise. The new space travel will be in the form of a balloon that rises into space and deflates slowly, bringing the travelers back to earth safely. For this project, the power for the vehicle is a balloon that is full of air attached to a small design of a car (water bottle). The balloon's air fizzles out and eventually there is no more energy that can be used to push the car ahead, reaching its final position. The size of the balloon is measured before the opening is released and the distance from where the car started and its final position is measured (displacement). A size of the balloon vs displacement graph can be made to see how the size affects the distance the car travels. What the graph suggests is that there is an exponential relationship between the size and displacement. The relationship they share can inspire new ways in how we think of using energy, in this case utilizing air pressure, for vehicles today.

316-02 The Coolest Way to Make Ice Cream

Gianetta Lazebnik & Serena Li (Ms. Cunningham – Chemistry)

Our motivation for this project stemmed from both of our culinary science interests. We wanted to create a project that everyone can and would want to replicate, therefore we chose to make ice cream and learn the science behind it. We tested which amount of salt in a bag is needed to freeze ice cream the fastest using the colligative property of freezing point depression. We did this by adding varying amounts of NaCl into ice water consisting of 0 Tbsp, 5 Tbsp, and 10 Tbsp. To analyze the data, we checked the bags every 30 seconds to record the solidity of the solution. The results of the experiment were that the bag with no salt did not freeze, 5 Tbsp formed after 2 minutes, 10 Tbsp formed after 1 minute. We concluded that the more salt we added, the quicker the ice cream solidified. This conclusion is significant in both our experiment and the real world because it was proven that salt decreases the freezing point of solvents, in this case ice cream base.

318-14 Are playgrounds safe for kids?

Zachary Lee & Samirkhon Bakaev (Ms. Cunningham – Chemistry)

Playground surfaces have caused second degree burns to children due to surfaces getting excessively hot. Studies have been conducted on this topic, and most of them illustrate that all substances get hot in warm weather. In this experiment, we have measured the initial temperature and final temperature of playground surfaces and calculated the difference between these temperatures. This was conducted in St. Petrosino Park and Seth Low Park, and in both parks, the average difference in temperatures was a much higher in Seth Low Park. Our results was that the wooden bench, metal slide, and rubber floor increased temperature. Our main conclusion was that there was an increase in temperature as the outside temperature increased, and playground materials like the rubber floor absorbed the most heat compared to the rest of the materials. These results are important because it can help us and other scientists figure out the next steps on how to stop thermal burns that happen every year.

314-10 The Nutritional Value of School Food Compared to Store-bought Food

Jaina Leung (Ms. Goldstein – Medicine & Health Science)

In the United States, the government spent 28.7 billion dollars on school lunches in the last year, feeding 30.1 million children per day. However, the quality of school lunches can be largely debated. This experiment measures the nutritional value of school lunches by comparing their vitamin C and iron content to store-bought food. The groups tested, school pizza compared to store-bought pizza and school fries compared to store-bought fries, went through separate titrations to determine the vitamin C and iron concentrations. The amount of the titrant needed to reach the endpoint was used to detriment the amount and concentration of each micronutrient. School fries had a greater concentration of vitamin C and iron than store-bought fries. While school pizza had a greater concentration of iron, the amount of vitamin C was the same as store-bought pizza. Yet, there is no statistically significant difference between the concentration of micronutrients in all the groups.

320-04 How does additional lactase affect the rate of glucose production in cows milk?

Whitney Li & Breniece Ng (Ms. Cunningham – Biochemistry)

Our motivation stems from our curiosity in lactose digestion in people whose bodies produce different amounts of lactase. Our interests arose as we found that after eating dairy products, we would suffer from discomfort in the stomach, often resulting in excrement. The purpose is to determine the basis of the effectiveness of additional amounts of lactase in aiding the digestion of lactose. 4 cups with varying levels of lactase tablets were tested in 5 trials to test the effect. One group received no tablet, and was found to have the longest duration in reaching a green color on the glucose strip compared to the rest of the cups. The analysis of our data was aided by the indication that the lactose is being digested properly. We concluded that the rate of glucose production in cows milk increased through additional tablets of lactase. This is noteworthy as it indicates that people with a higher production of lactase enzyme yield a faster reaction to the lactose that they are ingesting.

314-05 Permanent Markers to the Test.

Becky Lin & Sophia Luo (Ms. Cunningham – Product Testing)

Permanent markers are household objects which can cause stains on clothing that are not removable. In this experiment, what was done was the testing of different permanent markers in different solutions to dissolve the ink. These solvents being tested illustrate the idea of which solutions were able to break down ink and see which marker is the best to use. Different brands of permanent markers were used to draw on different same-sized squares. We would soak the cloth squares into the different solutions to remove ink. It was done to identify which permanent marker is most permanent and which substance is most effective in removing permanent marker stains. The results of this was that the Caliber marker was the most permanent marker and toothpaste is most effective in removing ink. The significance is that an everyday object can be used to remove certain stains and can be effective and that a non-known permanent marker: Caliber is the most permanent, unlike Sharpie.

316-11 The Effect Music Has on Food Choice

Yiting Lin & Cathy Chen (Ms. Goldstein – Behavior & Social Science)

Do you realize that your choice of food may be impacted by music? Populated places like restaurants, parties, etc. may play certain genres of music to trick you into getting a certain meal. Different types of food are generally separated into and labeled unhealthy and healthy. Therefore, we constructed a video displaying different options of healthy

and unhealthy foods. We added audios of different genres of music consisting of rock, pop, jazz, and classical. As each type of music is played, we displayed an equal number of healthy and unhealthy food choices in a jumbled order for students wearing headphones to pick from. The type of food changes every time the previous genre of music ends. Our findings showed a significant difference between the amount of people choosing unhealthy foods over healthy foods while listening to pop and rock, and the opposite went for classical and jazz. Thus, this supports our hypothesis that music does impact people's food choices in their everyday lives.

316-16 Gastro-Busting Gut Meds: Fighting E. coli and Gastroenteritis Takes a Whopping Left

Jennifer Lin & Sophie Chen (Ms. Goldstein – Medicine & Health Science)

Swiping right on gastrointestinal medications could be the perfect match for fighting E. coli in a simulated gastric environment. The experiment aimed to seek effective treatments for gastroenteritis, particularly E. coli gastroenteritis by observing the effects stomach medications have on E. coli K-12 growth. Antacids (Pepto-Bismol), Proton Pump Inhibitors (Omeprazole), Histamine Receptor Blockers (Famotidine), and Antidiarrheals (Loperamide) were tested. Simulated gastric fluid (SGF) contained hydrochloric acid, potassium chloride, pepsin, and amylase enzyme. 4 test tubes contained a different medication, while one, the control, contained only the SGF. The tubes were swabbed onto agar plates and incubated for 2 days. A One-Way ANOVA test was used to evaluate the statistical significance of the # of bacteria colonies for each medication. The p-value ≈ 0.98, meaning the results occurred by chance. However, Pepto-Bismol contributed to the growth of bacteria.

318-02 What is the Effect of the Different Music Genres on how Many Repetitions of a Specified Exercise that one can do?

Jeffrey Ling (Ms. Goldstein – Behavior & Social Science)

In this modern time, people are always either busy playing video-games, dealing with work, or just can't fit an exercise plan or gym session into their daily routines. However research shows that even just 30 minutes of exercise a day can be beneficial. As a result, the purpose of this experiment was to find out which music genre regarding Hip-hop, Indie, "Phonk", or if no music would bring out the most potential or benefits in that 30 minute period of time. The data recorded marks how many repetitions/number of times the exercise was completed. I collected these findings for both push-ups and curl-ups following the fitness-gram outline. We found that Phonk would provide the best results, and after finding that the Phonk genre usually has 130 beats-per-minute (BPM), stimulating the heart to beat faster allowing for an increase in respiratory and heart rates.

318-16 The tiny but mighty pollution war: The effects of polystyrene microplastics on the quantity of colony forming units of Escherichia coli

Zhuolin Liu & Philip Kong (Ms. Goldstein – Microbiology)

The average person in a week consumes the equivalent amount of a credit card's worth of plastics. To understand how these plastics affect the K-12 E. coli living in human small intestines, this experiment was conducted with Plastic-6 (PS) microplastics (MPs), blended from a PS egg carton. K-12 E. coli was swabbed into petri dishes and followed up by PS MPs. A control group was included where only K-12 E. coli was present. The trial conducted included separate K-12 E. coli petri dishes with 2 grams (g), 4g, 6g, and 8g of PS MPs, all had 2 milliliters of water. Using the colony-forming units (CFUs) of each petri dish, varying presences of PS MPs were compared to how much the bacteria grew. An ANOVA test was used to determine the relationship between the variables in this experiment. The control group had about 745 CFUs while the petri dishes containing PS MPs didn't allow K-12 E. coli growth meaning it can be concluded from this experiment that PS MPs reduced the growth of K-12 E. coli.

316-05 The Impact of pH on the Enzymatic Browning Process of Apples

Daisy Meza Veliz & Jenny Chen (Ms. Cunningham – Biochemistry)

The biochemical process of enzymatic browning within the produce industry requires an immediate solution with the purpose of preventing this process from diminishing the nutritional value of apples due to melanin production which has a tendency to reduce antioxidant activity. The methods used to address this issue include placing apple slices into different liquids with varying pH values. After soaking these apple slices into their designated solution for a duration of 10 minutes. We placed them onto a plate for 24 hours and then proceeded to use a color scale to quantify the enzymatic browning process of each apple slice. After collecting this data we used a t-test to determine whether or not there was a direct correlation between the enzymatic browning process of an apple and the pH of the solution it was placed in. To put it succinctly, our findings indicate no direct relation between the pH of a solution and its ability to inhibit the enzymatic browning process of apples.

318-05 Casein Plastic and pH Levels

Tehreem Noor & Kelly Ng (Ms. Cunningham – Chemistry)

Out of the 300 trillion tons of plastic produced annually, only 9% is recycled entirely. Plastic takes approximately 20 to 500 years to decompose, which poses a dilemma in the U.S. Researchers have formulated biodegradable plastics which are created from protein molecules found in milk. This experiment tests the relationship between milk's pH level and its ability to create casein plastic. Different amounts of vinegar were added to create a contrast in the pH level of milk. The milk-molded figures were analyzed through a series of tests, determining distinctions between the qualities of casein plastics produced by varying pH levels. An ANOVA test concluded that the p-value of 0.96091 isn't significant at $p<.0.05$. Therefore, different pH levels do not affect the creation of casein plastic. These findings can be used to assess whether larger differences between pH levels will have a greater impact on casein plastic, as a slight difference in pH levels suggests no difference.

320-05 Which Method Takes the Cake

Emily Oliner (Ms. Cunningham – Product Testing)

Various methods were tested to establish what effects cupcakes, compared to the control method. Through analysis of the results the optimal cupcake was achieved. One method utilized was the absence of sifting. Rather than sifting, unlike the other trials, sifting will not occur in this trial. Another method utilized in this experiment was separating egg whites, instead of mixing whole eggs, the egg whites were separated and beaten. The third method was the absence of creaming butter and sugar together rather than other trials in which the butter and sugar will be creamed. In the fourth method the ingredients will all be mixed at once instead of slowly adding the dry to the wet. Utilizing these methods it was hypothesized that the methods will affect texture, color and height of cupcakes. The results were gathered through height data and analysis of appearance. The results proved the hypothesis true as overall compared to the constant the height varied per method, as did appearance.

320-16 Best Brand For Less Waste

Shamsad Rahman & Vivien Jiang (Ms. Goldstein – Product Testing)

Americans consume 14 billion quarts of popcorn every year. As popcorn is consumed, there is bound to be as much waste. This is due to unpopped kernels that remain after they are heated. Our objective is to figure out what affects the number of kernels unpopped when making popcorn and if different brands of popcorn affect the amount of

unpopped kernels. Five different popcorn brands consisting of different ingredients were tested four times. All popcorn was weighed before being heated on the stove. The same amount of time, temperature, and oil was given. Then, the number of unpopped kernels were counted. An ANOVA test was conducted using the values obtained from the four trials. Our findings prove that the brand of popcorn does indeed affect the amount of kernels unpopped. The brand, Jolly Time, had the least amount of unpopped kernels. This discovery helps in conserving food and understanding how a higher number of kernels can be popped.

314-20 Print vs. Pixels

Ravital Reingold (Ms. Goldstein – Behavior & Social Science)

In a digital age where information consumption is at its peak, the battle for optimal learning mediums continues. This experiment was designed to find whether students learn better and score higher on exams from reading the information online or on paper. In order to address this question, tenth grade students were instructed to read an article and take an exam afterwards on the corresponding subject. Half of the students read the article online and the other half read the same article on paper. Upon collecting the data, a t-test was conducted and it was determined that there is no statistically significant difference in test scores between students who read an article on the subject online or on paper due to the fact that the absolute value of the t-value was less than the critical value. This demonstrates that there is no overwhelming difference in the effectiveness of reading online or in print and students should be encouraged to read in whatever median they prefer.

316-07 Decision Paralysis and Freedom of Choice

Gavin Rice (Ms. Goldstein – Behavior & Social Science)

If you have ever found yourself in a restaurant not knowing what to get, then you order an item in a panic and regret your decision after your meal, you have experienced the most common form of decision paralysis. Decision paralysis is when a person is presented with too many choices, and they will take a much longer time to make a decision, or they may make a decision in a panic and overall be less happy with their decision because they have more chances to regret their decision and more chances to overthink it. The problem of being less happy with a decision from having too many choices is addressed by this experiment. I presented one group of participants with 2 choices of jelly beans to eat, and a second group with 25 choices of jelly beans to eat. After recording and analyzing the data using a t-test, I was able to find that having more choices decreased how happy people were with their decision when they had more choices.

320-11 Artificial Pancreas Simulation

Yaritza Rivera (Ms. Goldstein – Medicine & Health Science)

Diabetes is a worldwide health issue that effects millions daily as it causes heart disease, strokes and other health complications. This study was designed to evaluate the performance of an automated insulin delivery system that mimics the function of a healthy pancreas. As I collected data from the experiment, I compare those results with the data collected from experiments based on glucose and insulin in the human body. The t-test showed an artificial pancreas causes a significant difference in regulating glucose levels. The results of the simulation experiment helped to identify areas where the system may need improvement and provide valuable insights into the optimal settings for glucose targets and insulin delivery. The use of an artificial pancreas automated insulin delivery systems allows for safe evaluation of system performance in a controlled environment before clinical testing on humans.

320-18 Screw E. coli: The effect of quorum sensing inhibitors on quorum sensing and the formation of biofilm

Joel Rodriguez & Mohammad Ahmad Sabri (Ms. Goldstein – Microbiology)

The study aimed to measure the effect of organic quorum sensing inhibitors (QSIs) on the growth of E. coli k12. Quorum sensing (QS) is a chemical communication model used by bacteria like E. coli, Salmonella, and Shigella. With QS, bacteria count the number of neighboring bacteria in a colony. Through using chemicals like autoinducers (AI), bacteria can control gene expression to attack a host simultaneously. Bacteria such as E. coli attack the host through utilizing biofilm, a culmination of microbial cells and the production of toxins. QSIs can chemically alter the shape of AIs, inhibiting QS. Inhibiting QS can assist in the prevention of spreading intestinal diseases and the growth of bacteria on produce. The use of organic QSIs can also be instrumental in sanitation. It was hypothesized that QSIs significantly inhibit biofilm development through preventing QS and results showed that grape seed extract performed best in inhibiting QS, where Citric acid also significantly inhibited QS.

314-06 Heart Rate Increase through Dance

Evelyn Giselle Serrano Flores & Anayeli Bermeo (Ms. Cunningham – Medicine & Health Science)

Growing up in a Hispanic household we were exposed to a beautiful culture that includes a lot of dance. Dancing is not only a way to express yourself and connect with others on another level but dancing also helps you maintain a healthy lifestyle. Through our experiment we had 22 Latinos pair up and dance to three different types of dance we have grown up with. These three included bachata, merengue, and cumbia. After conducting the experiment, we gathered data on their heart rate before and after and then we collected the average of the differences in heart rate to reach our conclusion. The conclusion we reached using the data was cumbia increases your heart rate the most, making it more attractive in terms of using dance to have a healthier lifestyle.

316-06 Dissolving Rate vs the Liquid

Amy Tang & Yi Tong Huang (Ms. Cunningham – Chemistry)

This project will look at how factors of different liquids affect the rate of a drug tablet dissolving. A drug commonly used for pollen allergies, cetirizine, was dropped into cups with different liquids at the same time. The data collected shows that the coffee, water, and wine dissolved the quickest out of all liquids while the cola, juice, tea, and milk took longer to dissolve. Cetirizine is a polar drug that dissolves quicker with liquids that have lower pH levels. Coffee had the lowest acidity which can be seen in the data since it dissolved the quickest. These findings can allow a person to know what to drink and not to drink before taking their medicine. Drinking coffee or wine while taking the drug would cause it to dissolve too fast which means the drug can start to take effect too quickly. If this does happen, there may be side effects that can affect the person`s body. Even though these are safe to drink with this drug, cetirizine is always best to drink water.

318-06 How does the amount of screen time affect a student's overall average in chemistry?

Firza Tariq (Ms. Cunningham – Behavior & Social Science)

The motivation behind this experiment is to find out whether or not certain factors that most people have in common, in this case, having screen time; actually, has some sort of impact on these individuals' school grades, in this case, chemistry class. The methods used to execute this project were a collection of google form responses with provided data regarding a student’s average screen time and what their average is in chemistry. The responses received ranged from one to eleven hours of screen time and averages

spanning from as low as a sixty-five to as high as a ninety nine. The findings resulted in there being no significant correlation between a student's screen time and their overall chemistry average. The ANOVA test revealed a value of 0.10355579 which is not less than 0.05 thus, causing it to accept the null hypothesis; the amount of screen time a student has doesn't affect his or her grades.

314-18 Effects of potassium electrolytes on E. coli growth

Denny Ting & Evin Gursoy (Ms. Goldstein – Microbiology)

Throughout the world, there are approximately 30 new cases of E. coli every hour, which adds up to 265,000 cases annually. However, previous studies on potassium and bacteria have yet to accomplish the results of potassium electrolytes on the growth of bacteria, which this experiment intends to accomplish. Within this experiment, various amounts of crushed potassium glutamate were mixed with 10 mL of water to form a solution before being distributed into three groups of Petri dishes with E. Coli bacteria. After 7 days, only the control group was able to successfully grow about 700 new bacteria circles, while the three other groups had no signs of any bacteria growth concluding that the potassium electrolytes killed the bacteria. The ANOVA test was performed on these results and suggested that the results did not occur by chance. These results suggest that consuming potassium electrolytes will threaten the survival of E. coli bacteria and thus can limit the number of new cases annually.

316-20 Effectiveness of Different Materials in Blocking Out Sound Frequencies

Rachel Troman (Ms. Goldstein – Physics & Space Science)

This project tests the effectiveness of certain materials in blocking out varying sound frequencies. The motivation for doing this project was to find out which material was the best at reducing sound. This knowledge could then be applied to real world situations, such as situations in which excessive noise could possibly cause hearing damage, including construction sites and concerts, or in order to reduce noise pollution. The data was collected using an online sound frequency generator to emit varying sound frequencies, which were measured by a sound decibel app. This was done without blocking the speaker, and when blocking it with either cardboard or fabric. The data was analyzed using data tables, graphs, and an ANOVA test. This proved that the difference between the effectiveness of the control group, the use of cardboard, or the use of fabric in reducing sound is not significant. These findings prove that these materials cannot necessarily be used to reduce sound in the real world.

320-06 Sunscreen and SPF revealing UV with color changing beads

Sienna Veseli & Adreinne Mercado (Ms. Cunningham – Product Testing)

Our motivation for testing sunscreens and SPF with UV light and color changing beads comes from the dangers of skin cancer. We want to encourage that protecting your skin by applying sunscreen with SPF is vital in keeping your skin and body healthy and avoiding skin cancer. In order to execute the project, we used an LED light to project UV radiation onto UV beads that had different sunscreens and levels of SPF on them and compare our results. The sunscreen with the highest SPF, 50, best protected the beads from UV radiation out of the other two sunscreens. We analyzed the data by comparing the color of our beads to a UV wavelength spectrum. Our key findings were that sunscreens with a higher SPF offer more protection than sunscreens with lower SPF. These findings are significant because they support that sunscreen can make a very clear and visible difference in people's skin health and show the dangers that can occur when sunscreen is not being worn.

320-10 Germs Roaming the City

Tiffany Wen & Elise Guan (Ms. Goldstein – Microbiology)

How do you get around the city? On a daily basis, approximately 2.4 million people ride the subways. In crowded places, bacteria are harbored in and spread like wildfire. Busier days of the week have more commuters that board the train which increases the amount of contact with hand poles and surfaces of the train. This sparks the reasoning for the experiment to determine the busiest days on subways. This enhances the importance of daily sanitation by the MTA. Petri dishes and swabs were used to collect bacteria from poles and the incubator was used to test this experiment. By counting the number of bacteria colonies grown each day, it was determined that the number of bacteria increased across the days of the week. With the use of a bar graph and the ANOVA test. Based on the ANOVA test, there was a significant difference in the bacteria colony count between the days of the week. It was determined that Friday was the busiest day since the bacteria count was the highest.

318-20 Feedback Style on Memory Retention

Wan Wu (Ms. Goldstein – Behavior & Social Science)

As education systems return from an online to a physical setting after COVID-19, teacher feedback is rapidly digitizing with the use of tools such as Google Forms. This experiment studied the effect of in-person and online feedback on the scores of Midwood High School research students on an English exam. Three groups of students completed a 10-question exam where they inferred whether or not the meaning of a new homonym was the same in a pair of sentences, and then received either online, in-person, or no feedback for their answers. One day later, students completed an exam with the same words used in other sentences. The difference between students' pre- and post-feedback scores (ΔS) was analyzed using an ANOVA test, which found that there was a statistically significant difference between the ΔS of each feedback group. It was concluded that the online and in-person feedback had a relatively positive and negative effect on ΔS, respectively, while no feedback had a minimal effect.

314-11 The Impact of Nitrogen Concentration on Chlorophyll Concentration in Basil Plants

Zongle Yang & Benjamin Brinzensky (Ms. Goldstein – Plant Science)

Not all heroes wear capes as some are green and covered with leaves. Our world is surrounded by lush green vegetation, but some wonder, where does all that green come from? Well, the answer to that is chlorophyll, a natural organic compound found in most plants. Inspired by the process of photosynthesis, which relies on chlorophyll, an experiment was conducted to find the correlation between the nitrogen concentrations with the relative SPAD value in basil plants, which is an indication of the chlorophyll concentrations. The Petiole Pro app was used to measure chlorophyll concentration in plants by measuring SPAD value, which was converted from the Dark Green Color Index that measures how green a leaf is. A line graph was created to graph the data points and a strong positive correlation was found between chlorophyll and nitrogen levels. Thus so, a strong conclusion can be stated – that increased fertilizer increases chlorophyll concentration, which can boost oxygen production.

316-10 The Secrets of Digestion: How pH Levels Affect Enzyme Activity

Janetta Yanova (Ms. Goldstein – Biochemistry)

This experiment explores enzymes like amylase, lipase, and protease, and their behavior in reaction to pH changes. Three of nine test tubes were tested at a time in this experiment. Each test tube received 2 mL of buffer solution and 1 mL of enzyme solution. Following that, 2 mL of substrate solution was added to each test tube and thoroughly mixed. The

test tubes were placed in a water bath for 5 minutes before a stopping solution was added to each one to stop the enzymatic reaction. The absorbance of each solution was measured with a colorimeter, and data was gathered to compute the enzyme activity for each. Amylase and Lipase were the most active at pH 9 followed by protease at pH 4. These findings are crucial by demonstrating the importance of pH levels in regulating enzyme activity in the digestive tract. Knowing the right pH ranges can aid in the improvement of digestion and the overall health of the digestive system.

318-11 Memories Over Time

Kaiyue Yuan (Ms. Goldstein – Medicine & Health Science)

Have you ever noticed that your grandparents seem to forget things more often than they used to? Our memories shape who we are, but what happens when they begin to fade? Exploring the connection between explicit memory and the aging process can shed light on the mysteries of the human brain. This study aimed to investigate the relationship between the decay of explicit memories and the aging process. During the memory test, participants would attempt to remember details from an image. Results from a memory test revealed that young adults between 20 and 35 years old performed the best, while older adults aged 40-55 and seniors aged 60+ showed a decline in memory. This decline may be due to a combination of factors, including brain cell damage, changes in hormone and neurotransmitter levels, and reduced myelination in certain brain regions. Understanding the mechanisms underlying age-related memory decline can help inform interventions to improve memory function in older adults.

318-18 Effect of Extroversion and Introversion on Reaction Times

Feiyang Zhang & Faiza Soha (Ms. Goldstein – Behavior & Social Science)

Personality types can affect one’s response to stimulus due to psychological behaviors. A study in 1980 showed a significant difference in reaction time between introverted vs. extroverted people. However, the research used a small sample size of only 18 people. Therefore, this online-survey-based study attempted to discover the specific difference of the extroversion and introversion reaction time within a larger sample size of 30 students. The identification of extroversion and introversion was based on the Myer Briggs Personality test, while the data was from the Human Benchmark and RED LIGHT-GREEN LIGHT Reaction Time Tests. Overall results are supported by the graphs and t-tests, showing a significant difference between reaction time of extroverted and introverted Midwood High School Sophomore students. These results provide future research on the role of dopamine and physical performance, as extroverts have stronger dopamine levels and display faster reaction time than introverts.

314-12 Aging Yogurt

Sylvia Zheng (Ms. Goldstein – Microbiology)

Yogurt contains active cultures, also known as “good bacterias”. Rich in calcium, protein and vitamins, yogurt greatly improves one's health and the addition of live microorganisms help nurture the good bacteria that help keep our digestive tracts in shape. Often when buying yogurt, people buy in bulk and refrigerate it over time. The purpose of this experiment is to see the correlation between storage time and the amount of bacteria cultures in yogurt. Yogurt which has been stored for various days (1 day, 4 days, 7 days) were swabbed on agar plates. After incubation, the amount of bacteria colonies were counted for data. Using an ANOVA test, it was found that there was a significant difference between the storage time on the bacteria cultures. It was concluded that yogurt which has been stored for 1 day has the most bacteria, making it the most nutritious. This signifies that it is best to eat fermented foods near the purchase date as the active cultures die off during storage time.

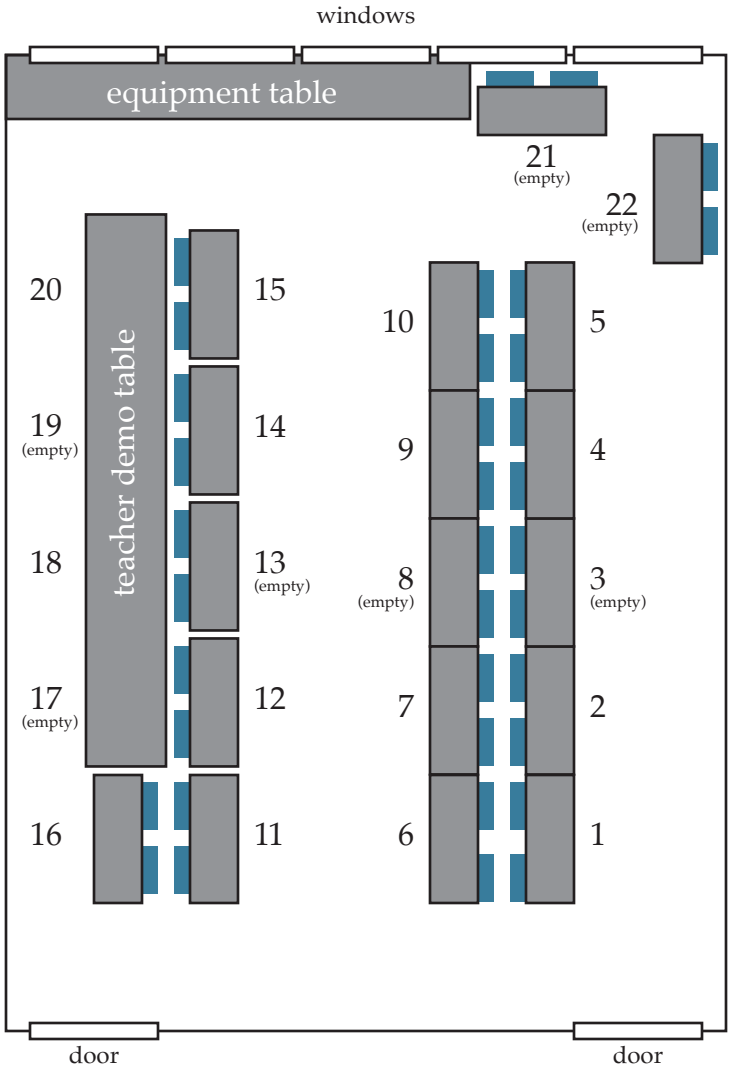
320-20 How do extracurricular activities affect academic performance?

Sunnie Zhong & Nina You (Ms. Goldstein – Behavior & Social Science)

Clubs, sports, internships, volunteering at churches or doctor offices, monitoring for guidance counselors or teachers. Sounds familiar? These are examples of extracurricular activities high school students participate in. Thus, the purpose of this project is to determine the relationship between the amount of time spent in extracurricular activities and academic performance with the use of a google form. Collected data was organized with a data table, bar graph and pie chart, and an ANOVA test was conducted. The results showed that the p-value is 0.013, which means that the null hypothesis is rejected because the p-value is below 0.05. In addition, on average, students who participated in 0-1 hours of extracurricular activities had a grade of 90.40 and those who participated in 4-5 hours of extracurricular activities had a grade of 95.11. This means that, there is a significant difference between those who participate in more extracurricular activities and those who participate in less.

Room Arrangements

Project boards in rooms
A314, A316, A318, A320



Room A215: Food service (get in, get out)
Rooms A219, A319: Overflow seating areas