



**March 13, 2021  
Junior Division  
Project Listing  
By Category**

## Project Categories

- Animal Sciences (AS)
- Behavioral and Social Sciences (BE)
- Biochemistry (BI)
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- Chemistry (CH)
- Computer Sciences (CS)
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# **Animal Sciences (AS)**

## **GRADE 5**

Fredenburg, Silas (05-09-17, AS)

Project Submission

### **Fill Her Up**

"This experiment was designed to help me figure out which feed additive would best help my heifer to get good show-day fill. My hypothesis was that the Fully Loaded would work the best. For this project we did a water trial to help set up the feeding trial. Since the Optiblend showed no growth, we didn't use that additive for the feeding trial. Also since we saw growth stop or decrease after three hours we only took pictures on the last feeding three hours after we fed the five pounds. As a result the Optiblend showed the least growth while the Ultra Full showed the most growth. In the pictures of the heifer I saw more growth when the Fully Loaded was pictured. This proves that my hypothesis was partially correct. Now we know which product has the best show-day fill."

**B**



games more challenging using this information. The parent of one participant stated she was told to always choose the left line at Disney World because most people go to the right line. If people usually go right inside of stores, the store owners can make sure products they want to sell are on the right side of the store. In conclusion, knowing that people typically choose to go right when they have a left-right option is helpful in a number of ways."

## GRADE

Akkineni, Aarna (07-08-31, BE)

Project Submission

### Do gender stereotypes/bias affect the confirmation/deviation of a color-related gender stereotype?

"My research question is "how do gender stereotypes/bias/generalizations affect the confirmation/deviation of a color-preference related gender stereotype?" Brief summary of procedures used: 1. Make four different google forms and number the surveys from 1-4. 2. Find images of the same exact object in 6-7 different colors and create a question asking which object the person taking the survey prefers most. 3. Change the description of survey #1-survey #4 to get increasingly more biased. 4. Use social media to post each survey with instructions of how to find the survey and with information about the survey. 5. Wait for 20 question responses from people on each survey. 6. Collect/analyze data. The data collected is of the percentage of times participants confirmed/deviated from color-related gender stereotypes. The following includes the percentages for the confirmation/deviation of participants in each survey:

of the geographies have better recovery rates than others and this could be attributed to natural molecules that are part of their dietary system. Based on my literature search, molecules such as Vitamins, Flavonoids, Saponin, Alkaloids, Natural Polyphenols, Carotenoids, and Curcuminoids can offer a great degree of immunity against the SARS-CoV-2 Virus provided they are present in a good amount in human blood to offer that immunity.

Hence, to assess the immunity of an individual it's important to measure the levels of these natural molecules. In this project, I divulged into the question of how we can numerically assess or grade the immunity level of an individual. I developed two prototypes of machines using the principle of a Spectrophotometer. Prototype A was based on the electronic arrangements where white light from light emitting diodes (LED) was made to pass through sample and light was received by a phototransistor which was then recorded on a digital voltmeter (DVM). I used the principle of Ohm's Law ( $V = IR$ ) to measure the voltage that was developed across the resistor (sample). The voltage that I read on the DVM is proportional to the light intensity, or power (P). The data obtained was converted into an absolute absorbance number using a linear equation. Prototype B was developed for relative and qualitative measurements and was made using multicolored LED lights where signals were collected using a collimator lens and recorded via attached diffraction prism connected to a web camera which was monitored by open source.

Further, I used four different experiments and validated both prototypes using five different chemical classes of molecules. Both prototypes were calibrated using homemade light emitting diodes-based calibration tools. In experiment 2, the linearity of the relation between absorbance and actual concentrations of Vitamin C (vitamins), Catechin (flavonoids), anthocyanins (natural polyphenols), Lutein (Carotenoids), and Curcumin (curcuminoids) was established and I also used polysaccharide as an internal standard during measurements. In experiment 3, I deployed excel based design of experiment (DoE) to design an experiment using three different concentrations (0.1, 10, and 100 mg/ml) of each of five molecules in triplicates ( $n=3$ ) in several permutations and combinations to generate

1000s of data points which were used to generate arbitrary number using python software. These arbitrary numbers were used as a reflection of

## GRADE

Alhaffar, Ayah (06-01-19, BM)

Project Submission

### Skin Cancer Prevention: Testing the Effectiveness of Sunscreen

"Skin cancer is caused by unprotected exposure to the sun's rays and a simple way to protect yourself is by wearing sunscreen. The UV index is a measurement of the strength of sunburn-producing UV rays. I decided to conduct this project because I learned that 20% of Americans will develop skin cancer in their lifetime. I hypothesized that for sunscreens with SPF 55 and greater, the difference in UV index will remain the same. To conduct this project, I held plastic wrap over the detector of my UV monitor and recorded the UV index before and after applying sunscreen. I looked to see how much each sunscreen decreased the UV index. I tested six different sunscreens and took 4 measurements each and averaged it. I found out my hypothesis was correct. The SPF 55, 70, and 100 sunscreens all had very similar differences in the UV index. The SPF 15 sunscreen had an average decrease of 2.75 and the SPF 100 had an average decrease of 4. At the end of the day though, any sunscreen is better than no sunscreen. Protecting yourself from UV rays is the best way to protect yourself from."

Fareed Nura (06-03-21, BM)

Project Submission

### Natural Remedies for Heartburn

"The purpose of this project is to explore natural remedies for heartburn. I hypothesized that certain herbs and foods would help reduce heartburn symptoms. To test this, I conducted a series of experiments using different remedies. I found that ginger, chamomile, and peppermint tea were effective in reducing heartburn. Additionally, avoiding spicy and acidic foods helped. At the end of the project, I concluded that natural remedies can be a safe and effective way to manage heartburn. Protecting your digestive health is important for overall well-being."

stha7-0.t

Bhai, Saleh (07-03-26, BM)

Project Submission

## Can Fitness Trackers detect Viral Outbreaks like COVID-19

"In my science fair project this year, I am trying to find out if Wearable Fitness Trackers such as Apple Watches, Oura rings, and Fitbits can detect viral outbreaks like COVID-19 by following a research study called DETECT. A group of scientists at Scripps Research is working on a health study called DETECT which monitors participants resting heart rates, sleep patterns, and steps via an app using their wearable fitness trackers. This app collects this data and also allows participants to record symptoms like fever or coughing. I studied their data and analyzed it, it was evident that when researchers used fitness tracker data as well as symptoms, rather than just symptoms, the results were more accurate. Researchers found that individuals who had Covid-19 typically slept a lot more than those who had symptoms but were Covid-19 negative meaning they were a lot less active which was captured via wearable fitness tracker. Resting heart rate was less of a differentiator in this study, but they did find that 30% of the individuals who had Covid-19 had a resting heart rate that went up to two standard deviations above their normal rate. So, it may be something that changes for some individuals, but not everybody. Analyzing this data helped me figure out the answer to the question and my hypothesis that the accuracy of predicting infection based on "symptoms alone" is less accurate versus

and rubbery. I gathered these materials around the house: 4 glass jars, 4 eggs, traditional vinegar, concentrated vinegar, Sprite, and corn syrup. I found labels for each jar. My procedure was to: Get the glass jar Gently put the egg into the jar Pour each liquid into their designated jars. Label each jar Put the experiment into the fridge. Check on eggs every hour I used an egg in water as the control variable. The other four liquids the eggs were submerged in were my experimental variables. I made several observations. The vinegar was bubbling around after several hours. The concentrated vinegar was bubbling all over the egg. The Sprite egg sunk to the bottom and bubbles at the top I had some interesting results. The traditional egg Shell completely solidified, The concentrated vinegar shell was semi-soft, the eggshell was not dissolved yet. The sprite had a slower reaction to the eggshell but the shell was not dissolved yet. The corn syrup in the eggshell was still hard and intact. My conclusion is that the components in the traditional vinegar broke down the chemical structure of the eggshell faster."

**SabryHuda** (05-03-11, CH)

Project Submission

### Put out the Fire

"This experiment is demonstrating how the chemical reaction between vinegar and baking soda create carbon dioxide to put out a fire. I conducted two experiments, which the first one, the vinegar touched the flame, which put out the fire before a chemical could have occurred between the baking soda and vinegar. For the second trial of experiment, my procedure worked just as I expected. Within 15 seconds, the flame of the candle was out. It answered my question of how vinegar and baking soda react to put out a fire. "

## GRADE 6

**Clark, Courtney** 06(05-23, CH)

Project Submission

### The effects of sugary drinks on your teeth

"For my project I wanted to see"

## GRADE 7

**Mountassar, Douaa** 07(05-28, CH)

Project Submission

### How does the substance an "ice cube" is made of affect the rate at which it melts?

"This question interests me because as a younger child my mother would freeze orange juice into ice cubes so that when they melted into the liquid orange juice the "juice cubes" would melt and cool my drink, but not water down like ice would. I aspire to find how the ice cubes with different liquids melt and if the speed would change in water. In science 1mh

## Computer Science (CS)

### GRADE 7

Xia, Megan (0712-35, CS)

Project Submission

#### Effective Computer Network Traffic Monitoring Against Malicious Attacks

"About a third of the world's total web traffic is now made up of malicious bots, and malicious bots are responsible for many of the most serious security threats that online businesses are facing today. The project aims to develop effective methods to detect bot traffic and defend against it. We use Python programming language and a number of network modules to analyze network messages, parse the header of each message and extract the IP address of the source of the message. A spreadsheet is then created to record all the IP addresses of network access to a website, and the time of the access is also recorded. Given all the information, the website administrator can use statistical tools to analyze the data and find IP addresses with suspiciously high requests or other attacking behavior and then block requests from those addresses."

to perform a few additional tests to check if the results would change if I collect the water samples at different times of the day or on different days of the week."

Hopkins Gabby (04-06-06, EA)

Project Submission

#### Can Mangroves Lessen the Force of Tsunamis?

"What is a tsunami? A tsunami is a powerful wall of ocean water that can ruin crops, lives, and homes. They can be caused by underwater earthquakes, which can happen when a volcano erupts. Tsunamis can also happen when a large piece of land falls into the water, and rarely, when an object falls from space. The worst tsunami ever recorded was on December 26th, 2004, and it killed 300,000 people! That is why it is so important to try and stop the destruction tsunamis can cause. A mangrove, which is a type of tree that grows near the coastline, is thought to help slow the force of a tsunamis powerful waves by creating a wall of branches. However, lots of them have been cut down due to the creation of new civilizations. I think that if there were more mangroves, then it would lessen the force of the tsunami

## Earth and Environmental Science (EA)

### GRADE 4

Shah Anwasha (04-02-02, EA)

Project Submission

#### Safe Drinking Water

"My project is titled Safe Drinking Water and I chose this project because I wanted to check how the water at school and home are different. My hypothesis is that tap water is the least safe and that boiled water is the safest. While doing my experiment I checked each sample of water for pH, copper, chlorine, and nitrates in the water. At the end, I found out that all 4 samples of water (tap water, boiled water, filtered water, and water from school) are safe when tested for the 3 minerals and pH. Even though my experiment is complete, I plan



### The Dirty Root Solution to Soil Erosion

" Soil runoff from farm fields is a problem in Indiana that affects local watersheds because it contains large amounts of nitrate from fertilizer. This is often caused by rain water that breaks up the soil, causing erosion and carrying nitrates and pesticides from farms to streams and other low-lying areas. Fertilizer contains nitrates and when this ends up in water it can cause dead zones (an area of low to no oxygen in the water) that can kill fish and other marine life. The purpose of this project is to analyze how effective different methods are at reducing soil erosion and nitrates in dirt during heavy rain. This experiment also developed a portable rain lab that simulates rainfall. The hypothesis was if mulch is added on top of dirt then it will reduce the nitrate levels more than the other methods tested. The methods tested in this experiment were placing rocks in the soil, adding mulch on top of the soil, and adding plants and roots to the soil. The experimental results did not support the hypothesis as the plants reduced the nitrate level in the runoff water the most. The results show that the methods with rocks, mulch, and plants had on average 100, 58, and 30 mg per liter of nitrate respectively. This is due to the fact the roots of the plants do a better job at binding the soil together than the other methods. The roots increase the strength of the soil and prevent it from washing away. The mulch did not bind together the soil since it only laid on the top of the soil. This initially stopped the impact of the water but once water pooled up, the light mulch pieces were easily washed away. In conclusion, methods that bind together the soil are better at

reducing nitrate levels in runoff water. The results show that the methods with rocks, mulch, and plants had on average 100, 58, and 30 mg per liter of nitrate respectively. This is due to the fact the roots of the plants do a better job at binding the soil together than the other methods. The roots increase the strength of the soil and prevent it from washing away. The mulch did not bind together the soil since it only laid on the top of the soil. This initially stopped the impact of the water but once water pooled up, the light mulch pieces were easily washed away. In conclusion, methods that bind together the soil are better at





best because of videos showing how high the diet coke would shoot out of the bottle. Experimental Design My dad and I integrated a bike tire valve stem into the cap of a soda bottle so that we could use a tire gauge to measure the pressure due to the gas created by the reaction inside the bottle. Experimental Design – Release Mechanism I needed to make sure no gasses escaped while tightening the cap so I had to devise various methods to keep the solids from mixing with the liquids until the lid was closed. I taped the Mentos to a magnet and held it to the side of the bottle with another magnet. For the baking soda, I created a cone that would hold baking soda out of the liquid until the lid was tightened. Once Baking Soda and Vinegar were shown to produce the most pressure, I varied the amount of liquid and solids to see if the pressure would change. Results & Data Analysis Please see my presentation for details on my data. A 12 to 1 vinegar to baking soda ratio produced the best reaction. Conclusion My hypothesis was incorrect, Mentos and Diet Coke do not make the most pressure.”

## GRADE 5

Gopal, Anirudh (05-04-12, PH)

Project Submission

### Mind Blowing Magnets

“Magnets pull metallic objects and (sometimes) other magnets towards themselves. Magnets are used in various applications, from headphones to home security. Understanding how magnets behave allows us to use them to solve many problems. This project measured the force and visualized the field to understand how shape and size of magnets affect their behavior. Force was measured using a scale and two repelling magnets. Field was visualized by spreading iron filings evenly over a paper, and placing the paper over a magnet. Magnets of various shapes and sizes were studied. The results showed that

I'm also questioning if the size of the bottle or canister affects how many molecules of air get pushed into the rocket and pushing it out farther. I



procedure I followed. First, I built a Vex robot with optical shaft encoders and a gyroscope. Then I programmed the robot with basic code to drive. Next, I programmed the bot with a Proportional-Integral-Derivative control loop (PID), a simple control loop using encoders (Encoders) and Gyroscope (Gyro) control loop. After that, I laid a 20 foot straight piece

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