Nebraska Junior Academy of Sciences

Central Regional Science Fair 2021

Abstract Booklet

Hosted by

HASTINGS COLLEGE

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Nebraska Junior Academy of Sciences

Central Regional Science Fair 2021

Welcome to the annual 2021Virtual NJAS Central Regional Science Fair!

We would like to extend a **Thank You** to all of the participants, parents, teachers, and judges. Without your support, this event would not be possible.

Neil Heckman, Science Fair Director

Sarah Higby, Science Fair Coordinator

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Participating Schools and Teachers

Adams Central High School.....Jay Cecrle, Zac Foster

Central City Public School.....Chelle Gillan, Anna Detlefsen

Sandhills Public School…….Zeta Greene

Silver Lake Public School.....Kim Bonifas

Junior Division Entries

Category 1 –Animal Sciences

J-1

https://youtu.be/5DDB0YO2Pic Animal Sciences

Hamster Food

Emily Cody

Sandhills Junior High, Zeta Greene

The purpose of this project is to see which hamster food recommended offline will make the hamsters gain more weight. Which food do two different hamster breeds enjoy more and which food brand will make hamsters gain more weight? If I test two different breeds of hamsters for weight gain I think that both sets of hamsters will not gain as much weight with the healthier and popular brand. I thought that the way that companies advertise their diet food as healthy when we don't know. I think that companies are able to get away with lying to use straight to our faces. So I took this into consideration and bought two brands of food and decided to test them. For this test, I decided to buy two different breeds of hamsters. I measured out 45 grams of food in the bowl that was included in the cage set that I had bought and filled the water bottle that was included with 100 mL of water. In my experiment, I found out that the more popular brand made both of the hamsters gain more weight than when they were fed the less popular brand. I think that maybe the more popular brands are the more likely to make the hamsters gain weight. I think that it was very unique and quite interesting that the less popular brands were better. I also noticed that the hamsters were also more energetic when they ate the other brand of food they were fed.

J-2

https://www.youtube.com/watch?v=ylyWiFxerfU

Investigating How South Central Nebraska Cattlemen Keep Records on Their Cattle Herds

Lane Conway and Cody Plambeck

Silverlake Public Schools, Kim Bonifas

This project is important because it is helping cattlemen in Nebraska figure out how to keep better records for their cattle herds so they are more healthy. This also helps them be more organized with their records throughout their herds. The question that is being asked is, How do Cattlemen in South-Central Nebraska keep records on their cattle herds? The hypothesis will be that all the cattlemen will probably check yes to most of the questions in the survey. The method that we used is we wrote out questions on a google form and sent them out to several different cattlemen that are in our area. The result showed how some cattlemen do keep some of the same methods and records and how they keep track of them. The graph shows that a lot of people do write down everything that happens on their cattle farms. But some people don't write down everything that they do and some people do write everything down.

J-3

https://www.youtube.com/watch?v=Y4VGQS3_G8Q

Determining Which Breed of Cattle Steak Tastes Best

Makenna Karr

Silverlake Public Schools, Kim Bonifas

This project is about whether or not there is a best-tasting breed of cattle steak. The hypothesis for this project is that it will be a close competition between Hereford and Angus. Farmers around the Bladen area have different breeds of cattle so steak can be bought from them. The steaks will all be cooked at the same temperature. The people will taste test the steaks without knowing which is which, then the people will fill out the forms and pick which one they liked the best. Then the questionnaire forms will be looked at to see which one the people liked the best.

J-4

https://youtu.be/oYRJ_jqeKmI

Do Different Breeds of Cattle Change the Water pH level?

Ross Martindale

Sandhills Public Schools, Zeta Greene

To see if different breeds of cattle affect the pH level of water. Do cattle breeds affect water pH, and if so, does lower/higher pH levels contribute to sickness in the pen. If I test the pH of feedlot cattle water using Red Angus, Black Angus, Charolais, and sick pen, then I think only the water pH in the sick pen will be affected by decreased pH value. I went out to the cattle pen and gathered the water. I put it in the fridge for a day. Then I used pH strips to test the water. Both Charolais and Red Angus had a pH level of 8, which is Alkaline. The sick pen had a little differential of numbers, but the average was 8. My hypothesis was wrong because I thought the sick pen would be more acidic, but I was wrong. I learned that no breed is more likely to get a certain disease because of pH level of water.

Category 2 –Behavioral & Social Sciences

J-5

https://www.youtube.com/watch?v=rZ29LR4CieE&feature=youtu.be

Evaluating the Effects of Covid-19 on the Mental Health of Farmers

Beau Bonifas and Trevor Kral

Silver Lake Public Schools, Kim Bonifas

We are talking about how the effects of Covid-19 have affected farmers' mental health. We will see if they respond in a positive or negative way. We will be evaluating the effects of Covid-19 on the mental health of farmers. Our hypothesis is that Covid-19 has had a negative effect on farmers. We will be asking many local farmers about how it has affected them personally. One of our methods is sending a google form to local farmers. We learned that some of our local farmers have been affected in many different ways since the start of Covid-19. We also found out that there could be long term effects on the farmers. If we could change one thing about our project, it would be to add another question to see which option has affected them the most. We are only in the middle of Covid-19, it could affect farmers in years advanced because farmers have had stress, anger, and anxiety. Many local farmers say that they've been stressed out lately with how the markets are. For example, if the markets aren't good, farmers don't have a stable income. This is also why local farmers have been saying that their income has been affected. Most farmers say that they weren't more isolated because of Covid since they usually are working alone or with family members. Therefore some farmers have been negatively affected by Covid-19.

J-6

https://youtu.be/5Urme1z5GZY

Night Light Not Phone Lights

Kyle Cox

Sandhills Junior High School, Zeta Greene

For my Science Fair Project this year was how do cell phone affect your blood pressure. I did this to find out the effects of cell phones on your blood pressure. My hypothesis was that if I test the effect of cell phones on blood pressure I think that the blood pressure will rise after playing tick-tack-toe, but I think the results will depend on the person. For my project I had subjects sit in a dark or light room for five minutes. The room would be quiet and there would be no distractions. After the five minutes were up I take the subject's blood pressure with my blood pressure monitor. I would write down their Diastolic Systolic and their Pulse rate. Then I would give them a phone with tick-tack-toe on it. I would then leave them in the same room and set the timer for five minutes. The subjects were instructed to try to play as many games as they can before I came back. When the five minutes were up, I would retake their blood pressure. Then I just had to repeat. It really is a simple project to do. It ended up being kind of hard though. First of all, I didn't end up getting the blood pressure monitor until there were four days left to test. Also one of my subjects wouldn't go into the dark room because she was scared of the dark. Eventually, she stayed maybe it wasn't by choice but I got her data. After the tests, were run and I looked at my charts, to be honest, I didn't see anything that suggested that cell phones affect your blood pressure.

J-7

https://www.youtube.com/watch?v=vPt_TnRyK7g

Determining if a Cell Phone is a Distraction for Students During Class

Blake Monie

Silver Lake Public Schools, Kim Bonifas

This project is that being on your cell phone or having your cell phone on you can be a distraction during class and at school events. How do teachers and parents feel about kids having their cell phones in class? During this project, it will show whether having your cell phone on you during class, or school activities will cause having a bad future and bad grades. The first step into this project is to get students that have cell phones, and that is on them all the time. The second step is to give the teachers a survey of questions to answer, and the students. The third step is to see if the students, teachers agree to the same questions. The fourth step is to start taking data and see if the students could lay their cell phones on the front of their desks. During this project data that was found, teachers, students are on their cell phones a lot during class. The graphs show which students struggle the most with having their cell phone with them.

J-8

https://www.youtube.com/watch?v=X1x1GU3xCME&feature=youtu.be

Determining Factors that Lead to Insomnia

Emma Schmidt and Sophie Butler

Silver Lake Public Schools, Kim Bonifas

The topic of insomnia is important because sleep is the most important thing for a person's mental health and lack of it can cause many problems. The question being asked is "What keeps people awake at night?" Insomnia is caused by your mental health, caffeine intake, sleep schedule, stress, and other possible health conditions. Prescriptions for insomnia may not always work if someone were to have a disorder such as anxiety or depression. For our methods, we gather people who have trouble sleeping, ask questions about technology, medication, activities, then we record data and fill out a survey about a specific person. Once this is done, we take our data and put it onto our board. Overall our hypothesis was somewhat right. Of course there are many more reasons but it seems to be that looking at your phone before bed is a large part of why people can't sleep at night. Other causes could be caffeine intake, stress, your sleep schedule and other possible health conditions.

J-9

https://youtu.be/bCPi9k1196U

Cool Eyes Cool Colors

Shelby Schukei

Sandhills Public Schools, Zeta Greene

"I want to know how different colors affect your eyesight so I know what colors I should use for visual clarity in the future. How does color affect your eyesight?

If I test different colors of eye charts on different people with the same distance away from the chart I think the easiest color to see will be blue because it is a bright bold color to see from a distance. For my experiment I made 6 eye charts in the colors blue, green, red, pink, purple, and orange. I used 9 subjects and had them sit in a chair that was 20 feet away from the eye charts. For each chart I had them read as far down as they could see without mistakes and then recorded the row number they made it to. As we went along a lot of my subjects said that orange was the hardest and red or purple were easier to see. Green and blue were also mentioned as being easier to see than orange or pink. I put the data in a chart and made 3 graphs. I then figured out averages. Based on the averages green, purple, and the red tied for the best. My hypothesis was wrong but I found out that darker colors on top of a light background was the best to see.

Category 3 –Biochemistry

J-10

https://youtu.be/9ViYDhdMZa4

Would You Take Your Milk Out On A Date?

Emily Chavez

Sandhills Public Schools, Zeta Greene

The importance of this project is to figure the bacterial growth in different types of milk (Unpasteurized Goat Milk, Pasteurized Goat Milk, Skim Milk, Low fat Great Value 1%, Hiland 1% Low fat, 2% Reduced Fat Great Value, Cultured Low fat Buttermilk, Vitamin D Whole milk) when sitting in room temperature in test tubes. The color indicates how much bacteria is in the test tubes of milk that have been left out. The project also tests the pH level after they have sat out long enough and rotted. How much bacteria grows in milk when left out or forgotten? What is the pH level after it has gone bad? In my hypothesis, I stated if I test different kinds of milk at room temperature, I think different bacteria's will begin to grow very slowly for all milk. I do not think that bacteria will immediately begin to grow and it will take over 24 hours. I think the unpasteurized milk will grow very fast since it's not pasteurized. In my experiment I tested what types of milk would grow bacteria the fastest. I tested different samples of milk. We tested this by putting methylene blue in 10 different test tubes of milk samples. I examined the bacteria growth by the color change in the milk. If the milk stayed blue then it means there was no bacteria growth. If it stayed blue that was rated that a 0. If it was in-between and the color was a light blue I rated that a 3. If it turned completely white there was a whole bunch of bacteria and that was rated a 5. I came back every 24 hours to see the color change. My milk samples were Unpasteurized Goat Milk, Pasteurized Goat Milk, Skim Milk, low-fat Great Value 1%, Hiland 1% low-fat, 2% Reduced Fat Great Value, Cultured low-fat Buttermilk, Vitamin D Whole milk. Unpasteurized goat milk changes the quickest since it is not pasteurized. Skim Milk changed the slowest and stayed blue even after it rotted. The rest of the milks turned completely white by 72 hours.

Category 4 –Cell and Molecular Biology

J-11

https://youtu.be/A3gARYQUeIo

Bread! Bread! Bread!

Kora Winkelbauer

Sandhills Public Schools, Zeta Greene

"My purpose is to figure out if different types of quick bread will mold more quickly than others. Which homemade bread out of banana, zucchini, and pumpkin would mold the quickest? I figured out that zucchini bread molded the quickest. This came as a bit of a surprise to me because I figured that banana bread would mold the quickest, as I said in my hypothesis. Pumpkin bread molded the second quickest, and to my surprise banana actually kept the longest. Later on, in my investigation I thought that pumpkin bread would mold the quickest but zucchini grew very rapidly. I decided to do this test because of the current pandemic. I've noticed that people have been making a lot more homemade bread and I thought that if I tested it people would know which bread to make. So now you know if you're planning on making homemade quick bread banana is the way to go.

Category 5 –Chemistry

J-12

https://youtu.be/3O3HIP13RiE

The Effect of Baking Soda Amount on Rocket Car Distance

Dylan Lovejoy

Central City Public Schools, Anna Detlefsen

I chose this project because I wondered if vinegar and baking soda could power something such as a car. I predicted a bigger reaction would be created with more baking soda added to vinegar than less baking soda. This bigger reaction would make the bottle car travel farther due to more pressure being built up. First I built a bottle car with a hole in its lid to allow the pressure escape after being uncovered. I then placed 10g of baking soda into the bottle and proceeded to add 50mL of vinegar. I then covered the hole in the lid with my thumb and shook the bottle to catalyze a reaction. I placed the car on the ground and uncovered the hole. The distance it traveled was measured. After three trials I changed the amount of baking soda, subtracting 2g each time. The results of this experiment showed 10g of baking soda had an average distance of 4.46m, 8g of baking soda averaged 4.18m, 6g averaged 2.14m, 4g averaged 2.04m, and 2g averaged 1.49m. A single-factor ANOVA was conducted on my results with a p-value of 0.0036. This data supported my hypothesis: the more baking soda added to 50mL of vinegar, the farther the bottle car went. If I were to expand this experiment, I would test if it matters much the vinegar and baking soda is shaken before releasing the car.

J-13

https://youtu.be/fv1QJkRCtFc

Ice Cold

Connor Sutton

Sandhills Public Schools, Zeta Greene

"I thought I tested if I tested different cooling techniques, I would find out which way is the easiest and fastest way to cool a soda after a hard day at work. If I test ice with salt and snow with salt then I think it will cool the can faster than plan ice and snow. I did test of ice, ice salt, snow and snow salt to determine what would be the easiest way to cool a soda after a good day at work. If I test ice with salt and snow with salt then I think it will cool the can faster than plan ice and snow. Some of the tests really show a dramatic decline in temperature along with the amount of snow and ice melting though out the one hundred and eighty seconds. Almost every trial was nearly the exact temperature. Throughout the testing, the averages of each trial were close enough to know and or determine what makes soda cool faster. If I could do this lab again, I would use a different container (glass). I would use multiple kinds of Pops, and furthermore, I would use more baking products.

J-14

http://youtu.be/k5I7P0g2qWM

Surface Water Quality

Caden Zutavern

Sandhills Public Schools, Zeta Greene

The purpose of this presentation is to find out what water has the highest nutrient content. I want to know if surface water that is moving has higher mineral contents than surface water that is not moving. If I test different types of surface water I think that the tank water will have the highest pH, Nitrate, Phosphate, and Dissolved Oxygen, and will have the lowest temperature. I went around to the tanks and got water. I then put them in the refrigerator and tested them after they got to room temperature.

Category 6—Computer Science

J-15

https://youtu.be/11NEHYbA4qI Computer Science

The Effect of High-end vs Low-end fans on Computer Temperature

Bryce Kunz

Central City Public Schools, Anna Detlefsen

I chose this topic because I have both expensive and fairly cheap fans for my computer, and I have wondered if expensive fans are actually better than cheap ones at cooling. I predicted the expensive fans would perform better because they are made by a more reputable company; therefore, they would move air faster. I installed the three cheaper fans, one as exhaust and two as intake, and ran one of the three games for 10 minutes. I then recorded the temperature of the Computer Processing Unit and Graphics Processing Unit using a software. Then I switched the cheap exhaust fan with an expensive fan and repeated the experiment. I also repeated the experiment with all expensive fans. The results show the mixed fans had the lowest temperature with the medium-stress game for the CPU with 39.5oC. The warmest temperature for the CPU was with the high-end fans and the VR game with 55.5oC. The lowest temperature for the GPU is with the cheap fans and the medium-stress game with 55.5oC. The warmest temperature for the GPU is also with the cheap fans and the VR game with 65.5oC. ANOVA tests were conducted on six subsets of my data with $p<0.05$ for four of the data sets. If I were to do a similar experiment and had the necessary equipment, I would attempt similar tests with games that require high amounts of rendering, thus have higher temperatures.

Category 7 –Earth and Planetary Science

J-16

https://youtu.be/9_gfJNIGJbY

Sunspots and how they Affect Weather

Caleb Furrow

Sandhills Public Schools, Zeta Greene

The reason that I decided to do this project was that Mrs. Greene told me about the telescope that lets you see a spot in the sun. I have always loved space. At my old school, I read all the space books in the elementary library. So, I knew that I would love to do this project so that's nice. My question for this project was how sunspots affect weather? Sunspots affect weather because sunspots are just very cold spots on the sun which makes it rain because the magnetic field from the sun makes it rainier when there are more sunspots. The answer to this question is that. My hypothesis was that there would be more sunspots in 2007 than in the present-day but they were actually very similar numbers. In fact, year 21 had a tiny bit more sunspots than 2007.

Category 8 –Energy and Transportation

J-17

https://www.youtube.com/watch?v=GYYS0I2G-2A

The Effect of Tire Size on RC Car Speed

Dalton Lovejoy

Anna Detlefsen

I chose this project because I like to use RC cars and I was wondering how I could make my car faster without buying a new one. My prediction was bigger tires will make the RC car go faster than the small tires because, the bigger the circumference of the tire, the more ground it could conver. I tested this by first driving the RC car with a full battery and four small (3.5 in) tires 20 meters and timed how fast it went. I then repeated this with the bigger tires (5 in). I then tested the combination of big tires in back and small tires in front and finally big tires in front and small tires in back. The results were as I predicted: four big tires were the fastest. However, what was surprising was the small tires in back and the big tires in front were the second fastest. My conclusion was that the bigger tires made the RC car go faster. I ran a single-factor ANOVA test on my results and had a p-value of 1.58E-13. This means there was virtually nothing besides tire size that could cause my results. If I got to test this again I would do laps around the gym the

RC car instead of just 20 meters because I think that the big tires may make it faster than small, but the big tires would also make it harder to turn.

J-18

https://www.youtube.com/watch?v=ZSc5aQQsV6k

The Effects of Weight on Drone Battery Life

Jeremy Sharp

Silver Lake Public Schools, Kim Bonifas

Drones have had a lot of impact on society in the last 20 years. It has improved farming by letting farmers use the cameras to look over their crops. It has improved photography and delivery. The question for this project is does weight effect drone battery life. This project is going to test 2 drones with 4 different weight amounts. The hypothesis of this project is that 75 grams is the worst weight to fly at because it is the most we tested in this project. This is true because it will make the propellers spin faster My results showed that this is true.

Category 9 –Environmental Sciences

J-19

https://youtu.be/-EI-vNv5RVY

The Effect of Cow Manure on Different Types of Soil

Taylyn Greving

Central City Public Schols, Anna Detlefsen

I chose this project because my dad farms and I became interested in understanding the process of growing a crop. I wondered what affect cow manure had on different types of soil. I predicted manure would have the greatest impact on Sandy Loam soil because it would be able to absorb higher levels of potassium and phosphorus (K and P). Loam, with its clay-like texture, and Sand, with its grainy texture, would not absorb enough K and P to produce an impact. I gathered two 5-gallon-bucket samples of each soil type from one field. Using manure from our fat steers, I added equal amounts to each bucket. Soil samples were taken before adding manure for controls. Half of the samples had the manure mixed in and half had the manure sitting on top. All samples sat outdoors for two weeks, then moved to a shed for six

weeks. After the eight weeks samples were taken for analysis. Results for Phosphorus showed Loam had the highest percent difference (48.3%) and Loam the lowest percent difference levels (-9.5%). Results for Potassium showed sand had the highest percent difference (34.4%) and sandy loam the lowest percent difference levels (0.7%). My prediction was rejected. All three soils had higher K and P levels with mixed-in manure. Next, I would compare the yield results of the different crops with the cow manure mixed into the soil.

J-20

https://youtu.be/Wr8GZ3Xsems

The Effect of Soil Moisture on the Decomposition of Biodegradable Silverware

Emma Schuele

Anna Detlefsen

When I chose this project, I wanted to find a way to help save our environment by testing different disposable spoons. I predicted the more moisture in the soil, the more the biodegradable silverware will decompose than in less moisture because the soil needs moisture to decompose things. I recorded the mass of three spoons in each container, then I buried them halfway under the soil. I put three each of three different types of spoons in three different disposable containers with soil. Each container had different moisture levels ranging from 0-10%, 10-20%, and 40-50%. Each week for four weeks, I found the mass of each spoon and reburied them. I added moisture as necessary to prevent the soil from drying out. The results showed the more moisture added to the soil, the more flimsy and darker each spoon got. The wooden spoons had the greatest change in mass over four weeks. The cornstarch and plant-based spoons had masses that remained nearly constant from the beginning to the end of the four weeks. My hypothesis was on target: the more moisture in the soil, the faster the biodegradable silverware will decompose than less moisture because the soil needs the moisture to decompose things, but needs

longer than four weeks to decompose. If I were to repeat this experiment I would add heat to each container simulating being outside.

J-21

https://youtu.be/YxRJ_I1n76I

The Effect of Distance from the Platte River on Water Hardness

Gracie Vakiner

Anna Detlefsen

I chose this project because I was curious about water hardness and mineral deposits on household dishes. I predicted the water hardness would increase the farther a location is from the Platte River. I traveled to different families in my class and measured the distance from the house to the Platte River; I took two 75 mL water samples from each house and recorded the distance. I conducted a water hardness test on 15 mL of the water collected with test strips and recorded water hardness results. I repeated this two more times with the same amount of water from the same places. The results showed that average hardness at distances of 1.6 miles was an average of 247.5 ppm and distances of 8.8 miles from the Platte was an average of 427.5 ppm. A single-factor ANOVA was conducted on the data and yielded a p-value of 0.0000312, showing that, despite the wide range of results, there was a very strong correlation between distance and water hardness. The data did not support my hypothesis because many households close to the Platte River had high water hardness levels. If I were to expand on this I would test more houses at a greater number of distances and may also test the bacteria levels in the water from the same locations.

Category 10 –Medicine and Health Sciences

J-22

https://www.youtube.com/watch?v=6AXTM7MqQC0&feature=youtu.be

Determining the Lung Capacities of Athletes and Non-Athletes

Kamille Karr and Sophie Schmidt

Silver Lake Public Schools, Kim Bonifas

Do athletes have a better lung capacity than athletes? Who will have the better lung capacity in the outcome? This project is about getting more people to be active. In this experiment, athletes should have a better lung capacity than non-athletes. First, the subjects inhaled as much air as they could into the balloon. Then the test subjects will blow that air out into a balloon. Last, the air that was blown into the balloon was measured to see which balloon is bigger. The results in this project showed that some of the non-athletes had better lung capacities than athletes. The non-athletes may work out at home like going on runs or going for a walk. This means that the athletic students should start being more active and healthy for the sports that they play. Since the Nnon-athletic students have a better lung capacity,

exercising might not affect how good of a lung capacity you have. During this project, the main idea was that the athletes had better lung capacities than the non-athletes, but one of the non-athletes had a greater lung capacity than the athletes.

Category 11 –Microbiology

J-23

https://www.youtube.com/watch?v=N2TzhOSkzys

Determining the Most Effective Type of Food Preservation

Casey Conway and Clay Plambeck

Silver Lake Public School, Kim Bonifas

This project is about determining the right and best preservation methods for food and how long it lasts. This topic is important because people can know if they are preserving their food right. The question is determining the most effective type of food preservation. The vacuum bags will have a much better seal than the tinfoil and or plastic container. Then put together all the materials and let them set. The vacuum bags did the best with each object. The plastic container was the second-best preservation method.

Category 12 –Physics & Astronomy

J-24

http://youtu.be/bXFqmsVmTjs

Light Heat

Aydyn Hall

Zeta Greene

Test the heat that 60 watt incandescent light bulbs, 100 watt LED Lightbulbs give off over a period of 24 hours. Will there be a temperature absorption from these two different kind of lights? If I test 100 watt LED and 60 watt Incandescent the 100 watt LED light will give off the most heat over a 24 hour time period. I set up the lamps for my lights first.

Category 13—Plant Sciences

J-25

https://youtu.be/IAHl5FR-6Uk

The Effect of Different Packaging on Banana Ripeness

Trent Detlefsen

Central City Public Schools, Anna Detlefsen

Bananas are one of the most traded fruits in the world. The banana market necessitates quickly packaging and shipping bananas to minimize ripening during transit. Refrigeration during the processes must be monitored to prevent chill damage to the fruit. Once available on store shelves, bananas ripen to a color level of 5-7 generally within five days. I wanted to know if placing bananas in different types of packaging affects the ripeness rate of bananas. I thought placing a banana on the counter with no packaging would cause it to ripen the fastest and that a plastic shopping bag would slow ripening the most. I placed four single bananas each in six packaging types: ziptop bag, plastic shopping bag, Press-N-Seal wrap, paper bag, in the refrigerator, and on the counter. I recorded the ripeness level of the bananas each day for ten days. The refrigerator had the lowest ripeness level after ten days with an average color level of 5.75, but also had chill damage. The next lowest ripeness was in Press-N-Seal. The most ripe bananas were in the paper bags (color level 9) with the counter bananas a close second (color level 8). A single-factor ANOVA was completed on my results; the packaging type had a statistically significant effect on the ripeness level of bananas with p=1.27E-14. My prediction was rejected since the bananas on the counter did not have the lowest ripeness value after ten days. Packaging does matter when trying to slow banana ripeness.

J-26

https://youtu.be/8SAC3FWcbAk

Take Care of Your Flowers

HayLynn Glidden

Zeta Greene

I wanted to do this experiment because as I get older my mom would like to keep the flower that she gets for parent's night alive for more than a day. If I test 40ml of Sprite, 0.2 grams of aspirin, 1.2ml bleach, 0.2 grams of floral, and normal water in the test tube which one will help the three flowers stay alive longer. If I test 40ml of Sprite, 0.2 grams of aspirin, 1.2ml bleach, 0.2 grams of floral, and tap water in the test tube then I think that bleach will help the flowers stay alive longer. In my hypothesis, I said that I thought that

the bleach would help the flowers stay alive longer and I was incorrect with all of my tests. In my first experiment aspirin had an average of 78.8 petals and my second experiment was also the aspirin with 78.8 petals. Then the third experiment was still the aspirin with an average of 72.4 petals. In the fourth experiment, the floral mix had an average of 46.2 petals, and in the fifth experiment, Sprite had an average of 21.2 petals. If I were to do this experiment again I would use roses instead of daisies because of a different kind of petal. A rose has a bigger petal and fewer petals. As a daisy has little petal and more.

Senior Division Entries

Category 1 –Animal Science

S-1

https://www.youtube.com/watch?v=pOlbZoN8NHo&feature=youtu.be

Comparing the Size Difference of USDA Certified Egg Sizes and the Accuracy of the Size of the Eggs Throughout a Dozen Eggs

Ashley Bonifas

Kim Bonifas

This topic is important because the size of an egg is needed to know if the correct size of egg is being accurately used in the proper recipe. People need to know that eggs are accurate to the size they are said to be to make food and recipes more accurate for the production of the world's food. This project is asking what the size difference of USDA certified egg sizes medium, large, and extra-large and the accuracy of the size of the eggs throughout a dozen chicken eggs? It was hypothesized that large eggs will have most accuracy in a dozen eggs because they are the most commonly used eggs, and that the difference between egg sizes will average the same. To do this project first, gather all materials. Next, measure all circumferences and weights. Record and form graphs with all data found. During this project, it was found that a dozen of eggs are not accurately the same size. There is lots of variation between eggs in a single carton.

S-2

https://www.youtube.com/watch?v=DJueoopFRNE

Homegrown vs Mass Produced Eggs

Hannah Gengenbach and Irelyn Samuelson

Adams Central Public School, Zac Foster

A lot of people have argued about whether store bought or homegrown products are better. A recent movement promotes natural products as better than mass produced. Our goal was to find and determine if this movement had any credibility. We chose to test this using eggs because they are one of the most nutritious foods and are accessible to people all over the world. We started our project by researching eggs and their nutritional value. We learned that an egg's air pocket grows as it ages and causes the egg to lose its nutritional value. From our research, we also learned that mass produced eggs are at least 30 days old by the time they are offered to consumers. Our hypothesis was that homegrown eggs are more nutritious because they are fresher. We tested this by doing float tests. When performing a float test, you observe the egg's position in water. If it rests on the bottom sideways, then it is a fresh egg due to its small air pocket. If it rests on the bottom of the container and tilts upward, then its air pocket is large, and it has less nutritional value. If the egg floats, then the egg's air bubble is so large that it most likely has bad bacteria growing in it. We tested 30 of each kind of egg and recorded the results in a t-test. After testing the eggs, our results clearly showed that the store bought eggs were old because they tilted upward in the water; whereas, the homegrown eggs rested flat on the bottom. We then candled the eggs using a flashlight to observe the thickness of their shells; this showed a noticeable difference among the different kinds. The store bought eggs had a lot of cracks and showed that they had less calcium in their shells. This shows that the homegrown chickens were healthier and most likely laid more nutritious eggs. Our conclusion is that homegrown eggs are more nutritious due to freshness because their air pockets are smaller than store bought eggs.

Category 2—Behavioral & Social Sciences

S-3

https://www.youtube.com/watch?v=5uBqAVQdbys&feature=youtu.be

Evaluating Different Brands of Masks Worn By Teachers and Student Athletes

Josi Sharp

Silver Lake Public School, Kim Bonifas

With the Coronavirus becoming an ongoing problem, masks will be a part of our everyday lives for now. This scientific research will find the most comfortable and effective mask determined by teachers and

students. A google form will be created and sent to teachers, athletes, and student athletes. Once the form has been completed, the votes will be counted for which mask was most preferred. After this research will be done to determine if the preferred mask or masks are effective. The results from the google form showed that the top three masks were black school logo masks (Truong Minh Company), a mask given to students by a teacher (Spoon Duct Fashion Masks), and blue surgical masks. The Truong Minh Company ended up being the most effective out of all of them, so that brand of mask was one of the most popular and effective. In conclusion, the Truong Minh Company masks work well and are comfortable.

Category 3—Biochemistry

S-4

https://www.youtube.com/watch?v=S-0bm1mb8RQ&feature=youtu.be

Determining if Avocados Ripen Faster Using Ethylene Gas

Savanna Junek and Morgan Dinkler

Silver Lake Public School, Kim Bonifas

The topic of this project is to find out if ethylene gas, produced by ripening fruits, will ripen avocados faster. Our question is if ethylene gas from ripening fruits ripens avocados faster? For this experiment, we used ripening fruits, avocados, a bowl, a plastic tube, and a hot glue gun. We gathered all of our materials, connected two bowls with a tube, put the fruit in one bowl and avocados in the other, waited it out to see if the gas will ripen the avocados, and examined the avocados to see if they will ripen faster. This experiment resulted in the avocados with the fruit took only two days to ripen, the avocados in the container took three days to ripen and the avocado outside of the container took the longest to ripen, taking five days. Most people ripen their avocados outside of the container. Ethylene gas from ripening fruits ripens avocados faster. Practically any fruit or vegetable will be ripened by ethylene gas.

Category 4—Cell and Molecular Biology

S-5

https://youtu.be/9irm_4HBj4I

Testing the Efficiency of Various Types of Masks

Libbi Hood

Jay Cecrle

In order to prevent the spread of coronavirus, wearing masks has been encouraged and mandated in most regions. Iit has been stated that masks cannot fully eliminate the spread of the virus but some materials for masks are better than others, such as N95 masks. The hypothesis was if you wear a thicker mask, then less particles will be able to go through. Methods: a bobby pin was used to stimulate a sneeze and red dye to show the particles that go through the mask/shield. Paper was used in order to catch the dye for data to be collected later. A face shield, gaitor, surgical, N95, and cloth mask were all compared. In the results, no particles went through for the cloth and surgical mask. Interestingly enough, some went through for the N95 mask. The particles for the gaitor mask went straight through and the face shield did little to protect particles from spreading. Looking at the ANOVA results and P-Value (0.0009), the hypothesis was accepted.

S-6

https://youtu.be/ORwuc9ILcqM

Investigating Potential Mutagenic Effects of Charcoal Toothpaste Using the Ames Test

Lauree Pickinpaugh

Chelle Gillan

The purpose of this experiment was to see if charcoal toothpaste was mutagenic. New products are developed and marketed that claim to enhance personal appearance and health, and, unfortunately, people are easily influenced to purchase these products without knowing their potential danger. Charcoal toothpaste is a product that is currently trending. It contains polycyclic aromatic hydrocarbons that have been found to be mutagenic in other substances, so I wanted to test whether charcoal toothpaste was a potential mutagen. I also tested charcoal powder because I suspected that if the toothpaste was mutagenic, it would be due to the charcoal. To test for mutagenicity I used the Ames test. The Ames test is a bacterial assay used to evaluate a chemical's potential ability to induce mutations in certain bacterial strains. I hypothesized that both charcoal toothpaste and charcoal powder would have a mutagenic effect on S. typhimurium. I designed a 48 well microplate protocol using 12, 96 well plates. I had three sterility controls, three backgrounds, two positive controls, and eight dilutions for both toothpaste and charcoal. The statistical test showed no significant difference in mutation rates for the toothpaste dilutions; however, there seemed to be an increasing trend in mutation rate as the concentration of toothpaste increased. The charcoal powder had no bacterial growth, so it's not possible to say whether the hypothesis was supported. For a future study, I would like to replicate the study to verify the results because the charcoal toothpaste did show possible signs of mutagenicity.

Category 5—Chemistry

S-7

https://youtu.be/6mVwkyYE7JYhttps://youtu.be/6mVwkyYE7JY

Honey's Effect on Watercolor, Acrylic, and Oil Paint

Jacie Boelhower

Adams Central Public School, Jay Cecrle

It’s difficult to conserve old and modern artworks because of the type of paint they use, especially modern acrylic paintings. Honey has been found to increase vibrancy and thickness levels in some watercolor brands, and might do the same with oil and acrylic. Red, blue, and yellow watercolor, acrylic, and oil paint were tested. It was predicted that the honey would make the paints have higher saturation and value rates. 3 drops of honey were mixed into 3 grams of red, blue, and yellow acrylic and 2 drops of honey into 2 grams of oil and watercolor. Squares of honey mixed paint and normal paint were painted in side by side to compare color. Canvases with honeyed paint and normal paint were also painted in before being rubbed with dirt and cleaned for restoration tests. For the color test, the lightest color and the darkest color of each square were found and the saturations and values were averaged. After running the results through a T-Test, there was no statistical difference ($P > 0.05$) between the honey and normal paint. The restoration tests had little difference between them, as well. A small amount of honey hasn’t proven to produce results, but a greater amount could affect paint much more.

S-8

https://www.youtube.com/watch?v=mMr6_VKS3ho

Moisturizers: Are you getting what you pay for?

Kenzie Bram

Central City Public School, Chelle Gillan

The purpose of this experiment was to see if people are getting their money's worth in the moisturizers they buy and if the moisturizers are effective. I wanted to test this because many people spend way too much money on expensive moisturizers that may have the same effect as the cheaper ones. The prediction was that cheaper moisturizers would have the same or better ability to retain moisture in the gelatin compared to the more expensive moisturizers. I had 4 different types of moisturizers and a control with no moisturizer. I set out 25 petri dishes (5 for each moisturizer) and I tested to see how well the gelatin was retaining moisture throughout a 2 week period. The data showed significant differences in moisture retention between most of the moisturizers. I found that Cetaphil and CeraVe were the most effective while also being the cheapest. Neutrogena was the most expensive of the 4, and had the poorest ability to retain the moisture. Next time I would test the effect of moisturizers on actual skin to get the real effect of how it works. This is important because it helps people find the most cost effective way to keep their skin healthy and moisturized.

S-9

https://www.youtube.com/watch?v=oTOcQag3rco

Testing Different Hand Sanitizers

Trista Hanson and Cierra Mankhey

Silver Lake Public School, Kim Bonifas

This experiment will determine whether hand sanitizer is effective after touching certain objects or not. What type of hand sanitizer works the best to remove the most germs? Our methods were washing our hands, placing artificial germs on them, using hand sanitizer, observing the germs, then repeating the process with all types of sanitizer. Overall, the sanitizers varied in the effectiveness of the removal of germs. The Germ-x Spray and the Bath & Body Works Gel worked the best overall. The Member's Mark hand sanitizer, Bath & Body Works Spray, and the school's spray were the three products closest in results.

S-10

https://www.youtube.com/watch?v=O5Rl_VXxgf4&feature=youtu.be

Detecting What Brand of Make Up Wears Off Exceedingly Under Different Materials of Face Masks

Lexi Wengler and Kassi Jones

Silver Lake Public Schools, Kim Bonifas

The importance of our project is while women are wearing masks right now it is extremely hard for them to keep their makeup looking the same way it looked when they left home. Certain brands of makeup will stay on better than other masks. Therefore, the question of our research project is will a certain brand of makeup stay on better with a mask than another brand? The hypothesis of this project was that more expensive makeup brands will last longer under a mask than the cheaper brands of makeup. Makeup will most likely fall off more on a double cloth or single cloth mask and the surgical masks will have very little effect on the makeup. For this project three subjects wore their brand of foundation for 8 hours under a double cloth mask, a single cloth mask, and a surgical mask. The results of the project were that the double cloth mask took off the most makeup and the most expensive makeup came off the most. Part of the hypothesis in this project was correct and the hypothesis was partially wrong. The hypothesis that the double cloth mask would come off more was correct but the most expensive makeup brand came off the most.

Category 6—Energy and Transportation

S-11

https://www.youtube.com/watch?v=Qh5dVDCdGlg

What Type of Cup Keeps Your Drink Hot the Longest?

Kaylee Buchholz

Adams Central Public Schools, Zac Foster

I want to research this topic because I have always wanted to know how to keep my drink hot for the longest amount of time. I want to know which type of cups works the best. I have always wanted to know why drinks don't stay hot for the same amount of time. If we find the answer to this problem, we can enjoy our drink for longer periods of time. I think that double wall stainless steel tumbler will keep my drink hot for the longest amount of time. The double wall stainless steel tumbler was the cup that kept the water the hottest for the longest amount of time. This makes sense based on the research I did. The double wall creates a bit of a vacuum, preventing some of the conduction of the heat. Also, the coating may have helped prevent some radiation loss. If I added a lid to the containers, I could have kept the liquid hotter longer by preventing convection. Next time I want a hot drink to stay warm for a long period of time, I will seek out the cup made of stainless steel and a vacuum system.

Category 7—Environmental Sciences

S-12

https://www.youtube.com/watch?v=KYSLj0qvEKY&feature=youtu.be

The Correlation Between Levels of Nitrates in Private Well Water vs Town Water

Sydney Bartels and Madison Karr

Silver Lake Public Schools, Kim Bonifas

This project is trying to find evidence supporting or against that there is more natural nitrates in well water than town water. The importance of this project would be to gain information so people who own wells would need to know whether to test and maybe treat your water. It would prevent methemoglobinemia before it happens. The hypothesis of this project was that the natural level of nitrates in well water would be greater than the amount of nitrates in town water. This hypothesis was came to because nitrates are caused by fertilizers and waste which are most largely found in rural areas. In order to conduct this experiment, we gathered water samples and tested them. The results matched our hypothesis. The hypothesis suggested that more nitrates will be found in private well water. The data and graphs show that the wells have a large amount more than town water. This shows that meanwhile, most wells are within the suggested limit, they still have a lot and some need monitored and even treated. Levels of nitrates can vary greatly, even by 1/100 of a mg. In conclusion, if you live in a rural area with well water you should have it tested to see if it needs treated, especially if you live in an area near animal waste or fertilizers.

S-13

https://youtu.be/_R8phaTvVEY

An Analysis of the Effects of Wetland Area on Algal Growth in Nearby Lakes in Eastern Nebraska

Elaina McHargue

Central City Public School, Chelle Gillan

Many plants and wildlife rely on lakes and their surrounding areas for food, water, and shelter, and lakes are considered prime locations for real estate and recreation. However, with harmful algal blooms (HABs), caused by excess nutrients, becoming an increasing global concern, the survival of freshwater ecosystems is threatened. Wetlands remove nutrients from soil and water as roots of aquatic plants absorb nutrients, process them into gases, and release them into the air, which makes wetlands an essential part of reducing HABs. I designed this experiment to test the effects of wetland size on algal growth in nearby lakes. I combined water quality data from several Eastern Nebraskan lakes from the Nebraska Department of Environmental Quality (NDEQ) and wetland area data from the National Wetlands Inventory. Much of this study was done using Geographic Information Systems (GIS), which combines spatial data relating to locations on the earth with attribute data, such as waterbody name or type of wetland. After running correlation tests, data were not conclusive enough to reject the null hypothesis that wetland area will not have significant effects on algal growth in lakes. I hope to have more opportunities to learn how to use technology such as GIS to contribute to the study of aquatic ecosystems in order to help landowners and government agencies make responsible decisions that promote environmental stewardship. Cooperation between organizations like the National Wetlands Inventory and the NDEQ are examples of how we can use technology to coordinate our efforts and drive research forward.

S-14

https://youtu.be/TprvIiK1usY

The Effect of Biochar on Phosphorus Losses in Chicken Manure

Breanna Vaughan

Central City Public School, Chelle Gillan

The purpose of this experiment was to determine if adding biochar to chicken manure would affect phosphorus losses. This is important due to the recent boom of chicken barns in the Nebraska area, which is located over the Ogallala Aquifer. It was hypothesized that higher biochar levels would decrease the losses from the manure because it has been shown to lower losses in cow manure. Four 200g samples of barred rock chicken manure were split into four groups. One of these groups remained the control group and the other three each received a different level of biochar (5%, 10%, 15%). Half of each sample was then sent for phosphorus testing. The remaining sample was placed on cheesecloth suspended over containers. Each sample was watered with 30mL of water every other day for twelve days. These samples were then also sent for testing. The data did not show enough of a significant difference, with an Anova test P value of 0.07 (α=0.05), so the alternative hypothesis was unable to be supported. A possible explanation for this is the small number of samples and the short trial time. An extension of this study that included more trials, a longer trial time, and manure from various types of chickens would give more insight into the effect of biochar on the leaching of phosphorus from chicken manure.

Category 8—Medicine and Health Sciences

S-15

https://www.youtube.com/watch?v=ZH57vYgUWxg&feature=youtu.be

The Efficacy of Masks Against Airborne Droplets

Nathan Acosta and Landon Nabower

Silver Lake Public Schools, Kim Bonifas

This project will help consumers identify what masks are most effective in protecting themselves from airborne droplets and disease, as well as what materials excel at the task. This project is meant to test the effectiveness of types of face masks against airborne droplets. The hypothesis is that filtered and layered masks will perform the best out of the mask types. To test the hypothesis, we trialed masks in two different tests. For the spray test, we held the mask 6 inches above a piece of graph paper and measured the number of squares that the water hit through the mask after 3 sprays. In the second test, known as the soak test, we dumped water within the mask while holding it above graph paper and measured the number of squares on graph paper. The filtered mask performed the best at the spray test, without any water getting through, and only 17 squares being filled in the soak test. The double-layered cloth did well on the spray test, and best on the soak test, with only 14 squares being filled. The single-layered cloth performed poorly on the spray test and poorly on the soak test. The disposable mask did the worst in both categories, making it the worst mask to use. In the end, the hypothesis was proven correct, as the filtered mask did perform the best out of all the mask types, and the disposable mask performed the worst out of all the mask types.

S-16

https://www.youtube.com/watch?v=UbVC2nR3wKI&feature=youtu.be

The Effects of Dust and Dust Masks in Agricultural Settings

Samantha Bonifas

Silver Lake Public School, Kim Bonifas

Dust is a harmful particle that is abundant in agricultural environments. Dust can cause side effects such as sneezing, coughing, hay fever, and asthma attacks and can eventually cause chronic bronchitis, lung and heart disorders, and lead to a condition called Farmer's Lung Disease. Face coverings such as handkerchiefs, cloth masks, and N95 masks can be used to combat these symptoms. This project is important to inform agricultural workers about the severity of dust exposure and importance of protection, especially in the COVID-19 pandemic that affects the lungs. All of the information found leads to the question in this project: Which face mask is the most popular in agricultural workers and which face mask provides the most protection? It is predicted that workers who use a face mask will experience less dust exposure symptoms and that N95 masks will be the most prevalent in agricultural settings. A survey was conducted amongst agricultural workers that asked questions about mask usage and dust exposure. It was found that 69% of agricultural workers use a mask in a dusty environment. 55%of mask wearers prefer a N95 mask. A decrease of mask availability was recognized by mask users since the COVID-19 outbreak. A large number of people have experienced a cough, runny nose, and congestion after dust exposure. Mask wearers averaged 4.61 exposure symptoms and non-mask wearers averaged 5.875. It was concluded that masks protect people from exposure symptoms and that N95 masks are the most prevalent.

S-17

https://www.youtube.com/watch?v=PPs2WqcHtyc&feature=youtu.be

Effects of 20-Hydroxyecdysone and Calcium Supplemented Prednisone on the Body Length of Drosophila Melanogaster

Jenna Cecrle

Adams Central Public School, Jay Cecrle

Due to asthma, I took prednisone, an oral corticosteroid, that is used to reduce inflammation in the airways. During my 7th grade physical, my doctor noticed my growth rate had decreased from the 50th percentile to the 20th percentile. Wondering if this could be shown in an animal model, the Fruit fly (Drosophila melanogaster) was selected because generation time is quick, and the medication and supplements can be mixed with the food. In Past years, there was a decrease in the body length of the Drosophila melanogaster as the dosage of prednisone increase. This year Calcium supplements with prednisone was decided to see if there was still an effect on body length. Also a low dosage of prednisone and 20-Hydroxyecdysone, which is a steroid that speeds up molting in fruit flies. Different dosages of a muscle supplement containing ecdysone was tested. As well as the prednisone when mixed with the calcium supplements. ANOVA and Scheffe tests showed no significant differences ($P<0.05$) between calcium with prednisone and control, and did not have a consistent significant decrease with the ecdysone muscle supplement, but had a significant decrease with the 20-hydroxyecdysone and prednisone when compared with control. Results showed that 20-hydroxyecdysone and some of the muscle ecdysone had a decrease in body length while calcium with prednisone did not show a decrease. Concluding that Prednisone may cause an ecdysone-like effect in the reduction of body length. As well as calcium supplemented Prednisone may have interrupted the effect of prednisone

S-18

https://youtu.be/Jyt3VtJzydI

Effects of Astragalus Membranaceus and Ligustrum Lucidum on Tumorous unc-32 Caenorhabditis Elegans

Maddie McDaniel

Adams Central Public School, Jay Cecrle

The purpose of this experiment was to examine safer solutions for treating uterine cancer. In a recent study by the Asian Journal of Biomedical & Pharmaceutical Sciences titled “Medicinal Plants of Asian Origin Having Anticancer Potential”, it was discovered that a formula of Ligustrum lucidum and Astragalus membranaceus could attain a 90% anticancer efficacy. A strain of Caenorhabditis elegans, a nematode, was tested with a solution of these two herbs. This specific strain of C. elegans needs to be kept at 15 °C. If kept at a temperature higher than 25 °C, the worms grow tumors in the uterine region. To measure the effectiveness of the solution, the size of the tumors formed were recorded every 24 hours. A solution of Astragalus membranaceus and Ligustrum lucidum were found to have preventative qualities when treating uterine cancer in unc-32 C. elegans. The solution decreased the tumor area to the nematode area ratio 62% in 120 hours. The p-value for this experiment was 0.05.

S-19

https://www.youtube.com/watch?v=hImPxMqtUB0&feature=youtu.be

Evaluating if Wearing a Mask in Your Daily Life Affects Your Heart Rate

Rehgan Miller

Silver Lake Public School, Kim Bonifas

The project being done here is “Evaluating If Wearing A Mask In Your Daily Life Affects Your Heart Rate.” The reason this project is important is to help people that have health problems especially heart problems. When testing this project out, the hypothesis before the project was actually done was that people’s heart rate would increase maybe not drastically but by at least ten beats per minute. The methods for this project are; first each person will not wear a mask for 20 minutes and just do what they would normally do. After the 20 minutes is up their heart rate will be taken to see what it is then write it down so it can remembered. Then they will have put a mask on for 20 minutes and do what they would normally do until that time is up. The last thing that will happen is after the 20 minutes are up then each person will have their heart rate taken, it will be written down so the rest of the data can be collected. At the end of the project the results found were that wearing a mask does cause your heart rate to increase. The conclusion to this project is that wearing a mask could harm a person by causing their heart rate to increase drastically.

S-20

https://www.youtube.com/watch?v=U3TdnEO6oqg

The Effect of the Amount of Saliva on the Number of Cavities

Derek Pfeifer

Central City Public School, Chelle Gillan

This study was performed to see if the amount of saliva a person produces affects the number of cavities they have. I predicted that saliva would affect the number of cavities a person has. To do this project, I collected saliva from people of various ages. I made sure I was working in a clean area and I then instructed the test subject to drink 3oz of water. The test subjects were asked to spit into a tube for three minutes. I was also curious about how tooth-brushing interacted with saliva production to impact the development of cavities. Finally, I ran a correlation test on whether or not the amount of saliva the person produced affected the number of cavities they had. Some of the constants I had were the same amount of water that they drank and the tube that the subjects spit in for the same amount of time. I separated the samples into groups of less than normal and more than normal of saliva collected. The data didn't show that increased saliva production is correlated with decreased cavities. Because the correlation coefficient was 0.006, the hypothesis was rejected. For future studies, I would recommend doing this project with just one gender or one age. I also think it would be a good idea to do more trials. This type of study is important because it shows that there needs to be ways to improve oral health.

S-21

https://youtu.be/AHWla0HsPyU

The Importance of Brushing Your Teeth Twice a Day

Olivia Redding and Lynsie Lancaster

Adams Central Public School, Zac Foster

We believe that brushing your teeth twice a day is crucial if you want to prevent future health issues and have overall better hygiene. Some people question i you really need to brush that often so we put that inquiry to the test. We did this by doing two tests/procedures. Test 1 included brushing your teeth twice a day for 5 days. They would brush morning and night. And Test 2 would only brush once a day, at night, for 5 days as well. During both tests the testee would swab their mouth at night before brushing to measure how much bacteria the mouth had acquired 24 hours prior to brushing. Another way we determined that our hypothesis was correct, was by using disclosing tablets to show all the plaque on your teeth. The testee used those at night before brushing, but only every other day. Once all the data was collected from our experiments, it was concluded that the bacterial and plaque difference was so immense and our hypothesis was correct. We determined that brushing your teeth twice a day is crucial if you want to prevent teeth, gum, and health issues.

S-22

https://www.youtube.com/watch?v=c-Y8W9l4230&feature=youtu.be

Evaluating Oxygen Levels While Wearing a Mask vs Not Wearing a Mask

Reagan Rust

Silver Lake Public School, Kim Bonifas

This project “Evaluating Oxygen Levels While Wearing a Mask Vs Not Wearing a Mask” was to see the outcome of oxygen levels when wearing a mask vs. not wearing a mask. The importance of this project is to help everyone especially at this time. Wearing a mask affects oxygen levels that could be harming people’s health, although it is slowing the spread of covid. The oxygen levels of five participants were taken at the beginning of a school day wearing masks, the middle, and also the end. The question for this project is, does mask wearing affect oxygen levels? The hypothesis to this experiment is that mask wearing does not affect oxygen levels. The results show that masks do not affect oxygen levels and do not harm people’s health. Although it may make a person feel claustrophobic wearing a mask but it is not harming them. The methods used for this experiment was to first get people and an oximeter. Then have them exercise and take all the data and compare. In this project, the data showed that the middle of the school day had the highest average oxygen level. The lowest average oxygen level was at the end of the school day. The middle of the three averages was the beginning of the day. The oxygen level of the participants when the participants were exercising showed that mask wearing does not affect oxygen levels while exercising. In the end mask wearing does not affect oxygen levels.

S-23

https://www.youtube.com/watch?v=NS2C_-rqDLY

Effect of Masks on Bacterial Growth in the Nasal Cavity

Jack Trausch and Nicholas Conant

Adams Central Public School, Zac Foster

We had to come up with an idea before everything but after that, we first collected all the data we needed to perform everything. We created a hypothesis and we researched more. We then collected our participants that we would use to experiment on for our science fair. We ended up using 4 participants in our experiment. We then asked many questions about our project to our teachers. We had to collect the materials we would need for our experiment. The materials we used was cotton swabs, petri dishes, an incubator, the participants, and information. We then tested our hypothesis and we put all of the swabs in the incubator. We waited 3 days and came back and observed the results. We took pictures of the final petri dishes and inserted them into our google slides and poster. We then had to start and finish our poster and slides. We then submitted them to the contest and we then had to finish the forms.

S-24

https://youtu.be/XVFgDF-TZkc

The Effect of Artificial Sweeteners on Fruit Flies

Carlee Wissing and Paige Dane

Adams Central Public School, Jay Cecrle

Our hypothesis was the following: there will be a significant relationship between the body length of the fruit fly and the type of artificial sweetener they consume. Artificial sweeteners are perceived to be better than regular table sugar because they have virtually no calories. But, there were other sources that found some negative effects of artificial sweeteners including weight gain, cancer, and diabetes. We wanted to find out what side effects the artificial sweeteners would have on the fruit flies. We tested the following groups: a control group, table sugar, Equal, and a Splenda. Splenda and Equal are both artificial sweeteners. Each group also had potato flakes and water in each vial. We left them in the vials for two weeks at room temperature. The fruit flies with the artificial sweeteners were significantly longer than the control group and sugar group (Scheffe $P < 0.05$). These results were consistent with others which said that when the fruit flies ate artificial sweeteners, they ate 30% more than other fruit flies because they thought that they were hungry, when they actually weren't. The fruit flies in the control group and the table sugar group reproduced significantly more than the artificial sweetener groups ($P < 0.05$). These results are consistent with others that found that artificial sugars cause weight gain. In conclusion, the negative effects of artificial sweeteners may outweigh the benefits of having a zero-calorie diet.

Category 9—Microbiology

S-25

https://youtu.be/QM6sEGhbXPk

Cross-species transmission of Drosophila melanogaster Nora virus in other Drosophila species and effect on geotaxis.

Ella Buhlke

Central City Public School, Chelle Gillan

This study was performed to determine the cross-species transmission of the Drosophila melanogaster Nora virus in other Drosophila species and its effect on geotaxis. There are millions of known viruses, and new ones are discovered every year. A major source of new viruses is epizootic and enzootic animal viruses, seen when viruses typically occurring in animals adapt and mutate to infect humans. COVID-19 is an example of one of these host-switching viruses, as it originated in bats (Ji, 2020). The Nora virus is a picorna-like virus whose only known pathogenic effect is a geotaxis defect. The cross-species transmission of this virus in fruit flies can be used to help scientists better understand host-switching in other viruses. It was predicted that the virus would infect the other species of Drosophila and that it would have an effect on their geotaxis. To test this hypothesis, Nora virus-positive males were allowed to defecate on fly food. Once they were removed, negative males and negative virgin females of each species were added to the vials. The geotaxis of their offspring was measured before they were collected for RNA analysis. RT-PCR was performed to determine infection, and all species tested positive, showing the Nora virus to be a host-switching virus. Geotaxis results showed a defect in the experimental groups in comparison to the control indicating that the virus does have a pathogenic effect on the other species. Learning more about cross-species transmission has increased importance in today's world as the number of zootic viruses increases.

S-26

https://www.youtube.com/watch?v=niz-aQSqDhw

Effective Cleaner on Bacteria

Katelyn Karr and Amanda Ehrman

Silver Lake Public School, Kim Bonifas

This topic is important because most people at a time where we are now with corona are wondering what soaps and detergents to be using. Most schools and workplaces have to sanitize all the items that were touched that day. In the project, the question being asked is trying to figure out what disinfectant cleans tables and desks the best. The hypothesis in this project is that bleach will work the best and strongest. After the class is done in the room the researchers will come in and use each cleaning supply on the different tables located in the room. Next, the researchers will use the different cleaning supplies on all the tables in the room to see which one cleans the best. Then the researchers will gather the data and put them in graphs. Dawn Soap and water worked the best and hand sanitizer worked the worst. Hand sanitizer did not take off as much bacteria as Dawn Soap did. In the project, the graphs showed that the disinfectant that ended up working the most effective was Dawn soap and water. Hand sanitizer ended up working the least effectively. It did not pick up as much bacteria.

S-27

https://www.youtube.com/watch?v=yDumFBdp0No&feature=youtu.be

How Effective Different Types of Disinfectant Actually Are

Megyn Scott and Peyton Baker

Adams Central Public School, Zac Foster

We all have been sick before; when your body aches and you can't seem to move very much. What if I told you that by using the right disinfectant, you could limit the amount of times you get sick each year? We think that it is important to know how much bacteria is left behind by different types of cleaning supplies. This is important because some surfaces are more susceptible to different types of cleaning methods.

S-28

https://youtu.be/yQ1b8Rn7uUY

The Effect of Multiple Hand Sanitizers On Staphylococcus and Escherichia Coli Bacteria

Leighton Weber and Grant Trausch

Adams Central Public School, Jay Cecrle

Hygiene is important for everyone, especially during a global pandemic. Hand sanitizer is a good substitute for when hand soap is unavailable. However, not everyone knows what makes a good hand sanitizer. This experiment attempted to determine what kind of common sanitizer is the most effective and what ingredients make it effective. It was hypothesized that if there is more alcohol/alcohol substitute in a hand sanitizer, then the more bacteria it will kill. Six Petri dishes were filled with nutrient agar. Three of the six dishes were coated with Staphylococcus bacteria and the other three covered with Escherichia Coli bacteria. Five different hand sanitizers were poured into small plastic cups labeled 1-5. One more cup was filled with pure water. Small paper discs were soaked in said cups and then placed on the Petri dishes containing bacteria. A disc from each cup was placed in each dish equally spaced apart. After three days, the zones of inhibition were measured. All sanitizers killed significantly more (ANOVA $P < 0$) than the control. The hand sanitizer with the most alcohol killed the most bacteria. The results showed that there was a relationship between the amount of alcohol in a sanitizer and how much bacteria is killed. The results supported the hypothesis. This shows that hand sanitizers with a higher percentage of alcohol will kill more bacteria.

Category 10—Physics and Astronomy

S-29

https://youtu.be/a_eb73ydUlM

The Effectiveness of Lights and Reflective Gear to Increase the Conspicuity of Runners at Night

Aden Mercer

Central City Public School, Chelle Gillan

This experiment was conducted with the hopes of finding the safest way for pedestrians to go jogging during nighttime. Thousands of pedestrians are killed in vehicular accidents in the United States every year, so I wanted to test what kind of running safety gear would give a runner the best chance at being seen by a driver. The experiment consisted of a driver driving towards a runner who jogged in place. The runner wore one of four clothing treatments; no safety gear, running lights, a reflective vest, or both lights

and vest. The order of treatments was determined by a randomizer. Using a GPS tracking app, the vehicle's location was recorded when the driver could see something that could be a person and again when the driver felt they could identify it as a runner. I hypothesized that the combination of the lights and vest would be visible from the farthest distance. The data showed that a runner wearing no safety gear could be seen from approximately 350 feet away, but a runner wearing a vest could be seen from 3000 feet away. On average, a runner with no gear was seen from the shortest distance, followed by lights, both lights and vest, and a runner wearing a vest could be seen from the farthest distance. If I were to perform this experiment again, I would test how different sized vehicles affected the distances a runner was visible from.

S-30

https://youtu.be/nGg_R0LYZ6M

The Effects of Ankle Braces on Mobility and Balance While Testing Two Types of Braces

Dylan Pfeifer

Central City Public School, Chelle Gillan

The reason for this experiment was to investigate the effect of ankle braces on mobility and stability. Athletes consistently face the question of whether it's worth it or not to wear ankle braces during competitions. Athletes don't want their performance to be weakened or their ankles to have a higher chance of injury. Because of this, I decided to test two different types of ankle braces and a control with no ankle braces while the participant hopped and reached with their foot. I used 15 test subjects ranging in age from 15-18. Test subjects stood in the middle of a star shaped diagram on one foot. They reached with each foot as far as they could without losing their balance while wearing one of the ankle braces. Next, I had the subject jump as far as they could jump without moving after they landed. Although I found that test subjects were able to hop farther without an ankle brace, and were able to reach farther distances without an ankle brace and with Compression Ankle Stabilizer, none of these differences were found to be significant. If I would do this project again, I would gather more test subjects and have more types of ankle braces, and I would possibly try to test athletic tape also.

Category 11—Plant Sciences

S-31

https://youtu.be/ykXLWOdXCNo

The Effect of Paper in Soil on Wisconsin Fast Plants

Lawrence Beyer

Central City Public School, Chelle Gillan

This project was about understanding the effect of paper in soil on a plant's germination, height, and color. Wisconsin Fast Plants were used. Wisconsin Fast Plants are small, quick and easy to grow, and able to produce many seeds. Paper is common in households and has many uses. It is made of pulp created from cellulose fibers from a variety of plants. I wanted to test what would happen if we buried paper in soil because I wondered how it would affect the plant's ability to absorb water. The question being asked was "What is the effect of buried paper in soil on plants?" The hypotheses were that the seeds would germinate normally, the experimental plants would be shorter, and the experimental plants would be a brighter green than the control. Eight of both control and experimental plants were tested. They were planted in styrofoam planting quads. The experimental plants were grown with paper in the soil. Germination data was taken once. Plant height and color were taken four times. The germination hypothesis was supported by the data because the paper had no effect on germination. This may have been because the paper was too far away to affect it. The stem length and the plant color hypotheses were not supported by the data because there was no change in stem length or color. This may have been because the paper was not plentiful or large enough to change the amount of water the plants received.

S-32

https://youtu.be/EgpPAekJ7eY

Effect of Electricity on Brassica rapa Growth and Germination

Brice Gravert

Central City Public School, Chelle Gillan

This project was about the effect of different types of electric currents on seed germination and plant growth. Electricity is used for many things, and it is being used more and more every day. I wanted to test electric currents because electroculture is becoming more common in other countries with positive effects when used correctly. Electroculture accomplished by hanging wires, with high voltage above the plants to help pull the nutrients through the plant. The hypothesis on germination and growth was the alternating current or the 45 minute direct current would have the best effects towards the plant growth. The hypothesis on plant color was the plants will be a lighter shade of green when exposed to electricity.

Three experimental groups of six plants each were tested, along with a control group with no electricity. The experimental plants were exposed to different types of electrical currents, alternating, direct, and 45 minutes of direct exposure. The germination hypothesis was not supported by the data because it was found that an electric current had little effect on germination. The stem length hypothesis was not supported because the Anova test showed no significant difference. However, the plants exposed to alternating current, were slightly taller. This may have been because the alternating current moved the nutrients just enough to make it easier for the plant to collect the nutrients. The plant color hypothesis was not supported by the data because there was little effect on plant color.

S-33

https://youtu.be/fvkwSwK7VK8

The Effect of Potassium Polyacrylate and Sodium Polyacrylate on Wisconsin Fast Plants

Brielle Hamer

Central City Public Schools, Chelle Gillan

This project was about the effect of potassium and sodium polyacrylate on Wisconsin Fast Plants. Sodium polyacrylate is used in diapers, and I found that when used to grow plants, it dries out the soil. However, potassium polyacrylate is what farmers use to help their plants grow. Potassium and sodium polyacrylate contain polyacrylic acid, salt, and either potassium or sodium. The hypothesis on germination was if potassium polyacrylate or sodium polyacrylate are put in the soil, seed germination will be unaffected. If sodium polyacrylate is added to soil, stem length will be shorter and color will be lighter, and if potassium polyacrylate is added to soil, the stem length will be longer and color will be darker.

The germination hypothesis was not supported because both potassium and sodium polyacrylate had a negative effect on germination. This may have been because the hardened soil weighed down the embryos and deprived them of oxygen. The stem length hypothesis was not supported because there was a negative effect on stem length. This may have been because the topsoil was not allowing the newly germinated plants to get light they needed to grow. After removing the topsoil, there were a few embryos that had grown underneath. They didn't grow much afterwards, however. The plant color hypothesis was neither supported nor rejected because there were too many varying results on plant color. This may have been because so few experimental plants survived that it was difficult to get consistent data.

S-34

https://youtu.be/FBQIbgs6FD0

Effect of Mealworm Frass on Wisconsin Fast Plant Growth

Andrew Heckman and Drew Goracke

Adams Central Public School, Jay Cecrle

During the production of mealworms, frass (feces) is a major byproduct. Mealworms produce as much frass as their body weight. This byproduct may potentially be an organic substitute to household fertilizer. It was researched how mealworm frass can be a possible new organic fertilizer. It was hypothesized that if Wisconsin fast plants were treated with mealworm frass, their growth would be enhanced as frass contains nitrogen, which is common in most fertilizers. A greenhouse study was conducted using Wisconsin fast plants and used 3 different fertilizer treatments: nontreated (no fertilizer), ½ Tb mealworm frass, and 1 Tb mealworm frass. The plants were watered evenly as needed until they produced seeds, height and seed production data was collected. The height data gathered from the project contained similar heights (Scheffe=0.08) throughout the plants. The data showed a significant difference (Tukey p=0.03) between the plants given 1 Tablespoon of Frass and the Control groups in both topsoil and potting soil. The results showed there was a direct relationship between the amount of frass received and the amount of seeds produced. These results partially supported the hypothesis. The height of the plants was not affected; however, the seeds treated with frass produced more seeds than those that received no frass.

S-35

https://youtu.be/y-CPtDzz3bE

The Effect of Banana Peels on Wisconsin Fast Plants

Brianna Mundorf

Central City Public School, Chelle Gillan

This project was about the effect of banana peels on plant germination and growth. Banana peels contain potassium, protein, fiber, vitamins B & C, carbohydrates, and magnesium. I wanted to test banana peels because of all the nutrients in them. I hypothesized that if banana peels were mixed in the soil, more seeds would germinate, stem length would be longer, and color would be darker green. I tested 8 control and 8 experimental plants. The only difference between the groups was that 8 4mm² pieces of banana peels were added to the soil of the experimental plants. The germination hypothesis that more seeds would germinate if banana peels were added to the soil was not supported because it was found that banana peels had no effect on germination. This may have been because the banana peels had not decomposed yet. If they had decomposed, the seed could have blocked nutrients from getting to the embryo. The stem length hypothesis was not supported because there was a negative effect on stem length. This may have been because bacteria or fungi that grew on the banana peels as they decomposed prohibited plant growth by blocking nutrients or water from entering the plant. Fungi may have also infected the plant. The color hypothesis was not supported because there was no effect on plant color. This may have been because in order to produce chlorophyll, the plant needs nutrients and the decomposing banana peels had no effect on the production of chlorophyll.

S-36

https://www.youtube.com/watch?v=ZREHlnFZoQc

Evaluating the Effects of Slope on Corn Emergence and Vigor

Georgiann tenBensel and Brooklyn Meyer

Silver Lake Public School, Kim Bonifas

This projects was very important to us because of fathers are both farmers. They always have trouble with the damage of crops from wind storms and hail. We wanted to know if it was the slope of the crop. Our question was “Will the crop vigor be effected by the slope of the soil?” We hypothesized that the slope would make the roots very useless to the crop and be able to be damaged quicker than the crops without slope. First we took soil from a near field and put them in buckets. After we planted the seeds, we then put the buckets at different slopes (0º, 45º, and 90º). The results showed that the crops with higher slope grew longer in their stock but shorter in their roots. In conclusion slope does effect the crop efficiency. Will we ever be able to stop this problem in our farming industry?

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