We would like to extend our sincere appreciation to all of the participants, parents, teachers, judges, Hastings College students and support staff, Sodexo employees, and Tim Jones from NBC Nebraska.

Without your support and help, this event would not be possible.

Neil Heckman, Science Fair Chairperson
Jody Haller, Science Fair Coordinator

www.hastings.edu/sciencefair
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hosted by

[Image of Hastings College logo]
Participating Schools and Teachers

Adams Central High School ...................................... Jay Cecrie
                                    Sandy Kliever
                                    Zac Foster
Central City High School ................................. Chelle Gillan
Elwood Public School ................................. Chelsey Neville
Hastings Middle School ................................. Bailey Johnson
                                    Kristen Slechta
Hastings St. Cecilia’s High School .................... Thera Jones
Overton Public School ................................. Sarah Bennett
Ravenna Junior High ................................. Stephanie Rodenborg
Wilcox-Hildreth Middle School ....................... Marilyn Hays
<table>
<thead>
<tr>
<th>Time</th>
<th>Teachers</th>
<th>Jr. Division Students</th>
<th>Sr. Division Students</th>
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<tbody>
<tr>
<td>8:00</td>
<td>Check-in and set-up projects (must be ready by 9:00) Morrison-Reeves Science Center</td>
<td>Check-in and set-up projects (must be ready by 9:00) Morrison-Reeves Science Center</td>
<td>Check-in and set-up projects (must be ready by 9:00) Morrison-Reeves Science Center</td>
<td>Judge’s Meeting Morrison-Reeves Science Center, Room 219</td>
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<tr>
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<tr>
<td>9:00</td>
<td>Presentation – Tim Jones, Weather Anchor, News 5, NBC Nebraska &amp; Iowa Storm Chasers French Memorial Chapel</td>
<td>Face-to-Face Judging</td>
<td>Face-to-Face Judging</td>
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<tr>
<td>10:00</td>
<td>Teacher's Meeting Morrison-Reeves Science Center, Room 130</td>
<td>Face-to-Face Judging</td>
<td>Presentation – Tim Jones, Weather Anchor, News 5, NBC Nebraska &amp; Iowa Storm Chasers French Memorial Chapel</td>
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<tr>
<td>10:20</td>
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<td>Face-to-Face Judging</td>
<td>Presentation – Tim Jones, Weather Anchor, News 5, NBC Nebraska &amp; Iowa Storm Chasers French Memorial Chapel</td>
<td>Face-to-Face Judging</td>
</tr>
<tr>
<td>12:00</td>
<td>Lunch Hazelrigg Student Union Cafeteria Line Dining Rooms A &amp; B</td>
<td>Lunch Hazelrigg Student Union Cafeteria Line Dining Rooms A &amp; B</td>
<td>Lunch Hazelrigg Student Union Cafeteria Line Dining Rooms A &amp; B</td>
<td>Lunch (optional) Hazelrigg Student Union Cafeteria Line Dining Rooms A &amp; B</td>
</tr>
<tr>
<td>1:00</td>
<td>Awards Presentation French Memorial Chapel</td>
<td>Awards Presentation French Memorial Chapel</td>
<td>Awards Presentation French Memorial Chapel</td>
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</tbody>
</table>
NJAS Regional Science Fair Abstract Form

* Required

Student's First Name* _______________________   Student's Last Name* _______________________________

Parent/Guardian Contact* (Please Submit Name, Phone Number or Email Address)
___________________________________________________________________________________________________

Teacher Sponsor* _________________________________________________________________________________

Teacher's Email Address* __________________________________________________________________________

School Name* ____________________________________________________________________________________

School Address* __________________________________________________________________________________

City, State & Zip* __________________________________________________________________________________

Research Title* __________________________________________________________________________________

Individual or Team* (choose 1)
  ____ Individual (1 researcher)
  ____ Team (2 researchers only)   2nd Student’s First and Last Name ________________________________

Does this exhibit require electricity? ____Yes   ____No

Abstract*
The abstract must include a brief review of the problem, hypothesis, and research method. Please include results and conclusion. Summary must be 250 words or less. You are responsible for editing your abstract!
___________________________________________________________________________________________________

___________________________________________________________________________________________________

Division* (choose 1)
  ____ Junior Division Grade 6   ____ Senior Division Grade 9
  ____ Junior Division Grade 7   ____ Senior Division Grade 10
  ____ Junior Division Grade 8   ____ Senior Division Grade 11
  ____ Junior Division Grade 9   ____ Senior Division Grade 12

Category* (choose 1)
  ____ Animal Sciences   ____ Behavioral & Social Sciences   ____ Biochemistry
  ____ Cellular & Molecular Biology   ____ Chemistry   ____ Computer Science
  ____ Earth & Planetary Science   ____ Eng.: Electrical/Mechanical   ____ Eng.: Matls./Bioengineering
  ____ Energy & Transportation   ____ Environmental Management   ____ Environmental Sciences
  ____ Mathematical Sciences   ____ Medicine & Health Sciences   ____ Microbiology
  ____ Physics & Astronomy   ____ Plant Sciences
## NEBRASKA JUNIOR ACADEMY OF SCIENCES JUDGE'S SCORE SHEET

<table>
<thead>
<tr>
<th>Project Title</th>
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<table>
<thead>
<tr>
<th>Total Score</th>
<th>Place</th>
<th>Judge’s Signature</th>
</tr>
</thead>
</table>

### SCIENTIFIC METHOD OR ENGINEERING GOALS:

#### Scientific Method:
1. Initial Observations and Identifying the Problem
   (Observations and Problem are clearly stated)  
   **RATING SYSTEM**
   
   | 2 | 4 | 6 | 8 | 10 |

2. Hypothesis Formation
   (Initial Hypothesis clearly defined)  
3. Experimental Design and Procedure
   (Procedure followed applies to the problem and uses controls)  
4. Collection of Data
   (Evidence of proper data collection is demonstrated)  
5. Analysis of Data
   (Graphs, percentages, statistics, or other appropriate illustrations used)  
6. Conclusions
   (Conclusions are logical, related to original purpose, and supported by data)  

#### Engineering Goals:
1. Clear Objective
   (Project has a clear objective)  
2. Relevant Objective
   (Objective relevant to the potential user's need)  
3. Workable and Feasible Solution
   (Workable, acceptable, and economically feasible solution)  
4. End Product Solution
   (Solution utilized successfully in design or construction of end product)  
5. Improved Solution
   (Solution is significant improvement over previous alternatives)  
6. Tested Solution
   (Solution has been tested for performance under the conditions of use)  

### COMMUNICATION SKILLS

| 1 | Oral Presentation & Ability to Answer Question
   (Presentation is well organized, clear, and concise)
   (Responses are clear and accurate; each team member familiar with all aspects) | **RATING SYSTEM**
   
   | 1 | 2 | 3 | 4 | 5 |

2. Visuals
   (Visuals aides are clear, neat, organized and complete)  
3. Written Work
   (All written material is organized and complete; contributions of each team member are clear)  
4. Background Research (Bibliography)
   (Use of library and resources are documented)  

### PERSONAL GROWTH

1. Scientific Value of Project
   (Information presented is relevant and significant)  
2. Creativity and Originality
   (Project shows a creative approach to the problem)  
3. Knowledge Gained
   (Understanding of concepts is appropriate to grade level)  
4. Effort and Attitude
   (Adequate time, effort and attitudes are demonstrated; each team member fully involved and reflects coordinated efforts of both team members)  

**Total Score**
NOTE FROM THE JUDGE

Student’s Name_________________________ Division_________________________ Exhibit #________
Project Title___________________________

Judge’s Signature________________________

NOTE FROM THE JUDGE

Student’s Name_________________________ Region_________________________ Exhibit #________
Project Title___________________________

Judge’s Signature________________________

12
Judging Guidelines
Suggested Evaluation Criteria for Judging

Judges scoring project entries are asked to use the Nebraska Junior Academy of Sciences Judge’s Score Sheet, which is based on a 100 point system. Points are assigned accordingly to the four categories listed below, with points weighted as per the approved judge’s score sheet. The following questions for each set of criteria can assist you in interviewing the students and aid in your evaluation of the top ten projects.

**SCIENTIFIC METHOD OR ENGINEERING GOALS (60)**

*Scientific Method (60)*

1. Is the problem stated clearly and unambiguously? (1)
2. Was the problem sufficiently limited to allow plausible attack? Good scientists can identify important problems capable of solutions. (1)
3. Does the original hypothesis address the problem? Is it clearly defined? (2)
4. Does the hypothesis lend itself to measureable testing? (2)
5. Was there a procedural plan outlined aimed at obtaining a solution? (3)
6. Are variables recognized and defined? (3)
7. Are there appropriate corresponding controls? Does the student recognize their need and use them accordingly? (3)
8. Are there adequate data to support the conclusions? (4)
9. Does the student recognize the limitations of the data and ... (4)
10. Does the student have an idea what further research is needed? (4)
11. How complete are the projects notes and/or logbook? (4)
12. Has the data been properly collected? (5)
13. Is the data complete? Disaggregated? Appropriately displayed?* (5)
14. Is the conclusion logical, related to the original purpose, and supported by data? (6)
15. Does the student understand the project’s ties to related research? (6)
16. Is the conclusion based on a single experiment or replication? (6)
17. Was the purpose carried out to completion within the scope of the original intent? (6)

*See Communication Skills for more complete evaluation
**Engineering Goals (60)**

1. Does the student project have a clear objective? (1)
2. Is the objective relevant to the potential user’s needs? (2)
3. Is the solution workable? Acceptable to the potential user? Economically feasible? (3)
4. Could the solution be utilized successfully in design or construction of an end product? (4)
5. Is the solution a significant improvement over previous alternatives or applications? (5)
6. Has the solution been tested for performance under the conditions of use? (6)

**COMMUNICATION SKILLS (20)**

1. How clearly does the student discuss his/her/their project and explain the purpose, procedure and conclusions? Watch out for memorized speeches that reflect little understanding of principles. (1)
2. Does the written material correlate with and reflect the student’s understandings of the research? (3)
3. Are the important phases of the project presented in an orderly manner? (2)
4. How clearly are the data represented? Are their charts, graphs, other visuals? (2)
5. How well does the physical display explain the project? Is it attractive, easy to read and otherwise accessible? (2)
6. Was the project presented in a forthright manner, without tricks or gadgets?
7. What about the bibliography; does the student cite scientific literature, or only popular literature? (4)
8. Does the bibliography seem to be shown in the student’s work, or is it just a compilation of sources that the student doesn’t seem to have really consulted? (4)
PERSONAL GROWTH and CREATIVITY (20)

1. Does the project show creativity, ability and originality in the questions asked? (2)
2. Does the project show creativity and originality in the approach to solving problems? (2)
3. Is there enhanced mental discipline and order in the analysis and interpretation of data? Is there a sense of seriousness, rigor and humility as opposed to gadgeteering? (3, 4)
4. Can the student tell you what he or she has learned from the project? (3)
5. If it is a group project, has each student contributed significantly to the project, at least in ways that reflect his or her skills and abilities? What part did each student play in the project? (4)
6. Was the project done independently, or are there indications of excessive outside help? (4)
7. Did the student show maturity and good judgment by organizing a project that is relevant and significant? (1)
8. Have the student's observational skills been enhanced? How? (3)

POTENTIAL MAXIMUM SCORE CHART

| Scientific Method or Engineering Goal | 60 points |
| Communications Skills               | 20 points |
| Personal Growth                     | 20 points |

Total Possible Score 100 points
Junior Division Entries
What is the Nutrient Difference in Various Horse Feeds?  

Jaycee Wooters  
Elwood Public School – Chelsey Neville

The purpose of this study was to find out the different nutrient levels in name brand horse feeds and compare them to both their published values and two samples randomly selected alfalfa hay samples. For testing crude protein in feed samples the LECO FP-2000 Nitrogen Combustion Analyzer was used. The LECO FP-2000 is set at a furnace temperature of 1050 degrees Celsius. One has to multiply the crude protein results by 6.25 and you can get nitrogen levels in your feed samples. Testing the calcium in feed samples you use a very hot machine that dissolves the sample as soon as it is exposed to the temperature that is hotter than the Sun itself. When testing dry matter in feed you use a forced air oven set at 64 degrees Celsius for initial drying. Then you have to dry the sample again in a forced air oven set at 105 degrees Celsius. You test the calcium, crude protein, nitrogen, and dry matter levels in feed samples for many reasons. Horses need a good amount of calcium for strong bones and teeth so your calcium results will help you determine the correct amount to feed or allow you horse to have. A mature horse that does heavy work needs 2 to 2.15 pounds of protein per day and 21 grams of calcium per day. Most of the tested results were fairly close to the estimated percent from the companies that distribute the product.

Cavia porcellus  
Grace Dinell  
Hastings Middle School – Bailey Johnson

My question; Can a Cavia porcellus (Guinea Pig) run a maze multiple times using provided sources and improve their time. The purpose? To test small rodents such as the Guinea pigs’ and their brains to see if they can improve their time using memory. Can they improve their time and use their memory? My independent variable was the wooden maze and the sources given to them. My dependent variable was the time it took them to complete the maze, minutes and seconds. My hypothesis was that if all three guinea pigs ran the maze multiple times using the sources given to them, (sound and smell) all their times would vary, but overall they would improve. I accept my hypothesis because my data shows that after three trials the Guinea Pigs improved by more than a couple seconds, but minutes. In conclusion the experiment showed me that a small rodent such as a Guinea Pig are not as dumbfounded as we assume.

Fish Tails  
Gabrielle Kelly  
Hastings Middle School – Bailey Johnson

When I first started my experiment it was to test what shape of fish tail would swim the fastest, by the end it evolved into something much more, how could I change the world with this data? Approximately 2,215 fish species were endangered as of 2014, by the year 2050 that number could be half of what it is today with the help of the data I collected conducting my experiment. I simply tested which fish would swim the fastest out of three tail types by chasing them with a net. The data I collected could benefit fish species for years to come. The heterocercal (split) tail shape traveled the fastest with an average time of 10.163 cm/sec. The homocercal (round) tail swam second fastest with an average time of 8.630 cm/sec. The protocercal or leptocercal (triangle) tail swam the slowest with an average of 7.363 cm/sec. I conclude that the shape of a fish tail does affect how fast it swims and the split tail swims the fastest.
**Turkey Hunting in the Rain**

Ryker Van Brocklin  
*Hastings Middle School – Bailey Johnson*

My Science Fair project compared the consistency of the volumes of the Primos and Typhoon box turkey calls under dry and wet conditions. My hypothesis was that the volume of the Primos box call would be more consistent because it is the more expensive call and it has a coat of finish and stain on it. First, I did five clucks, a specific type of turkey call, on each call while dry. I measured the decibel level for each trial with an app on my IPod. Then I submerged both calls into 4.4 degrees celsius water. I then did five clucks on each call and measured the decibel level. I repeated this process a total of ten times. In conclusion, I rejected my hypothesis because the results indicated that the volume of the Typhoon call was more consistent between dry and wet conditions. The Primos call's volume increased 6.9 decibels per trial while the Typhoon call's volume increased 4.9 decibels per trial. I believe that the Typhoon box call kept a more consistent volume level because it soaked up all of the water on the friction surface. The Primos box call didn't because it was stained and finished, which left water on the friction surface and caused the sound to change. These factors caused the cheaper Typhoon call to be more consistent than the Primos call when going from dry to wet conditions.

**Dog vs Water**

Rebecca Zeleski  
*Overton Public School – Sarah Bennett*

The purpose of my experiment was to find out which type of water dogs prefer, tap water or bottled water. My hypothesis was that the dog would drink more tap water than bottled water. I conducted my experiment for three days. On each day I would give the dog 18 fluid ounces of tap water. I allowed the dog thirty minutes to drink the water, I would wait twenty minutes between the types of water, and then I would give the dog 18 fluid ounces of bottled water. I measured the water left after each drinking time and subtracted this from my original 18 fluid ounces. For day 2 and 3 I did the same as day one. The average of tap water drunk was 6 fluid ounces, the average of the bottled water drunk was 5 fluid ounces. The dog drunk more tap water than bottled water which made me accept my hypothesis.

**Where's the Cheese?**

Wyatt Riebschlager  
*Overton Public School – Sarah Bennett*

The purpose of my experiment was to see if a mouse, named Veronica, could finish a test maze in 30 seconds with either her memory and or sense of smell. I made two mazes a control maze and a test maze. The control maze was a start to see how fast she could get through a maze. The control maze took her 38 seconds after being exposed to it for 3 days. I then placed her in the test maze. The first trial took her 5 minutes and 20 seconds. The second trial took her 1 minute and 11 seconds. The last trial took her 3 minutes and 47 seconds. On average she completed the test maze in 1 minute. I rejected my hypothesis because I said she would complete the test maze within 30 seconds and she did not.
Do Dogs Understand English?  
Kati Caddy  
Ravenna Junior High – Stephanie Rodenborg

The purpose of this experiment was to determine if a dog can understand English or just a humans tone of voice. Dogs have a very sensitive ear that enables them to hear higher and lower frequencies than people can. They say this is because dogs have 18 muscles in their ear and many important parts of the ear.

The experiment was done by having the dog do a specific command and then repeating the same command but with different wording. The dog was not rewarded or petted after each trial of the experiment that was done. After the first command and action was done at that point the experiment called for another set of commands that require a different action from the dog.

The findings of this experiment were all the same. The dog has done all three of the commands and the separate wording of the same commands. This could mean that the dog can only understand the tone of voice of its owner, and other people, or human error like having a monotonous tone of voice when saying the commands could have played a part in having the dog do every single command with the related words acting as this command.

Category 2 – Behavioral & Social Science

Does Intervention and Education Affect Beverage Consumption?  
Ty Smith  
Elwood Public School – Chelsey Neville

The problem addressed in this research is poor beverage choices are contributing to levels of obesity and health due to increased sugar consumption. This project was chosen because when kids go to school without breakfast their pursuance goes down 0.1%. 36% of children under 5 are growth retarded and 50% of high school kids are growth retarded due to poor nutrition. About 17 percent of new born babies are born with low birth weight resulting in poorer cognitive performance during infancy. Although this effect is overshadowed by poor nutrition. Children that are born with low birth weight tend to not pay attention in school. Nutrition affects schools indirectly because undernourished kids enroll later in school than better nourished kids. Sports drinks such as Gatorade or Powerade give individuals carbohydrate, electrolytes, and fluid during high-intensity workouts that last sixty minutes or longer. Energy drinks have as much sugar as soft drinks and enough caffeine to raise your blood pressure. All of these facts are not well known by the public and this project seeks to inform the public about health affects due to beverage consumption. The first part of the experiment was to distribute beverage consumption booklets for participants to track their beverage consumption for a two week period. After the first week, the experimental group was given a presentation on nutrition, emphasizing sugar amounts in various beverages. After the two weeks, the change in beverage consumption was tracked between the control group and the experimental group. The hypothesis was the experimental group would alter their consumption after education. The results show more sugar was consumed after the education. This information in combination with the low adherence to the program, illustrates the need for better methods of public education.
**Radon Awareness**

Rebeka Lehmkuhler  
*Elwood Public School – Chelsey Neville*

This project investigates Radon Awareness. Radon is the second leading cause of Lung Cancer. With high amounts of radon for long periods of time an individual may contract lung cancer. With this topic the goal is individuals will become more aware of the effects of radon. A test kit may be easily purchased from a local hardware or convenience store or from the Nebraska DHHS website. Participants were recruited for the study and signed informed consent form. Next all participants took the survey with no additional information as a baseline of their knowledge on radon. Before giving them a second survey, participants were asked to read a short story about the radon. After, this the percentages correct were calculated for each questions and overall. When all done compiling the results, graphs were created to represent the data. The data was inconclusive. This is because, the first score average was higher than my second score average. The project had human error. The error was that most people still guessed after reading up on radon. This experiment showed many people don’t know about radon. In the future I hope that many more people will become informed, but expecting individuals to read about radon and understand the reading may not be the best educational measure. The results of this study were unexpected. Applying this to the broader public, a more interactive form of education is necessary to reach more people.

**Brain Games vs. Age**

Chyna Delker  
*Hastings Middle School – Bailey Johnson*

Does age affect how you respond to brain tricks, riddles, or games? In my project, I took ten people over and ten people under the age of 50 and asked them five brain tricks, riddles, and games. The results of my experiment showed that people under 50 did 50% better than people over the age of 50. On each individual question people under 50 were 20-40% more successful. The reason that this happened was because when we are asked a difficult question our brain is under cognitive strain. Cognitive strain lowers our creativity levels and we become more focused on unnecessary details. People under 50 are normally more recently out of school, in school we experience cognitive strain and our brains become better at coping with the cognitive strain therefore making the people under 50 more likely to succeed. We have two types of thinking system one and system two. System one files out unnecessary information and system two is learned things. As we become older we let system one file out unnecessary information a lot easier. When solving difficult problems people need to focus on all of the information to successfully answer the questions, this is another reason people did not do as well when they were over the age of 50.
Is Music the Key?  
Katherine Strickland  
Hastings Middle School – Bailey Johnson

This experiment was conducted to benefit the life of students of all ages and grades. It was also conducted to prove that music can and will improve things other than your mood. I had three people take two algebra tests, one of them listening to music and the other not. My hypothesis is if I have three people take two tests one listening to music and the other not then the test where they were listening to music will have the best test scores. I expect my hypothesis. The results showed that the average test score on the test with music was a 72% and a test taken without music had an average of 52%. Only one of my test subjects did better without music. The genre of music that my test subjects listened to was their favorite genre of music. So each person listened to something different. Although studies have shown that music without lyrics have produced the best test scores. Studies have also found that the reason music improves test scores is that when the brain hears music the blood flow increases allowing the brain to work better getting the better test scores. Music is one of the best forces in the world.

Jam Out While You Work Out  
Kyla Rickert  
Hastings Middle School – Bailey Johnson

There are numerous reasons for why I decided the experiment I did. I always saw athletes listening to music before games and it got me curious on if the music really does boost their performance. Athletes and coaches are the main purpose, to know that by listening to music it will improve their time and performance. Does motivational music improve athletic performance speed was the question to be answered. After all three runners ran and I averaged their time (dependent variable) after no music and subtracted that from their time with music (independent variable), I got the difference and noted that motivational music does improve their time and performance. My hypothesis was, If I test three runners with and without motivational music, then motivational music will improve their performance speed. I accept my hypothesis, because my data and my research proved that with the right music and alpha waves they help distract the runner from pain and fatigue. Overall my experiment proved that music does indeed help and this will inform athletes, runners, marathoners, and coaches that motivational music improves the time and performance.

Music Magic  
Courtnie Wendt  
Hastings Middle School – Bailey Johnson

Instrument players have always had the question of if it helped them in school or not. The reason I had this question is because I play an instrument and wanted to see if I had the best benefit of it. I wanted to see if this tale was true or just a tale you tell your kids to have them play an instrument. There were multiple kids at my school that I tested to see if their musical instrument helped them or not in multiple subjects such as Math, Reading, and Social Studies. Their grades in the subjects made the decision in this case. My hypothesis was that instrument players would have higher grades in which I was able to accept. The data I collected shows that the grades were higher by a 7.25 average in Math and a 5.21 average higher in Social Studies but Reading was almost a tie with the non-instrument players beating out the instrument players by a 0.625 average higher. This has showed me and professors that if you take the time to learn a musical instrument than you can succeed more in school and life in the long run.
Music of Minds

Zipporah Johnson
Hastings Middle School – Kristen Slechta

My science experiment is “Music for Minds”. The purpose of my experiment was to find out what people heard when they listen to a piece of music. I think that composers and musicians would like to improve the songs that they write or the pieces of music that they play. Musicians might want to train their ears better to find the bass line. My hypothesis “If I take musical intelligent and non musical individuals and have them listen to the same piece of music, then I predict that musical intelligent people will hear the bass line.” This is how I proceeded with my experiment gathered ten test subjects five were music intelligent and five were not. (To be “musically intelligent” you had to be active with a musical interment or an organized choir.) Then I had my ten test subjects listen to the same piece of music. After the song, I had them tell me in one sentence what they heard. Later, I asked them if during the entire song if they could pick up the melody or bass line. In my experiment I discovered that 10% of people hear the bass line. I discovered that it is really hard to pick the bass line in a piece of music. I should have done younger and older age groups. I also would have done more test subjects. In conclusion, my hypothesis was rejected because of the majority of people hear the melody.

TGIW

Arich Fruehling
Hastings Middle School – Bailey Johnson

Students always say that the best day of the week is Friday, but which day of the week do students really behave better. My project asks which day of the week do students behave and complete their homework the best. I tested this by looking at our school’s BMS (Behavior Management System) to see which day of the week really is best. The day of the week was my independent variable and the amount of logins each day was my dependent. My hypothesis was that Wednesday would be the best day of the week. I accept my hypothesis because Wednesday had the lowest number. My experiment showed that Monday and Friday were the worst days of the week at almost twice as bad as the middle days of the week (Tuesday, Wednesday, Thursday). This experiment showed that Wednesday was the best day of the week because it was a shorter school day.

Under Pressure

Evan Davis
Hastings Middle School – Bailey Johnson

The purpose of this experiment was to understand whether it was beneficial to do something under pressure or not. I believe it is important to know this so that we eliminate stress or pressure causing circumstances. My condensed hypothesis is that given differing levels of pressure, the test with the lesser levels of pressure would withhold the best results. Test subjects were given 3 tests consisting of the same questions. The tests were given at 3 different pressure levels. In conclusion, this experiment demonstrates that it is better to have limited amounts of pressure. The test administered under the least amount of pressure did nearly twice as well as the test with the highest pressure. The results demonstrate that outcomes are greater under lesser amounts of pressure.
**Best Friend Color Choices**

Samantha Sarratt  
*Overton Public School – Sarah Bennett*

The purpose of my experiment was to find out if “Best Friends” choose the same favorite colors as their favorite. My hypothesis was that “Best Friends” would choose the same favorite color two thirds of the time. How I conducted this was by testing “Best Friend” pairs using 5 different colors: Neon green, Neon blue, Neon orange, Neon yellow, and Neon Pink. For each pair I tested one person at a time and showed them a color. After showing them one color, that person answered a series of questions. For each color I repeated this with each pair of “Best Friends”. The data I collected showed me that two thirds of the time, best friends would choose the same favorite color. Due to this I accept my hypothesis.

**Gum Concentration**

Krystal Meyers  
*Ravenna Junior High – Stephanie Rodenborg*

“Does chewing gum increase people’s speed and accuracy on simple cognitive tasks” (Smith, 2014). “Educators have found that chewing gum can help children struggling with problems related to ADD/ADHD (Attention Deficit Disorder/Attention Deficit Hyperactivity Disorder). The Cardiff researchers believe this improved performance could be due to an increase in oxygen to the brain. As we chew, we get the blood in our heads pumping and increase the amount of available oxygen to the part of the brain responsible for paying attention (Michael Harper for redOrbit.com, 2013).

Generally, all of the subjects did better with gum in trials 1, 2, and 3 . In the data table, the subjects chose their gum. The times of how long the subjects took to finish the tests. The experiment showed the percentage of the subjects grades of their tests. The control variable was no gum. The independent variable; the subjects got to choose their gum. The dependent variable results of the test scores of the subjects.

By chewing gum one can increase one’s concentration and have higher levels of accuracy on simple cognitive tasks. The data supported this because the majority of the subjects tested better chewing gum than without gum. On the average people that did better with gum was 0-4% better. The experimenter explained the procedure to the test subjects and tested the subjects and found that the majority of the subjects tested better chewing gum than without gum. The hypothesis was supported; chewing gum does help concentration.

**Can Students Really Multi-Task Well?**

Logan Jones  
*Wilcox-Hildreth Middle School – Marilyn Hays*

Multi-tasking is the ability of a person to do more than one thing at a time. Research has indicated that people don’t really multi-task, but switch between tasks. Some people can get pretty good at that, perhaps so good at it that they think they can perform just as well on academic tasks with music or other distractions. The questions was asked, how does distraction affect a person’s ability to complete a task? It was hypothesized that if students complete a simple addition test, they will perform just as well with music and other distractors as they will when they are not distracted. To test this, the performance of students on a simple addition test was measured. On one test the students were allowed to make noise, like kicking the desk or listening to music. In the other test students were not allowed to talk or make any kind of noise. The students had thirty seconds to complete each of the tests. After the data was analyzed it was shown that all of the students did worse with distractions than without the distractions. This suggests that even though students my think they can do their work while listening to music or watching TV they are probably not going to be as efficient or accurate with their work as they would be if they work in a quiet place free from distractions.
Can You Detect an Urban Legend?  
Alex Pistulka  
Wilcoxon-Hildreth Middle School – Marilyn Hays

Many people believe what they see. They think that if they see it then it must be real. Many urban legends have shown up over the years, which are just believable enough to trick people into thinking it is real. This led to the question; At what age are you most gullible to believe an urban legend? The hypothesis was that, younger children are more gullible to believe an urban legend and older children/young adults are more able to detect an urban legend. To test this hypothesis, participants were asked to take a 50-question quiz in which they marked if they think the picture of an urban legend was real or fake. 2nd graders, 7th and 8th graders, and college students took the quiz. The results were put into charts. It was discovered in this survey, that the 2nd graders had the lowest percent of correct responses for detecting pictures that were of fake information out of the three age groups. That suggests that they were the least able to discriminate an urban legend from a real image. The college students had the highest percent out of the three age groups. This suggests that they were able to detect an urban legend as true or untrue more often. The results suggest that younger children are more trusting and do not think that someone is going to tell them a lie or try to trick them. It also shows that young adults may be more cautious and not as easy to trick.

Fine Arts and Behavior in School  
Claire Van Laningham  
Wilcoxon-Hildreth Middle School – Marilyn Hays

Fine arts have been found to improve academic performance; some studies show that they also improve behavior in schools. Negative classroom behaviors interfere with the educational process and also put other students at risk. Therefore, it is important to find ways to reduce the number of behavioral incidents occurring in high schools. This research examines whether participation in Fine Arts by high school students is associated with the number of disciplinary referrals. Qualtrics Survey Software was used to create an online survey. The survey was sent to 283 public high school principals across Nebraska; 108 completed surveys were received. The resulting data were analyzed using SPSS statistical software. High school principals were asked if they personally believe there is a correlation between Fine Arts participation and student behavior. Only about 20% of principals believe there definitely is a correlation and 45% believe a correlation probably exists. However, about 35% of principals do not believe there is a correlation between Fine Arts participation and student behavior. Cross-tabulation analysis was used to examine the effect of Fine Arts participation on student behavior. The results show that schools with higher percentages of students participating in Fine Arts report lower rates of disciplinary referrals. Schools with fewer students participating in Fine Arts have a higher rate of disciplinary referrals. The findings support the hypothesized relationship. These results suggest that encouraging students to participate in Fine Arts may be an effective way to reduce behavioral problems at school.
How Does Music Affect Mood?

Estefania Gonzalez
Wilcox-Hildreth Middle School – Marilyn Hays

Has your heart ever raced when hearing your favorite type of music genres? Have you ever become happier or felt and behaved in a different manner while listening to genres of music you don’t really like? The questions was asked, what physiological affect do different genres of music have on people? It was hypothesized that if the music has more of an energetic beat the more your heart rate will increase and therefore make a person who listens to Punk Rock angry and behave more aggressively and intensively than they would while listening to country music because that is its opposite. The same would be true of a person who listens to pop becoming more excited and become slightly agitated when listening to Punk Rock or country. To test this hypothesis participants were asked to listen to some common music genres and then some less common ones. The test consisted of the test subject expressing their mood and then observing their behavior. Before after each song the heart rate was also tested and recorded. The results of these tests showed that the test subjects who liked Rap (Hip-Hop) were more prone to be angry or mad and slightly agitated when listening to Country or Pop, as seem in their heart rate and mood. The tempo was very energetic and uplifting for each song, but some found it calming or rather depressing.

The Affect of Color on Pulse and Blood Pressure

Abby Quadhamer
Wilcox-Hildreth Middle School – Marilyn Hays

It has been proven that a variety of colors have an affect on moods and heart rates. In this project the questions was asked, How Does Color Affect Pulse and Blood Pressure? It was hypothesized that red would cause blood pressure and pulse rates to be higher. It was also hypothesized that the color blue would cause people’s pulse to be most stable and lower than those of red. To test this hypothesis, students were seated in a dimly lit room. Students were asked to stare at a color cube while their pulse and blood pressure was monitored. Results were recorded. Five colors, red, blue, green, white, and a rotation of these colors were tested using the above procedure. Test data concluded that the color with the highest pulse rate for girls was Red, with an average pulse rate of 85.2 bpm. The color with the lowest pulse rate was the variety of colors, with an average pulse rate of 78 bpm. The lowest blood pressure was red with an average of 110/66 and highest was green with an average of 120/72. As for boys, the color with the highest average pulse rate was the variety of colors with 67.2 bpm and the lowest was red with an average 63.6 bpm. For Blood Pressure the highest color was Red with an average of 121/80 and lowest was Green with an average of 114/67. Knowing the physiological affect color can have may affect choices in color for various locations around us.
Category 4 – Cellular and Molecular Biology

Battleground Against Bacteria

Dawson Jacobus
Hastings Middle School – Bailey Johnson

My project was about which hand sanitizer would work the best between Purell and Germ-X. The reason I did this experiment is to see if I didn’t have an option to wash my hands which hand sanitizer would I want to use to avoid unwanted bacteria and illnesses. For example if you were in the rush to get to an airplane at an airport and you were in the middle of flu season you might want some protection. My hypothesis was, if I test the hand sanitizers Purell and Germ-X to see which one eliminates more germs, than I think that Purell will eliminate more germs. I did this experiment by swabbing my hand with a Q-tip before hand sanitizer and then swabbing it again after using hand sanitizer. I tested each hand sanitizer 3 times then calculated an average of the amount of bacteria. I soon found that after I looked under a microscope that my hypothesis was rejected. Germ-X (26 bacteria counted) had the lowest average compared to Purell (27.6 bacteria counted) in the amount of bacteria each microscope slide contained. Overall I did this project because I see myself over and over not washing my hands and having to use hand sanitizer as an alternative so I wanted to see which one worked the best. I learned that Germ-X was my answer and I now know which one I would need to use in these situations.

Labels? Instructions? Does it Matter?

Mikey Hernandez
Hastings Middle School – Bailey Johnson

I did my science fair project because my mom is a cleaning lady. One day she asked me “Which cleaner would clean the best for tables?” So, because science fair was coming up, I took a twist on that idea. The hypothesis I based my experiment on was if I use 4 cleaners on my kitchen table surface, then I predict that Lysol will get rid of more bacteria than the other. To execute my experiment, I took a cotton swab and I swabbed it on my kitchen table surface. After that, I used a cleaner from my test cleaners, and tested them. After that, for each one, I used a cotton swab and rolled it over the surface, and put it under a microscope to see how many bacteria were left. After looking in the microscope, I could accept my hypothesis. Lysol had the least bacteria of all 5 of my cleaners. My science fair contributes in the life of many cleaners. Because of my experiment, I now know that I could buy soapy water and almost have the same results as Lysol.

Category 5 – Chemistry

Hissing Hissing
Rosalinda Perdomo
Overton Public School – Sarah Bennett

The purpose of my experiment was to see how long it would take for Carbon dioxide to release from a warm bottle or a warm can of Coke-A-Cola. I hypothesized that the warm bottle of Coke-A-Cola would take the longest to release the Carbon dioxide. In order to test this I timed how long each container hissed after I opened them. The bottled Coke-A-Cola lasted for 11 minutes. The can of Coke-a-cola lasted for 10 minutes. Based on this I accepted my hypothesis.
Squirt Squirt
Alexandria Altwine
Overton Public School – Sarah Bennett

The purpose of my experiment was to see which stain remover works best when removing a chocolate syrup stain: Resolve or an off-brand. My hypothesis was that the Resolve would work better than an off-brand. To test this I placed ½ a teaspoon of chocolate syrup in four different spots and let it sit for 5 minutes. After 5 minutes I put 5 sprays of the resolve on the stain. I waited 2 minutes before scrubbing the stain. I repeated this process every 5 minutes for 20 minutes for both stain removers. When I tested the syrup the first time for 5 minutes resolve worked best. The 20 minutes for both did not work that well. I decided to conduct a second trial I tested the syrup with 2 more sprays than before and let the stain remover sit for 2 minutes. For the second test I found that the off-brand worked better than the Resolve stain remover. Due to this I accepted my hypothesis because I thought that the Resolve would work better.

Endothermic and Exothermic Reactions
Macy Unick
Ravenna Junior High – Stephanie Rodenborg

An exothermic reaction describes the process that releases energy in the form of heat. The process that absorbs energy in the form of heat is the endothermic reaction. These reactions are opposite of each other.

The procedure to determine which reaction would occur started by mixing liquids and additives together and comparing the starting and end temperatures. Each trial started by measuring the temperature of one half of a cup of the test liquid. Then an additive was added to the liquid to create either an endothermic or exothermic reaction. The final temperature of the reaction was recorded after waiting two minutes for the mixture to react. The change in temperature of each reaction was calculated by subtracting the final value from the initial value. Every experiment has safety concerns and it is important to be careful not to splash the solutions to avoid injury of the eyes, skin or damage any work surfaces.

The results of most reactions ended with a temperature either increasing or decreasing. The end result determined whether the liquid and additive mixture was an endothermic or exothermic reaction. The conclusion of the experiment showed exothermic reactions had more energy than the end product. The extra energy was given off as heat making the temperature rise when the liquid and additives were mixed. The endothermic reaction absorbs energy, therefore, the temperature decreases and the mixture feels cool. The reactions are opposite of each other and they show different results.
Minty Sensations
McKenna Schmidt
Ravenna Junior High – Stephanie Rodenborg

Mint likes to grow in cool areas and it is often noted as having a cooling effect when consumed. Mint flavored gum, hard candies, and breath fresheners all have this effect but, does mint actually lower temperatures to produce this cooling effect? The hypothesis for this experiment is, if mint is added to room temperature water, then the water temperature will not change.

To prepare for the experiment, the experimenter will label two glass cups, glass one and glass two, three different times and fill all with room temperature water. Then, the temperature of the water needs to be measured before the experiment. To begin the actual experiment, the experimenter is to add three mints every five minutes to the trial one glass and record data. Then, repeat two times. The second glass in each trial is to be used as a reference. This is due to the fact that we know water temperature may change over time and we want to make sure that if there is any change in temperature, it is not independent of time, but of the mints speeding up the cooling process.

At the end of the experiment, there was no change in temperature at all. The starting temperature in trials one, two, and three were 16 degrees Celsius. After thirty minutes of adding mints, the temperature had not changed. In conclusion, the hypothesis for this experiment was supported. The temperature of water will not change when mint is added to room temperature water.

Category 6 – Computer Science

The More It’s Fixed the Smoother the System Works
Johnny Nguyen
Hastings Middle School – Bailey Johnson

My family always asks me for help about what is wrong with their computer or laptop. So I told them step by step how to fix it. This is the purpose I chose for my project. My dad motivated me when I was a kid because later in life I will learn the things I need for electronics or devices. If loading all threats on a computer or laptop than, I predict that Webroot will fix the virus and be more accurate than Norton. The secure system were tested on a laptop (Toshiba) with a CD of Webroot and a system of Norton by timing the duration it took to remove the threats (Independent variable) which the 50 threats were coming in from files I had running (Dependent variable). During the process of my experiment was that my last 3 trials were different on both Webroot and Norton. They both have a unique way of fixing a threat because Norton took its time memorizing the threat but the last 3 went really quick which was 2 minutes and 50 seconds to remove the threat from the computer, as Webroot took longer at the end, which was 3 minutes and 10 seconds. When I got to my conclusion I have to reject my hypothesis because Norton did better than Webroot because it took its time to memorize the threat it came from while Webroot forgot the threats which surprise me by their unique way of the process of removing the threats.
Robotic function this project was completed using the voxCad program. It allows virtual robots to be built simulating hard and soft tissue movement. Cubes simulating these tissues are arranged to produce the desired movements. The question was asked: Which combinations of cubes (tissue) are needed to create the fastest moving robot? It was hypothesized that the robot with the slim body and strong base would be the fastest. Tissue blocks were organized to simulate muscle and bone that flex and move. To test this in a virtual world of the computer, three tissue combinations were constructed. Movement was tested for the fastest speed using the simulation. The time necessary to get from the starting position to off the screen was recorded. The first robot exited in 0.6 seconds, the second in 0.9 seconds and the third in 0.4 seconds. The speed and body types were compared. The slimmer robot with long strides, was the fastest. The second robot had the biggest body, but not as long of a stride. The first was fast and had a slim body but not a long stride so it fell behind the third robot, which had a long stride and a slim body. With practice it seems possible to produce any desired type of movement. This application may be useful in designing prosthetic limbs, perhaps by creating them on voxcad and printing them using a 3D printer.
Does Sandy Soil Work Best?

Jacque Beahm

Hastings Middle School – Bailey Johnson

While doing this experiment many adversities were faced. The point of my experiment is trying to see in some types of conditions if a plant would grow in sandy soil or soil better. If someone is a gardener or a florist they might want to know the data. Telling them is so that they can have this feedback for other purposes. It depends on your job if I changed their daily business, because people who have jobs that have nothing to deal with gardening. Depending on everyone else’s procedures in the world I could of developed a new procedure or process for other people who have tried mostly everything they could find to get their plants to grow properly. From here on out the data from this experiment and everything else may have helped others. If I test a plant to grow in soil and another in sandy soil, then the plant growing in soil will have greater height. After doing the experiment my hypothesis was rejected, so a problem wasn’t possibly solved. My approach to doing this experiment was simple I wanted to test another project in the same field, but it wasn’t possible, so I did some research and found my project. After collecting data I found that a plant growing in sandy soil turned out with a 6.88 will have very little greater height over normal soil that had a 6.24 centimeters. Yes I did meet my objectives, even though my hypothesis was rejected.

Star Light, Star Bright

Lillian Kingsley

Hastings Middle School – Bailey Johnson

In my experiment, I investigated the number of stars I could see at any 5 given locations around the Adams County area. I have always personally been very interested in astronomy and stars in general, so this project was a great opportunity to look further into a topic that I really enjoy.

My hypothesis was that if I test 5 different locations around the Adams County area and count the number of stars I could see per one point in the sky, that the Sachtleben Observatory would be the best place to view stars. In order to find the average number of stars I could see per one point in the sky at any given location, I took a toilet paper roll, held it to my eye, and counted the number of stars I could see through the tube. I moved my tube slightly around the skyline 10 times for each location, and found the average number of stars.

After collecting my data, I concluded that the Sachtleben Observatory was indeed the best place to view stars. At any given point in the sky at the Sachtleben Observatory, one can see about 13.2 stars according to my data analysis. Overall, I thought my project was a successful one, and I accepted my original hypothesis.
A Low Cost Alternative UV-Visible Spectrophotometer

Baylee Diefenbaugh
Elwood Public School – Chelsey Neville

The problem this research came from was the lack of a reliable UV-Vis for high school science. Most UV-Vis spectrophotometers are hundreds to thousands of dollars and may not be affordable to high schools. The hypothesis was if the proposed plan was followed, then a reliable UV-Vis could be created using low cost materials. The set up of this device used legos for the support structure, leaving space for a cuvette, and creating a moveable arm by attaching a hinge using epoxy. A diffraction grating was used to focus the beam of light from a simple LED light source. Light was detected using a photodiode attached to the moveable arm. A multimeter was used to detect voltage at various angles and, using De Broglie's relationship, absorbance was calculated for various angles, where relate to wavelength via the Fraunhofer diffraction formula. Results were compared to values obtained from a Perkin Elmer UV-Vis spectrophotometer and known calibration samples.

Hot Bulbs

Preston Shively
Overton Public School – Sarah Bennett

The purpose of my experiment was to see which was hotter a C.F.L or a L.E.D light bulb. I hypothesized that the L.E.D. would be hotter than the C.F.L. To test this I made a lamp board using a piece of plywood with two sockets so I could test the two light bulbs at the same time. After screwing in the two light bulbs and before plugging them in I took the starting temperature of each bulb: C.F.L. was 64.1 F and the L.E.D. was 65.8 F. For each test I would allow the light bulb to heat up for 30 seconds and then let them cool for 5 seconds before testing again. I also took the temperature of the bulbs at the beginning of each test. I did this three times worth. On average the C.F.L. had an ending temperature of 91.4F and the L.E.D. had an ending temperature of 70.6F. I rejected my hypothesis because the L.E.D. was not hotter than the C.F.L.

Paper Towels

Anna Brennan Brennan
Overton Public School – Sarah Bennett

The purpose of my experiment was to see what brand of paper towels, Viva or Bounty, would absorb the most water. I hypothesized that Viva would absorb the most water. For each brand of paper towel I put 20mL of water into a measuring cup and placed one sheet of paper towel into a bowl. I poured the 20mL on top of the paper towel. I waited 1 minute before I rang out the paper towel into the measuring cup in order to see how much water was absorbed. I repeated this 2 more times. The average amount of water absorbed for Viva was 15mL compared to Bounty that had an average of 10mL. I accepted my hypothesis because Viva had absorbed the greatest amount of water.
Lawn Mower Grass Level Indicator: Is Your Lawn Mower Bag Full?  

Evan Blank  
Wilcox-Hildreth Middle School – Marilyn Hays

The purpose of my project was to develop a grass level indicator that lights up when the lawn mower bags are full. I hypothesized that my lawn mower grass bag level indicator light will tell me that the bags are full. I used red and black wire, wire ends, limit switch, fuse holder, light, aluminum angle iron, rubber grommet, bolts, and nuts. I drilled a hole through the plastic dash of the lawn mower with a drill bit for the light. The light was installed into the hole.

Another hole was drilled through the aluminum angle iron bracket to mount the limit switch. I labeled the wires ground, power and signal on both ends. The power wire and signal wire were hooked up to the limit switch. This wire was also hooked to the light.

My lawn mower grass bag level indicator was ready to be tested. When the bags are full, the grass pushed against the limit switch and closes a circuit which sends power to the light which makes it come on. My grass bag level indicator will prevent grass from plugging up the grass chute which can cause delayed time and extra wear and tear on the engine. My grass bag level indicator is a safety device that should be installed on lawn mowers. My grass bag level indicator would benefit every person that mows lawns. The cost of materials for my project was around $50.00.

Category 9 – Engineering: Materials/Bioengineering

Which Size of Truss Bridge Holds the Most Mass?  

Clara Lauby  
Elwood Public School – Chelsey Neville

The purpose of this experiment is to determine if a smaller truss bridge will hold more mass than a larger truss bridge. The hypothesis was if a bridge is more massive, then it will have greater bridge efficiency. Two truss bridges were built, one with smaller dimensions and one with larger dimensions. Then they were tested to see how much sand each of them could hold by attaching a S hook to a piece of twine that was tied around the handle of a bucket. Then, small amounts of sand were poured into the bucket. The smaller bridge held quite a bit but still broke faster than the larger truss bridge. In conclusion, the larger truss bridge was sturdier than the smaller truss bridge.

Scorching Water in Cups  

Haley Fleischman  
Overton Public School – Sarah Bennett

The purpose of my experiment was to find out what kind of cup: glass, paper, plastic, or Styrofoam, would keep the liquid (water) above 80°F the longest. I hypothesized that the Styrofoam cup would keep the liquid above 80°F the longest. In order to test this, I heated the water in a KEURIG till 175°F. Each cup had approximately ¾ cup of water. I placed a thermometer in each cup. When the temperature hit 80°F, that particular cup was done being measured. The Styrofoam cup kept the water the warmest for the longest period of time, which was 90 minutes. The glass cup lasted 75 minutes. The plastic cup lasted 70 minutes, and the paper cup lasted 55 minutes. I accept my hypothesis, because the Styrofoam was the cup I guessed would keep the water the longest.
Alternative Flour for Chocolate Chip Cookies.
Chelsea Garrett
Wilcox-Hildreth Middle School – Marilyn Hays

In recent years there seem to be more people who are gluten intolerant. Several alternatives to wheat flour have come out on the market in the past few years. The question was asked; how will different kinds of flour products affect chocolate chip cookies?

It was hypothesized that it is possible to produce a high quality chocolate chip cookie with different kinds of flour, including gluten free varieties that will be of good quality and tasty. To test this hypothesis, chocolate chip cookies were baked using Coconut flour, whole-wheat flour, almond flour and All-purpose flour.

All of the cookies were baked using the same basic chocolate chip cookie recipe. When all the different cookies were tasted by 21 subjects ages 12 to adult, the generally most preferred cookies were the ones made with All-purpose flour. However the second best choice was the cookie made with Almond Flour. This suggests that with a little creative manipulation baked products can be made using gluten free flour.

How Strong are Your Grocery Bags?
Juliet Billington
Wilcox-Hildreth Middle School – Marilyn Hays

No one wants to drop their groceries or the contents of their shopping trip because of a plastic bag tearing. The purpose of this project was to determine which stores shopping bag was the strongest. To find out, shopping bags were collected from Holdrege market, Wal-Mart, Ace, Shopko, and Hy-Vee and were placed on a rod and were weighed with 2 lb. bags of corn and other weights. Weights were placed in the bag until it ripped and then the weight present at that time was recorded, along with where it ripped. Following the test it was determined that the Holdrege Market was the strongest bag because it held 66.5 pounds. There was a tie for second. The bags from Menards, and Wal-Mart each held 53 pounds. However the Wal-Mart bag broke in multiple places showing that the overall strength was weaker in the main part of the bag. This indicates that all of the bags will probably hold all the weight an average person would want to carry. If you have any sharp corners on anything in the bag the result would likely change. Because sharp corners can put pressure on the bag which might cause the bag to make a hole. The third strongest bag is the Shopko bag because it held 48.5 pounds. The fourth strongest bag is the Hy-Vee because it held 47 pounds. The weakest bag is the Ace bag because it held 38.5 pounds.
Solar Reflector for Water Purification

Clayton Nichols, Ryan Smith
Wilcox-Hildreth Middle School – Marilyn Hays

Contrary to popular belief water does not need to be boiled to make it safe to drink. Heating to 150°F for 5 minutes causes a reduction of water-borne microbes that cause disease. The purpose of this project was to design a solar reflector that can raise the temperature of water to this extent. The design objective was to use a car sunshade to accomplish this goal. A sunshade was curved into an oval form to catch as much sunlight as possible. The effectiveness was tested by placing it in a location facing the sun. The temperature was measured. Initial test results showed that on a partly overcast day with cool outdoor temperatures the solar reflector only reaches about 100°F. That temperature is not hot enough to sterilize water. Tests were continued and it was determined that adding an artificial light source such as a light bulb increased the temperature to an acceptable level. This suggested that more intense sunlight would also increase the temperature to the level needed to meet the established goal. Testing on a very sunny day was completed on a later date. The results of this test showed the temperature quickly rising to over 190°F. Now that a desired temperature has been accomplished, tests will be conducted to raise the temperature of water to the desired level under the conditions described. It is believed that this simple solar reflector may be an efficient way to free water of disease causing microbes in remote areas.

Which Cake is Better?

Bryanne Lieb
Wilcox-Hildreth Middle School – Marilyn Hays

People bake cakes for special occasions and want their cake to be enjoyed by those attending the special occasions. The question was asked: Which brand of cake has the best flavor, texture and is best to bake with? It was hypothesized that Pillsbury will be moister and taste better. Chocolate Cake mixes, one from each brand were chosen and mixed following the manufacturers instructions. Each cake was cooled and then covered to maintain moisture. The next day the cakes were measured and then tasted by several volunteers. Measurements taken showed that the Pillsbury cake had risen highest. Pillsbury was a lot more moist than Shur Fine. Shur Fine was an okay taste. More testing with different flavors would be needed to know if these results are consistent across the brand when other flavors of cake mix are used.
Category 10 – Energy and Transportation

See the Light

Lucy Nielson
Hastings Middle School – Kristen Slechta

Color is all around us, and it is a truly amazing thing. We see it everyday, but do not really understand how incredible it is. But what exactly is color? My project looks at dye and exactly what wavelength we are seeing when we look at certain colors. I built a spectrophotometer, which shows the color spectrum when light is shone through dye. After taking pictures of the spectrum of each of my four colors (red, yellow, green, and blue), I inserted the images into my CellPhone Spec program. This program enabled me to create a graph to see the wavelength of each color. I discovered that each color has a very unique wavelength, which is why we see so many different shades of every color imaginable. The wavelength of every color in the dyes was seen, especially with green, a mix of blue and yellow. The red had an average wavelength of 432.67nm, the yellow was 418nm, the green had two: 406 and 643nm, and blue had an average of 462.67nm. My project may interest artists or lighting designers, and optometrists or researchers in color and light like photometrists. I discovered many new things while doing my project, and it opened a door to much more research on this fascinating subject. I very much enjoyed this experiment, and I would love discovering more in the future.

Volumetric Thermal Expansion of Water

Jefferson Mai
Hastings Middle School – Bailey Johnson

The theoretical volumetric expansion equation is used to predict changes in volume in accordance to changes in temperature. My project looks at how close I can experimentally get the expansion of water to the prediction of the theoretical equation. The water was put in a flask, heated up by different wattages light bulbs (independent variable), and calculated how much it rose up the two glass tubes (dependent variable). My hypothesis was that the percentage difference from the results of the experimental and the results from the theoretical will be close. The experimental results supported my hypothesis for the 25 wattage light bulbs. There was a 5% difference between experimental and theoretical, the 40 wattage light bulb had a 23% difference, and the 60 wattage light bulb had a 27% difference. The experiment showed that the results will be close when there are small temperature changes. As the temperature increases, the difference between theoretical and experimental increases as well. The theoretical expansion was always greater than the experimental expansion.

Baseball Bats Bats Bats

Paetyn Florell
Overton Public School – Sarah Bennett

The purpose of my experiment was to find out if the length of the bat affected the distance the baseball traveled. I hypothesized that the longer the bat the farther the ball traveled. I tested this by taking two baseball bats of different lengths, one 29-inch long bat and one 34-inch long bat. I had the pitcher stand the same distance away from home plate. I started with the 29-inch long bat, and I measured the distance from home plate to where the ball hit the ground with the meter tape. I repeated the steps two more times with the 29-inch bat and three times with the 34-inch bat. When I hit the 34-inch bat the distances were 11 meters, 11 meters, and 23 meters. When I hit the 29-inch bat the distances were 18 meters, 18 meters, and 11 meters. The average distance for the 34-inch bat was 15 meters and the average distance for the 29-inch bat was 16 meters. I discovered that the length of the bat did affect the distance the ball traveled. I reject my hypothesis because the 29-inch bat hit the ball further than the 34-inch bat.
Pop Pop Pop
Alexis Barnes
Overton Public School – Sarah Bennett

The purpose of my experiment was to find out which brand of popcorn would leave the fewest un-popped kernels: Secret Pop or Orville Redenbacher. To test this I microwaved each type of popcorn separately for two minutes. Once the popcorn was done I poured the different brands into separate bowls and counted the un-popped kernels. I repeated this two more times for each brand of popcorn. I discovered that Orville Redenbacher had the fewest un-popped kernels compared to Secret Pop. I accept my hypothesis because I thought that Secret Pop would have more un-popped kernels.

To Melt or Not to Melt
Zoey Reeves
Overton Public School – Sarah Bennett

The purpose of my experiment was to see which brand of chocolate melted fastest in the sun. I thought Hershey’s would melt faster than Kit Kat. I used a Hershey’s plain candy bar that was 1.0 oz. and a Kit Kat bar that was 1.5 oz. in size. I placed each candy bar on a paper plate with the wrapper off in a window seal with direct sunlight. The experiment took two hours and forty-five minutes. I checked the candy bars every 45 minutes. I found that Hershey’s melted faster than Kit Kat. I accepted my original hypothesis.

Weight of Baseball Bats Bats Bats
Rachel Ecklund
Overton Public School – Sarah Bennett

The purpose of doing my experiment was to determine which bat, a 22 ounce bat or 19 ounce bat, would allow me to hit a baseball the farthest. I hypothesized that the heavier the bat is, the farther the ball would travel. To test this I hit both of the bats separately. After each hit, I measured the distance the ball traveled. I did three trials for each bat. On average, the 22 ounce bat allowed the ball to go 12.03 meters and the 19 ounce bat allowed 10.23 meters. I discovered that the ball went further when it was hit by the 22 ounce bat. I accept my hypothesis because I guessed that the ball would go further when it was hit by the heavier bat.
Many people today still have fireplaces that they use for comfort and heat. That means many people would have a need to know which types of wood will burn most effectively in their fireplaces. The question was asked; what wood will burn the longest and the hottest in a controlled environment? It was hypothesized that the deciduous woods would burn longer and hotter. To test this question four types of wood were used. They were Pine, Cedar, Oak, and Cottonwood. Each type of wood was harvested and bundled into packages of equivalent volume. Each sample was then burned in a small wood-burner. The length of time that it burned and the hottest temperature were recorded and analyzed. The process was repeated and the results were compared and averaged for each sample type. The Pine and Cedar are classified as coniferous trees or soft woods, and the Oak and Cotton are classified as deciduous trees or hard woods. This test suggested the best wood for burning appears to be the Oak with the hottest point being 560 degrees and continuing for 6 minutes and 22 seconds. The least effective seemed to be Cedar with the hottest point recorded at 300 degrees and the length of burn 3 minutes and 49 seconds. It was concluded that hard woods tend to burn longer and hotter than the softer coniferous varieties of wood.

Category 12 – Environmental Sciences

Does Urbanization Affect Nitrates in Water?

Taylor Hickey
Elwood Public School – Chelsey Neville

Problem: Nitrates in water affect fish and other wildlife that use the water source. Nitrates come from feces and urine of animals, and over fertilization of crops, so levels are not easily controlled unless the water source is drained and cleaned out, like in a manmade lake or reservoir.

Hypothesis: It is believed that water in areas of higher urbanization will have higher levels of nitrates because of higher chance of pollution due to society.

Methods: A nitrate test kit was used to test samples in urban and rural areas for nitrates. Five tests were taken from each location. Color comparison was used to determine the level of nitrates in each solution.

Results: The results of the experiment support the hypothesis that areas of more dense urbanization have higher levels of nitrates; however, it may be necessary to test more sites and take more samples to solidify this conclusion. It is shown that there are higher levels of nitrates in this public pond. As previously stated, nitrates mostly come from feces and urine, and runoff from over fertilized crops. There is a substantial number of geese, ducks, and fish in this environment, as well as neighboring lawns, making the results relevant to this location. Another factor to consider, is that the creek has fresh water pulsing down it all the time, and the public pond is fairly stagnant. The public pond’s water circulates throughout it due to pipes connecting the three sections and a water fountain to maintain oxygen levels.
Scented Feeling

Annie Wu
Hastings Middle School – Bailey Johnson

Smell is a powerful sense which we use everyday. The odor of sweat coming from people who were just in gym could be worse without deodorizer or perfume. My question was does smells affect how you feel? My hypothesis was that if I used nice “light” smells then I predict that the test subjects would feel soothed. I simply used smells that I had available and put them on Popsicle sticks to give to my test subjects to smell. Then I just took the data based on how they feel. One of my test subjects had rated all the smells 4 which is soothing. I accepted my hypothesis because at least one of the test subjects found these nice “light” smells soothing. This research should help perfume makers make better smells for people to enjoy.

Seeing Without Sight

Andrea Gaston
Overton Public School – Sarah Bennett

The purpose of my experiment was to find out if people could identify 10 objects without using sight as one of their senses. I hypothesized that people would be able to identify 5 of the 10 objects correctly without using their sight. To test this I used 10 objects, a blindfold, and 3 subjects. I took one subject and blindfolded them, then I presented an object to them and recorded whether they could identify that object. Subject 1 got 9 out of 10 objects correct, Subject 2 got 6 out of 10 objects correct, and Subject 3 got 6 out of 10. On average the subjects combined got a 7 out of 10. I rejected my hypothesis because the subjects were able to identify more objects on average than I had thought.

Category 13 – Mathematical Sciences

Stretch

Isaiah Brant
Hastings Middle School – Bailey Johnson

The point of my experiment was to test whether or not stretching improved running time. I tested the variables no stretching, half stretching, and full stretching to discover if stretching did indeed help. I thought this experiment would not only be fascinating but I thought it would be important to know for, not only me, but for coaches, athletes, trainers, and physical therapists around the globe. My question I wanted to answer was "Does stretching affect running time." I decided to put my family to the test. I have five members in my family including myself.

We ran nine quarter miles, three for each variable (no stretching, half stretching, and full stretching). After Nine quarter miles, I rejected my original hypothesis which was that "If I test five people including myself and my family using the variables no stretching, half stretching, and full stretching then, stretching will not have any affect on the running time." The average full stretch improved running time by more than 15 seconds faster than the average no stretching time. While average half stretch improved running time by almost 11 seconds faster than the average no stretching time. Overall I was extremely pleased by my results as I found out how important it is to stretch!
How Does Noise Effect the Probability of a Free Lay-up?  
Skye Knaus  
Wilcox-Hildreth Middle School – Marilyn Hays  

Through the years, the game of basketball has been getting more intense and more popular. Games can become noisy as the crowd gets involved in the game. When someone gets a steal, the crowd goes wild. The question was asked; does making a loud sound while someone is shooting lower his or her percentage of makes? It was hypothesized that with loud sounds, a person will shoot a lower percentage than with no sound. Suggesting that the intense noise will decrease the probability for a successful shot. To test this, people were asked to shoot lay-ups with no distractions, and then shoot the same amount with distractions. After running this test, it was found that 57% performed worse with distractions than they did with no distraction. The hypothesis was correct. I further hypothesize that the percentage that performed the same or higher are people who are better at tuning out sounds that don’t apply to what they are thinking about.

Category 14 – Medicine & Health Sciences

Clock Face Conundrum  
Corianne White  
Hastings Middle School – Bailey Johnson  

Is one gender faster at speed of processing in the brain than the other gender? For my project, I printed off pictures of clock faces displaying different times, then I used a stopwatch to time how long it took eighth graders to call out the time displayed. I tested each eighth grader, three boys and three girls, individually, and I had each participant read three clock face pictures. My hypothesis was that girls would be able to process and relay information more quickly than the boys. I reject my hypothesis because boys actually had faster average times than the girls, although only by a small margin.

Let it Mold  
McKenna Schneider  
Hastings Middle School – Bailey Johnson  

Fast food is a major part of society today. And everyone eats out every once in a while. I wanted to know which fast food cheeseburger is the better choice! To find this out, I compared sodium and the rate of decay in McDonald’s, Burger King, and Runza cheeseburgers. Basically, I let the cheeseburgers mold and compared it to sodium levels. My hypothesis was, if I test fast food cheeseburgers, then the McDonald’s cheeseburger will contain the most sodium and will decay last! The results were not a surprise. The McDonald’s cheeseburger with a whopping 68 grams of sodium did not mold after 30 days! The Burger King with 63 grams of sodium in it molded on average of 17 days. And the Runza cheeseburger with only 53 grams of sodium in it molded on average of 14 days. In conclusion, sodium does affect decay in these fast food cheeseburgers, however they are not the only factor in the rate of decaying time. Refined sugar is another big ingredient that is filled with preservatives. As you can see, from my results the Runza cheeseburger is the best out of the three. So I would like to encourage you next time you are trying to decide where to go get lunch, make the healthier choice! And eat in moderation! It is impossible to have a perfect diet in this world, but there are choices! And the everyday changes can make a big difference in the future!
**Splashletes**  
Danny Vuong  
*Hastings Middle School – Bailey Johnson*

Hydration, its an important factor for us humans. Through the past decades drinks have evolved to support our hydration requirements. Now there are 2 drinks competing with each other claiming to help you keep hydrated during vigorous sports. This project dives into the depths of the two drinks and how long they could keep you hydrated. The test subjects were tested on how long they could withstand being hydrated before feeling dehydrated and started to sweat. The subjects were tested in a gym doing intense basketball drills. Which both test subjects were basketball players which kept things fair. One drinking Gatorade and one drinking Powerade both of them were clueless about what they were consuming. The trials were tested 3 times at 2:00p.m exact everyday for a total of 6 days. With the drinks being the independent variable and their hydration times being the dependent variable. My hypothesis was that Gatorade would keep you hydrated longer than Powerade. The results I came up with corresponded with my hypothesis by showing a 1.9 difference in the averages of both drinks. The experiment shows that Gatorade keeps you longer in the game for about 2 minutes which to an athlete is very crucial and valuable time to preform all the hard work that you’ve worked for. As an athlete myself I was really excited, inspired, and motivated about this project to find out the real truth behind both products.

**The Music of Memory**  
Saylor Pershing  
*Hastings Middle School – Bailey Johnson*

For my project, I asked does music affect memory? How I tested this is I had three eighth grade girls play a memory game on my kindle while I timed them. First, they played it without any music playing, then they played it with a classical song playing and headphones in. I had them repeat this three times with one day in between each trial. My hypothesis was that if I test music and no music while someone is playing a memory game then their time will improve with music playing. The experimental results of my experiment caused me to accept my hypothesis. On average, students performed 1.89 seconds faster than without music. Two out of three people improved with the music playing, and on average all the scores improved with music playing. In conclusion, music does affect your memory.

**The Systolic Pressure of Becoming Vegetarian**  
Diego Hernandez  
*Hastings Middle School – Bailey Johnson*

My experiment was to see how not eating meat and eating meat affects your systolic blood pressure. I did this experiment because their are a lot of problems with blood pressure and keeping our bodies healthy. I did this so i can measure and see how eating meat affects your systolic blood pressure. Hematologist should care so they can use the research i found to see how to keep our blood pressure at a health rate. Also diabetes is a very big disease in America. Eating meat raises your blood pressure, so knowing how to control our blood pressure is a great way to stay in health. I found that if you stop eating meat it lowers the risk to hypertension, stroke, and having heart attacks. Something that was important was how you changed your diet. If you were to stop eating meat changing your diet plays a big role in health. i picked six subjects two stopped eating meat slowly. Two stopped eating meat instantly and the other two were already vegetarians. I had my two vegetarian be the control because i compared the other subjects blood pressure the the vegetarians blood pressure. My data showed that not eating meat is good for blood pressure, but you would have to find another source of protein to make up for what is you lost. Eating meat and not eating meat can be both healthy and not healthy.
Greased
Calli Weston
Overton Public School – Sarah Bennett

The purpose of my experiment was to find out which brand of potato chips has less grease: Lays classic or Lays Kettle Cooked. I hypothesized that Lays Classic had more grease than Lays Kettle Cooked. To test this I laid out paper towels in stacks of 6. I crunched the potato chips and left the potato chips from each bag on separate stacks for 5 minutes. I did this three different times. The first time the Lays Classic soaked through 1 more towel than Lays Kettle Cooked. The second time Lays Classic and Lays Kettle Cooked had the same amount of towels which was 5 paper towels. The third time they had the same result which was 6 paper towels. On average Lays classic had more grease soaked paper towels than Lays Kettle Cooked. I accepted my hypothesis that Lays Classic had more grease than Lays Kettle Cooked.

Investigation "Pop"
Lexi Reil
Overton Public School – Sarah Bennett

The purpose of my experiment was to see how strong or weak a person’s taste buds are based on the gender. I hypothesized that more girls were able to identify the types of pop than boys were. In order to test this I set up three groupings of cups. Group 1 had Sprite, group 2 had 7up, and group 3 had Sierra Mist. The test subjects did not know which pop was in each group of cups. Each subject filled out a form for each group of cups. They answered whether they liked the pop and which one they thought it was. There were a total of 40 test subjects. There were 20 girls and 20 boys. 18 out of the 20 girls identified the correct pop for each of the groups and 18 out of 20 boys identified the correct pop for each group. I rejected my hypothesis because more boys identified the correct pop for each of the groups of cups compared to girls.

Chemical vs. Natural Antibiotics
John Vacek
Ravenna Junior High – Stephanie Rodenborg

Antibiotics are a substance that an organism produces to ward off competition. Bacteria are the main organisms that create antibiotics and bacteria are prokaryotic cells that live everywhere.

The experimenter’s hypothesis was, “If chemical antibiotics work better, then the whole bacterial colony will die.” The experiment was conducted by introducing antibiotics into Petri dishes filled with bacteria. The materials that were needed to conduct the experiment were as follows: hydrogen peroxide, rubbing alcohol, green tea, honey, five Petri dishes, sterile swabs, permanent marker, and three pipettes. First, the experimenter needs to swab five different locations and wait 36 hours for the bacteria to grow. Second, introduce the antibiotics into the petri dishes and write down observations. Third, records how long it take for the bacteria to die. Fourth, repeat step 2. The controlled variable was the Petri dish that had no antibiotics in it. The independent variable was the type of antibiotic, and the dependent was how much of the bacteria was killed.

There were 2 different tests in this experiment. In test 1 of the experiment, there were no initial reactions when the experimenter added the antibiotics, except for the hydrogen peroxide. It fizzed and bubbled on contact. After coming back 36 hours later, the experimenter saw that most of the bacteria in the chemical antibiotic Petri dishes was gone. Some of the bacteria was gone in the natural Petri dishes but not a lot. Test 2 went the same.
Muscle Memory

Caleb Mundorf
Ravenna Junior High – Stephanie Rodenborg

Physical activity helps improve memory as one grows older, however will it help someone remember a paper for the next day? There were four types of activities held in this experiment including: sitting, stretching, lifting, and running.

This project needed four groups with five individuals in each. The first group would try to remember the words by sitting, the next group tried to remember the words by running, then lifting, and finally stretching. The experimenter created a list of twenty words for the participants to remember. They had to do this twice because this project required two trials.

In trial 1, the data chart revealed that sitting was the highest average number of words remembered. Right behind that type of exercise came lifting, then stretching, and then running. Trial two had minor differences than the first one. Stretching came in first, then sitting, lifting, and finally running. The reason for the outcome, was mainly because of multi-tasking. It is harder for the brain to focus on two things at once. Since running requires so much focus and hard-work; that type of exercise had the least number of words remembered. Sitting was usually one of the most remembered groups because the brain can focus on just one activity. Running is the strongest type of exercise and many scientists do agree that over-time running will improve the memory, but not for studying a paper for the very next day. Distractions were the main human errors in this experiment.

Testing the Relationship Between Eye Color and Sight

Sadie Fiddelke
Ravenna Junior High – Stephanie Rodenborg

Eye color affects the ability to identify colors in low light. The pupil grows bigger or smaller depending on the amount of light it receives. The color of the eye depends on genetic makeup which you get from your parents. If brown eyes are more dominant than green eyes, and green eyes are more dominant than blue eyes, then brown eyes will see colors better in low light.

First gather twenty people with different colored eyes around the same age. Next find different colors of paper and tape them to the farthest wall in the room. Then make sure the room is not completely dark but dimly lit. Next bring a blindfolded test subject into to the room and stand them on the side of the room opposite the wall with the colors. After that, close the door and take the blindfold off of the test subject and ask them to immediately state the colors from left to right; after two minutes ask them to identify the colors again. Then record their answers, repeat with each of your test subjects. In the end analyze your results calculate the percentage of the right colors said.

Green eyes saw the colors the best but not by much, next was brown followed by blue. They all saw the colors about the same. In conclusion, my hypothesis was not supported. So really the different eye colors do not really affect how you see colors in low light.
Category 15 – Microbiology

Fingerprints and Surface Temperature
Gracie Walker
Hastings Middle School – Bailey Johnson

Imagine sitting on a beach and sipping on a cold smoothie. Your mind may start to wonder, and possibly in the direction of fingerprints. Does the surface temperature of glass affect the quality of fingerprints? I wanted to know this because I plan to become a forensic scientist when I am older, and fingerprints will play an important roll in my job. I think the CSI, FBI, and forensic scientists of many varieties would benefit from my test. I hypothesized that if I have two test subjects place their right thumbs on the surface of a cold glass with ink, I predicted that it would show up better than on a warm or room temperature glass. I ended up rejecting my hypothesis, and discovering that room temperature works the best. In conclusion, I made many mistakes such as using graphite and only having two test subjects.

Truly How Clean is My Eye?
Breanna Gilmore
Hastings Middle School – Bailey Johnson

I wanted to find out which soap cleans a prosthetic eye the best. The reason was quite simple, I have a fake eye and was curious to see if my eye was truly clean. People who should know about this experiment are: ocularists, eye doctors, people who care for a fake eye and lastly soap companies. Johnson baby shampoo is way cheaper than Equate contact soap, so when I found less bacteria on the eye after washing with baby shampoo it was beneficial. I hypothesized that Equate contact lens cleaner would be the best soap to clean my eye with. My independent variable consists of Equate contact soap and Johnson’s baby shampoo. My dependent variable is the number of approximate bacterial colonies. Through my 5 trials I only had the first trial where Equate had beat by approximately 16 colonies than Johnson. I later hope many people can benefit from this in years to come.
Category 16 – Physics and Astronomy

Battle of the Bats
Sam Wibbels
Hastings Middle School – Bailey Johnson

My experiment was to find out which type of baseball bat hits at the highest velocity, and by how much more it hits. The two types of baseball bats I used were a Demarini aluminum bat, and a Louisville Slugger wood bat. I hit 30 balls with each bat off of a tee, and I put a radar gun on a tripod on the level that the balls were being hit. The reason I did so many hits for each bat was so that I could get a larger sample size, and therefore a more accurate viewing of the data. After I did these tests, I found that the aluminum bat hit with an average velocity of 73.85 miles per hour, and the wood bat with an average velocity of 68.6 miles. As you have probably already figured, that means that there is a 5.25 mile per hour difference between the two bats, with the aluminum dominating the aluminum. After doing some simple arithmetic, I found that there is a 7.6 percent difference between them. This may not seem like that huge of a difference, but that can mean the difference between a wimpy double and a heroic home run. This is why Major League Baseball will never be able to make the switch from wood to aluminum, because number one, it would be very dangerous, and second, it would completely change the record books. Home run numbers would soar through the roof, and this would be detrimental to the records set by Babe Ruth and Hank Aaron. I accepted my hypothesis that the aluminum bat would hit with a higher velocity, and my conclusion is that an aluminum bat hit with a higher velocity than that of the wood bat.

Embolen the Art
Sarah Waite
Hastings Middle School – Bailey Johnson

Dance studio owners are often debating on which floor is best to teach young dancers on, but what floor has enough traction for turning and isn’t as costly as natural hardwood? My experiment looks at which floor, vinyl tile or tile, has a better quality for a simplified pirouette turn. The vinyl tile and tile (Independent Variables) were tested by two trained dancers and two people without any training. Each test subject had three trials of pirouettes on each floor. The accuracy (Dependent Variable) was tested by the number of turns completed and how long it took for each turn to be completed. My hypothesis was that if I tested vinyl tile and tile for accuracy then the vinyl tile will have superiority over tile when doing pirouettes. The experimental results supported my hypothesis by showing that not only did the vinyl tile have four more completed turns, twenty-five, but an astonishing lower time of 16.19 compared to the tile with twenty-one turns in 19.52 seconds.
Shooting Science

Sierra Kyle

Hastings Middle School – Bailey Johnson

When playing the game of basketball, many coaches have different methods when it comes to shooting hoops. Many say your shooting percentages are affected by where you receive a pass, so I wanted to create an experiment that tested that statement. “Does the place you catch a basketball, (high, medium, or low) affect a player’s shooting percentage?” was the question that I was determined to answer. My hypothesis was that I thought the shots from the medium height would show the best results because that is consider the best place to shoot from by many coaches. I tested 3 different heights of where the shooter would receive the pass and shoot the shot: above the shoulders (high), between shoulders and waist (medium), and below the waist (low). Using 3 different girls that play basketball as my test subjects, I had each of them shoot 10 jump shots from the free throw line at each height level. My results from the 30 total shots from each height showed that the “high pass shots” had the best average shooting percentage, winning with 16/30 shots and 53.33% over the 46.66% and 40% by the medium and low pass shots. I came to a conclusion that the high pass shots are more effective, because they give you a higher arch, or trajectory, to the basket, making the shots more accurate. Even though my experiment was a success, I had to reject my hypothesis. Overall, this experiment can greatly improve the game of basketball.

Super Soccer Balls

Taigan Trew

Overton Public School – Sarah Bennett

The purpose of my experiment was to find out how far a soccer ball would go when aired up or deflated to 7psi, 5psi and 3 psi. I hypothesized that the deflated ball would go less than the aired up ball. The soccer ball I used for my experiment was a size 4 (for my age group). I aired up the soccer ball to psi of 9 as a control since this was the recommended psi. I kicked the ball and recorded the distance it went. For my experiment I released the air pressure from the soccer ball to the predetermined psi and then kicked it and measure the distance the ball traveled. On average the 7psi ball went 5.79 m, the 5psi ball went 4.57 m, and the 3psi went 4.88 m. I accepted my hypothesis because the deflated soccer ball went less than the fully aired up soccer ball.

The Strongest Bag

Elijah Heusinkvelt

Overton Public School – Sarah Bennett

The purpose of my experiment was to find out if a plastic bag was stronger than a paper bag. My hypothesis was that the plastic bag would hold more because of the stretch. What I did to test this was secure each bag in a 2 by 4 frame with clamps. I placed a 5-pound weight in the bag one by one waiting 5 seconds until I added the next weight. I repeated this for each bag two more times. On average the weight for the plastic bag was fifty-five pounds. On average for the paper bag it was seventy pounds. The paper bag held about twenty-five more pounds than the plastic bag did. I rejected my hypothesis because the paper bag held more weight on average.
Apparent Weight of an Object in Motion

Jeremy Schepler

Wilcox-Hildreth Middle School – Marilyn Hays

Apparent weight is the weight of an object in motion. Galileo Galei showed how objects dropped at the same time hit the ground at the same time because of apparent weightlessness. Can apparent weight be simulated in an elevator as it starts its ascent or descent? The question was asked: why does my stomach turn when I’m in an elevator? It was hypothesized that in a moving elevator, the apparent weight of the small mass will change with the movement of the elevator. If this were true, it would also result in the strange feeling in a person’s stomach while riding elevators. To test this, a small mass was attached to a spring scale. The mass was measured while stationary and then when the mass was moving both up and down in an elevator. This process was repeated five times, and recorded using a computer. When the elevator was going up the weight increased by twenty grams in respect to a two hundred gram mass. When the elevator was going down the apparent weight went down twenty grams using the same mass. The apparent weight of the mass increased or decreased by ten percent when the elevator first started moving. This increase and decrease of apparent weight may explain that feeling one gets in their stomach as the mass of the stomach gains or loses mass while moving up or down rapidly. Further research to determine how much affect the rate of speed has on this phenomenon is suggested.

The Physics of a Free Throw

Sidney Gruwell

Wilcox-Hildreth Middle School – Marilyn Hays

Have you ever shot free throws and, wondered why you sometimes missed? It was asked: What does an accurately shot free throw look like? It was hypothesized that when you shoot a successful free throw, it needs to be a constant height at its highest point.

To test this, 30 free throws were shot and videoed using an iPad application called DARTFISH. Shots were viewed in slow motion and controlled by a feature on the application that allows forward or backward viewing. When the ball reached the highest point, a screen shot was taken. The application let you draw on it, so an arc of the ball was drawn. That was done on every picture with three arcs on each shot. One arc was from your hand to the ball. One was from your eyes to the ground, and to the ball. The last one was from the ball that is still in your hand to the ground to the height of the shot. The arc of the shot was measured in millimeters.

The lines were drawn and the height was measured on the iPad. The results were put on an Excel document to be graphed. The results showed that most of the successful shots were about 3775.88mm at the balls highest point. When shots at that height were missed it is hypothesized that they were off just a little to the left or right. Videoing from a different angle to show the flight vector will be needed.
Category 17 – Plant Sciences

Green Means Grow

Kylie Hanna
Hastings Middle School – Kristen Slechta

My science experiment measured the difference in growth of six ivy plants when they are placed under different colored lights. I hypothesized that between green, blue, red, black, regular, and natural lights the green light would most effectively increase the growth of the plants. I grew the six plants for three weeks each under a different color of light. I measured each plant and repeated the process every three days. The conclusion to my experiment matched my hypothesis. The green light enabled the biggest increase in growth compared to the other five lights. Research shows that the ivy plant absorbed the green light and reflected the other colors, so the plant used the most energy from the green light. The average growth for the green light was 0.487% compared to the least growing plant, the red light, which had an average of 0.187%.

Flavored Popcorn

Becca Larson
Ravenna Junior High – Stephanie Rodenborg

Popcorn is scientifically known as Zea Mays Everta, and it is made of germ, endosperm, and pericarp (hull). Each kernel contains a drop of water inside a circle of soft starch, and when heated, the water expands, then pops. If popcorn kernels are soaked in different mixtures, then the flavor of the popcorn will change.

To do the experiment, put 1 cup of dehydrated kernels in four different bowls. Put 1 ½ cups of lemon juice, vinegar, apple, and cranberry raspberry juice in different bowls, label them, and soak for 12 hours. Strain each bowl separately and have them dry for 1 ½ hours. Pop the different flavors separately, then have people taste the popcorn and fill out the opinion form.

The original popcorn tasted perfectly normal. It hit the target taste and it was the favorite. The apple flavored popcorn was different, it didn’t taste like apple. The apple juice wasn’t strong enough, so it tasted close to the regular popcorn. It was almost the same with the raspberry/cranberry flavor. On the other hand, the vinegar and lemon flavors were very strong. There was a very clear difference from the regular popcorn with the lemon popcorn. It was crunchy and did not have an appealing smell, along with the vinegar, which was even stronger and overtook your sinuses. Overall the hypothesis was supported by the lemon and vinegar flavors, and not supported by the apple and raspberry/cranberry flavors.
**Tap Water vs. Aspirin Water**  
Megan Van Winkle  
*Ravenna Junior High – Stephanie Rodenborg*

In this experiment, the scientist hypothesized that adding dissolved aspirin to plants help them grow healthier and faster. As soon as seedlings sprout, new seedlings need food right away, but they are not use to food yet. The seedlings should be kept at 72-75 degrees Fahrenheit while sitting in the sun.

First, label the pots and and plant the tomatoes, petunias, and parsley. Next, put the tablets in the hot water and let them sit in room temperature. In the other glass, put tap water. Then, water the plants for five weeks with the water that corresponds with the label. Water the plants with 5 cc of water. Last measure the growth of the plants.

When the experiment started the tap water plants, (except parsley) grew one or two inches in the first week. The same week, the aspirin water tomato plants grew only a half an inch. By the next week all the plants have grown at least a half an inch. The tap water plants have at least grown an inch, all but the parsley in both aspirin and tap water. The tap and aspirin water plants grew half inch to one inch in week three and four. By last week, the aspirin water plants started to die and the tap water plants grew only a half an inch at the end of the last week. Overall the tap water plants grew better than the aspirin plants. The scientist conclude the hypothesis was not supported.

**Growing Potatoes in Aquarium**  
Jordyn Preston  
*Wilcox-Hildreth Middle School – Marilyn Hays*

People need food for their nutritional needs. How might this be done efficiently? For this project white and sweet potatoes were propagated using a hydroponic method. It was hypothesized that both varieties could be successfully propagated in aquarium water. To test this hypothesis cuttings from both varieties were suspended in an aquarium. It was hoped that the nutrients added by the snails and fish would support the growth of the potato sprouts. After several weeks of observation, it was concluded that sprouts and foliage grew on both types of potatoes. This suggests that potatoes might be successfully propagated in an aquaculture. At this time no new potatoes have begun to develop on the root structure. The aquarium was tested for acidity on the pH scale. This test showed the water being a 7, neutral. This suggests a balance between nutrient input and out put between the plant and animal species in the aquarium water. Using this method of propagation could be a way to grow potatoes for people who are not able to grow regular plants in soil due to weather, climate, animals or overcrowded civilization. Propagation by this method is also helpful if you are not able to grow seeds. The trait or character of a plant is preserved by vegetative reproduction. People may be able to grow vegetables in aquarium water or in a container of fresh water. Growing fish and vegetables in the same system may provide both vegetable and protein food sources in specific situations.
**Why do you have to be so acidic?!**

Dusti Kiger

Overton Public School – Sarah Bennett

The purpose of my experiment was to test which was more acidic: orange, lemon, watermelon. My procedure is: I washed the fruit, and cut the fruit into fours. Using separate glasses, I squeezed each fruit into separate glasses. I dipped a separate piece of litmus paper into each glass of fruit juice. I compared the color of the litmus paper to the guide, which provided different acidity levels. I accept my hypothesis.

**Metal Bat vs Wooden Bat**

Cody Shubert

Overton Public School – Sarah Bennett

The purpose of my experiment was to see which type of bat, a metal or wooden, would vibrate more when hit against a tree or concrete. I hypothesize that the wooden bat would vibrate the longest. To test this I hit the two bats separately on a tree and also concrete three times each. Each time I recorded how long the vibration lasted. To ensure there was no residual vibration I switched with a family member to hit the bats. The Wooden bat vibrated for 0.44 seconds, 0.64 seconds, 0.67 seconds, and the average was 5 minutes and 33 seconds. The metal bat vibrated for 0.83 seconds, 0.96 seconds, 0.96 seconds, and the average 9 minutes and 16 seconds. I rejected my hypothesis because the metal bat vibrated more than the wooden bat.
Senior Division Entries
Category 1 – Animal Science

The Effect of Colored Rocks in a Maze on the Memory of Goldfish in 10 Days
Valerie Fousek
Central City High School – Chelle Gillan

This project involved goldfish with a certain rock color going through a maze to see if they could decrease the time it took to complete the maze. Fish have a reputation for not remembering things. The experiment was to see whether this is true.

I had an interest in goldfish memory because I had watched videos about scientists training goldfish to complete different tasks so I decided to experiment with goldfish memory. My hypothesis was that the goldfish would make it through the maze with food at the end because they would remember the reward, but would be unaffected by the color of rocks.

I made a maze for goldfish to complete. Every day for ten days, I put no rocks, purple rocks, and then blue rocks at the bottom, and timed each fish with their rock color. My independent variable was the rock color, and my dependent variable was the time it took for the goldfish to complete the maze.

The data found no significant difference between the rock color and time it took goldfish to complete the maze. Each goldfish had a different range of time. For day 10, control group had 79, purple rock group had 98, and blue rock group had 10. Some didn’t complete maze on some days. My hypothesis was not supported because all goldfish needed some help during the maze. If I did this again, I would work with the goldfish longer than a week, and I would make my maze sturdier.

From Beginning to End: The Importance of Market Beef
Felicia Knoerzer
Elwood Public School – Chelsey Neville

This experiment compared how Knoerzer cattle grew compared to state averages. The importance of this study is to inform consumers how much time, work, and knowledge is needed to raise cattle that produce the most product. The hypothesis is: If best rations, genetics, and management are used, then high performing cattle will be produced. This project compared average daily gain, also referred to as ADG. I chose 125 calves born in March, 2014 to use for this comparison. Birthing weights are nearly identical between the experimental group and the University of Nebraska data. My selected group of calves weaning weights was higher than the states. But the Universities feedlot weights surpassed mine. Which can be because of different dates the data was recorded on different dates. I weaned my calves earlier than the recommended date, and/or the date of the university calves were. I did this because I have had high success rates in the past years. I believe that I can achieve this, because of the ration I feed my cattle while their calves were nursing, also proper genetics. Having good genetics meant my calves would grow with a more powerful build. With my calves having a structurally correct build they were able to grow and put on muscle weight to achieve these high weights. I found that sticking to my year to year routine I am still raising high performing cattle, In spite the fact that my selected group of cattle did not exactly meet with the University records.
Driving and the Effects of Texting and Talking
Cale Pleak, Kendall Oberheide
Adams Central High School – Sandy Kliewer

The purpose of our lab was to understand how using a phone can negatively affect reaction times, and how it can apply while driving a vehicle. Our reason behind choosing this lab was to develop a better understanding amongst ourselves and with others around us what texting and talking can do to reaction times. We hypothesized that using a phone, whether texting or talking, would make reaction times longer by 50-90%. We tested 12 subjects, asking them to catch a meter stick that was being dropped vertically. We then took the measurement when the stick was caught and plugged it into a standard reaction time equation, \( d=vi^t+0.5a^t^2 \). Once we solved for \( t \) we knew the reaction times. Using these numbers we could make numerous conclusions about what effects texting and talking have on reaction time.

Effects of Color
Jade Spady, Sam Cass
Adams Central High School – Sandy Kliewer

The purpose of our project was to test the effects of color on tests. Our focus was on two colors of paper: traditional white and bright orange. Our experiment compared the scores of tests taken on both colors of paper. To begin, we first researched to see which colors have been linked highest to increased brain activity. After concluding that orange would be a good testing color we created two different tests. On November 8th, 2014 we gave the first set of tests to a study hall class at Adams Central High School. Half of the students took orange tests, half took white. A month later we came back to the same students and gave them a new test on the opposite color of paper. After all tests were graded we came to the conclusion that color does affect test scores with the orange tests averaging 5% higher than white tests.

How Texting Affects Reaction Time
Mariah Everhart, Bethany Nitzel
Adams Central High School – Sandy Kliewer

Multitasking is something everyone does without realizing, it could have serious risks. For example, texting and driving is one of the most common yet dangerous way to multitask. Texting while driving slows down your reaction time, and it is because of this that my partner and I have decided to show you how reaction times slow while texting. Our procedure went as follows: We had two human subjects to test and they each took turns doing the same thing. The subject began by holding a ruler. My partner and I dropped the ruler and they caught it (with their thumb and middle finger) as quickly as possible. They did this several times, the first time they did this was while they were watching the ruler fall, then while speaking, and then finally while texting. After doing this experiment and calculating the speed of reactions, my partner and I did indeed discover that reaction speed slows while texting. We used the physics equation for acceleration and discovered the average speeds.

After conducting this experiment a total of 60 times, we can safely conclude that texting does indeed slow reaction times as can be seen in our graphs and in our equations, and all our subjects were doing was catching a ruler. Just think of how much more dangerous it is to text while driving if reaction time changes when our subjects are simply catching a ruler!
Juke Box Hero

Amber Hollister, Michaela Nissen
Adams Central High School – Zac Foster

Our experiment is discovering which different holding style sounds best when performing with a guitar. We tested this using the classical style as well as the folk style. Not only did we use different styles, but we also used both an electric guitar and an acoustic guitar. Our prediction was that the folk position would have a better sound quality due to having more control. In order to test this theory, we gathered up some materials: acoustic guitar, electric guitar, sound wave app, and some other necessities. Using the app, we found our prediction to be correct. While classical was louder in some scenarios, folk were more consistent. Since louder is not always better, we concluded that folk, for both acoustic and electric, provided the better sound quality.

Lung Capacity: Which Sport has the Best?

Jonathan Nienhueser
Adams Central High School – Sandy Kliewer

I am involved in X country, track, band, and choir. And I love doing each of them. I am a letter in all of them. Over time I have learned more about the body and how it works. Especially in the respiratory area. Which made me ask the question: “do sports impact ones breathing and lung capacity?” In pursuit of an answer, I built a device to measure one’s lung capacity, tested one person per sport. The yielded results surprised me greatly and they will for whom ever reads this paper about sports and lung capacities.

The Effect Temperature has on Tennis Balls

Sarah Krueger, Chandler Yurk
Adams Central High School – Sandy Kliewer

In our project, we took four Wilson tennis balls and put them in various temperatures, such as room, freezing, cold, and boiling temperatures. After leaving these tennis balls in the different temperatures, we bounced each tennis ball three times against a yardstick and got the average height of each tennis ball bounce. We found that the warmer the tennis ball, the higher the bounce will be. Through our research, we were able to find out that the reason this is, is because of the air molecules inside of the tennis balls. The warmer the ball is, the faster the air molecules inside the tennis ball move around. The colder the ball is, the slower the air molecules inside the tennis ball move around. The movement of these molecules then affect the bounce of the tennis balls. We found our experiment to very successful and it matched our hypothesis.
The Effect of Art on Blood Pressure, Heart Rate, Mood, and Learning

Katrina Gomez
Central City High School – Chelle Gillan

The purpose of this experiment was to determine whether art affected heart rate, blood pressure, mood, and learning. I have heard how people can benefit from art, so I wanted to see for myself. I predicted that participation in art activities would have an effect.

Different age subjects participated in art activities and their blood pressure, heart rate, and mood were recorded before and after. The 10th graders were also given a quiz. The control groups participated in an alternate activity.

The 6th and 10th graders' blood pressure decreased and the elderly and the 10th graders heart rate decreased. This may have been because participating in art is a way of expressing oneself, which decreases stress and lowers blood pressure. The 6th grade and the elderly participants' mood improved after participating in an art activity. When stress levels go down, mood usually improves. Little difference was found in the test scores between the two groups. This may have been due to the small sample size. My hypothesis was supported because art did have an effect on blood pressure, heart rate, and mood. If I were to do this experiment again I would make sure all of the variables are exactly the same except participation in art. The time that the elderly spent doing the art activity was longer than when the control data was taken. This research could benefit society by increasing our knowledge about the benefits of art and could help keep art programs in schools.

The Effect of Fear on Memory

Allison Kohl
Central City High School – Chelle Gillan

The brain is a fascinating thing, especially when it comes to fear. The brain has two different pathways which fear travel along, triggering either the fight or flight response. But, when our body is going through fear what happens to our memory?

I chose to do my experiment testing what happens to our memory during fear. I thought that when the subjects became scared their memory would decrease, because when people get scared they become irrational and focus on “conquering” what scares them more than what they are expected to remember.

I ran a memory test in which I would show the subject 10 items, cover the items and ask them to write down what they could remember. I took their heart and oxygen rate before and after the memory test. For the experimental group, I showed them a video based on their fear, (I got this information from a short informational survey I gave them) and repeated the memory test with a different set of items. Then I looked for change in heart and oxygen rate, and the difference between the two scores.

My results partially supported my hypothesis. Based on the data I took fear decreased memory and oxygen increased. However heart rate decreased. During fear heart rate is supposed to increase so this goes against my hypothesis. If I were to run this experiment again I would put the subject through a higher amount of fear and something based on crime, such as stimulating a mugging.
The Effect of Sports Participation on Students’ Academics  

Jasmine Wilson  
Central City High School – Chelle Gillan

The purpose of this experiment was to see how sports affected students’ academics. I choose to do this because I wanted to see how my involvement in sports affected my grades and GPA. I wanted to learn if doing more sports helped your GPA and if students tested better before or after game days. My hypothesis was students in basketball would have lower quiz scores the day after the game and the more sports a person is in the higher GPA they will have.

To test the GPAs, I analyzed the senior GPAs by getting their GPAs and how many sports they were involved in. To test the quiz scores, I quizzed the Algebra II students before and after a basketball game. I record how long it took them to take the test, what grade they were in, and how many hours of sleep they got the night before the quiz.

I learned that the more involved you are in activates the higher GPA you have. The quiz grades showed that students that participated in basketball had a higher score after the game, but the students that don’t participate in basketball had higher scores the first time taking the quiz. Next time I would make the quizzes different because I think that the students in basketball understood the material better and tried harder the second time and the students that aren’t in basketball didn’t try as hard. I would also include different sports not just basketball.

The Effects of Floor Color on the Mobility of Alzheimer’s Patients

Shayleen Hubbard  
Central City High School – Chelle Gillan

Alzheimer’s disease is the most prevalent cause of cognitive decline in older adults commonly affecting visual function. Many ongoing studies are testing the visual depth perception in Alzheimer’s patients. When one lacks depth perception they cannot tell relative distance of objects. I’m interested in Alzheimer’s because I work in a care facility. When working with these patients, the lack of depth perception is most evident when walking. This is because of the different types of floors they encounter. The patients seem to avoid the dark areas making mobility more difficult. I thought that when Alzheimer’s patients walked on solid floors they would reach destinations much faster because there is not a concern with “deep spots”.

To determine the type of floor color that would best suit an Alzheimer’s Unit, 10 Alzheimer’s patients and 2 control patients went through 10 ambulation trials on contrasting tiles and solid colored flooring. They traveled 20 feet on each surface and were timed each time. Data was recorded for each resident. T-tests and standard deviation tests were performed to find the significance of my results.

I found that Alzheimer’s patients take longer to travel the same distance on floors with different colored tiles. The data supported my hypothesis that patients with Alzheimer’s would reach destinations faster on solid colored flooring. I believe that these results were obtained because Alzheimer’s patients lack depth perception. In further research, I recommend checking which stage of Alzheimer’s the patients are at so that this factor could be kept constant.
Category 3 – Biochemistry

Decifering Protein Crystallographs

Martin Manon

Elwood Public School – Chelsey Neville

Predicting protein structures can take years to figure out. If we were to decrease that amount of time scientists could focus more on researching new medicines. My hypothesis was does the amount of education you have decrease the amount of time it takes you to do a puzzle. Predicting protein structures using X-Ray crystallography has become a big thing in the current cancer research. The current research has shown that if we are to figure out a protein’s structure we will gain a better understanding of how its function could be manipulated using drugs. Proteins are found in virtually every body part or tissue. It makes up the enzymes that power many chemical reactions and the hemoglobin that carries oxygen in your blood. At least 100,000 different proteins make you what you are and keep you that way. There are four levels of a protein. The primary level is the actual sequence of amino acids that make up the protein. The secondary level is primarily h-bond interactions between amino acids that confer a helix or b sheet formations. The tertiary level is the interactions that are caused by a helix or b sheet leading to the folding of the polypeptide. Such interactions are typically conferred by H-bonds, ionic bonds, hydrophobic interactions, or disulfide linkages. The fourth and final level is the quarternary level.

Jiggly DNA

Zachariah Fanning

Hastings St. Cecilia’s High School – Thera Jones

I am doing this Experiment because I would like to find out if certain bands (Macromolecules) will match up with different food coloring. Forensic Scientists would find this very useful. If the Forensic scientist collects DNA from a crime scene, and from a potential suspect, then the Forensic Scientist can put the DNA samples through the electrophoresis process. After the forensic scientist conducts experiment and if the samples go the same distance then the DNA is a match.

I am testing different types of dyes and seeing which one of the molecules in each dye mixture will match up with the other unique dye.

Category 5 – Chemistry

Don’t Panic It’s Organic

Casey Gibson

Adams Central High School – Sandy Kliewer

In this experiment, I tried to see if biofuels heat combustion value is similar to other sources of fuel such as ethanol, methane, and diesel. I believe that biofuel would have similar values and could possibly have higher values than some common fuels such as ethanol. To conduct this experiment, I had to create my own source of biofuel. To do this I took regular vegetable oil and mixed it with Methyl Alcohol with 2.5% Potassium Hydroxide. After heating it and draining the waste material I had made my own biofuel. To test the heat combustion values, I set up a system to test the heat combustion value. By suspending a soda can over a wick soaked in biofuel I would heat water placed in the can to a certain temperature and then record the mass of the remaining fuel to calculate the heat combustion value. After the experiment, I calculated the value to be 24.5 kJ/g. My value was not very accurate to the accepted value. One reason for this is because some of the energy from the burning fuel was absorbed into the metal can.
Tyler Djernes
Central City High School – Chelle Gillan

Fossil fuels are being consumed at an alarming rate. Ethanol is an adequate fuel source for now but with a growing world population, corn is needed as both a food and fuel source. There is a need to develop alternative fuel sources. I tested Datura stramonium and Amaranthus retroflexus L. to see whether alcohol could be produced. I also tested the density and the relative flammability of the solution. I then compared this to alcohol produced from corn. I predicted that the Datura stramonium and the Amaranthus retroflexus L. would both create fuels that burn well. The stems of the plants were broken open and the starch was scraped out. For the corn, the kernels were crushed into a powder. Then the substances were boiled, and amylase was added to break down the starch into sugar. The solution was fermented to produce alcohol. Then the product was distilled. The solutions were weighed and their density calculated. Lastly the product was ignited and the length of time the flame was blue was recorded. Data is currently being recorded and calculated to establish the significance of the data. Next time I would use the seeds instead of the stems and try and find a better way to separate the seeds from the foliage. This type of research is important because we need find other fuel sources and become less dependent on fossil fuels.

Nanoparticles: The Biosensor of the Future
Danielle Forster
Elwood Public School – Chelsey Neville

At the nanoscale, gold particles behave differently. They can turn different color based on their size and shape. This project focused on facile methods of synthesizing gold nanoparticles in solution, attempting to develop complex structures for use in biosensors. These gold nanoparticles could be used to "tag" molecules and sense the presence of viruses, proteins, or other molecules by shifting peaks in their absorbances. Branched Au nanoparticles have been prepared in the past, but stabilization has been elusive. The reactions proposed in this experiment focus on the effects of various reducing agents on the growth of these particles. The nanoparticles were characterized using a Vernier UV-Vis spectrometer. Results show little change between reducers, but it is hypothesized the gold solution age and light reactivity may alter the experiment. Future plants are to try other pathways to create these particles and attempt to achieve more branched particles.
The Pain Killer Debate: Advil vs. Generic Equate Ibuprofen

Cameron Hucke
Hastings St. Cecilia’s High School – Thera Jones

Although each ibuprofen has the same function of relieving pain, knowing which type of pain killer is the fastest to dissolve will help ease peoples’ pain in a shorter amount of time. Which brand and what type of ibuprofen pain killer works the fastest to relieve pain? Will the stomach’s acidity determine whether ibuprofen dissolves faster? I will be using Advil tablets, Advil caplets, generic Equate ibuprofen tablets, and generic Equate ibuprofen caplets. To determine which pain killer works the quickest, I will record how long each pill takes to dissolve in vinegar, with a pH of 2.4, and in water diluted with muriatic acid, with a pH of 1. These two solutions will simulate the range of the acidity of the stomach. I will calculate the results of the dissolution times to see which ibuprofen pain killer is the best to buy. I hypothesize that the Equate caplet will dissolve the fastest in water diluted with muriatic acid. In addition, I hypothesize that the more acidic the stomach is, the faster the pain killer will dissolve. After completing this experiment, I observed that the Equate tablets dissolved the fastest in the water diluted with muriatic acid while the Equate caplets dissolved the fastest in vinegar. I concluded that if one has a highly acidic stomach, they should purchase the Equate tablets. If one has a low acidic stomach, they should buy the Equate caplets. This experiment proved that brand name does not matter in terms of ibuprofen pain killers.

Category 6 – Computer Science

One-To-One: Is it Worth it?

Hundter Biede
Adams Central High School – Jay Cecrle

One-to-One teaching programs have been highly controversial in recent years. Do they actually make a difference to the student’s learning? This project looks at how the use of computer based testing affects the students’ test scores. Students in two different science classes were divided into two groups: one group would take their test via an online test site, while the other would take their test via paper test. I hypothesized that if students are given two identical tests, with half taking the test through paper and pencil and the other taking through computer testing, then we will see very little variance in test scores. My results confirmed this hypothesis that the test taking method didn’t affect the scores of the test in a significant manner.
How Does Fluid Viscosity Affect Flow through an Archimedes Screw

Kent Rae
Elwood Public School – Chelsey Neville

The purpose of this project is to show how a certain liquid may be moved from lower elevations to higher elevations, based on its viscosity. People in the 1600s had problems with moving water out of mines and the only simple way was using buckets or pales of water. Not only was this method ineffective, it was time consuming. During this time a Greek inventor created a new innovation, which he called the Archimedes Screw Pump. This innovation helped pave the way for new improvements in today’s technological development, and advances. Liquid viscosity can be related or even called “fluid friction” due to its resemblance and relation. While a liquid travels through a pipe, the sides of the pipe catch the liquid, which slows it down. When liquids with the same viscosity meet or mix together, the results are that they stick together. This causes certain liquids to mix, creating a positive reaction, like creating a new combination of liquid, or they create a negative reaction, which create a negative chemical or unresponsive liquid mix. So when certain liquids with viscosities nearly the same, or are the same, remember the negative or positive consequences. I plan to demonstrate how certain liquids can affect how many turns it takes to move the liquid to a higher elevation. This project compared three different fluids with various viscosity to determine how the pump handles these fluids. It was found the Archimedes screw pump handles low viscosity fluids best, and it was discovered the device can be created using common supplies.

The Effect of Aspirin of Plants

Kaylee Eberle
Central City High School – Chelle Gillan

This project is about plants that are grown in soil with crushed aspirin. Aspirin is an over-the-counter drug and treats pain, fever, inflammation, and other things. You are not suppose to take it crushed up, it is suppose to stay whole. One of its most active ingredient is acetyl salicylic acid which naturally occurs in some plants.

I started this experiment by looking up information on both aspirin and Wisconsin Fastplants. Then I made a procedure list which I followed to plant my seeds and put them under the light. Throughout the next two weeks I took data every 3-5 days and recorded it in data tables. I hypothesized that the plants would germinate faster in aspirin soil than in regular soil, but actually the regular soil germinated better. Also, I thought the plants in aspirin soil would be taller because the aspirin would keep them healthy. This hypothesis was partially supported because the plants in aspirin soil started out growing slower, but by the end were taller. My last hypothesis was that the aspirin plants would be a darker green then the regular soil plants, which was supported because the plants in aspirin soil were always dark green.

I found out that Wisconsin Fastplants do not germinate as fast in aspirin soil, but they do grow taller and are darker. Next time I would test aspirin in the water.
The Effect of Famed Land on Plants

Brooke Johnson

Central City High School – Chelle Gillan

This project is about over using farmland and the vital minerals we are taking out of our once fertile soil. Minerals and organic matter are key to how long a field can be farmed. Crop rotation and no till farming are very important, so I wanted to see if soil from a field that is properly taken care of will be able to support plants without fertilizers.

For this project I took soil that has been farmed on for several years and soil from a pasture that has never been farmed. The soil from a field that has been previously farmed was used to farm corn in the previous planting season. My plan was to see if the plants in the nonfarmed pasture soil would grow better due to the natural minerals still stored in the ground.

As I watched the plants, the result was quite clear. The plants in the previously farmed soil were smaller. Plants in the nonfarmed soil were also small. I believe this because the land that we farm isn’t packed with natural fertilizers and organic matter like potting soil is. This has a negative effect on plant growth. Natural ground is not as efficient as potting soil for the growth of plants. This is why we have to use so many fertilizers to get our crops to grow.

The Effect of Freezing on Plant Growth

Kaylee Hostler

Central City High School – Chelle Gillan

This project was about the effect of freezing seeds before planting on the plant’s growth and health. Wisconsin Fast Plants were used. Another name for them is Barassica Rapa. To freeze the seeds I used a basic house hold freezer. The question was “What effect does freezing seeds have on plant growth?”

My hypothesis was if the seeds are frozen, more seeds will germinate, the plants will be taller, and will have a darker color. Four control and eight experimental plants were tested. They were planted in Styrofoam quads and were watered with a wicking system. The seeds were frozen for 48 hours before planting. Germination data was taken once, while plant height and color were taken four times. The germination hypothesis was rejected because the freezing had a negative effect on the plants. 100% of the control plants germinated and 88% of the experimental plants germinated. This may have been because freezing them sent them into a state of dormancy. My pant height hypothesis was supported because there was a positive affect on the frozen plants. This may have been because freezing them allowed them to germinate under ideal conditions. My plant color hypothesis was not supported because the experimental plant color and the control plant color were the same. Next time I would like to try using a different plant, such as corn, to see the effect of freezing on a food crop.
The Effect of Paper in the Soil of the Wisconsin Fast Plant

Fatima Al-ebadi
Central City High School – Chelle Gillan

This project was about the effect of paper in the soil of a plant. Wisconsin Fast Plants were used. They are also known as Brassica Rapa. White copy paper was used because I wanted to test bleached paper. It is made from cellulose in wood. The question was “What is the effect of paper in the soil on a Wisconsin Fast Plant?” The hypotheses were if paper is added into the soil less seeds will germinate, the plants will be shorter and will remain the same color. Four control and eight experimental plants were tested. They were planted in Styrofoam quads and were watered with a wicking system. One cup of soil was mixed with paper shreds. This soil was used for the experimental plants. Germination data was taken once. Plant height and color were taken four times. The germination hypothesis was supported because it was found that paper had a negative effect on germination. 100% of the control seeds germinated and 62% of the experimental seeds germinated. This may have been because the paper absorbed the water the plants needed. The plant height hypothesis was supported because there was a negative effect on the plant height. This may have been because the control plants had more nutrients than the experimental plants did. The plant color hypothesis was not supported because the experimental plant color was not the same as the control. Next time I would like to test Mountain Dew.

The Effect of Red Food Coloring on Wisconsin Fast Plants

Colton Drage
Central City High School – Chelle Gillan

What affect does soaking seeds in red food coloring have on the germination, growth, and color of a plant? My hypotheses were that if seeds are soaked in red food coloring less will germinate than seeds that are soaked in water because the chemicals in food coloring may stop water from entering the seed. The stem length will be the same as the control plants because the food coloring has some nutrients in it, and the plant color will be more red than the control plants because the food coloring will stain the seed and make them grow with a red stain.

I started by soaking each set of seeds; one in water and one in red food coloring. I let the seeds sit in the substance for two hours. Then, I planted eight cells of experimental seeds and eight cells with control seeds. On day 6 after sowing I took data on germination, stem length, and plant color. On days 10, 14 and 20 I took data on plant color and stem length.

To conclude, I found that red food coloring has a negative effect on the germination of seeds, by 81%, a prolonged negative effect on stem length of close to 20 millimeters by the end of the experiment, and both sets of plants remained dark and light green throughout the experiment. If I was to test again, I would try using different colors of food coloring.

The Effects of Big Blue River Water on Casper Fish

Colton Kohl
Central City High School – Chelle Gillan

In this study I placed Danio rerio, also known as the Casper fish, in water from the Big Blue River. I wanted to test how polluted water affects the heart rate, gill movement, and length of fish. These things where chosen because when a fish is stressed it will have faster gill movement and heart rate and it may cause a decrease in size. I hypothesized that the river water would have a negative effect on the fish.

After the Casper fish were placed into the Big Blue River water the gill movement and heart rate sped up substantially. The length of the fish decreased by 10%. The reason for these results may have been because when water is contaminated it causes fish stress making it difficult to maintain homeostasis. This causes their heart rate and gill movement speed up. This takes a lot of energy and deprives the fish of nutrients needed for growth. This decreases their size. This project shows the importance of keeping our waterways cleaner so fish will stay healthy.
The Effects of Cooking Grease on Plants

Abbie Hillmer
Central City High School – Chelle Gillan

This project is the effect of cooking grease mixed with the soil of plants. I thought that by doing this the fats and oils in the cooking grease would slow down the growing process.

Cooking grease is a common use in the United States so I thought it would be a good substance to test in the soil. I was trying to learn what effect cooking grease would have on these types of plants. I hypothesized that cooking grease would lessen the amount of seeds germinated. I also hypothesized that the plants would be shorter and the plant color would be the same as the plants in the regular soil.

To answer my problem I set up an experiment where I planted 8 seeds in each of the two control quads and two experimental quads with 8 seeds in each also. I then mixed cooking grease with the soil in the experimental quads. With these plants under light and plenty of water I took germination, stem length, and plant color data on selected days.

It was found that mixing cooking grease with soil does not affect the germination of seeds. Both cooking grease and regular soil germinated at 88%. It was also found that it has a negative effect on plant color and on the stem length of the fast plants. The average of the stem length with cooking grease was about 30mm and the regular soil was about 120mm.

The Effects of Magnesium on Fast Plants

Katy Gathje
Central City High School – Chelle Gillan

This project is about the effect of magnesium added to the soil on plants. I chose to add magnesium because I thought if I added more of a certain nutrient to the soil, more seeds would germinate. A balanced supply of magnesium serves as a foundation for healthy plant development.

In my experiment, I had eight experimental plants and eight control plants. Four quads total were used. I mixed one magnesium supplement into one cup of soil. Next I inserted three fertilizer pellets and two Wisconsin Fast Plant seeds. I filled two of my experimental quads with the magnesium soil and my control quad with regular soil. I hypothesized that if magnesium is added to the soil, more seeds would germinate than plants in regular soil. Since magnesium is already naturally in the soil, and is an essential plant nutrient, I predicted that adding more would help the plant seeds germinate more effectively.

The magnesium had a negative effect. The seeds planted in regular soil had 100% germination, while seeds planted in magnesium soil had 63% germination. The average stem length for plants in regular soil was 67 mm and 22 mm for plants in magnesium soil. This may be because too much magnesium in the soil caused an off balance of nutrients. Having an excess or deficiency of nutrients in a plant could lead to a decrease in plant production. Next time I would put less magnesium in the soil and try to balance the plant’s nutrients.
What are the Effects of Dawn Soap on Plants?

Cole McReynolds
Central City High School – Chelle Gilan

When the BP oil spill in the Gulf of Mexico occurred in April of 2010, the dishwashing detergent Dawn played a major role in rescuing and cleaning the animals that were coated in the sticky oil. They used regular dish washing soap (used for cleaning grease) to clean wildlife. This made me wonder if the leftover soap has any effect on the environment.

The problem states, “What effect does Dawn Soap have on a plant?” My hypothesis is that if the plants are watered with a Dawn Soap Solution, fewer plants will germinate and they will have a shorter stem length.

I planted seeds in two quads for the control and two quads for the experiment. The experimental plants were watered with 1 mL a solution of 3mL of Dawn dish soap and 50 mL of water and placed on a separate deli dish. Data was collected on days 4, 8, 14, and 17 (day 0 was the day I planted). On day 8 I watered the experimental plants again with the same solution.

My hypothesis was supported by the data. 100% of the control plants germinated, while 75% of the experimental plants germinated, but some experimental plants germinated late. However, when watered with the solution again, all plants withered and died by day 14. The soap may have prevented capillary action from occurring and the plants died from a lack of water. Next time, I would like to water the plants at a different time in their life cycle.
Does Density Affect Nutrition?
Taylor Bunde
Adams Central High School – Zac Foster

Not all fruits and vegetables are the same. Although whole foods are healthier, there is a grading of nutritional value between fruits and vegetables. For example, apples provide fiber and vitamin C but they do not provide a sufficient amount of other nutrients.

Gastro-logic: A Pain Pill Consumption Competition
Justin Enberg, Lauren Reiman
Adams Central High School – Sandy Kliewer

The purpose of our experiment was to discover what pain medication would dissolve the fastest thus relieving pain the fastest in the human body. Our hypothesis was that off-brand medications would dissolve faster than the name brand versions, and acetaminophen would dissolve the fastest of them all. We conducted research and compared the different characteristics of each pain reliever medication. In our experiment, we recorded the amount of time each pain reliever medication took to completely dissolve in hydrochloric acid heated to 37 degrees Celsius, or body temperature. Our results did not support our hypothesis. The results of our experiment was that Aspirin took the least amount of time to dissolve and Acetaminophen took the longest amount of time to dissolve. Name brands dissolved faster than off-brands. The order of time to dissolve from shortest amount of time to longest amount of time was: Aspirin, Tylenol, Advil, Ibuprofen, Acetaminophen. The least time to mass ratio to dissolve was Aspirin. Ibuprofen had the greatest time to mass ratio to dissolve. The following is the order from least to greatest second per gram: Aspirin, Tylenol, Advil, Acetaminophen, Ibuprofen. Possible errors could be due to discrepancies in the temperature and the fact that we may have needed a greater quantity of acid.

How Does Caffeine Affect Athletic Performance
Sophia Conant, Abby Klammer
Adams Central High School – Zac Foster

Living in a world where caffeine surrounds us in our everyday lives, it’s important to know how caffeine affects us. As athletes, my partner and I wanted to know how this substance affected us in sports. We conducted this experiment with 2 male and 2 female subjects that we had run 55 meters without drinking any Mountain Dew. After that they drank a 20 fl oz bottle of Mountain Dew (approximately 80 mg of caffeine). They waited 45 minutes after drinking it to run their last set of times. We hypothesized that our subjects would be slower after drinking the Mountain Dew. Our experiment gave us helpful answers. My partner and I now know the effects of caffeine on our athletic performance.
Jumping for Science
Alli Johnson, Kenna Steinkruger
Adams Central High School – Jay Cecle

You always hear how boys are better athletes than girls and if you are older, you must be better. For our experiment we chose to find out if this is actually accurate. We believe that it will come out to be true, age and gender will affect your ability. To test this we took 6 students, 3 boys and 3 girls, two from each grade (7th, 10th, and 12th). We had them take a vertical jump test involving three trials each. Our variable obviously being age and gender. We simply tested to see what ages and genders jumped the highest. You will see our results in a table below. The boys in each age group had a consistently higher vertical jump than the girls. In conclusion, we found that what you hear is true, age and gender both affect your athletic ability. Boys can jump higher than girls, older kids jump higher than younger kids.

Stop Hair Crimes
Carlie Sitzman, Elyse Keller
Adams Central High School – Jay Cecle

The hair strength experiment included the data from using different hair products, various sorts of hair colors, measuring diameters of the hair, and what heat really does to the vital strength your hair needs. To make sure the hair results didn’t fluctuate just because of hard water or hair products they used. We came up with idea to drench the hair in bleach for 1 minute, stripping the hair of old grime and oils. The tests were all done with weights glued to the bottom of the hair to get the results. The first experiment was shampoo. Does it strengthen hair or damage hair. What we concluded is that Paul Mitchel had a great effect on hair strength making it almost a fourth stronger. Sad news for BB they on average made the hair stay the same or even go down in strength. Hair color is all-average. What we found is that red hair tends to be the strongest after numerous results and averages. Blondes came in last with the lowest average score of 88.75 grams. So to group the data together, yes, the redheads have it, but the real test is hair diameters. Any home remedy cannot control hair diameters. It is simply in your make up. Each hair diameter whether it was wide or slim gave a good foreshadow on what was to come up for the strength weights test. But how do people with wide diameters sometimes show up on the bottom of the bracket. They use heat products that kill the natural strength in the hair.

The Truth on Beverages and Your Teeth
Becky Rose, Kalee Reams
Adams Central High School – Sandy Kliewer

When searching for a science project this year, we wanted to do something relevant to our daily lives. When the idea of teeth staining came up, we had a few questions. What to use and how it was going to work were to major ones that we asked. Using the shell of an egg and different liquids gave us an idea of which liquids stain teeth the quickest and the darkest. Each drink had one similarity, darkness of color. Every drink was a darker color except for our constant; water. In this project, you will find that we found out several things about these specific drinks. First, you will look at our hypothesis and introduction, as we explain the materials we will be using and the procedure steps we followed during our experiment. Next, you will look at our data collected and our findings. Then, you will see what we concluded along with if our hypothesis was correct or not. Finally, you will be informed on the websites and information we used to research our project. A big reason behind why we wanted to do this specific project is simply because most of us have dealt with one drink or another staining our teeth. With this, we can then take the contents and ingredients of the drink to further our experiments to see why a particular drink cause such a dark stain color, or why a beverage stained so quickly. This experiment was simple to do and gave us quality answers.
Stop the Pop?

Trey Alexander

Adams Central High School – Sandy Kliewer

The purpose of my experiment was to test both Pepsi and Diet Pepsi to see if they had an effect on cardiovascular endurance. To test the soda, I had four test subjects run one mile. My hypothesis was that the speeds would be slower when the test subjects ran the mile after consuming soda. When I performed my experiment, I had the participants run on the same track both days so that the distances and conditions would be the same. For the control, the participants ran a mile after drinking 12 ounces of water. The second day, the participants ran one mile after drinking either Pepsi or Diet Pepsi. Everyone was slower by at least eight seconds; Pepsi and Diet Pepsi were both very similar and only differed by less than .4% in slowing down the times. I concluded that the times were slower due to the carbonation in the soda because Diet Pepsi has artificial sweetener instead of real sugar and caffeine has been shown to improve times. To conclude my experiment, it is never a good idea to drink soda within 15 minutes of running because soda makes it even harder for muscles to work efficiently. This experiment showed that coaches are correct to advise against soda, especially before working out.

Testing the Relationship Between Eye Color and Vision

Lindy Eberle

Central City High School – Chelle Gillan

This project was about how eye color affects vision and how we see. I wanted to determine which eye color could read colors, words, and numbers quickest; also, which eye color had the best results in the peripheral vision test. I hypothesized that subjects with brown eyes would see better than blue or green eyes. I tested the volunteers each day for a week. I started by having the subject read colors, then words, and then numbers. While the subject was reading, I recorded the time it took and how many mistakes were made. After the subject got done reading everything, I tested the peripheral vision. I found out that people with brown eyes did better in reading colors; people with green eyes had better results in reading words and numbers. Blue-eyed people had the best results in the peripheral vision test on both the right and left side. In the future it would be interesting to include reaction time to see if people with darker eyes would have better reaction times than people with blue eyes.

Are You A Righty or A Lefty?...What Does Your Brain Think?

Lucia Smith

Hastings St. Cecilia’s High School – Thera Jones

Are you right handed or left handed? What about your right eye and ear? Do you prefer to use them more than your left ones? Which side do people prefer? This problem will be addressed by this scientific study. You will find out whether people have a sidedness which means, whether they do most activities with one side of their body more than the other. The brain enables a person to think and perform actions in a certain way. Each person’s brain is divided into two sides, known as hemispheres. A person’s brain is unique in how it is connected and patterned. Ultimately, this has an effect on how the brain and body work together. Your brain is made up of neurons, which are cells that send certain signals to other cells. These signals are how the cells communicate. The neurons in the brain, and in the different hemispheres, are all connected together in a network. The part of the brain that controls our body movement is called the motor cortex. This section of the brain controls your voluntary muscle movements, such as eye, foot, hand, and ear tasks. In summary, there is some correlation between the side we use in our brain and the side we use on our body. The preference to use one side over the other is known by several terms: sidedness, laterality, or left/right dominance.
How Much Bacteria Is On Your Toothbrush?
Claire Landgren
Hastings St. Cecilia’s High School – Thera Jones

The main purpose of my experiment was to determine the most sanitary location to store a toothbrush. It is important to discover this in order to restrict the amount of bacterial growth on an instrument most people use daily. Since we know that our mouths harbor hundreds of different microorganisms, it is not shocking that some of them transfer to our toothbrushes. If we constantly re-inoculate ourselves with these microorganisms, we could promote the spread of such bacteria as streptococcus, lactobacillus, and staphylococcus. These bacteria could cause numerous diseases including laryngitis, gingivitis, pharyngitis, candidiasis, and dental decay.

I hypothesized that toothbrushes kept in damp, enclosed environments would grow more bacteria than those able to dry in the open air. I tested twenty-two different toothbrushes in seven different locations to find my results. I proved that a toothbrush kept in a zip-lock baggie grew the most bacteria. This was closely followed by one stored in an enclosed case. The third most bacteria infested surface was on a counter top and the forth was in a case with holes. After that, was keeping a toothbrush in a case that only covered the brush portion of the toothbrush. Next was in a drawer. The safest place to keep your toothbrush was in cup. The control grew virtually no bacteria.

Category 15 – Microbiology

Adams Central Bacteria
Emma Raders
Adams Central High School – Jay Cecrle

Does Human contact affect the quantity and the rate at which bacteria grows? My experiment tests whether people increase the spread of bacteria, or if bacteria spreads better without the help of human contact. Bacteria samples were taken from areas with high human contact like desks and computers. I also took samples of areas with little to no human contact like the bottom of trash cans and the underneath of a lab tables. The bacteria was tested in petri dishes for two weeks in a dark desk drawer at room temperature. My hypothesis was that I thought that human contact would drastically increase the speed and amount of bacteria that grew. My experiment proved that my hypothesis was correct by showing that not only that a greater variety of bacteria was grown but, it also grew faster. The experiment also proved that human contact can spread funguses too.

Monsters Inside the School
Emilea Rogers, Brooke Meyer
Adams Central High School – Zac Foster

Everywhere we look these days, you see something about procedures to use to limit bacteria growth. Whether it’s using germ ex, washing with soap and water, covering your cough, etc., the school’s and many other public places are making a big jump to spread awareness of the harmful bacteria that is getting us sick. Bacteria is everywhere, but many only take time to appoint the obvious places such as door handles, desks, pencils, and things that many students use every day. We tested ten different places around the school. Gym water fountain, locker room shower, gym door handle, germ ex by the lunch room, library book, laptop computer mouse, school desk, school locker, bathroom sink, and the trashcan are the ten places we swabbed. We hypothesized that the trashcan was going to be the dirtiest and the germ ex was going to be the cleanest. The experiment results partially supported our hypothesis, the library book and the trashcan were the two that contained the most bacteria, and the locker room shower was one that produced less bacteria.
**What is in Your Water?**

Clare Keller

*Adams Central High School – Jay Cecrle*

Drinking fountains are a normal part of a student’s environment. Since drinking fountains are used by so many people everyday, and may have been exposed to saliva that could be carrying diseases. Additionally, bacteria maybe already in the water before coming out of the spout or maybe on the spout. However the water coming out maybe harmful or benign. I chose four water fountains in Adams Central High School. I grew the bacteria found in the water. Then gram stained it. Found out that all of the bacteria is benign, but a few could be harmful if they combine with other things. These results confirm that public water fountains maybe a place for infection, especially for people with weak immune systems.

**The Effect of 0.05 mg of Vitamin D3 on Inhibition of the T2 Coliphage**

Jill Gathje

*Central City High School – Chelle Gillan*

This project relates to viruses and alternative treatment options. Because viruses and antiretroviral therapy are harmful to humans and unaffordable to many, homeopathic treatments have become popular. High-dose vitamin D is said to have antiviral properties through its active metabolite, calcitriol. However, there is not much research surrounding alternative treatments, and many are under speculation. I chose this topic because I’m interested in viruses and current treatment methods versus natural/homeopathic methods. To begin, I prepared media plates using tryptone base layer agar. Then, I inoculated soft agar tubes with bacteria and prepared a dilution series with coliphage T2. Plate dilutions were as follows: (P1) $10^4$+Vit D, (P2) $10^3$+Vit D, (P3) $10^3$, (P4) $10^2$+Vit D, (P5) $10^1$+Vit D, (P6) $10^1$. Next, I inoculated the soft agar tubes with the specified amount of virus. Then, I added 0.05 mg of Vitamin D3 to the specified soft agar tubes and prepared the experimental and control agar layer plates. Upon completion, I incubated the finished plates. After forty-eight hours, I took data, which included counting the number of viral plaques and calculating the titer of each petri dish. After data collection, there were discrepancies. My hypothesis could not be rejected nor accepted because of experimental error. If further study was possible, proper equipment would need to be obtained to help eliminate error. In addition, the dosage of vitamin D3 would need to be adequately adjusted for each dilution. Finally, more trials would be an absolute necessity if I were to conduct this project again.

**The Effect of Different Types of Mouthwash on Bacteria in the Mouth**

Hannah Hines

*Central City High School – Chelle Gillan*

This project concerns how effective mouthwash can really be in the human mouth. My experiment consisted of placing colored disks in a petri dish with some agar and saliva. I placed the disks in the petri dish after I dipped each one of them in the different mouthwashes. The colored disks were coordinated with the mouthwashes so each mouthwash had its own colored disk. I placed the petri dishes inside an incubator for 96 hours, and started taking data on the clear area around the colored disks at 48 hours. My hypothesis was “The Colgate Total Advanced brand of mouth wash will have the largest effect of removing bacteria in a person’s mouth, because it has the best reviews from customer ratings compared to the other six mouthwashes, and it’s the most effective in keeping gum disease away.” I took data for three consecutive days each 24 hours apart. I learned that Colgate Optic White was the best acting mouthwash. Next time I would test something a little more challenging like try using some different kinds of mouthwash to see if it changes the results. I would also include more trials. I would test it on more than two people to see if this changed the results. If I did another experiment I would do something with insects, possibly spiders. I would love to test different kinds of sound effects on them to see how they react.
The Survival of Lactobacillus rhamnosus GG ATC53103 in a Simulated Teen Gastrointestinal Tract Environment

Jonah Peterson
Central City High School – Chelle Gillan

The purpose of this experiment was to see how well probiotics survive in the teen population. I hypothesized that the environmental and biological stressors associated with this population would have an effect on the survival of probiotics because there are factors unique to this sub-group such as chlorination, pH, medication, hygiene, and habits. Three control agar plates were inoculated with a slurry consisting of one capsule of Culturelle and purified water. The plates were placed in an anaerobic environment and incubated at a temperature of 37 degrees Celsius for 24 hours. The Colony Forming Units were counted on one quarter of the plate. The above procedure was repeated, and the purified water was replaced with each of the following stressors individually: tap water, bacterial amylase, Equate Antiseptic Mouthwash, doxycycline, and hydrochloric acid with a pH of 3.5. It was found that the stress that was introduced had a negative effect on probiotic survival. The hypothesis was supported by the data because the induced stress caused a statistical difference in the bacterial growth. For future experiments of this nature, I would recommend an extended planning period in order to allow time for any experimental complications, additional trials to ensure reliability, and further study on the unique characteristics of the teen population. The results of this experiment could help determine whether or not probiotics should be administered differently in this sub-group.

Makeup or Made for Bacteria?

Mary O’Keeffe
Hastings St. Cecilia’s High School – Thera Jones

Would the makeup grow enough bacteria that it would be necessary to put a time limit on how long it should be used, or is the method of the application what causes the bacteria growth? My hypothesis is that the makeup containing any liquid would have the most bacteria. Brief review of my method would be that I used petri dishes with makeup on them and put them in an incubator and waited for bacteria to grow. Results proved my hypothesis correct in that only the makeups containing liquid components had bacterial growth.

Category 16 – Physics and Astronomy

Bouncing Balls

Nate Kiolbasa, Peyton Brodrick
Adams Central High School – Jay Cecrle

Sports companies, like tennis ball companies, are always trying to boast that they have the best products and that you should purchase and use them. But which brands are actually telling the truth? Which brand of tennis ball actually gets the most bang for your buck? Our project looks into which brand of tennis ball is the best by testing to see which brand has the most rebound bounciness. We tested just that. The three tennis ball brands that we used were Penn, Wilson, and Dunlop. Our hypothesis was that the Wilson ball, which was the most expensive, would retain the most rebound bounciness due to it being of better quality. We experimented our theory by playing nine full games with each ball separately and after each of those games, we bounced the ball to see how high it would go, thus examining how much bounce it still retained. Our results showed that the Wilson, the most expensive ball, had the most bounciness. However, when statistically analyzed, we found no significant difference.
Centripetal Force

Cole Spady, Cam Anderson
Adams Central High School – Jay Cecrle

People go to amusement parks all the time and ride roller coasters, but are you aware of the centripetal force involved in the ride? This project examines the centripetal force required to move and keep you secure while on the coaster, but also how we measure it. We tested this on a smaller scale with a cup tied to a string, we placed Jell-O in the cup and a marble in the center to measure the distance the marble traveled through the Jell-O. Our hypothesis was that although we implicated a smaller scale, the same concepts should still apply. The experimental results showed that a force of 13336363.39 Newtons would be exerted onto each person during an average ride if the ride moved at the speed of our model. Mass of the person may also play a factor. By taking the mass of the marble over human mass, times force of marble over human force we calculated force on humans.

Jell-ooooooooo

Nicholas Lindblad, Reid Ostrander
Adams Central High School – Sandy Kliewer

Our project, “Jell-ooooooooo,” was made to test the ability to find the speed of light using household items. We thought of the idea to test the speed of light by looking on websites such as www.sciencebuddies.org. We hypothesized that the speed of light would be relatively equal at all different angles within the jello. We began our experiment by making the jello, placing it on the protractor parallel to 90 degrees, and taping the laser pointer down to a table. We then rotated the protractor to a 10 degree angle and shot the laser through it. We noted how it bent and measured the angle of incidence and angle of refraction in our chart. We then moved to a 20 degree angle and continued the same process through 80 degrees. We then repeated this two more times. After, we took the sine of angle of incidence divided by the sine of the angle of refraction and found the refractive index of jello. We know this to be true because of Snell’s Law n1*sin?1=n2*sin?2. Once we found the refractive index of jello all that was left to do was to take the speed of light (299,729,548 m/s) divided by (n2) the found refractive index of jello. After completing all of this, we concluded that our hypothesis was correct and we found the speed of light through jello at each individual angle. Our independent variable was the angle of incidence.

Near-Ground Tornadic Wind Speed and Pressure Recorder

Joey Caraballo, Ethan Lang
Adams Central High School – Jay Cecrle

Tornadoes are unpredictable, dangerous, and at times very catastrophic. What we do know about these things is what the wind speed and air pressure is like 100+ feet above ground but we have no clue what they are like a the surface. So we designed a wind speed and pressure recorder that would be placed in the path of a tornado and that would stay on the ground inside the tornado to take these precision measurements on the surface. Our probe is made from 16-gauge steel and is constructed into a cone to make it aerodynamic. The cone is made at such an angle that the tornadic winds will actually push down rather than lift it. In the future we hope to do some wind tunnel testing before we take it into the field. Then we hope to take this into the field and eventually get it into the tornado.
Pykrete Analysis

Lucas Goldenstein, Alec Baker

Adams Central High School – Sandy Kliewer

In our experiment we tested the strength of ice, sawdust mixed with ice, and wood shavings mixed with ice under various conditions. Our hypothesis is that sawdust mixed in with the ice will outlast the other two mixtures. We froze 9 blocks of ice over a period of one day. Three blocks were only frozen water. Three other blocks were water with an addition of sawdust mixed in. The last three blocks had wood shavings mixed in with the water. We performed three tests. We took one block of each kind and dropped a sledge hammer from a set height onto them one at a time and observed the damage done to each one. Then we took one more of each. We shot an air rifle from point blank range at each one and measured how deep the bullet went into the block. We took the final three blocks. At a set height, each type of ice was dropped onto a smooth concrete surface. The damage done to the blocks of ice were observed and recorded. After all three tests were completed we moved onto the final stage. We compared the results of all the tests to determine which mixture was the toughest. The regular ice with nothing mixed in was easily damaged in all three tests. The ice with wood shavings came close, but in the end the sawdust mixed in with the ice was the one that outlasted the other two blocks in all three tests.

Category 17 – Plant Sciences

Which Fertilizer Works The Best?

Hannah Fleischer, Rachel Kort

Adams Central High School – Jay Cecile

Many people don’t know what kind of fertilizer to use when planting and maintaining their plants. This experiment looked at which fertilizer worked best under controlled conditions. We used three different fertilizers and put each one into a separate pot and let the plants grow for three months. Throughout the course of those three months, we observed and recorded data on how the plants were growing. We also watered them periodically. We also did an additional experiment using petri dishes. Before we could grow the plants, we dissolved the fertilizers in water to make it easier for the filter discs to absorb the fertilizers. We grew 15 seeds per each fertilizer. We let the seeds grow for one week. After the week was over, we measured and recorded the shoot and root lengths of each seed. At the end of our experiment, we found that our results disagreed with our hypothesis. The Espoma Organic fertilizer actually produced the best results over the Miracle-Gro and Earl May brands, going against our previous notion of Miracle-Gro being the most effective fertilizer.
**The Effect of Blue Food Coloring on the Wisconsin Fast Plant**

Andrew Ziska  
Central City High School – Chelle Gillan

This project is about the effect of blue food coloring on the Wisconsin Fast Plant germination rate, stem length, and color. The Wisconsin Fast Plant is mainly used for educational purposes; its life cycle is approximately 40 days. And blue food coloring is made from man-made chemicals and is used to make food more visually appealing.

The problem was, “How does food coloring added to the water alter the plant’s growth?” For this experiment, I had three different hypotheses, one for germination rate, stem length, and color. They were if blue food coloring is added to the water the plant’s germination will increase because the chemicals in the substance; the plant’s stem length will not be affected since the chemicals aren’t harmful to plants; and the color will be somewhat blue because the substance’s purpose is to give color.

My procedure involved eight experimental and eight control plants. On days 6, 10, 14, and 20, all plants are measured their stem length and color, while making sure the deli dish is filled with water.

Some of the results were what I expected and others were not. The germination rate was 100% for food coloring, and 88% for regular water. Stem length of experimental plants increased more than the control plants. Its color was a darker shade of green, and then the leaves started to turn brown and curled up. I didn’t see any blue plants, but I learned from this experiment.

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**The Effect of Clorox Bleach on Plant Growth**

Sydney Williams  
Central City High School – Chelle Gillan

I did my experiment on how Clorox Bleach could affect the growth of Wisconsin Fast Plants. The reason I chose to do this topic is because I wanted to know how certain chemicals in our laundry detergent could affect plants. I predicted that the control plants would be more successful than the experimental plants in germination, stem length, and plant color.

In my experiment I had 8 experimental plants and 8 control plants. In each cell I placed two Wisconsin Fast Plant seeds and three fertilizer seeds. Both the experimental and control plants were watered with a wicking system. The experimental plants were watered with the bleach on day 0 (the day they were planted), and day 10 (days after sowing) with 10 mL of bleach that was diluted with 50 mL of water.

By conducting this experiment I learned that bleach is a very harmful substance that can be dangerous. I know this because after I watered the experimental plants with the bleach the second time, the next day they all appeared to be dying. The data showed that the control plants were more successful in all growing aspects than the experimental plants were. If I were to try this experiment again I might try the effect of bleach on a more durable plant that can live in harsh conditions.
The Effect of Fish Oil on the Wisconsin Fast Plant

Amy Gathje
Central City High School – Chelle Gillan

In my experiment I wanted to know what effect fish oil had on Wisconsin Fast Plants. I decided to test this because my mom used to have me take fish pills so I wanted to know what it would do to plants. I thought that when I put fish oil in the soil the Wisconsin Fast Plants would grow better because there would be more nutrients in the soil. When I did my experiment I had eight experimental plants and eight control plants. I mixed one 1000mg fish oil pill into one cup of soil. I then placed three fertilizer pellets and 2 Wisconsin Fast Plant seeds into my eight experimental quads and eight control quads. I learned that fish oil might not be the best thing for plants. The experimental plants didn’t grow very well and didn’t grow as tall as the control plants. I thought maybe the fish oil affected the water intake because water and oil do not mix well. The control plants had 100% germination, while my experimental plants had only 63% germination. If I had the chance to do this experiment again I think I would put the fish oil in the water to see if it would affect how much water the plant could take in.

The Effect of Lemonade on Wisconsin Fast Plants

MacKenzie Rinkol
Central City High School – Chelle Gillan

This project was to show the effects of lemonade used as a watering substance on plants. Lemonade is made up of sugar, fructose, and citric acid. When the powder mix is poured into water, it is dissolved into a liquid. Lemonade is used for a beverage, not normally for a watering substance. The problem was to see the effects on a plant’s stem length, plant color, and germination. It was hypothesized that less seeds would germinate, the stem length could be shorter, and plant color would be lighter than normal.

The seeds were planted in each cell of three Styrofoam quads. The plants were watered with a wicking system from below. 2mL of lemonade was added to each cell of the experimental plants. Data was taken four times to see if the hypotheses were supported or rejected.

I found that over a 20 day period, lemonade had a negative effect on plants. For germination, water had 94% and lemonade had 69%. For stem length the averages for distilled water increased greatly each time. For lemonade the averages gradually went up, but still there was a negative effect. The plants in water were dark green and the plants in lemonade got lighter each time. The hypotheses were supported by the data.
The Effect of Microwaving Seeds on Plant Growth

Will Wagner
Central City High School – Chelle Gillan

This project was to see if seeds could grow in irregular conditions. I had the choice of changing the soil content, changing the watering substance, or manipulating the plants in some sort of way before I planted them. I chose to manipulate the seeds by microwaving them.

The idea of this experiment was to see if microwaving the seeds had any effect on the plant’s germination rate, plant color, and stem length. Before I did any research, I came up with three hypotheses. I thought that microwaving the seeds would cause the germination rate to be lower, the plant color to be lighter, and the stem length to be shorter.

I microwaved 16 seeds for 15 seconds and then planted them in the soil. I also planted 16 unmicrowaved seeds in a separate container. After that, I watered the seeds on the first day after sowing. The plants had a constant supply of water through a wicking system.

After all the data was collected, I analyzed my results. I concluded that all of my hypotheses were rejected. There were no effects on the plants during this experiment. Both groups of plants had a 100% germination rate, had the same plant color after day 6, and the microwaved seeds’ stem length was only slightly shorter on average than the controls’. Next time, I could test microwaving seeds at different wattages.

The Effect of Mouthwash on Fast Plants

Edie Erickson
Central City High School – Chelle Gillan

In my experiment I wanted to know the effect of mouthwash on Wisconsin Fast Plants. I chose to test this because this is the mouthwash I use everyday and wanted to know what it would do to a plant. I had eight experimental plants and eight control plants in my experiment. My control was distilled water and my experimental variable was a mouthwash/distilled water mixture. I diluted 2mL of mouthwash with 8mL of distilled water. I placed 3 fertilizer pellets and 2 fast plant seeds in every cell and watered the experimental with 1mL of the mixture and the control with distilled water. In doing this experiment I learned that the mouthwash didn’t have much of an effect on the plants. The experimental plants were only a little bit smaller than the control and all around they had a similar color. My results showed that the plants weren’t helped by the mouthwash but they survived and were only harmed a little bit. If I were to do this experiment again I would maybe try a different brand of mouthwash with a different alcohol content and see how that would affect the plants.
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