



81st Pittsburgh Regional Science & Engineering Fair

Intermediate Division

Student Project Abstracts

March 25, 2020

Notes to Judges

Students prepare Abstracts limited to 100 words that include the following:

- Purpose of the experiment
- Procedures used
- Data
- Conclusions
- Possible research applications
- Minimal reference to previous work
- For continuation projects, the abstract should focus on work done since the last PRSEF
- Should not include: a) acknowledgments, or b) work or procedures done by the mentor

Many students continue their research after the Abstract is submitted, and therefore the Abstract may not fully represent the Project.

Abstracts are available to the Judges prior to the Science Fair as an aid in pre-screening the Projects. Judging is to be based on the actual Project as presented by the student.

Project Numbers are assigned as XYYABC

- X: M – Intermediate Division (7th and 8th grade)
- YY: Category Name
 - BS – Behavioral and Social Science
 - BI – Biology
 - CH – Chemistry
 - CM – Computer Science and Math
 - CS – Consumer Science
 - EE – Earth & Environment
 - ER – Engineering/Robotics
 - MH – Medicine/Health/Microbiology
 - PA – Physics & Astronomy
- ABC: Project number
 - 1xx or 2xx – Individual student projects
 - 3xx – Team projects (2 or 3 students)

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Behavioral and Social Science (MBS)

MBS100: The Effect of Personality Type on the Occurrence of Chromesthesia

The purpose of this experiment was to determine if introverted or extroverted individuals had a higher incidence of a type of synesthesia called chromesthesia. It was predicted that introverts would show a higher occurrence of chromesthesia. To perform this experiment; participants were given a Briggs-Meyer personality test; then tested to see if they associated certain pitches of sound with colors. Final results available at the fair.

MBS101: The Effect of Gender on Pixel Shade Determination

The purpose of this experiment was to determine whether males or females would be more accurate at identifying shades of pixelated color. The hypothesis was that females with normal color vision would be able to see shades of color better than males with normal color vision. To perform this experiment; participants were recruited to complete a survey of gender; eye color; and age. Next; participants were given a colorblindness test to ensure that only participants with normal color vision were used. Finally; the participants took 2 online color quizzes to see how well they could distinguish pixelated hues. Final results available at fair.

MBS102: The Effect of Eye Color on Light Perception

The purpose of this experiment was to determine if the color of an individual's iris has an effect on perceived color. It was predicted that individuals with blue or gray colored eyes would be able to identify the greatest range of color shades. To perform this experiment; participants were recruited and eye color was recorded. A colorblindness test was conducted to eliminate any individuals without a full range of color vision. Full color vision participants were then asked to complete 2 color identification tasks on a computer. Accuracy of these tasks were recorded and eye color groups were compared. Final results available at the fair.

MBS103: The Effect of Storytelling on Memory Retention

The purpose of this project was to determine if information presented in a storytelling format is more easily recalled than information presented descriptively or only visually. It was hypothesized that hearing information in a story would lead to better short term memory recall than presented without storytelling. To test this hypothesis; human participants were shown a picture of an underwater scene under one of three conditions: visual information only; visual information with description of scene read aloud; or visual information with an accompanying story of scene read aloud. After observing the image; it was removed and participants were asked recall questions about the scene. Participants were scored for correctness of recall questions and experimental condition performances were compared. Final results available at the fair.

MBS104: Meowster Maze

Cats make chirping and chattering noises when they see birds. This happens because birds are cats' natural prey. Cats have not heard all bird calls and might be confused if they hear an unknown bird call or a predatory bird call. However; do cats respond differently to native bird calls or non-native bird calls? Cats would naturally respond to a predatory animal; how would they respond to a predatory bird call?

MBS105: Do We Rely on Visual or Auditory Memory?

Do we rely on visual or auditory memory? Memory is one of the most significant functions of the brain; for people of all ages. Numerous researches are ongoing to preserve/magnify memory functions. The purpose of my experiment is to see what age group relies on visual or auditory memory the most? To do that; I approached nearly 200 individuals from ages 6 to >65 years and was successful in collecting data from 111 participants who agreed to participate. Informed consent was obtained in individuals younger than 18 years of age. To test short-term visual and auditory memory; I showed them an image and read a story and asked to answer questions based on the image and the story. Data collected based on their accuracy of the correct answers. I analyzed further; and my results supported my hypothesis. By learning more about this; schools can create ways to teach students in ways that are effective. I would like to expand this current project even further by testing school curriculum by auditory learning as well as testing long term memory in ways to help Alzheimer's Disease.

MBS106: Does Creative Thinking Decrease with Age?

Participants will be asked to view inkblot drawings and write down what the inkblot appears to be.

MBS107: What Test is Best?

In my experiment; I gave both middle schoolers and adults a math test using an iPad and a piece of paper on basic multiplication and division concepts. I calculated the results and found the average score of both tests for each age group. Then; I used those averages to determine which test-taking platform produces higher test scores: my experiment's purpose. My hypothesis was - If I give middle schoolers and adults a test on both an iPad and a piece of paper the participants who took the test on paper will score a higher average because taking a test on paper may be more familiar to the participants then taking the test on an iPad. I gave each participant both tests and eight minutes to complete each. My results are not yet finalized but they will be available at the fair.

MBS108: The Effect of Video Games On the Body

My project is The Effect of Video Games on the Body. My hypothesis is that when the person plays the videogame; their heart rate will go higher. I did my experiment by having people play Mario kart and checked their heart rate ever so often. My results supported my hypothesis because in general; the heart rate of the participants went up.

MBS109: Anole Nocturnal Hunting

In recent science fairs anoles have only eaten live food. They also respond to different vibrations. However; very little information can be found on how well anoles hunt their prey at night. Most predators hunt during the day; but anoles eat crickets which are prevalent during the nighttime. How well would the non-nocturnal anoles hunt if there was not light to see their prey?

MBS110: Fire Alarms: Now you hear me; now you don't

The main objective of my project is to find out if fire alarms can be harmful to students because of the loud noise they produce. In order to find this out; I used a decibel meter to measure the decibel levels produced by the fire alarms. Using the data I determined that the decibel levels generated by the alarms are too loud and could cause permanent hearing damage. This could mean that thousands of American kids a day and roughly 56.6 million students a year nationwide are exposed to potentially harmful sound waves. Given the risk that fire alarms used in schools could be damaging children's hearing; they should be made quieter and safer.

MBS111: Does being exposed to laughter make you laugh?

The purpose of this experiment was to figure out if laughter really is contagious. The concluding data showed that the sound of laughter made someone laugh more than the image of laughter; or both the image and the sound together. The independent variable was the different videos played/shown to the participant. The independent variable did make a difference; because showing them only one video would have just been testing if the sound of laughter makes you laugh or if the image of laughter makes you laugh. One problem that occurred in the experiment was that it was difficult to determine what was a laugh and what wasn't. Some people's laughs were quiet giggles but others' laughs were loud and very easy to tell. Another problem that occurred was that the video actually made me laugh. Unusual observations were that most people laughed more in between the videos then they did watching videos. These laughs weren't counted because they weren't a direct result of the videos. The changes that could be made to the experiment would be for the video to be longer and to have more test subjects per grade instead of two.

MBS112: Musical Memories

Problem: Can music recall memories? Hypothesis: If music is played while learning; test subjects will do better on tests of the information learned when the same music is played during testing. Materials: permission slips test subjects grades 2-7 lesson plan test music speaker SmartBoard computer folder Procedure: Pass out the permission slips and get 10 test subjects from each grade. Have half of the test subjects come into the room about 5 at a time. This group will be group A. Give lesson. Record the test subjects and the time they were there. Repeat steps 2-4 for the rest of group A. Have the other half of the test subjects come into the room about 5 at a time. This will be group B. Set the speaker on repeat and start the music. Give the lesson. Turn the music off. Record the test subjects and the time they were there. Repeat steps 6-10 for the rest of group B. Wait one week. Have group A come into the room about 5 at a time. Have the test subjects take the test on the lesson learned one week before. Grade the tests. Record the results of the tests. Repeat steps 13-16 for the rest of group A. Have group B come into the room about 5 at a time. Set the speaker on repeat and start the music. Have the test subjects take the test. Turn the music off. Grade the tests. Record the results of the test. Repeat steps 18-23 for the rest of group B. Graph the test results and identify outliers. Analyze the results. Give Dr. B a bag of Doritos for his time.

MBS113: Sleep Soundly

My experiment was called sleep soundly; and it was to find the best temperatures to fall asleep in. All I needed for this experiment is a thermometer; or to help make it cooler or warm a heater or fan. During my research I found out that the best sleep temperature is between 60 and 67 degrees. Also it depends on who you are to determine your temperature. When doing the experiment I found that for my dog the best sleep temperature was 65 degrees for three days; and she fell asleep fast and normal. Then I changed it to 60 degrees for five days so she could get used to the different temperatures; and she fell asleep a little bit later than normal. Then I set the temperature to 70 degrees; and gave my dog more seven days so it could adapt to the temperature a little bit more. She fell asleep a little after the cold temperature. In my research the best temperature to sleep in is 65 degrees; but it can be different to everyone. This research can help people who have a hard time falling asleep; and can help with insomnia. My research can also help with falling asleep fast and stay asleep. I found most of my research and facts from sleep.org; NBC News; and Web.md. My research will help people who have a hard time falling asleep and staying asleep. My research shows the best temperature is mid 60s.

MBS114: Bouba Kiki Effect

Whether they realize it or not; most peoples' brains are wired to hear sounds when you look at certain shapes; due to a mental condition called synesthesia; which most people have; even if it is just slightly. Is the sound heard the same for almost everyone? According to my experiment; yes! About 78% of the people I surveyed said that the spikier shape was "kiki" and the more round shape was "bouba." This supports my hypothesis because more than half of the people I interviewed said that the spikier shape was "kiki" and the more round shape was "bouba." Again; the reason I got these results was because of synesthesia. The 22% of people who said that the spikier shape was "bouba" have little to no synesthesia.

MBS115: Musical Madness

Problem- Will 5th and 8th grade students be able to distinguish the discrepancy between words and color with or without pop music playing? Hypothesis- The researcher hypothesizes that 5th and 8th grade students will be able to better distinguish between words and color without pop music playing in the background. Materials- a display source the scientist will be using a projector a timer or stopwatch students permission slips a notebook or chromebook pencil or pen Procedure- Send out permission slips Now get your test subjects Bring up your slide of the stroop effect Then start the stopwatch and have the student read the color not the word Then when the student finishes record the time Next do it again but with your choice of music playing Then record that score Lastly repeat for the rest of the subjects Where I got the idea- <https://prezi.com/qd66kn1tu4pn/copy-of-how-does-music-affect-the-stroop-effect/> This person did this experiment.

MBS116: Do stereotypical gender based items affect memory within that gender?

The purpose of the experiment was to find out if boys or girls remembered items that related to their gender rather than relating to the opposite gender. The independent variable did not make a difference because the independent variable was the gender being tested and both genders remembered on average about five masculine items and four feminine items. In all the girls had a higher average than the boys on how many items they remembered but the participant that remembered the most amount of items was a boy. For the female testing two of the participants remembered the same amount of masculine and feminine items; two remembered more feminine items than masculine items; and two remembered more masculine items than feminine items. For the male testing it was the same exact results where two remembered the same amount of masculine and feminine items; two remembered more masculine items; and two remembered more feminine items. There were no problems that occurred during the experimenting that affected the results of the data. Some unusual observations were that everyone seemed to remember the sport items even though most people do not play sports and it is probably because people seemed to remember the more common items that they see everyday. Some changes that would be made to the experiment would be to test more people and test different age groups. Other than that nothing else would be changes in this experiment. This experiment is important to society is because it is important to identify gender stereotypes so men and women can have equal treatment and pay.

MBS117: Does upbeat music increase basketball shot accuracy.

The purpose of the experiment was to test if listening to uplifting music makes an impact when shooting a basketball. The hypothesis stated that listening to uplifting music would improve a player's performance because studies show that this kind of music gives a boost of endurance and confidence during a workout. The data collected did not support this idea and instead suggested that listening to music is a distraction to players. The independent variable did make a difference but not in the way that the hypothesis established. Instead in the first round; the experimental made an average of 1.6 more shots then the control group who had an average of 1.4 shots made. After listening to music in the second round the experimental group decreased their average shots made by 1.6. The control group who did not listen to music in the second round increased the average shots made by 0.2. While the experimental group had an average improvement of - 1.6 the control group improved by an average of 0.2 shots made. A few unusual observations were made while testing. A participant with a fractured elbow made more shots than one who could shoot regularly. A participant in the experimental group made five shots without music and no shots with music. These unusual observations may have been a result of some problems that occurred during the experiment. The first two participants in the experimental group had to use a different ball in the second round of the experiment.

MBS118: The Effect of Musical Training on Pitch Identification

The purpose of this experiment was to determine if the type of musical training (instrumental vs. vocal) an individual undergoes has an effect on identifying and matching pitches. To test this experiment; 100+ participants were recruited and asked to identify their background in musical training (instrumental; vocal; both; or none). Participants were then played a series of pitches with identifications given (e.g. C"). The pitches were then played a second time in varying order and participants were asked to identify the pitch by letter. Experimental groups were compared to determine which type of training was associated with the greatest occurrence of correct identification. Final results will be available at the fair.

MBS119: Working for a good night of sleep--relationship between exercise and sleep

Sleep plays an essential role in one's life. Studies show that getting enough high-quality sleep can boost one's daytime energy; activity; mood and immune system. Despite the health benefits associated with physical activity; sleep quality; and sleep quantity; the effect of exercise on sleep remains unclear in athletes; especially junior athletes. The sleep and exercise patterns of a 13-year-old competitive swimmer were measured over the course of 60 days. An initial sleep intake evaluation was completed using the Pittsburgh Sleep Quality Index (PSQI). A sleep diary was maintained. A FitBit Charge 3 was used to monitor daily activity and sleep which records the number of steps and time spent in different sleep stages. Data was analyzed using Microsoft Excel. Sleep data was subdivided into days of swimming competition and days of intense training. There was no significant correlation between number of steps and the FitBit-generated sleep score which is a quantitative measurement of one's quality of sleep. However; there was a significant difference between the amount of total sleep and deep sleep on days of competition compared to non competition days. It is well known that physical exercise is important for a good night's sleep. These data validate the guidelines from the Center for Disease Control (CDC) for exercise and sleep in children and highlight the importance of having a component of high-intensity exercise.

MBS120: Does Cardiovascular Exercise Improve Memory?

Does Cardiovascular Exercise Improve Memory? PROBLEM: Does cardiovascular exercise improve memory in middle-school students? HYPOTHESIS: The researcher hypothesizes that a short burst of 10 minutes of cardiovascular activity will improve memory in students. MATERIALS: Computer Printer Printed pages of 10 pictures Permission slips Tests Stopwatch Students PROCEDURE: Exercise Group~ Pass out permission forms to 6th; 7th; and 8th grade. Print out the 10 pictures (have enough copies so each student can have one). -Possibly test heart rate on students. Let the students study the pictures for 2 minutes. Let the students participate in 10 minutes of gym class. Have the students recall as many images as they can. Repeat steps 2-5 3 times Collect the data Average the data Control Group- Pass out permission forms to 6th; 7th; and 8th grade. Print out the 10 pictures (have enough copies so each student can have one). Let the students study the pictures for 2 minutes. Let the students participate in 10 minutes of regular class. Have the students recall as many images as they can. Repeat steps 2-5 3 times Collect the data Average the data

MBS121: Music to my Ears

This experiment tested which genre of music hip; hop; classical; or heavy metal show the greatest increase in heart rate. The data did not support the hypothesis; If the subjects listen to heavy metal; classical; and hip-hop music for thirty seconds; then the heart rate will increase most while listening to heavy metal music. When the hip hop music was playing the heart rate increased 60%. When listening to the heavy metal music the subjects heart rate increased by 23%. Lastly when the subjects listened to the classical music the heart rate increased by 17%.

MBS122: Colorful Memory!

According to the data for the Colorful Memory investigation the most missed questions were on the blue paper. The blue paper may have caused some of the participants to think about something other than the words on the paper and not focus on the questions presented. The least amount of questions was the white paper. The color white leads to better readability and understanding. The white paper had the most correct answers because white is a brighter color and more commonly used compared to blue paper which makes it easier for the participant to answer correctly.

MBS123: I Flunked. Why Should I Care?

This investigation was conducted in an attempt to reveal the fact that academics affect a student's self-esteem. To prove this opinion; the participants were divided into two separate groups. Both groups took a self-esteem test. Then; both groups took a science quiz. One group was told their true grade; while the other group was told their grade was a letter worse than their true grade. Then; both groups took the self-esteem test again. This resulted in the second group of participants having lower self-esteem than the first group who was told their true grade.

MBS124: Real Life That Captures your heart

The purpose of this experiment was to find out if a person's heart rate changed when looking at different categories of emotional pictures. Watching a slideshow of emotional pictures relating to happy; sad; and disturbing feelings affected people in various ways; but for many of the subjects; the heart rate raised the most when looking at a series of sad pictures. For the sad pictures; 76% of subjects heart rates increased. For the happy slideshow; 47% of subjects heart rates increased. For the disturbing slideshow; 58% of students heart rates increased.

MBS125: Does Enjoyment Equal Success? A study in the correlation between enjoyment and grades

This is a study in the correlation between enjoyment and grades. It will help students and teachers with learning about growth mindset. It will also enable us to understand if helping a student enjoy class will increase their grade. Approximately 115 7th grade students will be surveyed from 4 different home rooms. After each student and their parent completes the parent consent form; they will complete a Google Form. The survey will ask them to rate each of science; social studies; math; and English language arts on enjoyment and provide their grade. The responses will be recorded; compared; and analyzed. The experimentation is continuing; and results will be available on fair day.

MBS126: Which Type of Memorizing Strategy Is the Best?

1) Problem: What memorizing strategy is the most effective? 2) Hypothesis: The experimenter will test sixth; seventh and eighth graders multiple times to see which strategy is best to use to memorize material. There will be several different memorizing tactics included in this project. The scientist will have sixth; seventh; and eighth graders chew gum; bounce on an exercise ball; and listen to music versus regular. In order for the students to memorize the material; the scientists will simply give all of the groups the same sentence each and see what group can copy it down the same. The scientist predicts that the group that chewed gum and while attempting to memorize will have the best results because she believes that spearmint flavored gum will trigger a certain taste of remembrance.3) Materials: The scientist will need to use: Extra gum; computers; music; two exercise balls; headphones; paper; a computer; paper clips; a folder; a notebook; pencils or pens; and students. 4) Procedure: First; the scientist will make permission slips for kids in sixth grade; seventh grade; and eighth grade. Next; the experimenter will create the sentence and print out at least 20 copies. Then; she will buy gum. After; the scientist will ask for permission to have access to the computer lab. Next; she will begin testing students by having them studying while chewing gum. After; the experimenter will have a different group of kids study while listening to music. Then; she will have another group regularly study. After; she will have the students write down the sentence she gave to them and see which group has the best results. While waiting in between results; the experimenter will write down names; scores; and make charts. Finally; after calculating and grading the tests; the scientist will have finished the experiment! With the data and information the scientist has gathered; she will use it when she studies to get better results as well.

MBS127: Which gender is better at solving optical illusions?

The purpose of this experiment was to test whether males or females ages 12-14 were better at solving optical illusions. The data did support the original hypothesis which was that males would get more optical illusions correct because they have better spatial perception. Males got more correct on average although they did take longer. The independent variable did make a difference because different genders had different average times and answers. A problem that occurred was during one of the participants trials the data was not recorded. This may have affected the results although they recalled their answers and part of their time. In this experiment an unusual observation is when a male participant took 20 times as long as a female participant on optical illusion one; 10 times as long as another female participant on optical illusion two; over 11 times as long as another female. If this experiment was replicated they should have a shorter time constraint. Participants typically all solved each optical illusion in under 45 seconds; therefore it was not necessary to give a three minute time-limit. This experiment was also made difficult because it is difficult to find optical illusions to solve; and not just cool pictures. Therefore; instead of solving the illusion; participants were asked questions about each of the illusions. The data collected in this experiment demonstrates that on average males are better at solving optical illusions.

MBS128: How Weather Affects Humans

The researcher tested how weather affects the mood process. A google form was used to ask the same 6 students to rate their mood on a scale of 1-10. The students took a mood survey. Weather data was collected from the national NOAA website. Results will be available on fair day.

MBS129: Social Media Type : Real or Hype

Social media has brought massive change in our lives; bringing people closer together virtually; while unknowingly creating more physical distance between us and our loved ones. Some people are more inclined to use social media than others; and my project explores if there is a connection between personality type and social media usage. My study uses the Myers-Briggs test to determine if people with specific personality traits are more likely to connect in a virtual world. Subjects complete an on-line Myers-Briggs personality assessment followed by a 10-question survey about their social media usage. The results of the personality test; which are broken down into four distinct categories: introversion vs. extroversion; sensing vs. intuition; thinking vs. feeling; and judging vs. perceiving; are recorded as a four-letter code at the top of each survey; along with the degree (percentage) of each personality trait that was indicated with the results. I hypothesized that extroverts; or more socially outgoing people; will have greater social media usage because they enjoy making social connections. I intend to analyze the relationship between extroversion and frequency of social media use; but also want to explore whether other personality traits show any connections to social media use. My experimentation is still continuing; and conclusions will be available when analysis is complete.

MBS130: The Effect of Aromatherapy on Test Anxiety

I intend to analyze data that suggests that Aromatherapy does not improve test performance. I will have participants take a generalized timed test with different essential oils diffusing. I will then compare the data to see whether my data supports or rejects my hypothesis.

MBS131: What type of memory do you have?

Please visit student's exhibit for abstract

MBS132: A Closer Look At The Stroop Effect

My purpose was to evaluate visual processing with a Stroop test. My hypothesis was that boys would be better than girls. To test this I gave students a Stroop test; asking them to read printed words and then to read the color of the words. Results were that when asked to read the ink color instead of the printed word; more mistakes were made and it took longer. In the future; I could test more students. These results show that when the brain must overcome the challenge of ignoring certain stimuli; there is a delay and mistakes can be made.

MBS133: Children Language Shows...Do They Really Work?

1) Send out permission forms for three boys and three girls in grades k-3 2) Find a video of "Dora The Explorer" for the participants to watch 3) Set up notebook before hand 4) Before showing participant the five minute clip; I will ask them if they know any Spanish before 5) They will then watch the five minute clip 6) I will ask them what Spanish they have learned after watching and record it in my notebook 7) After I get through all of my participants; I will analyze my data 8) I will then put all of my data in graph form 9) I Will put my whole project on a slide show 10) I will finally put all of my information on a presentation board.

MBS134: Gut Genius

For my project; I tested intuition for people varying in age and gender. I tested twenty-two individuals: ten seventh graders; ten eighth graders; and two adults. Two different test materials were given to each subject; one which they had the option of changing and one which they did not. I tested whether an individual should stick to their "gut". My results found that seventh graders did better when they could change their answer; but the eighth graders did better on the intuition test. The adults scored equally on both tests. I concluded that trusting your intuition may not be the best thing to do on every test.

MBS135: Mind Your Tone

In my experiment; I am testing whether or not using a tone of voice affects the ability to remember what you say. This is important so you know which tone of voice to use if you want people to remember what you say. I think that the more emotional voiced will be remembered better than the monotone voice because people will be more interested in what is happening. I will record myself saying a bunch of different words in three of different tones of voice. First; record yourself saying a bunch of words in different tones of voice. Then play the monotone voice for the participant and record which ones they remember. Repeat with the emotional voice. My hypothesis is that the voice with emotion in it will be remembered better than the monotone voice; because studies show your brain classifies memories as important by the amount of emotion in the memory. Results will be available on fair day.

MBS136: Does music affect concentration

Please visit student's exhibit for abstract

MBS137: Does increased heart rate help a 5th grade athlete take a test?

Please visit student's exhibit for abstract

MBS138: How does text color affect readability?

Please visit student's exhibit for abstract

MBS139: Are eye witness testimonies really 20/20?

Eyewitness testimonies are the accounts that bystanders; or a victim of a certain event; tell what happened from their perspective. An example of an eyewitness testimony would be when a judge would ask someone who witnessed a robbery through a window to retell the event in court. The importance of eyewitness testimonies could be the difference between someone being sent to jail and being framed; or them being able to live their life without a guilty conscious.

MBS140: Can Mental Exercise Help Alzheimer's?

For my project; I tested whether concentration or imagination could help someone with Alzheimer's Disease remember a simple origami shape. This project is helpful by showing which is more effective in prolonging memory. I conducted this experiment by giving participants a focus exercise and a creativity exercise. Beforehand; I showed them how to make an origami figure. After each test I recorded how much of it they could remember. I learned that using creativity helped memory slightly more and seemed less frustrating since there was no specific answer. For future experimentation; I could try using other skills to test participants.

MBS141: Inattentional Blindness

Please visit student's exhibit for abstract

MBS142: Will It Test or Stretch?

Stretching is vital for sports; but have you ever thought about doing it before a test? My experiment provides us with a new way to score higher on tests. To do this I will need to have two groups of 5 people be tested at the same time. One group (group A) will stretch and the other group (group B) won't stretch. Both will take a test for 5 minutes and we will see if stretching improves test scores. The next day I will use the same two groups except Group A won't stretch and Group B will. This process will continue for over 7 days. At the end of this process I will see if stretching improves test scores. My final results will be available on fair day.

MBS143: Sports Affect School Progress?

Though the data collection process is not complete; I have made a considerable amount of growth in the project; how can sports affect a child's grades. I have made multiple presentations throughout the school in different science classes. Resulting in multiple Human Informed Consent Forms returned and signed and a total of 25 responses to the survey; which I later sent out focused on questions to answer my research. I plan on continuing to collect data until March 1; 2020. This way I am able to receive the most accurate results and come to a solid conclusion. I plan on adjusting my goal of 200 children to a goal of 60 children this way; this way I have an attainable goal as well as enough data to come to a solid conclusion. Though I have not gotten enough results for the control group of the study; the children that do not play sports; I am working on improving the numbers to be further even with those of the experimental group.

MBS144: Casino Statistics

Most people don't know off the top of their heads the statistics of winning a card game or different dice rolling techniques. There are additional things such as the shuffling and other factors that are variables in winning. This study is to show the odds of different games and other things commonly found in casinos.

MBS145: Time Perception's Effect on Cognitive Processing

One of the most important issues is not having enough time. Time is limited; so we need to learn how to use it efficiently. Time perception is the perceived duration of an event. There are two main ways we calculate time. By estimating how long something would take; and pacing ourselves based on previous experiences. I had participants do four color matching worksheets. Each trial had a different factor that made their time perception different. I am trying to find out which way makes neurotransmitters create faster intellectual brain waves by using tools like timers; stopwatches; and by giving items. The first trial was the control; the second had a stopwatch; the third was with a timer; and the fourth one was with a possibility of getting a sticker. I hypothesized that the first trial; which is the control and has no extra variables; will be the worst time because the participants are not adapted to the cognitive task in front of them. I also hypothesized the best time will come on the very last trial due to the fact that participants would have done the task 3 times before. My hypothesis was correct; however; the third trial was almost equal to the result from the fourth trial. This shows that the most efficient cognitive processing speed can be achieved through the time perception of a stopwatch or a neurotransmitter rush due to the possibility of getting an item.

MBS146: Synesthesia: An Aid to Memorization

In this experiment; I hypothesize that Synesthetes would remember information more accurately than people without Synesthesia. Synesthesia is a condition where a person associates senses with sensory perceptions. For example; if you have Synesthesia; hearing sounds may evoke a taste. I experimented on three people with and three without Synesthesia. I showed them a slideshow with a series of sequences they had to memorize. Then; I gave them a written test on it. The purpose of this experiment was to see if Synesthesia is a Mnemonic Device. As a result; my hypothesis was proven correct. With the data from this experiment; I hope; in the future; to develop a system or technique that helps students retain information from their school day.

MBS147: The Effect of Rewards on Effort

This experiment was designed to assess perseverance. The location of the experiment was Robinson Mall. Quarters and pennies were placed in several locations inside the Mall; on the ground next to gumball machines; on the base of gumball machines; and in front of the massage chairs; nowhere near the gumball machines. At each of these locations coins were adhered to the ground with 3M adhesive strips. Not all of these coins had adhesive; to allow mall-goers the chance to persevere and pick up the loose coin. The study found that children were far more likely to persevere in picking up the coins; when there was a visible use or reward.

MBS148: Unlearning False Information In Deepfake Videos

How does fake news affect memory? Do people have a hard time unlearning things they learned from deepfake videos? I hypothesized that if someone viewed a video of a myth; and were then told that the video is fake; after a week they would begin to believe the myth again. Two surveys measured participants' beliefs and memory for myths and facts learned through videos; Survey 2 revealed which were myths. To measure how people's memories for myths and facts changed; Survey 3 was sent to the participants one week later. I tested Teens and Senior Citizens. I predicted differences in the level of belief between the two groups. My hypothesis was supported; but the effects were not as extreme as I had predicted: initially; both groups believed the myths and facts equally; and after Survey 2; the facts were believed more than the myths for both groups. A week later; the Teens believed the myths slightly less; and the facts slightly more. The Senior's belief of the myths increased slightly; and their belief of the facts stayed the same. After Survey 3; Seniors believed the myths more than the Teens. As people age; their memory for facts gets worse; and as a result; they don't remember which are myths and facts. One thing that may help people remember myths and facts is whether someone notices anything strange about a video. Participants who noticed something strange about a deepfake video; had lower beliefs of myths in the end.

MBS149: A Correlation Between Video Game Usage and Manual Dexterity

The purpose was to see if gamers who used a controller with their hands and fingers had better manual dexterity than people who didn't. Somebody would fill out a form with basic questions like how many hours of video game time do they play each week; Then they would do a dexterity test; they would do this three times with their right hand and the same on the left. Then they would be timed and repeat that until there is enough data for a spreadsheet. The data showed video game time did not affect the participants time on the test.

MBS150: How do Non-Newtonian Fluids affect Helmet Padding

In my hypothesis; I anticipated that one fluid would be more effective at a different height. I was correct; but the dents or divets that were left after the dropping 5 lb-weight meant something as well. A non-newtonian is a fluid whose viscosity is variable based on applied stress or force. The viscosity of fluid measures the resistance to deformation at a given rate. So this means that the fluids should be able to "bounce-back" if pressure is put upon it. That is exactly what the oobleck did. But the slime didn't return to its original state until 10 minutes later. This would have an immense effect on football padding. Because if you are repeatedly; and landing on your head hard it is inevitable that you will get hurt. Non-Newtonian fluid The decrease in pressure from 1ft The decrease in pressure from 1.5ft Oobleck 40% 25% Slime 30% 35% Collect your materials and place them on a covered table. This way; you can easily clean up any residual left after mixing. Take your bowl and separate it from the rest of the materials. Mix two cups of cornstarch to one cup of water into a bowl. Mix the cornstarch and water until your oobleck is formed. Place the oobleck aside and start creating the slime. Take two tablespoons of borax and mix it with half of the glue. Mix until it has formed as well. Place both of the fluids in zip lock bags. Connect the gauge to the airbag; and place the oobleck on top of it. Then; drop the 5kg weight from a 1ft and 3ft height Repeat the last step with the slime. In conclusion; my project was a success with a few minor difficulties. My procedure and experiment were great; but I did almost break my assistant's hand in the process. My hypothesis was correct. But that doesn't necessarily mean that slime would be the best option for a football helmet. And that is all because of the fact that it doesn't return to its normal state quickly enough.

MBS151: Are Guppies' Big Brains Just for Show and Does Light Affect That?

The purpose of this project was to determine if guppies can be trained by ringing a bell at feeding time; and if the type of light affects this. Guppies are one of the most intelligent aquarium fish. Their behavior can be conditioned with sound and influenced by exposure to too much light. The hypothesis of the project was that if fish are trained to approach food at feeding time with and without bells; under white LED; blue LED; or natural light; those trained with bells under white LED light will feed fastest; and those trained without bells under natural light will feed slowest. Three trials were conducted in this experiment. For each; twelve tanks were used (containing two guppies each). Six served as the experimental group (with a bell rung at feeding time); and six served as the control (with no bell). Of the six tanks; two were kept under white LED light; two under blue LED light; and two under natural light. Fish were fed once per day for one week. At the end of the week; a bell was rung and the feeding reaction time was measured. The results of the experiment supported the hypothesis. Fish trained with a bell under white LED light fed fastest; and those trained without a bell under natural light fed slowest. Fish trained with a bell reacted to food noticeably faster than those without a bell; and white LED lights were associated with slightly faster feeding times than the other lights.

MBS300: Habitual Ritual

Accents are a fascinating thing if you have a mother with a British accent but a father with an American country accent you most likely have a strange British country accent. I talked how people did in olden times and counted how many times I messed up I also read an article before and after talking in an accent to see how it affected my vocal fluency. The article I read was "Many animals are shifting from night to day to avoid people" by Emiliano Rodriguez Mega (published by Newsela). Before talking in an accent I messed up 9 times after I messed up 7 times. While talking in an accent I messed up 2 times on the first day; 4 times on the second day and 1 time on the third day. My hypothesis was close but not exact I messed up more on the second day than the first but talking in an accent didn't have any effect on my vocal fluency.

MBS301: M3m0ry Through the Ag3s

People say that as their minds grow older; they forget more. On the other hand; kids do not need to remember as many things as adults do. The purpose of our project is to see which age group has a better digit span: adults or kids. To do this; we are giving 15 adults and 15 kids 1 minute and 30 seconds to look at a piece of paper with a 20 digit number sequence. Then; we are giving the participants 20 seconds to remember the sequence. Finally; the participants will write down as much of the sequence as they can; and we will check it for accuracy. The experimentation is continuing; and results will be available on fair day.

MBS302: Dreams: Who Remembers Their Dreams More and Why?

Younger people seem to be affected by their dreams more than older generations do. We want to figure out if younger people of different genders remember their dreams more. We are going to have our subjects write down their dreams when they first wake up and again ten hours later. After a week of testing; we will compare the data. We will see how many details the person consistently remembered and make a graph based on that data. We will also make a pie chart for the gender based off how often the person remembers the dream.

MBS303: Fear

Please visit student's exhibit for abstract

MBS304: The psychological and physiological effect of color on people

We learned the psychological and physiological effects of color on people. We hypothesized that if the test subjects are exposed to only red; blue; yellow or green; then blue will cause them to be calmer/less stressed. We had a sphygmomanometer; glasses with color; a timer; and a participant. We asked them a question; took their blood pressure; then did the same thing with the glasses on. We repeated that for all 4 colors. It took 10-15 minutes. The cerebellum controls participants blood pressure so the cerebellum will trigger their blood pressure to rise/fall according to the color.

MBS305: The Effect of Distractions on Cognitive Function

Distractions are things that prevent someone from giving full attention to something else. We hypothesized that distractions affect performance. We also thought that the effect would be lower for different ages. We tested if distractions affect reading comprehension and math skills. We found that not all of the distractions affect us; and some like music even made a better performance for some people. In addition; we thought that pain would be hard to ignore; it indeed was the hardest to ignore. It seems that we were wrong about the age; because we did not find a significant difference between ages.

MBS306: Fears and How They Vary With Age

A bird is standing on the walkway you are walking on; looking in your direction. Did you find that scary? If so; you might have ornithophobia. "A phobia is a persistent; irrational fear of a specific object; activity; or situation that leads to a compelling desire to avoid it." For our science fair project we are attempting to determine common fears in three different age groups and how the fears vary. Our hypothesis is that as you age; your fears would get less physical and more psychological. With the knowledge that we will discover in our experiment; we will be able to understand and help with common fears.

Biology (MBI)

MBI100: Will Magnets Make Plants Grow Taller?

Plant seedlings will be placed at various distances from magnets. Rate and amount of plant growth will be measured over a set time period.

MBI101: The Effect of Temperature on Rate of Cricket Chirps

The purpose of this experiment was to determine if there is a relationship between temperature and rate of cricket chirps. It was hypothesized that as the temperature increased; so would the rate of cricket chirps. To test this hypothesis; crickets were purchased and placed in different temperature conditions (cool; moderate; and warm). Crickets were video recorded in the different temperature conditions. After recording; random time intervals were selected from the video recording and the number of cricket chirps was measured. Final results available at the fair.

MBI102: Nonorganic vs. Organic Fertilizer: Why it Matters to Our Aquatic Ecosystem

Global warming is being fought in many different ways; renewable energy; reduction in power use; the Paris agreement; etc. Though when thinking about alternative sources of energy or "cleaning" the earth's atmosphere; people rarely consider the uses of floating masses in water; algae. Algae is a broad category for floating masses that photosynthesizes and produces oxygen (algae produces 50 percent of the world's oxygen). It can also be used to create oil; the slimy texture of algae comes from its protective solution that protects it from the rays of the sun; this "slime" like substance has oil in it that can be extracted and used. Though it has its positives; it can also be quite harmful to the environment that it is growing in if it starts growing out of control. This issue is mainly caused by fertilizer; it contains all the perfect nutrients for algae to multiply uncontrollably. So is there a way to reduce the effect fertilizer runoffs have on algae by switching from organic to inorganic or visa versa? I hypothesize that switching to organic will reduce the effect on the multiplication of the algae. I am providing Spirogyra algae with different levels of organic and inorganic fertilizer and measuring its mass before and after the experiment as well as dissolved oxygen levels of the water at intervals throughout the experiment. The experiment is still in progress.

MBI103: Removing Bacteria on Cell Phones

Phones are a must-have in the world today. However; people do not realize that their phones are the main provider of illnesses and how much bacteria are on their phones. My experiment is about testing how dirty phones are; and what could clean them best. I wanted to find out if 70% isopropyl alcohol; tissues; or hand sanitizer would clean phones the best. To do that; I selected three phones and named them Phone A; Phone B; and Phone C. After that; I marked out three areas and named them Area 1; Area 2; and Area 3. Then; I bought some tissues; hand sanitizer; 70% isopropyl alcohol; nutrient agar; Petri dishes; and cotton swabs. I first set up the Petri dishes by microwaving the agar and pouring it into the plates. Then using a cotton swab; I swabbed each area and swabbed those on different Petri dishes. Then; I cleaned each area with a different cleaning agent and swabbed those on different Petri dishes as well. Afterward; I put the swabbed Petri dishes into an incubator which is set at 36.5° for 48 hours. After 48 hours; I took them out of the incubator and counted the colonies that formed on each Petri dish to gather my results. In the end; I accept my hypothesis because I stated that 70% isopropyl alcohol would clean the best out of the three cleaning agents; and it succeeded in doing that.

MBI104: To Feed or Not To Feed

A variety of deterrents will be used in conjunction with bird feeders to evaluate which deterrent works best.

MBI105: Can Food Make You Faster?: The Effect of Spices on Daphnia Heart Rate

The purpose of this experiment was to determine if different dietary spices could influence the heart rate of living creatures. Due to its susceptibility to environmental conditions; Daphnia magna was selected as the creature of study. Individual daphnia were exposed to various dietary spices including but not limited to cinnamon; cayenne pepper; and garlic. Daphnia individuals were placed on concave microscope slides containing 1 drop of spring water and allowed to acclimate to a low-light setting of a compound light microscope for a time interval of 1 minute. After acclimation; 1 drop of spice solution or an additional drop of spring water (control) was added and heart rate was monitored for a time period of 30 seconds. This heart rate was multiplied by 2 to calculate the heart rate of the Daphnia in bpm. Average heart rate for each experimental condition was compared to determine the effect of the various spices on the Daphnia. Final results available at the fair.

MBI106: Are Cat Paw Prints Unique?

The purpose of this experiment was to determine if cat paw prints are unique and can be used for individual identification; similar to human fingerprints. It was hypothesized that paw prints would be unique. To test this hypothesis; cat paw prints were taken and compared to one another to determine if unique qualities were present. Final results available at the fair.

MBI107: A Plant's Favorite Drink

Please visit student's exhibit for abstract

"MBI108: Sleepless"" Nights""

Obstructive sleep apnea is a common but often undiagnosed disorder in the US population. You can screen for obstructive sleep apnea by asking people just a couple of questions. My problems are; what percent of the general population of Wexford PA have undiagnosed cases of sleep apnea? What is the prevalence of obstructive sleep apnea between the age groups of 20s-70s+ and what percentage of people will screen positive by using the STOP BANG questionnaire for obstructive sleep apnea. Hypothesis- Given Adult participants ages 20-29; 30-39; 40-49; 50-59; 60-69; and 70+ The researcher hypothesizes that the STOP BANG screening tool will be most effectively testing positive in diagnosing the prevalence of obstructive sleep apnea with all the age ranges. Obstructive obstructive sleep apnea is an underdiagnosed disorder and can be easily screened for by using a STOP BANG screening test. This researcher believes that 10% of the participants screened will screen positive for obstructive sleep apnea with the STOP BANG tool. The researcher also hypothesized that 50% of obstructive sleep apnea cases in the general population of Pittsburgh are undiagnosed. Materials- STOP BANG questionnaire Oxygen saturation monitor Permission slips Phone Scale Measuring tape Sphygmomanometer Procedure- Select participants for the screening portion of this study with the goal of recruiting 6 participants in each age range: one male and one female in three different BMI groups (1) one of normal weight (BMI 19-24); (2) one overweight (BMI 25-29); and (3) one obese (BMI 30+). Age ranges are: 20-29 30-39 40-49 50-59 60-69 70+ Consent participants for this study. Screen participants for obstructive sleep apnea with the STOP BANG screening tool. Confirm measurements in the STOP BANG screening tool: Check blood pressure (mmHg) to determine if it is in control or not. Check participants BMI (kg/m²)(weight and Height) Check neck circumference (inches) Score each participants STOP BANG screen with the scoring criteria to calculate the risk of obstructive sleep apnea. Select participants at random of various risks of obstructive sleep apnea to undergo an overnight monitoring of oxygenation. Analyze data of STOP BANG screen to determine the prevalence of obstructive sleep apnea in a general population sample in Pittsburgh in size(at least 36). Determine if risk of obstructive sleep apnea depended on age; BMI; presence of high blood pressure; neck circumference; or symptoms. Also determine the percentage of cases of obstructive sleep apnea that were undiagnosed in the general population ofPpittsburgh and the percentage of participants that screened positive for obstructive sleep apnea.

MBI109: Muscles Clean Water

With my project; I am trying to see if we can use a specific breed of muscles to clean water; and possible to clean Pittsburgh rivers. To see this; I will be testing the contaminant levels of dirty water with mussels in it every day to see what contaminants they clean and line that up to the common contaminants from sewage overflow and the other things in Pittsburgh water to see if the mussels could help with anything. I will have the same mussels in the same place for the same amount of time and test for different kinds of contaminants to see how clean the water is each day; therefore showing if it could help with Pittsburgh's current river pollution crisis. After testing my experiment; I concluded that these mussels can be used to clean water because the water got a lot cleaner after putting the mussels in.

MBI110: The Diets of the Red Wigglers and How They Effect Them

If the scientist tests; how do different diets effect the worms and soil? In order to perform this test; the scientist needs potting soil; red wigglers (redworms); four 25.4 cm. diameter plastic or clay pots; a spray bottle; large paper cups; a pH test kit; a metric scale; black plastic bags; aluminum trays (to place the pots in); newspaper; and food for the worms.

MBI111: Light Exposure vs. Spoil Rate of Milk

Please visit student's exhibit for abstract

MBI112: How does adding nitrogen fixing bacteria affect plant growth?

The purpose of this experiment is to reveal the viability of a possible substitute to nitrogen fertilizer; which runs off into streams creating algal blooms that harm the environment. This solution is rhizobia; a bacteria that produces nitrogen symbiotically with clover; leaving an excess of nitrogen in the soil and making the field more viable for the next crop planted.

MBI113: Whats in Your Water?

Problem: What is the best way to filter tap water? Hypothesis: The scientist hypothesizes that out of boiling; commercial filter (Brita); Ultraviolet light (UV); and Solar disinfection. The scientist thinks that the most effective way to filter water will be by using an Ultraviolet light. The scientist think this because UV lights penetrate and kill many types of bacteria that are even able to cause illnesses. Materials: Pot full of water Oven Faucet Brita Tap Water Filter System Ultraviolet light/ lamp Spot that gets hit directly by sunlight Water bottles Water quality test kit Procedure Boiling: Fill the pot with water Place the pot on the stovetop and turn it to its highest setting Once bubbles start rapidly bursting it is boiling Take the pot off the stovetop Pour water into bottle/cup Test water for cleanliness Do this 3 more times Brita tap filter: Order filter Once filter comes in attach it to your faucet/tap Pour water into bottle/cup Test for cleanliness Ultraviolet light: Order an ultraviolet light or lamp Fill a cup/bottle with tap water Point light directly at the water for 1 hour. (Make sure it is covering all of the water.) Once the hour comes take the lamp/light away Test for cleanliness Solar disinfection Fill up one bottle of water with tap water Place bottle in a spot that gets directly hit by sunlight all day Keep bottle there for 6 hours Take bottle back inside Test for cleanliness Where I got the Idea from. I got this idea from all the questions and concern about water being infected or being dirty to the point where it can cause severe illnesses. So I decided why not see how dirty my water is and what were the best ways to filter those dangerous illness causing bacteria.

MBI114: Testing the Relationship Between Diet and Exercise

Background: The purpose of this study is to examine the relationship between exercise and diet. The hypothesis is that animals consuming balanced diets and having the opportunity to exercise will gain the least amount of weight over the period of the study while animals with a diet that includes a "junk food" option and no opportunity to exercise will gain the most weight. What is unknown is whether or not animals consuming "junk food" will be more or less likely to exercise. Moreover, if these; "junk food" animals do exercise as much or more than the standard chow animals; can they moderate their weight gains? Materials and Methods: 20 Long Evans rat (males) approximately 4 weeks old Groupings: 1: n=5; animals on standard chow with no access to running wheels 2: n=5; animals on standard chow with access to running wheels 3: n=5; animals on standard chow with access to high fat/high sugar options with no access to running wheels 4: n=5; animals on standard chow with access to high fat/high sugar options with access to running wheels Animals will be individually housed in standard rat caging either with (Groups 2 and 4) or without (Groups 1 and 3) options to access running wheels. While individually housed; the animal caging will be positioned so the animals have the opportunity to see; smell; and hear other animals of the same species. Animals will have access to standard environmental enrichment; including contact bedding and nesting material. Groups 3 and 4 will receive a 10% sucrose solution as their drinking water. Animal data will be recorded for a maximum of 8 weeks and will include weekly animal weight recordings; weekly diet consumption recordings; and weekly recordings of running activity (Groups 2 and 4). The high fat/sugar diet (Groups 3 and 4) will consist of peanut butter (Jiff? Creamy); sweet cookies (Golden Oreo?); and extruded savory snacks (Ruffles? Sour cream and Cheddar Chips). Animals in Groups 3 and 4 will have ad lib access to the special diet as well as the standard rat chow.

MBI115: A Mother's Meow

In this project; a mother cat was investigated to see if she would be more and more comfortable leaving her kittens alone as they get older. Twila; the mother cat; had terrible separation anxiety during the first 2 weeks of her kitten's lives. As the kittens got older; she would be more comfortable leaving the room that her kittens are in. For example; when the kittens were four weeks old; she remained outside the room for an average of 161.3 seconds. When the kittens were 12 weeks old; she remained outside the room for an average of ;635 seconds.

MBI116: Does eye color affect peripheral vision?

The purpose of the experiment was to see if peripheral vision would be affected by eye color. The results did not support the hypothesis because brown eyes had better peripheral vision than blue eyes. The independent variable did not make a difference because the average only consisted of a tenth of a percent difference. Blue eyed participants had an average of 2.7 correct answers and brown eyed participants had an average 2.8 correct answers. A problem that occurred was that there were a scarce amount of students with green eyes. This scarcity caused the experiment not to include students with green eyes. Some unusual observations were that height does affect testing accuracy which was controlled by the tester. Extensions for this study could include; but are not limited to; testing different genders and eye colors. This experiment can benefit society by improving vision technology and bringing awareness and to topics such as driving safety.

MBI117: How UV Radiation Affects Daphnia

The researcher is testing the effects of ultraviolet light on daphnia or water fleas. This was done by exposing them to Ultraviolet radiation for two days. The researcher also had a group of daphnia that was not exposed to any radiation. Results will be available on fair day.

MBI118: The Effect of Magnets on Plants

Plants are a vital part of our daily lives; yet is there a way for them to grow quicker and taller? My experiment provides another potential way to alter plant growth. I wanted to find out if magnets can effect the plants growth. To do this; I placed a neodymium disc magnet next to scarlet heirloom radish seeds and provided daily water and sunlight to the soil. I'm also growing radishes (with the same soil and water conditions) with no magnets in them to compare the height of the plants. Each day I observe the two plants; make observations; and record the plants height. After one week of growth both plants are approximately the same height; and they have similar amounts of radish sprouts. Experimentation is continuing; and the results will be shown on fair day.

MBI119: The Effects of Carbon Dioxide on Microbial Survivorship

From early ages; I was very curious about the growth and development of microorganisms. We are living in a microbial dominated planet. Microbials perform and maintain our ecosphere. They are everywhere in the world from inside your body to outside in the environment. These microorganisms can be harmful; but some can be useful. For example; microbials help us throughout our day. Some can help us with body control but some make us sick. I was interested to examine how microbials react to different concentrations of chemicals. I chose CO₂ as my control. The concentration of CO₂ is changing in our environment which is large issue causing climate change. I performed many experiments to learn whether rising CO₂ levels may affect the Microbial survivorship.

MBI120: Is This Milk Safe to Drink?

Best-by dates: Is this milk still safe to drink? Many Americans prematurely throw away milk; not necessarily because it is bad; but because the best-by date on the product has passed. But the milk may stay fresh for days after its best-by date. Companies may put conservative best-by dates to guard against early spoilage. Milk producers are very careful about making sure that milk almost never spoils before the best-by date to avoid unhappy or sick customers. This would leave many milks that are still fresh days after the date. I aim to test how long after the best-by dates milk is still fresh with a pH test. Milk; under the right storage; is safe to drink days after the date printed.

MBI121: The Effects of Rising Ambient Temperatures on Leaves

Global Warming and its associated temperature changes have a significant impact on the world's plant and animal species. While animals are capable of migrating to cooler places in order to escape the hot temperatures; plants have distinct features to avoid the scorching outside temperatures. This experiment is designed to find out the different qualities of plants that help them survive in the hot temperatures. I wanted to find out how the different characteristics of leaves respond to the rising ambient temperatures. To do that; I collected leaves from different plant species for studying three different variables; size; shape; and color. Four to five leaves were collected for each variable. For size variable; I collected leaves from the same plant species with different sizes. Leaves from different species were collected for testing color and shape variables; while trying to keep the other two variables the same each time. I placed them outside in the bright sunlight for ten minutes along with a reference material and then measured the leaf temperature in degree Celsius using an infrared thermometer. I kept the thermometer at the same distance from the leaves every time to measure their temperatures. Repeated temperature measurements were taken to find out the highest value for each leaf. I am finding out a pattern in my data; recording them in graphs; and analyzing them in order to bring conclusions. Results and conclusions of this experiment will be available on fair day.

MBI122: The Inhibitory Benefits Of Turmeric with Trimethoprim/Sulfamethoxazole on E. Coli

While antibiotics are an effective way to eliminate bacterial infections; they can be very harmful to small children. Common antibiotics can cause many side effects; and using antibiotics can also lead to antibiotic resistance. Herbal remedies; however; are a safer alternative. Turmeric (*Curcuma longa*) has been used in Ayurvedic medicine for conditions such as arthritis; fatigue; and serious pains; due to its main active ingredients; curcuminoids. Curcumin gives turmeric its yellow color and is an anti-inflammatory compound. A medically approved amount of turmeric can reduce skin irritation from radiation treatments and act as a dietary supplement for inflammation across the human body. My purpose for this project is to aid children by finding a more effective antibiotic composition for children. Due to the kind and generous support of Dr. Rebecca Gonda; I am performing this experiment is the University of Pittsburgh's Department of Biological Sciences. My experiment consists of testing the synergistic effects of turmeric and ampicillin on *Escherichia coli*. My project is separated into two phases. In the first part of my project; I found the effective concentrations of both turmeric and ampicillin. In the second part; I will use these concentrations to find the ideal synergistic concentration of the two substances. While I am in the process of experimentation; detailed results; with supporting data and a conclusion; will be provided on the science fair day.

MBI123: How does colored light effect plant growth?

The purpose of my experiment is to determine which color of light benefits a plant's growth the best. I grew yellow tomato and cilantro plants under purple; green; red; and white light. My data said that green light was best for yellow tomato; and purple light was second best. It also said that green light was best for cilantro and red light was second best. In conclusion green light is best for growing yellow tomato and cilantro plants.

MBI124: The 5-Second Rule

Please visit student's exhibit for abstract

MBI125: Effects of Vapes and Cigarettes on the regeneration of planaria

Please visit student's exhibit for abstract

MBI126: Orange Cat Personalities

My purpose is to tell people who want a cat with a better personality which one to get and is also for a TV show or movie. If the movie/TV show needs a cat in it; I am telling them which cats are the easiest to train and are the most intelligent. For this experiment; I need at least 15 orange cats and at least 15 non-orange cats. My results stated that orange cats have a better personality than other cats. I can compare my results to a study done by National Geographic; who's results were equal to mine.

MBI127: How a change of soil affects a purple bean plant

Does a change of soil affect the growth of a purple bean? Purple beans-bluish purple beans that turn green when cooked-grow and taste exactly like the green beans we are used to. I planted the seeds for the beans on October 20th; 2019 and watered them thoroughly. I recorded the temperature daily in case a change in temperature affects the growth. I measured and recorded the height daily after the first week. Every three days; I rotated the trays containing the plants so that tray would not be getting more light than another. I took pictures daily. In the beginning; the pictures were of each pot. Once the beans were taller; I took pictures of all the pots in the same soil; zooming in on something new or unique on a plant. I observed that the loam soil started out strong; and had the most plants. But; like a runner who gives all his speed to the start of the race; the loam soil was the last place finisher in height by the end. The clay soil; who had the least amount of plants; finished in first place at 60 centimeters tall. The sand soil was the second place finisher at 40 centimeters tall. Fans of the loam soil; though; will argue that it had the most leaves and plants. My hypothesis was not supported because the clay soil was the tallest; not the loam soil.

MBI128: Are dandelions able to inhibit bacterial growth?

Some research shows that dandelions; *Taraxacum officinale*; have been known to show some antimicrobial effects; which means that they may work to help kill bacteria. If dandelions have antibacterial properties then people should save their money by using the natural properties of dandelions instead of paying up to hundreds of dollars to get rid of them. For this project; dandelion root extract was made and added to petri dishes with the bacteria; *Escherichia coli*; to try to determine if the treatment could inhibit or decrease the amount of bacterial growth.

MBI129: Under what color light do plants grow tallest?

Different light colors affect plant growth in multiple ways. In this experiment; I used spider plants and put them in cups of water. I figured out which color lights helped the leaves grow and multiply and which colors slowed down the process. I assembled red; blue; green; and yellow lights in four different boxes and put them on a timer. I found out how many leaves the spider plant produced and how tall the longest leaf grew. The plant under the blue light grew the most in both measurements. The plant under the red light lost leaves and barely grew. Unlike how I predicted in my hypothesis; The plant growing under green light did actually grow more than the plant under the red light. The plant under the yellow light did not grow very much; but it didn't lose any leaves. The information and data collected from these types of experiments could be useful to greenhouses who want various color lights to help plants grow differently.

MBI130: Effect of Insulation on the Temperature of Overwintering Honeybee Hives

Effect of Insulation on the Temperature of Overwintering Honeybee Hives The estimated value of honeybee-pollinated crops is \$200 billion worldwide. These crops are at risk because of the loss of western honeybee populations. The honeybee population loss is called colony collapse disorder (CCD). CCD occurs most frequently during times of colony stress; such as in winter. In northern climates honeybees survive sub-freezing temperatures by huddling together into a cluster and vibrating flight muscles in order to produce heat. In this way the colony is able to maintain the temperature of 35C. I am testing to see if insulation helps keep honeybee hives warm. In this work I measured the inside temperature of the honeybee hive and compared it to a control hive without insulation. The results of this work can be used to improve survival rates of overwintering honeybees in northern climates. Experimentation is ongoing and results and conclusions will be available at the fair.

MBI131: Woolly Mammoth Relative

The purpose of my experiment is to determine who the woolly mammoth's closest living relative is. I will use a computer to search a website called BLAST(Basic Local Alignment Search Tool) and type "Woolly Mammoth" where it will show the woolly mammoth's closest relative. The data I will be collecting are the database for the woolly mammoth on BLAST to find the descendants of it that will be in my notebook. The data will also be research articles related to my topic. In conclusion; the experimentation is continuing and results will be available on fair day.

MBI132: Color and Taste

Does green apple juice taste the same as red apple juice? Food coloring does not have any flavor - so how could it change how something tastes. Find out in this science project.

MBI133: Bird's Lifestyle

The project that I will be doing for my science fair project is about birds. The question of my science experiment is can you predict a bird's lifestyle based on its feet? The reason why I chose to do this science experiment is because I enjoy learning about animals and their personality. The purpose of this science experiment is learning how birds use their feet and do they use them for. One of the steps for my experiment that I will be taking is going to the aviary to observe all of the different types of birds that live there; all big and small birds. The data to be collected is from the pictures I took of the birds. Experimentation is continuing and final results will be available on the day of the Science fair

MBI134: Autoimmune Disease

What are the genetic chances of getting an autoimmune disease?

MBI135: The Effects of Homemade Pesticides on Cherry Tomato Growth

The purpose of this experiment was to determine if cherry tomato plants sprayed with either vegetable oil pesticide; garlic pesticide; salt pesticide; or tap water twice a week for 8 weeks would have a different growth rate. It is thought that the salt pesticide will have the greatest negative effect because too much salt on the stem and leaves can harm the plant by making it dry and wilted. Organic homemade pesticides will be made and used for this experiment. For the results to be as reliable as possible the experimenter will keep the following constant: cherry tomato plant; amount of pesticide sprayed on plant; amount of light and temperature exposed to cherry tomato plant; type of soil used for cherry tomato plant; amount of water given to cherry tomato plant.

MBI136: Smart Plants?

One day I wondered how well do plants grow towards the sun. Then I realized I could find out. I started testing to see if plants really grow towards the sun. If they did; would they grow better in natural sunlight or better in plant light? After some research; I personally thought they would grow better in sunlight. I also thought they would grow through a maze. To test this I got two plants and I made a maze for them. I made this maze by getting a cardboard box and putting holes in the top. I put one of my mazes and plants near a window and my other maze and plant in front of a plant light. As they grew each day I recorded the results. I found my hypothesis was correct and is validated by my results. I concluded that plants do grow through mazes and better in natural sunlight.

MBI137: Which brand of soil grows the tallest plant after 3 weeks

The purpose of the project was to determine which brand of soil would grow the tallest plant after 3 weeks. The experimenter filled 15 cups halfway with soil for each brand; and planted every seed. Then they watered each seed with 20ml of water. Then for 3 weeks the experimenter watered each seed with 15ml every other day. Sta-green had the tallest plant over all and the highest average.

MBI138: What preserves a flower the longest?

The purpose of this experiment was to find out how well roses preserve with different household items. The data collected did not support the original hypothesis. Overall; the rose preserved in air yielded the best results with the flower looking relatively the same as when it started. The sugar water came in second with it still looking good but with clear physical deformities. The independent variable did make a difference as the independent variable was the substance that the flowers would be tested in. This made a huge difference and contributed majorly to the outcome of the experiment. No problems occurred over the ten day span of this experiment. For the first few days; the rose that was being preserved in air had water droplets on it. This might have occurred because some spit might have gotten on the rose while filling up the bag with air or because breath has moisture in it. The rose being preserved in salt was fine for the first few days; then it suddenly started to rapidly decay with the stem drying out faster than the other roses' stems and the flower itself shrinking. The rose that was being preserved in Vitamin E soaked up the oil very quickly; causing the rose to get very heavy and the petals to get dark. After taking the flower out; it became less heavy and this was probably caused by the excess oil dripping out from the petals. Something that could have been done differently is the process of preserving the flowers. They could have been preserved for a longer duration and they could have had a longer exposure to the outside of the bags that they were being preserved in. If this experiment was going to be done again; this experiment would be done for fourteen days instead of ten. The application to society is that people would want to know how to preserve flowers in an easy; cost effective way. This would be practical for newlyweds and people who like to save things that have sentimental value.

MBI139: Does Coffee Affect Plant Growth?

The purpose of this experiment was to see if coffee affects plant growth. The data collected during this experiment did not support the hypothesis. The data did not support the hypothesis because the plants that were given coffee grounds started to die and the tallest strand of grass fell off. The independent variable; which was the types of coffee; did make a difference because the plants grew taller. One thing that might have been a problem during this experiment was the time that the plants were watered. The first two weeks the plants were consistently watered but the last week the plants were not watered on the same day as the first two days. During this experiment there were no unusual observations. If one thing had to be changed in this experiment; it would be the type of plant used. The plant used during the experiment was grass. In conclusion; coffee does affect plant growth in a good way.

MBI140: Plant Growth

Please visit student's exhibit for abstract

MBI141: Can you separate flower DNA with the 'Gel Electrophoresis' Method?

The purpose of my experiment is to set a base for future methods of genetic modification. I used a gel electrophoresis chamber to separate the macromolecular bonds with electrical charges from a battery pack. In my trial; Flower 1 traveled the farthest; and Flower 4 traveled the least; so I was able to record some bands even though I came across a few issues. The main problem was that my copper wire eroded during the experiment; which made it more difficult to see my results; but in the end I got the data needed to finish my experiment. In conclusion; I was able to determine that you can separate DNA somewhat easily; but using the gel electrophoresis method you cannot label the similarities the DNA structures are grouped by.

MBI142: Best Compost For Pea Plants

Overall the composted plants will most likely effect the plants growth. It is possible that because I am growing my plants inside that their growth may be affected due to lack of insects and also the being in a room temperature environment. I also think that by doing this experiment that there will be a measurable difference in the plant's height. It is possible that because I am only doing a miniscule amount of trials that my experiment may not be fully accurate. Still I feel that it will be effective enough to show which of the six composts help a pea plant grow the most.

MBI143: How Music Lowers Your Heart Rate

The purpose of this project was to determine the best type of music to lower heart rate after exercise. The hypothesis of this project was that classical music will lower heart rate the most; and rock music will lower it the least. Two trials were conducted in this experiment. In each trial; ten individuals were tested. For each test subject; a resting heart rate was taken. Then each individual was asked to sprint up and down a set of stairs four times; after which a heart rate was taken again. After finishing the exercise; each test subject was asked to listen to a specific type of music (classical; country; rock; or no music) for one minute. When the music was finished; a heart rate was taken one final time. Each test subject was asked to repeat this process three more times; with a different type of music each time. A five minute break was given between each repeat of the process. The percentage recovery after exercise was calculated; to determine which type of music was most effective at lowering an elevated heart rate after exercise. The results of the experiment refuted the hypothesis. Classical music did not lower heart rate the most. Rock music lowered heart rate the most (the greatest %); while country music lowered heart rate the least. One possible explanation for this is that rock music is familiar and recognizable to many people; so it may have more of a calming effect than other types of music.

MBI144: Microbial Fuel Cells

Can we create a clean was to generate energy through microbial fuel cells? Looked at the collection of energy through a small number of fuel cells; it was concluded that we can eliminate dirty fossil fuels little by little. If we reduce the amount of energy we use; and supplement we clean energy source; like these microbe driven generators; we might be able to solve a few problems with one solution.

MBI145: Plant Preference

Please visit student's exhibit for abstract

MBI300: The Effect of Pthalates on C. elegans Heart Rate and Activity

The purpose of this experiment is to determine if phthalates in mac & cheese powder have an effect on *Caenorhabditis elegans*. It was hypothesized that the addition of mac & cheese powder would increase heart rate and movement due to irritation. To perform this experiment; *C. elegans* are put in separate pools of water containing different concentrations of cheese powder. As the powder is added to each pool; the worm's heart rate and movement are compared to the pool with no cheese powder. Final results available at fair.

MBI301: Elodea

We alluded to be registered in the environment category because we are dealing with elodea plants that can apparently clean up oil spills in the water. Our procedures would be getting clean containers that can hold 1 liter than fill them with two or three inches of gravel than completely fill it with water. (The plant should be able to submerge in the container and water). Pour enough oil to coat the surface that's at least 1/2 an inch thick. Then we will check every two days to see if the experiment works. This experiment is useful because we are increasing our numbers of oil spills with around 130 oil spills in 2018 just in America. These are contributing factors to climate change and global warming.

MBI302: Oh Honey!

Please visit student's exhibit for abstract

MBI303: How does using Oleic acid as pesticide affect the Harvester ant?

Has your house ever been invaded by ants? Mine has. As you probably know; it's a real pain to get them out of your house. Ant traps are unreliable because ants may seem to ignore baits for some time when the bait is placed near a trail of ants. Most people expect the ants to quickly feed on it. But they will often ignore the food as they go past it following the chemical trail that already exists leading them to another food source at the end of the trail; and squishing them individually is a pain. Therefore; you should use oleic acid instead. We hypothesize that if we pour oleic acid then the other ants will carry it to the graveyard. When it gets sent to the graveyard then the oleic acid will wear off and it will return to the colony. Oleic acid typically lasts around three days. What we did was get an ant colony with harvester ants and let the ants live for awhile. Next; we took an ant out and refrigerated it. After its metabolism had been slowed; we put some oleic acid on it; and then returned to the colony. The oleic acid successfully made the ants temporarily stay in the graveyard; all for around the aforementioned two days.

MBI304: Comparative Plant Growth - Watering with Tap Water vs. Filtered Water

Our project is based on the hypothesis that plants will grow better with filtered water than with tap water because tap water sometimes has extra chemicals in it that might hurt plants. We are comparing the same types of plants; beans; wheat; lettuce; and basil; for each type of water. We are growing them all in the same types of containers with the same light. We are measuring same amounts of water each time. The only thing that changes is the type of water. We think our hypothesis will be right.

Chemistry (MCH)

MCH100: Using Food Scraps to Adsorb Iron Oxide from water

Dried food scraps will be used to remove iron oxide from wastewater samples.

MCH101: How Much Fat Is In Food?

Please visit student's exhibit for abstract

MCH102: Accelerating the Degradation of Synthetic Polymers

"Recent compostable"" plastics are believed to degrade in an aquatic environment at temperatures of 50 degrees Celsius or greater. Since the average temperature of an ocean environment is closer to 17 degrees Celsius; the question becomes "Can a substance be added to the water to enhance or speed up the degradation of such compostable plastics?" Samples of compostable plastic were immersed in a variety of solutions to see the amount of degradation over an extended time period.

MCH103: Using pH to Assess Food Safety

Samples of cooked food were allowed to sit outside a refrigerated environment. The pH of pureed aliquots was measured after different time periods; and the results tabulated.

MCH104: Does It Rust - oxidation

My project is titled The Rust Race. My hypothesis is that the cup with the saltwater will have more rust than the cup with just tap water. I did my experiment by taking two paper cups and filling them eight ounces full of water; then in one cup put half an ounce of salt; next place one of your bobby pins in each cup and over the next week observe your experiment. My results did support my hypothesis because the cup with saltwater had more rust on the bobby pin than the cup with tap water.

MCH105: Fizzy Candy Balloon

Please visit student's exhibit for abstract

MCH106: Cleaning of pennies

My Experiment is called cleaning pennies. I did this experiment to see what substance cleans a penny the best. What I did is I filled six cups with one substance in each and placed one penny in each cup. I waited overnight then took them out. What I learned is that ketchup did the best and dish soap did the worst. My hypothesis was not supported.

MCH107: Slime Time

Everyone loves slime; I know I do! But.... What person would like hard slime or really runny slime? What amount of viscosity is the perfect amount for slime? How can that be tested? But before that; how is slime formed? To create slime; the molecules in the glue chemically combine with the borax molecules. The cool thing about slime is that it is a non-Newtonian which means it has properties of a solid and liquid.

MCH108: Does a scent in the air affect memory?

If six students take a test after studying a vocabulary slideshow while exposed to an aroma made of a combination of essential oils made for focus; then they will have better scores than students not exposed with an aroma because the sense of smell and memory are very closely related and certain scents can help improve certain memory functions.

MCH109: Testing Form 1 human participants

Please visit student's exhibit for abstract

MCH110: Just a Little Rusty

Are there certain products that prevent rust better than others. The investigator thought that vegetable oil would prevent rust the best; then hairspray; then Shaklee soap; and nail polish would prevent rust the worst. Lay out steel scrubbing pads and spray water on them three times a day. Then place them in water add sea salt then weigh them to see if its weight is higher. Nail polish did the worse; vegetable oil and hair spray were tied for second place; Shaklee soap did the best. The investigator was right that nail polish would do the worst but was not right on the rest. The investigator's hypothesis was a little bit supported.

MCH111: Our world is Drastic Because of That Plastic

1. Problem: Which plastic bag will degrade the most? 2. Hypothesis: The scientist believes that when testing the biodegradability of three different plastics; a Giant Eagle Plastic Bag; compostable plastic bag; and a Cellophane bag; the compostable plastic bag will degrade the fastest. 3. Materials: Three Giant Eagle plastic bags; three homemade compostable plastic bags; three Molotar Cellophane bags; 88 milliliters cornstarch; 30 milliliters Giant Eagle distilled 5% acidity white vinegar; 30 milliliters Pure Organic Pure Vegetable Glycerin; 354 milliliters water; three buckets; four bags of Miracle Gro Potting Mix; shovel; ruler; 1.41953 liters saucepan; spatula; three sheets of Reynolds Wrap aluminum foil; digital compact scale; graduated cylinder; Sharpie; tape; stove 4. Procedure: 1. Gather the soil; buckets; shovel; ruler; tape; sharpie; and bags. Label each bucket with the name of each bag. 2. Weigh each bag and record the weight of each bag. 3. Fill each planter to four inches of loose soil and place the bag in the soil. Cover the bag in one inch of soil. Repeat for other bags. 4. Keep the bags outside in the soil for two full weeks. Record the average temperature of each day for two weeks while the bags are buried. Then dig out of the soil. Allow each bag to dry out. 5. Weigh each bag. Compare results between bags. Instructions for Compostable Plastic Bag: a. Mix 88 milliliters cornstarch; 30 milliliters vinegar; 30 milliliters vegetable glycerin; and 354 milliliters water in saucepan. Mix thoroughly until smooth. b. Heat on high for approximately three minutes. When fully heated place on a sheet of aluminum foil to cool for about three hours. After three hours; mold into the shape of a plastic bag. 5. The scientist got the idea from <https://www.sciencebuddies.org/>.

MCH112: Strength of Glues

1. Which glue best bonds pine lumber? 2. If the scientist tests Elmer's White Glue; Gorilla Wood Glue; and Loctite Super Glue; then the scientist thinks that; Gorilla Wood Glue will hold the most weight using pine lumber. 3. Materials: ~ pine lumber ~ pencil ~ Loctite Super Glue ~ rope ~ paper ~ bucket ~ Elmer's White Glue ~ water ~ Gorilla Wood Glue 5. First; take two pieces of pine lumber [8.89cm x 8.89cm] [circumference]; attach 60.96cm of rope to each piece of wood. After that take Elmer's White Glue and give an even amount on one side of one of the pieces of pine lumber. Wait for 7 seconds and then attach the other piece of pine lumber to the side with Elmer's White Glue. Wait for two hours. When dried; attach the bottom rope the bucket. Following that take water and add it incrementally until the boards detach. Once the boards detach record the amount of water; which will be transferred to weight (weight will equal to weight of board+ weight of rope + weight of bucket + weight of water). Repeat 2 more times with Elmer's and then repeat every step 6 more times using the other glues; Gorilla Wood Glue and Loctite Super Glue. 5. The scientist received their idea from: <https://www.sciencebuddies.org/search?s=strength+of+glues>

MCH113: Too Hot to Handle!

The purpose of this experiment is to see if different proteins denature at the same temperature. This information is necessary to learn about the effect of heat on the nutritional benefits of a denatured protein. Therefore this experiment can help give scientists information to come up with new developments in the health and nutritional areas. The question that this experimenter is trying to answer is; do different types of protein denature at the same temperature? It is the experimenter's hypothesis that different kinds of proteins will denature at different temperatures because different proteins have different chemical makeups. The procedure for this experiment is to heat different kinds of proteins (in this case eggs; hair samples; and powdered milk) and record the temperature at which the appearance of each sample changes. The change in appearance indicates when the proteins denatured. The results of this experiment show that the proteins in the hair samples denature at the highest temperature of 375 degrees Fahrenheit; the proteins in the milk denatured at a lower temperature of 201 degrees Fahrenheit; and lastly the egg proteins; denatured at the lowest temperature with an overall average of 128.38 degrees Fahrenheit. Therefore; the hypothesis of the experimenter is supported by the results of the experiment because the averages that show the temperature that each protein denatured differ.

MCH114: Bust That Rust!

Abstract- The experimenter's experiment was done to find which substance rust nails the most. It is important to know when you need a more galvanized nail. The investigator did six tests; two for each time range. The experimenter tested common nails among water; saltwater; bleach; vinegar; and lemon juice. The time periods the investigator tested were one week; two week and three week tests. The investigator found that in all tests bleach won except for one. The one exception was vinegar winning in one of the three week tests. The experimenter thought the bleach would win. All of the nails' weight started out as 7 grams.

MCH115: What Helps Remove Salt Water Best?

The title of my project is; What Helps Remove Salt from Water Best? I want to do this project; so I can find a way to help use more of earth's water. The materials I need to preform my experiment are paper; cardboard; plate or bowl; measuring cups and/or spoons; three cups; six liters of fresh water; 210 grams of salt; scissors; test strips; pencil; journal; backyard. The steps I need to follow to test my experiment are first gather everything I need. Second make three filters using the paper; cardboard; and plater/bowl. Third fill the three cups with two liters of water and seventy grams of salt. Fourth using the driveway; experiment with all the filters. Try to get all the salt out of the water. Then using the test strips test the salinity of the water and record. Next clean up everything. Finally record everything.

MCH116: The Effectiveness of Antioxidants on Apple Browning

Antioxidants are molecules that neutralize free radicals (molecules produced when the body breaks down food or is exposed to toxins like tobacco smoke or radiation) and unstable molecules that can harm your cells. Antioxidants are present in fruits and vegetables like blueberries; grapes; strawberries; kale; red cabbage and more. Like lemons; antioxidants can also stop enzymatic browning of fruits. A chemical process that usually results in a brown pigment in fruits and vegetables. Nonetheless; because antioxidants are compounds that inhibit oxidation; antioxidants are able to give electrons to a free radical; thus stopping the free radical chain from occurring. To quantitatively determine the concentration of the antioxidant or analyte we perform a redox titration. By adding a volume of the tirant (potassium permanganate) to the known analyte (the antioxidant); we can check how many drops of the analyte are needed; to turn the tirant from a dark purple to a light pink. Finally; it is essential for a nutritious diet to have enough antioxidant intake to help prevent infections; cancer and other medical conditions.

MCH117: Soda Pop!

For this experiment; Soda Pop; Coca-Cola was stored at room temperature; 19.5°C; 1.9°C; and 26.9°C. Then the Coca-Cola was quickly opened and placed in the carbon dioxide chamber where the ppm of carbon dioxide was measured. I hypothesized that if the temperature that Coca-Cola beverage is stored is increased; then the level concentration of dissolved carbon dioxide will decrease. As a result; the Coca-Cola stored at 1.9°C produced an average ppm of carbon dioxide of 2630. The room temperature Coca-Cola produced an average ppm of 4086 and the 26.9°C Coca-Cola produced an average ppm of 4864.

MCH118: Steel Away

Have you ever wondered why buildings and structures start to rust? This process is called corrosion. In this investigation Steel Wool pads were placed in three different liquids: Lemon Juice; Vinegar; and Distilled Water. The procedure lasted for a ten-day period; and ever 48 hours the steel wool was taken out of the liquid and weighed. Then; after all the pads are weighed on the last day; the averages were calculated and the Lemon Juice had the greatest mass; 20.74 grams on Day 10.

MCH119: Oxidation and Apples

The experiment that was conducted was to determine whether or not citric acid solutions slow down or stop the process of oxidation. The citric acid solutions that tested were lime juice; lemon juice; grapefruit juice; and orange juice. The apple slice with the lemon juice showed the best result 4.7cm² of oxidation. The lime had an average of 5.3cm². The grapefruit juice measured an average of 7.7cm². The control had the next highest with 10.3cm². The apple slice with the orange solution showed the highest amount of oxidation. The orange juice measured an average of 10.6cm².

MCH120: Dancing Polymer Balls

In this investigation the bounce height of two bouncy balls with different chemical compositions was tested. Elmer's glue; borax; cornstarch; and warm water were used in the mixtures. The average bounce height for the white glue ball was 14.03cm. For clear glue ball the bounce height was 13.97cm. White Elmer's glue is watered base. Clear Elmer's glue is solvent based. The white glue ball was larger and less dense.

MCH121: POP Goes the Acid!

Please visit student's exhibit for abstract

MCH122: Bouncing Polymers

Please visit student's exhibit for abstract

MCH123: Beneficial Bioplastics: Developing a More Efficient and Effective Alternative

Please visit student's exhibit for abstract

MCH124: How Brittle Do Objects Get the Colder They Turn?

Rubber is a very useful material because of its elasticity; and we use it in our daily lives. When an object freezes; it gets harder and so does rubber. But will its elasticity drop as its temperature drops before it freezes? How will it change after it is frozen? Although there are so many rubber products; there are few that provide the elasticity change information. In my project; I plan on finding out how elasticity changes as its temperature drops because rubber's elasticity change relates to its usefulness. My hypothesis is that the rubber would lose its elasticity the colder it gets. First; I will drop multiple rubber balls that are at room temperature from 1.5 meters in order to compare how differently the rubber behaves as they grow colder. I will then cool them to targeted temperatures; some of which are below zero. Next; I will drop them from the same height that I will drop the balls at room temperature and measure how high they bounce up.

MCH125: Ocean Acidification: Its Effects on Marine Life

With an increasing amount of carbon emissions; there is a steady effect on marine life. Carbon emissions are a climate driver and add to ocean acidification. The impact of emissions is important because it shows why humans need to create solutions to prevent ocean acidification to protect marine life. This experiment will focus on the impact of different amounts of carbonic acid on shells. The shells will be placed in water with varying acidities and data will be collected through observation and a record of mass changes. This experiment is useful because it shows how global warming is affecting all life forms.

MCH126: The Relationship Between Air Pressure and Desalination

Currently; there has been an increase in the demand for new methods of desalination. We are starting to outgrow the 2.5% of consumable fresh water we have on earth. There are many inefficient methods of desalination. Thermal desalination; however; is a potentially efficient solution for such a crisis. By manipulating atmospheric pressure's correlation to evaporation rates; thermal desalination can be improved. By desalinating certain amounts of water under varying air pressures; we can determine the air pressure's relation to desalination rates. I hypothesize that a negative correlation will be present as desalination rates will increase as the air pressure decreases.

MCH127: Orange You Glad There Is Vitamin C?

The purpose of this project was to determine the amount of Vitamin C in three different citrus fruits (navel oranges; mandarin oranges; and grapefruits); and determine which sustains the most Vitamin C over time. The hypothesis was that grapefruits would sustain the most Vitamin C; and mandarin oranges would sustain the least; since a thicker peel should better protect Vitamin C in the fruit from degrading due to heat and light. For each trial; four juice samples from each fruit were prepared initially after purchase; and one; two; and three weeks later; to determine the amount of Vitamin C in each. Each sample was diluted with distilled water and a small amount of soluble starch solution; then titrated with iodine (Lugol's solution) until a color change indicated the endpoint of titration. The volume of iodine used was recorded. Two trials were conducted. To determine mg of Vitamin C per mL of iodine used; a Vitamin C pill was tested via titration as a standard. The results of the experiment showed that navel oranges had the most Vitamin C both immediately after purchase and after 4 weeks; while grapefruits had the least Vitamin C both initially and after 4 weeks; and also the biggest % decrease in Vitamin C over time. Mandarin oranges lost the least Vitamin C over 4 weeks. The hypothesis was refuted. Thickness of the peel did not affect Vitamin C over time. The fruit's age at time of purchase was probably a big factor.

MCH128: What substance in a basketball makes it bounce the highest?

The purpose of the experiment was to find out what gas makes a basketball bounce the highest. So that it could be changed to help the game of Basketball. The data collected did support the original hypothesis. The data showed that helium had the highest average of 282 cm. It exceeded the lowest average 100cm by 182 cm. The independent variable did make a difference. Because it was that substance inside the ball and that affected the bounce. The problems that occurred during the experiment was the set up of the experiment and the reading of the measurements. There were no unusual observations in the experiment. The recording of the measurements could have been different. The results could affect society by changing the gas inside a basketball when playing.

MCH129: Icky Sticky & Ooey Goopy

This project was done to find the most quick and effective means of removing melted marshmallow from human hair. While experimenting; I rubbed melted marshmallow into hair then attempted to extricate it using soap and water; peanut butter; or a homemade concoction. Soap and water were the best substances for removal; peanut butter was the worst; and the mixture fell between the two. Conclusively; when marshmallow is caught in someone's hair; peanut butter is useless; but soap and water should work. Sometime later; I would like to see if my results are consistent with different types of human hair.

MCH130: Which Homemade Deicer is Most Effective?

The purpose of this experiment was to see which homemade deicer melted ice the greatest at incredibly cold temperatures. This was done to try and see if there was a solution that put less salt into the environment. The data collected did support the original hypothesis in two out of the three trials. In the zero and five degree conditions; beet brine worked better than salt brine but in the negative five degrees condition; salt brine melted the most ice. Proof of this is seen in the percent change of each variable. At zero degrees; beet brine had an average decrease in ice weight of 23.72%; while salt brine only had a 15.96% decrease. At five degrees; beet brine had an average decrease in ice weight of 24.03% and salt brine had a 17.23% decrease. However; at negative five degrees; beet brine only had a 15.35% decrease while salt brine had a 18.42% decrease.

MCH131: Super Spherification

Liquids are able to spill and get very messy. But; what if we found a way to change that? Juice balls is my solution to liquid messes. Juice balls are a liquid that has undergone the process of spherification. But; what if it had a different taste? I will be testing this on about nineteen people to see what they think. I will give them a random liquid and a juice ball and they will have to rate both of them and see if they think they taste the same or different; and carbonated or not carbonated. My results are that the people that tested couldn't really taste the flavor in the juice balls; and they didn't like the consistency. They liked the liquid better and only very few of them thought the juice ball was carbonated. Only one person out of the 18 thought that the juice ball and the liquid were the same flavor.

MCH132: Life's Hottest Question?

This project's title is Life's Hottest Question. The purpose of the project is to find which species of tree burns hottest and longest; out of hickory; oak; apple and cherry. The hypothesis is that the density of the wood directly correlates with the temperature at which the wood burns; and it will also affect the time it burns. Out of the chosen samples hickory is the densest; so the prediction is that it will burn the hottest and the longest. The wood is burned in a firebox that is not affected by wind; humidity; or outside temperature. The size of the wood chips and the number of wood chips varied greatly from fire to fire; but the volume remained perfectly consistent for each. Both the time and the temperature are considered when analyzing the results. The experiment confirmed the hypothesis; because hickory was found to burn best overall; although apple burned hotter.

MCH133: Yeast... How Sweet!

33 mLs of distilled water was measured out first. Then I measured 3.0 g of sugar and put that into A balloon. I used a flask and put 6.0 g of yeast into the flask that i measured out. are used a mini stove top to heat the distilled water until I got to 33 ML. I used a thermometer to make sure that the water was the right temperature. next I put the 6.0 g of yeast into the distilled water And I put the 3.0 g of sugar into the balloon and hung it off the side of the flask; I also duct taped the balloon to the flask to make sure that the balloon would not fly off. I waited approximately 20 minutes for the balloon to blow up. then I got a string and measure it around the balloon to see how wide the balloon was.

MCH134: Dyeing to Know

The purpose of my project was to discover if common allergy causing dyes are in M&M's and Skittles. Using paper chromatography; I will dissolve and test my candies and then compare them to samples of allergy causing dyes. I then measured the Rf value of each color. I learned from my project that some candies contain small amounts of the dyes in the same colors for each sample; which only applied to some of the candies. I concluded that some companies are aware of these dyes and are either using different dyes or are making their own; safe dyes.

MCH135: What causes rust to form?

Iron is the most commonly used metal world-wide. Iron is prone to rusting which makes the iron break down and become useless. By exposing iron to water and air and adding catalysts and barriers; I propose to discover which deterrent is most effective and stimulus is most destructive. Iron Oxide is quickly formed when iron is combined with oxygen and water. The reaction can be accelerated with different factors. It is very important to protect iron from air and water to prevent oxidation. Paint and oil are primarily used as barriers. Scientists are researching new options daily.

MCH136: How does Adding Salt to Water Change the Boiling Point?

The purpose of this experiment was to see if sea salt would raise the boiling point of water more than Himalayan pink salt and table salt. The procedure was to first gather 100g of each salt; 2000ml of distilled water; saucepan; and thermometer. Put 100ml of water in a saucepan and set to medium heat on a stovetop. When the water starts to boil; take the temperature. Then; add 20g of table salt to the pot and wait for that solution to boil. When it boils; take the temperature and record. Repeat these steps four more times for table salt; and five times for sea salt and pink salt. When collecting all of the data and putting it into the form of a graph; I saw that Himalayan pink salt raised the boiling point the most. This could be because it contained more minerals than the other salts (sodium chloride; potassium; and calcium); or that there were more crystals of pink salt in the water than the other salts. The three salts were measured by mass; not volume; so there were more crystals in the pink salt; which meant that it had a larger volume. After the experiment; I measured 20g of each salt and put them in a graduated cylinder to check their volume. Himalayan pink salt had the highest volume. Its volume was 29ml compared to the other salts' volumes at 27ml. This is probably why Himalayan pink salt raised the boiling point the most.

MCH137: Are You Suited for This?

In my project; I will be testing the strength of three different threads in swimsuits. I will be soaking each thread in its own container of chlorinated water for 1 day; then 2; then 3; then 4; then 5 days each with new chlorinated water each time. After this process is done; I will let my threads dry. I will then weigh all of my materials that will be attached to my thread when testing its strength. Next; I will tie a loop on each end of the thread. I will then attach one end of my thread to a metal extension; which will then hook onto a metal S clip; which will be attached to a metal wire that will be going through a can which will hold my sand; which is what I am using to test the strength of my thread. When my thread breaks I will have a plastic bin underneath my can to catch all of my materials and sand that falls. I will then weigh my sand and add that weight to the weight of my materials to see how much weight that thread could hold. I will repeat this process for each of my threads each time.

MCH138: The Science of Making Perfume

Project Title: The Science of Making Perfume Enfleurage is an ancient way of extracting the oils which contain the scent of flowers or other organic materials. My experiment is observational and tests this process with two different oils; vegetable shortening and coconut oil; and two different types of roses. I use a traditional red rose; which is scientifically called Rosa; and the Damask rose; which is identified by Rosa ? Damascena. When conducting the tests; the rose petals are pressed into the oil in between a sandwich of cardboard pieces covered with foil. They sit for 24 hours and the oils are then melted to create the base of the perfume. Isopropyl alcohol is added; and the mixtures sit for a week in a dark room. Small strips of sketch paper are then dipped into the perfume and smelled. My project will identify which oil base and which rose offers the best perfume based on how it smells; how long the smell lasts and other factors. Experimentation is continuing and results will be presented at the fair.

MCH139: The Effect of pH on Lead Solubility in Water

My project demonstrates how pH level of water effects lead solubility and the difference of the amount of lead that corrodes in to the different substances. I took 7 jars and I filled them all up with filtered sink water. After letting all of the waters set to room temperature; I added different everyday chemicals and liquids into the water to change the pH. After that; I added lead blocks into each of the jars and let them sit for over a week to give them time to corrode. After letting the lead sit in the jars I took it to a lab in Oakland to get a sample of each of the substances tested for lead. That is where I got the numbers of the lead concentration in the jars so that I could answer my question. My hypothesis was that that the higher the acidity in the water the more the lead will corrode.

MCH140: Rocking Purification

Water filters throughout the world have been known to take out harmful substances from the dirty water. In my experiment; I will be using three different rocks and comparing them as to which rock serves as the best purifier. The rocks I will be comparing are charcoal; limestone; and shungite. First; I will fill one large glass with tap water and make it dirty. Using scissors; I will cut off the bottom of a bottle. Then; I will poke holes in the cap; before placing a thick cloth over the mouth of the bottle. Then I will tighten the cap on top of it and place the top part of the bottle upside down in a tall drinking glass. For the layers; I will add limestone; gravel; and clean sand. I will pour the dirty water on top of the filter. Using a pH kit; I will measure the pH value of the water. I will repeat this with shungite and charcoal. I will then compare the pH values of each rock to choose which rock is the best purifier. Unfortunately; I am not finished with my experiment for results. My experimentation is continuing. Results will be available at the competition.

MCH141: PH and TDS Levels

pH and TDS is an important indicator of water quality that can change chemically. pH measures the amount of hydrogen ion concentration in water. The range of pH starts at 0 and can go all the way up to 14. Total Dissolved Substances (TDS) affects the taste of water. TDS also correlates with the pH changes in water. In order to find the purity of water in the South Fayette district; there were about 50 samples collected and tested. These samples were tested for the pH level and the TDS level. The maximum pH found throughout the three communities is 7.79 and the maximum TDS is 188ppm. The minimum pH found throughout the three communities is 7.27 and the minimum TDS is 96ppm. As per the WHO. guidelines the pH of most drinking water lies between 6.5 - 8.5. From the study of the above parameters and observed that all the samples are in the permissible limits of the WHO guidelines .However; it is also important to examine other potential water quality parameters such as turbidity; conductivity; total suspended solids (TSS); and heavy metals (Cu; Zn; Mg; Fe; Cd; Pb; Cr; As; Hg; and Sn); etc. for the long run of time.

MCH142: What do different baking ingredients do to the food you are making?

Many people tend to run into problems when baking confectionaries; bread; or pastries. This project is based on figuring out why food results differently than expected; how can we prevent our food from turning out too lumpy or too flat; and what roles do all the ingredients in a recipe play? In my experiment; I baked chocolate chip cookies and divided the cookie dough into 3 parts before putting it into the oven to bake. To one of the groups; I left as is. To the second group; I added too much flour. To the final group; I added too much oil. My hypothesis was that if I added too much flour; the cookies would turn out more dense and heavy. My hypothesis was proven correct by the results of the experiment. The results of the cookies with too much flour proved my hypothesis by turning out more heavy; clumpy; and dense. The results of the cookies with too much oil also supported my hypothesis by expanding widely; showing the huge difference between the two groups of cookies.

MCH143: Slime Chemistry

Everybody who has made slime means they either made it out of glue and detergent or glue; contact solution and baking soda or even using other edible ingredients that make edible slime. The purpose of this experiment is to find out what kind of liquid mixture or ""activator"" to use to actually make slime. The way I did this experiment was I poured glue into a bowl then I mixed food coloring into it the next thing I did was add the solution to the glue mixture and then it turned into slime after I was done making the slime I knead and play with it to make sure it wasn't too sticky then I put it in the plastic bags. A few days after I made my slime the ones I used tide on started to bubble and foam at the top of the slime and the ones I used with contact solution and baking soda stayed the same as I put them in their bags. Conclusion my experiment worked because using the contact solution made it nicer than using the tide."

MCH144: Effect of temperature on battery life

In today's world; batteries are extensively being used for a variety of devices; and the disposal of batteries is a huge problem. This experiment shows the optimum temperature range for battery life; to make them last longer. To do this; I used 3 different brands of AA-type alkaline batteries and placed them in various temperature settings while they are powering a DC motor. I'm collecting data to measure the running time of the motor against battery temperature. Experimentation is continuing; and results will be available on a fair day.

MCH145: Does the flavor of Mentos affect the size of the explosion when put in Diet Coke?

The purpose was to see if the flavor of a Mentos affects the size of the explosion when put in Diet Coca Cola. The procedure was to put a folding table on a flat surface. Then place a shooting target in the middle of the table. Third; put a Diet Coca Cola bottle in the middle of the target. Fourth; put a Mentos into the bottle and measure the distance the soda traveled. Fifth; clean up the table and replace the target for another test. The experiment showed that the flavor did affect the size of the explosion.

MCH146: Height of reaction above beaker (mm) with different ratios of H₂O₂ to KI using 6 ml of dish soap

The purpose was to see which ratio of hydrogen peroxide to potassium iodide resulted in the highest reaction of Elephant's Toothpaste. The experiment used 4 ratios 2:1; 1:1; 1:2; and 4:1. Height was recorded each time. 4:1 resulted in the highest reaction.

MCH147: Which Liquid Produces the Most Gas?

The purpose of this experiment was to determine which beverage would produce the most gas in our digestive system to help decrease the amount of gas in your digestive system and that causes pain and bloating. The data collected did not support my original hypothesis. The hypothesis was that orange juice would produce the most gas because high-fiber foods produce more gas and orange juice is made with fruit which is a high-fiber food. In the end; the balloon for orange juice didn't receive enough gas to be measured even though it did produce more gas than lemonade. The independent variable made a difference because the drinks with more fizz released more gas into their balloon. Some problems that occurred was that the balloon above the orange juice inflated but not enough for it to hold itself up and be measured. An unusual observation was that Coca-Cola was the first drink to release gas and blew its balloon up the fastest but didn't get that big. Something that could have been done differently is that the bottles could have been placed in a deeper pot to allow a larger amount of liquid to be hot and release more gas into the balloons. This project can help society and decrease the amount of pain in our digestive system. It can also people and help avoid a lot of bloating.

MCH148: Which Solvent Works Best on Removing Sharpie?

For my project; I decided to test which household item could erase Sharpie stains the most effectively. In this experiment I used 5 different solvents to attempt to remove red Sharpie from 3 different surfaces. The solvents I used are 100% acetone nail polish remover; 70% rubbing alcohol isopropyl; Herbal Essences hairspray; Colgate toothpaste; and tap water. The three surfaces I used are plastic; cloth; and wood. I put a line with red Sharpie on pieces of wood; cotton cloth; and plastic. I scrubbed the stain with each of the solvents to test which one removed stains the best on these surfaces. First; I experimented on the pieces of wood. Overall; the best solvent on wood proved to be acetone nail polish remover. The least effective solvent was water. Next; I experimented on the pieces of plastic. In conclusion; the toothpaste and the rubbing alcohol were the best solvents for the plastic. The worst solvent was; again; water. Lastly; I experimented on the pieces of cotton cloth. In conclusion; acetone nail polish remover got rid of the stain on the cloth the best. The toothpaste and water had no reaction with the Sharpie. The best house-hold solvent overall was acetone nail polish remover. The least effective solvent was water.

MCH149: Which acidic liquid is best to re-create Baghdad Battery?

During this experiment I tried to successfully recreate a working Baghdad battery. I learned which liquids had the greatest acidic charge that would (in theory) send a charge out. I used vinegar; lime juice; and lemon juice for my acidic liquids and learned that vinegar has the highest charge as well as being the most cost effective. I found out that it could not power a 3v LED light; but then used it in series to then power the light bulb. I believe that this experiment was a very interesting topic because the original Baghdad battery was found in ancient tombs; so it must have emitted a small charge; which I found out to be true. In conclusion I was successful in making the battery; but not charging the 3v light bulb as I thought it would; this data could potentially help someone to branch off of my idea; and have a more successful outcome.

MCH150: Electrolysis; The Separation of Water into Hydrogen and Oxygen

Please visit student's exhibit for abstract

MCH151: The Oxidation of Fruits

The purpose of this experiment is to understand; how different types of fruits react to natural antioxidants; like salt and lemon. I will test this experiment is by adding to apples and pears; a solution which will contain water and lemon to one pear and one apple; and then another solution; to another pear and another apple; which will contain water and salt; and see how they react to both solutions. The Oxidation in fruits is a normal thing that happens to every fruit eventually; fruits decompose because of the damage caused by microorganisms. When fruits and vegetables are exposed to light; their outer layers start to spoil in a process known as photodegradation that causes discoloration; loss of flavor; vitamins; and proteins. By doing this experiment we can delay that process of photodegradation so that we can have a longer time to enjoy the fruit after it is cut last longer in their kitchen or in a plastic bag so they can eat it later.

MCH152: Dye Wars

My experiment is called ""Dye Wars"". The purpose of this experiment was to test the effectiveness of dyes which are advertised to lighten hair. Several of my family members dye their hair consistently (usually shades of blonde); so I wanted to see which of the marketed brands get the hair closest to its desired color while keeping the hair healthy. I have witnessed my mom dying her hair and not being happy with the results. This then has led her to dye it again; causing unnecessary damage. In the experiment I tested 6 different dyes (various brands and modifications within brands) on unprocessed 100% natural human hair. This experiment had to be done twice; with the second round tests actually showing results. The most effective dye was actually the cheapest option- a pack of lightener with developer added to it (which several of the box brands contained). These stand-alone products lightened the hair most and appeared to have minimal (negative) change to the hair.

MCH153: Nature's Gift of Water

Please visit student's exhibit for abstract

MCH154: Chill Out!

Imagine being at the store trying to pick a thermos to keep your water cold. Should you pick the brand you've seen advertised most? Perhaps the one your friends have? Which one will keep your water coldest! In my experiment; I tested 5 bottles to see which would keep water coldest over the course of 12 hours. My procedure included filling each bottle with chilled water; checking it in 4 hour intervals; and calculating the change. By the end; my hypothesis was conclusive; the RTIC 768.912 ml bottle changed by only 4.6°C in 12 hours; as I predicted.

MCH155: How Sweet it is! Measuring Glucose in Fruit and Fruit Juices

My project is measuring the glucose levels in five fruits and their bottled juice counterparts to determine the ones with the highest and lowest levels. The ones containing the highest levels would be the sweetest items. After creating the control solutions; I tested the sliced fruit and juice with the test strips. I compared the results to the controls to determine the glucose levels. After I completed the experiment; my hypothesis was proven that lemon contained the least amount of glucose and the apple contained the highest level. Except for the pear; the bottled juices showed higher levels of glucose.

MCH156: Temperature and Viscosity

The purpose of this experiment is to determine if temperature affects viscosity. Our experiment is going to be filling a small glass with a liquid and dropping a marble to see how fast it touches the bottom of a glass. This could accurately determine a viscosity of a liquid. We then heated the liquids corn syrup; honey; and water and saw that there was a difference of time between the time when the marble touched bottom of the glass in the regular liquids. I also chilled the liquids honey and corn syrup and water. I saw a time difference between when the marbles touched the bottom. The time of the marbles that touched the bottom of the glass with a room temperature liquid had a time difference from the marbles who touched the bottom of the glass with the chilled liquids. Therefore I concluded that temperature affects viscosity based on my results.

MCH300: Conduction Junction

Our question is: does salt water conduct electricity faster than tap water? In our experiment; we will have a tub of water; where we have two wires connected to either side of a battery in one end of the tub. The other end will have a voltmeter; connected with two more wires in the tub. We will see which has a higher voltage: electricity through salt water or tap water? If saltwater is better; people in aquatic environments could use it as an alternative to wiring.

MCH301: Our Water Quality

The purpose of our experiment is to help our community by finding the turbidity(cleanliness)of the water. In our experiment; we will buy a turbidimeter kit and build it ourselves. Then we will go to the Chartiers creek and test our water's turbidity. Our research applications are online resources. This experiment is useful because it tells our community the quality of the water that we are drinking.

MCH302: Which Water Bottle Will Hold ice Longer?

The purpose of this experiment is for athletes that are wanting a water bottle to stay cold so that they can have a refreshing drink. The procedures that will be used in the process will be to fill one 32 ounce water bottle with one cup of ice and fill a different brand one with the same amount of ice. We will see which water bottle will hold the ice the longest. The data we will be collecting is which water bottle will hold the ice the longest. This project is useful for athletes that practice hard and want a nice cold drink.

MCH303: Comparing Methods to Desalinate Salt Water

The purpose of this project is to determine if the relationship between the amount of salt in water and the energy used to distill water is linear. As the population grows; we are running low on potable drinking water so we must utilize one of our main sources of water: the oceans. Studies have shown that the amount of salt in the Atlantic Ocean is in fact greater than the amount in the Pacific. This being said; energy consumption is another big problem in society today; so we have to keep this in mind while distilling water. First; we will acquire the necessary materials to complete our experiment; and test our home distillation setup. Our next step includes preparing salted water samples with different salt concentrations. We will start with 473 mL (2 cups) of water; and 14.8 mL (1 tablespoon by volume) of salt. The rest of the samples will still have the same measurement of water; but double the salt. Then; we will record the energy used to distill each sample; by checking the amount of alcohol (fuel) used--our distiller uses an alcohol burner as its heat source. We will then do this several times to check for measurement error. Note: The project is still in progress; so we have no data or conclusions yet.

MCH304: How do different liquids affect how nails rust?

The purpose of our experiment was to find out how different liquids affect how nails rust. Our work is important because it shows people that different liquids with varying pH cause different amounts of rust. For our experiment we put 25ml of each liquid in three graduated cylinders then we put five nails in each graduated cylinder; for the following two weeks we measured the mass of the nails. In the conclusion of our experiment the nails submerged in hydrochloric acid had the greatest amount of rust compared to the other nails. Our hypothesis was supported.

MCH305: Testing School Tap Water vs. Filtered Water and Bottled Water

We are testing to see if school water is less safe than filtered water or bottled water. We are using a water test that anyone can buy that tests for lead; mercury; fertilizers; and other dangers. We are testing our types of waters multiple times to compare results over time to see which ones have the lowest levels of the most dangerous possible chemicals. We are keeping everything else the same like using the same types of collection cups; always testing right after collecting water.

MCH306: Rocketology

Rocketology: Baking Soda + Vinegar = Lift off ! The purpose of my rocketology experiment is to show how to use basic ingredients and water bottles. And we also want to see how far a bottle go up in the air from the ground with two ingredients: Baking Soda and Vinegar. The data that will be collected will be one water bottle; baking soda; vinegar; Measuring spoon ; water; bowl; and an open space for this. Experimentation is ongoing and the results will be available on the day of the Science Fair.

MCH307: Spherification

The experiment we chose to do is how is the PH level of juice is affected by juice balls. The purpose of this project is to measure how acidic or basic the PH level becomes once the liquid is put into juice balls. For our procedure; we will be dropping the juice into calcium chloride and determining whether or not the PH level shows any change from spherification. We'll be collecting the data from the PH level of the juice by itself and the juice that went through the spherification process. In conclusion; we will determine if the PH level of the juice made into juice balls differs from the PH level of the juice without spherification. Data is still being collected and final results will be available on the day of the Science Fair.

MCH308: Bath Bombs

The purpose of our experiment is to know how bath bombs work and what unique qualities bath bombs have that are not surfaced. A bath bomb is a dry ingredient sphere that fizzes when it gets put into water. We used baking soda; citric; cornstarch; and Epsom salt. We will be attempting to make our own homemade bath bombs with the ingredients that were listed. For our data section; we were looking to see what inside of the bath bomb causes it to fizz up. And how long the bath bomb can last. While it is going into the bathwater it eventually falls apart releasing the pigments; essential oils; glitter; and its fizziness. Experimentation is continuing; and results will be available on a fair day.

MCH309: Ice Cream

The purpose of our experiment is to create ice cream and lower the freezing point of its water. Our procedure is first we will need to gather our materials and set up the experiment. Next; we'll have to start our experiment of lowering its freezing point and recording our data. Thirdly; we would have to start setting up for our ice cream then making it. Lastly; we will get it out of the freezer and eat it. Our data would consist of us figuring out what causes the salt; or sugar to affect its freezing point. This experimentation is continuing; and results will be available on fair day.

MCH310: Volcano Experiment

The purpose of the experiment is to see if the volcano would be the same with and/or without water. The volcano experiment seems to have water in every experiment; such as the two we are doing. This means; this is the main variable being used and also food coloring; simplifying the main variable and shrinking the percentage of water or removing the water. This is fun in many ways; you could see it erupt. Like; the volcano in Hawaii; it explodes at least once or twice a year.

MCH311: Mint's #Cool Factors

Does Mint cool your Mouth down? This was the question we tested for our experiment. All of our group members chew Mint gum and wanted to know if it actually cools your mouth or if it is just a sensation. To test this; we first measured the temperature of 1 cup of water. Then; we dropped a mint product into the water for a minute. Finally; we recorded the temperature of the water again. Our data confirmed that mint doesn't cool your mouth; it is simply a sensation. This was proven when the temperature didn't change when the mint product was put into the water. With further research; we determined that the cause of the sensation was due to the chemical menthol found in most mint products.

Computer Science / Math (MCM)

MCM100: Which Kinds of Websites Track Users the Most

The purpose of this project is to examine how the contents of a website affects web tracking. I investigated how the content of a website affects the number of third-party cookies. I hypothesized that if I test each of the top 20 most visited websites in the categories of kids and teens; health; shopping; games; sports; and the top 20 websites overall for the average number of third-party cookies; then the category of kids and teens will have the most third-party cookies. To collect my data; I used a program called webXray that analyzed each website for cookies and other elements. I compiled a list containing the top 20 URLs per category or control. I used webXray to visit each URL on the list 5 times and record information in an SQLite database file. I wrote a program to extract all the data I needed from the database file and put it in a csv file so that I could analyze the results with Excel. I determined the average number of third-party cookies and unique domains on each website and the average for each category. I discovered that my hypothesis was wrong: on average; URLs in the category of sports; with an average of 93 third-party cookies per website; had the most third-party cookies while the category of kids and teens had an average of 59 third-party cookies per website.

MCM101: Cool Water

People at parties drink cold water. The water would need to be cooled at a fast pace. What is the fastest way to cool water bottles?

MCM102: Box Storage Program

The bin packing problem; or knapsack problem; is one of the problems that warehouse workers face every day; it takes a tremendous amount of effort to pick the right sized box for hundreds and thousands of products. The programs that we have currently waste time and the energy of the workers. I have decided to explore this problem and to do that; I have created a small program that generates random blocks; and the goal is to fit as many blocks into a box as possible. The blocks will be moved by a human via touchscreen or mouse. The program will be made of a button to activate the computer; a button to reset the blocks; an outline for a 2nd box; and some randomly generated blocks. A function will be used for computer sorting. I will collect data by comparing the human and the computer to see which could fit more blocks inside the box. I will analyze the data by looking at the results and comparing them to my hypotheses; and finally; I will reach a conclusion. The results will be displayed on Fair Day.

MCM103: Motion Detecting Camera

The purpose of this experiment to create a cheap and effective camera for house security. I will be attempting to create a camera that can effectively alert the house owner that movement from a human being is being detected nearby. We will be testing the time it takes for the camera to detect movement and send an email to the owner's phone. This experiment is useful since it may create a way for more people to have a camera to monitor their homes.

MCM104: Concussion rates and how to reduce injury

At a very young age I became interested in tackle football. I love sitting on my couch on Sundays watching the Steelers play their weekly opponent. I love to play tackle football. But my parents never allow me to play as they are afraid of injuries especially concussions. My Mom always argued with me that for all the money NFL players make in their career they don't have good quality of life after their retirement. They spend all their hard earned money in Health Care and in Therapy. These arguments made me look into concussions and whether any changes in the game or playing rules can help with the players safety. I love Math. Couple of months back my father was talking to me about a fascinating Kaggle competition held last year on using data to suggest new rule changes that could reduce the number of concussions during punt returns. In this project I have combined my two passions - football and math; analyzed concussion data released by the NFL to make informed decisions on how to make the game of football safer for players while maintaining the integrity of the game. Reducing concussions will also help improving the quality of life of the football players while reducing the health care costs.

MCM105: Calculating the circumference of the Earth by Measuring shadows

Please visit student's exhibit for abstract

MCM106: What is the best material that blocks RFID signal?

Please visit student's exhibit for abstract

MCM107: Applying Neural Networks to Image Analysis in a Biological Experiment: Coping with Limited Training Data

Neural networks can "learn" just like humans. They are formed by neurons organized in layers and have been very effective at computational tasks such as object detection. They "learn" how to detect objects by updating the weights of the connections between the neurons and the biases of each neuron. A neuron fires if the sum of the weighted inputs; when combined with a bias; is greater than zero. When it fires; it sets up the input for the next layer of the neural network. If a neuron in the final layer fires; it means an object has been detected. If it does not; then there is no such object in the image. Teaching such a neural network involves showing it a set of images that have been pre-labeled with whether they contain the object of interest or not. The network's weights and biases are then modified until it can accurately detect the objects. Once a network has been "taught/trained"; it can accurately and efficiently identify the same object in any new images shown to the network. In this project; I will develop a neural network to detect cockroaches. Detection is difficult as the images have other objects in the background such as apples; a plate; and an egg carton. Furthermore; there are very few images of cockroaches to train the neural network. I use a combination of algorithmic pre-processing of the images along with neural networks to overcome this problem of imbalanced data.

MCM108: What Makes a Good City?

I wanted to identify and improve issues of struggling cities. To conduct my experiment; I will build six test cities using Cities: Skylines; a videogame. I will find similar factors in good cities and bad cities to help real life leaders improve their cities. I learned that a wealthy city is not always the best. Citizens must have access to power and clean water; great healthcare and schooling; and good jobs. The city needs low crime and low pollution. Without these; citizens will be poor; unhealthy; and unhappy. Future experiments could be conducted to add improvements to the bad cities.

MCM109: The Development of Virtual Creatures

This artificial life simulation is designed to model specific occurrences in evolution or natural selection. The creatures are 3D rectangles; with AI teaching them about what food they should and shouldn't eat. Creatures move around randomly; and every 60 seconds; if enough good food is collected; they replicate. In the simulation; strength and smelling ability weren't very useful; as they were too expensive to have. The creature's eating behavior remained the same across a creature's life span; and usually; it was the children of the creatures who learned new eating behavior. The simulation functioned properly and creatures learned consuming food.

MCM300: Water Purification Robot

The purpose of this experiment is to make sure that everyone has safe water to drink; especially in areas that are in poverty. We will make a robot that will test the lead and Phd levels of water and it will then purify it and it will come out of the robot cleaner. We will be collecting data about how to make a robot take in water without getting electrocuted. This experiment is useful because it can save so many lives for people who do not have clean food.

MCM301: Author.Txt

When choosing our project the first thing we thought about was that we wanted to do something with computers and code. We ended up choosing to do a project about authors; since some people have trouble thinking of original ideas. While the outcome was just random words; it could still help when it comes to writing styles; and the idea was to provide ideas to starting out authors; not give them whole plotlines.

Consumer Science (MCS)

MCS100: Does Washing Clothes with Borax make them Flame Resistant?

The purpose of this experiment was to determine if natural and synthetic fabrics could be made flame resistant by washing with borax. It was hypothesized that washing fabrics in borax would make them more flame resistant. To test this hypothesis; 2 white natural fabrics (linen and cotton) and 2 synthetic fabrics (rayon and polyester) were purchased and cut into 5cm squares. 10 squares of each fabric were washed under different conditions (1;2; or 3 washes with no borax; or 1; 2; or 3 washes with borax). Each square was then attached to a ring stand with an alligator clamp and held above a bunsen burner flame. Recordings were taken of length of time needed to ignite the fabric and length of time for the fabric to be fully burnt. Averages for each treatment were calculated and compared to determine the effectiveness of washing with borax in flame resistance. Final results available at the fair.

MCS101: Which Insulation Will Keep Heat in Best?

Various materials will be evaluated with regard to their ability to insulate a hot water bottle.

MCS102: Opening Up the Gates on Flooding

Families are affected by water damage. Families can get chemical; biological; or physical contaminants and causes discomfort or sickness when exposed to grey water. Also Black Water contains unsanitary agents; harmful bacteria and fungi; causing severe discomfort or sickness. Black water includes water sources from sewage; seawater; rising water from rivers or streams; ground surface water or standing water. Families should know what works best to protect their houses; one of the cheapest ways to protect your house is with bags that you fill with sand.

MCS103: Homemade wood glue V.S Store-Bought wood glue: Which one would be better?

Wood glue is expensive. Also store-bought wood glue can have dangerous chemicals that you probably don't want near your skin. Homemade wood glue does not typically have dangerous chemicals and will probably not harm you. Homemade wood glue is convenient because you can make it with house hold ingredients. Homemade glue is also more cost effective. However; does homemade glue work as well as a store bought commercial product?

MCS104: pH level of different water used in daily basis

In our world now; cancer and osteoporosis are big problems sometimes caused by highly alkaline or highly acidic water. Many people suffer from these diseases everyday; and to fix this problem I decided to test the pH of different brands of bottled water. For my experiment I bought a pH tool kit to be able to find if different water types had very different results or if they were close. I got many popular bottled water brands. After I had all my materials I started my experiment by pouring each type of water into different measuring cups; each measuring « a cup. I used approximately 2 drops of the pH testing tool in each measuring cup to see it change colors. It was all different colors but in my experiment the best results were given from filtered water and Kirkland water.

MCS105: What Bat hits the farthest- BB Core or a Wood

When I did my experiment I hit a baseball 10 times with each bat. I first started with the BBCOR bat. In order; with a radar gun; these were the times calculated. 64mph; 64mph; 59mph; 61mph; 64mph; 62mph; 64mph; 64mph; 62mph; and 63mph. Pretty much all of the all of them were consistent and hit pretty hard. When I added them all up; and divided it by ten; I got a average of 62.7 mph. Next was the wood. Here were the times in order. 58mph; 55mph; 62mph; 56mph; 62mph; 59mph; 57mph; 57mph; 59mph; and 65mph. After finding the mean of the wood; it was an average of 59mph hit. My hypothesis was correct about BBCOR hitting harder; but the wood bat did hit a ball the hardest out of all of them. But in my opinion BBCOR is the best option with more pop and a bigger sweet spot with a more contact and harder balls hit rate. Wood is a longer bat but in my opinion BBCOR is the better option.

MCS106: Stay Sticky

Please visit student's exhibit for abstract

MCS107: Paintastic: Which Paint is Most Resistant Against Corrosion

The purpose of this experiment is to test different brands of paint on aluminum to see which one resists corrosion the best. The question being solved is; what is the best brand of paint that resists corrosion of moisture on aluminum? The hypothesis of this experiment is that Behr Marquee will surpass the other brands of paint in retarding corrosion. After gathering the necessary materials; the equitable amount of paint was measured. Two samples of the aluminum were painted; one to be kept in a controlled environment; the other to be tested. A plastic container was then filled to the top with water where one of the samples from each paint was placed. At this point in time; Behr Marquee is showing minimal signs of corrosion; however; Sherwin Williams is showing no difference. This project will be extended through March of 2020.

MCS108: Which Shampoo is a Sham?

The purpose of this project was to determine which shampoo was the most acidic; which is better for the hair. The question that the investigator is solving in this experiment is; which shampoo is best for the hair? The investigator believed that Pantene was the best shampoo because it contained acidic ingredients; which is good to keep the hair healthy. The investigator first recorded the pH of the undiluted shampoo; and then recorded the pH of diluted shampoo. Dove was the best shampoo for both the undiluted and diluted shampoo tests. In conclusion; the investigators hypothesis was incorrect; and the hypothesis was not supported.

MCS109: Beyond the Towel

My science fair project is on paper towels and comparing their absorbencies. For this project I purchased six brands of paper towels. Bounty; Scott; Viva; Dollar General Soft and Strong; and Black and White generic. All of these will be put to the test with different liquids. My first cite was... <https://www.nytimes.com/1981/09/01/business/paper-towel-battle-generic-savings-vs-brand-quality.html> "Introduced in 1977; generic goods have become fast selling items; although their volume still lags far behind national brands... expected to total about \$200 million." This helps me to see that my generic paper towel(s) make great intrust; though by the stating of reviews; that generic paper towels aren't the best at absorbing. So by reviews state; you should probably buy name brands though you would spend more. I guess we will put that to the test. My second cite was Good Housekeeping. According to Good Housekeeping; "If you frequently find yourself mopping up big spills...you'll want to look elsewhere; these sheets were slow to soak up liquid..." This site helps me to understand that Scott may not be the best. I guess that we will put it to the test. My third cite was Wire Cutter. According to the Wire Cutter; "...thicker and more absorbent than regular paper towels; and they weren't as great at scrubbing." My fourth cite was indianapublicmedia.org . According to indianapublicmedia.org; "Paper towels are made up of cellulose fibers; which also make up cotton; wood; and most other plants;" and "These cellulose fibers are actually giant molecules that consist of many small molecules linked together." My fifth site is infograph.venngage.com. According to infograph.venngage.com;?" The Bounty towels absorbed more of the water in the cups than the Sparkle did by a large amount." All of these sites allow me to have a possible idea of what could happen during my experiment.

MCS110: It's "Stain" Right Here!

The purpose of this project was to find the best stain-remover. Two questions needed to be answered: What makes a stain-remover work? And; Which stain-remover works best? The investigator's hypothesis was that the best stain remover would be Zout; because it had the surfactants and enzymes needed to erase stains. The procedure was to place the stains on the cotton; let it sit; spray the stain on the fabric; let it sit; and put the fabrics in the washing machine. The results were that the best stain-remover was a tie between Shout and Dreft; second place was also a tie between Puracy and Oxi-Clean. In last place was Zout. The investigator's hypothesis was not supported by this experiment.

MCS111: Concussion Safety: Do Guardian Caps Reduce the Amount of Force Transmitted to the Head in a Collision?

Football is the most popular sport in America; but how safe is it to play? Participation has decreased in high school football due to concerns about concussions. My experiment tests the effectiveness of Concussion Caps; the soft shell caps worn over the regular hard shell helmet. I am investigating to see if Concussions Caps actually decrease the force transmitted to the head in a collision. I will drop the helmets from the same height with and without the concussion cap and measure the force applied to the inside of the helmet. I predict that the concussion cap will decrease the force transferred to the head. The data collection process is still ongoing and results will be available on fair day.

MCS112: A Fee to Fiddle?

Please visit student's exhibit for abstract

MCS113: Stain Remover

When it comes to smelling nice or to feel good in your clothes you need to have a healthy habit of doing the laundry. When picking detergents you may go for the smell or price; but what your'e paying for does it work for its purpose? I wanted to test this fun experiment to find out if you really get what you want out of your choice of detergent. I started off with staining each sock/fabric with either lipstick; soda; or paint three times each. Then I left it sit for about an hour to let the stains settle in. After that I put each stained sock in the washer with either the detergents of Tide; Oxi- clean; or A great value brand and some extra fabrics for more of a realistic scenario. Then when the washer was done ;I moved it to the dryer. This was a whole cycle per hour. In order of the costs of them it ranged from Oxi-Clean; Tide; to Great value in highest to lowest prices. From my tests I have seen that Great value had a little difference in removing stains rejecting my hypothesis of Tide removing the most.

MCS114: Which candle burns faster?

Traditionally; paraffin wax candles have been the most widely used. In recent years; soy candles have gained in popularity. Understanding which type of candle burns slower and which is more efficient can be weighed against availability and cost. Combining this with efforts to be sustainable can help determine the best type of candle for everyday use. To do this experiment I got 2 sets of 3 soy candles and 2 sets of 3 paraffin wax candles. I burned each candle for 7 hours each with one set of each kind of candle per trial. I performed 2 trials. Results of this experiment identified that soy candles burn more slowly than paraffin wax candles. The paraffin wax candle most likely burned faster than the soy wax candle because there is crude oil (gasoline) in the paraffin candle. Since gasoline is such a flammable substance; it would make sense that the candle with gasoline in it would burn faster. Thus; soy candles are the optimal candle since they are made of more readily available and natural ingredients (sustainable and better for the environment).

MCS115: H2 Whoa

Our water sources naturally contain certain minerals/ contaminants. Certain contaminants can also be introduced from the environment; from the systems used to store or transport the water to our homes and from nearby farming or other operations. I researched the different contaminants that could be contained in the water we drink and the levels at which those contaminants can be harmful to humans. I wondered how different types of drinking water sources would test in terms of the levels contained in those waters of the most common contaminants of Copper; Iron; Fluoride and Lead. I conducted a blind taste test of six different types of water and hypothesized that Well Water would contain the most contaminants based upon taste. My hypothesis was incorrect. Ice Mountain bottled water contained the highest level of the contaminants tested; except for Lead. Well Water contained the highest content of Lead.

MCS116: Digital Hall Pass

The purpose of this project is to improve the inefficient analogue school hall pass system. Digital Hall Pass monitors student locations and records hall pass histories using automatically generated QR codes. As each student enters or leaves the classroom; he or she simply scans a QR code generated by the student's phone or school-given tablet. Information about the student's trip is then recorded and sent to the teacher version of the app. Teachers and administrators can then use this information to make schools and classes more efficient and safer.

MCS117: Which drinking water has the best Ph?

My experiment was about testing different water's pH levels. The purpose of doing this project was to see out of these different waters: Deerpark; Dasani; Fiji; Essentia; Lifewater; Aquafina; Icelandic; Evian; pure filtered water; and Smartwater. The procedures where to get 30mL of water put in a cup; then use the pH water tester and put two drops of it in the water mix the cup and you will get a color. When you get a certain color you look at the scale for it and estimate what color is the closest to the color on the scale. In all the waters the one that had the worst pH level was Dasani; the most neutral was Essentia; and the one with the best pH level was Fiji.

MCS118: What Do Sugary Drinks Do To Your Teeth?

Please visit student's exhibit for abstract

MCS119: The Best Whitening Product

Have you ever wanted to have nice ; white teeth? If so; you would try countless products. Which teeth Whitening product cleans teeth the best? Looking at research; I inferred it would be whitening strips. Using white tiles; I began investigating for two weeks. I applied the whitening strips; whitening pen; three different toothpastes; and baking soda with hydrogen peroxide twice a day making observations. At the end; I created an observation scale. Countering my hypothesis; baking soda and peroxide cleaned the best; Arm and Hammer toothpaste also whitened well. The baking soda in both shows the power of the product.

MCS120: Aluminum vs Dark Non-stick Pans

The experiment and research that I performed was to determine if there is a difference between dark non-stick pans and aluminum pans when baking. My hypothesis was to determine that as the cookies baked on the aluminum pan; there would be an increase in the overall texture and appearance of the cookies; whereas; when using the dark non-stick pans there would be a decrease in the texture and overall appearance. I performed my experiment in the kitchen of my home using a convection oven for baking. Using the same cookie dough for each trial; I baked the cookies on the aluminum cookie sheets and dark non-stick pans. I also used a cookie scoop; giving an even amount for each cookie. The cookies were baked at the same amount of time and temperature; which was 375 degrees for ten minutes. I then took pictures and compared the texture and appearance of the cookies baked on the different pans; and recorded my results. The results from my project supported my hypothesis that after testing my experiment; I have concluded that the cookies baked on the aluminum pans; baked the best. The cookies baked on the dark non-stick pans were dark; crispy; and hard. However; the cookies on the aluminum pans were light in color; soft; and moist. Finally; the overall appearance and texture of the cookies baked on the aluminum pans; were better than the ones on the dark non-stick pans.

MCS121: Will a Thermo Flask Keep Water Just as Cold as a Hydro Flask After 24 Hours?

The purpose of this project was to determine if a Thermo Flask could keep water just as cold as a Hydro Flask after 24 hours. The procedure was first putting one liter of water in a pitcher and letting it sit in the refrigerator for 24 hours. Then put .5 liters of water in each flask and let them sit for 24 hours. In the end they both performed the same.

MCS122: Does the Ratio of Water to Cement Mix affect the Strength of Concrete Forms?

The experimenter tested concrete forms to see which ratio of water to cement would be the strongest. The purpose of this project is to get stronger concrete for daily use. The experimenter built a way to crush concrete and make the pucks. Overall the experiment worked well and the third ratio 150cc to 200g was the strongest.

MCS123: Crazy or Nah?

Please visit student's exhibit for abstract

MCS300: The Voted Video Game

Our project is a video game made based on the results of a survey. The survey will be about elements of video games such as characters. The responses will be those of students. Once we have the results from the survey; we will develop the game. Whatever the majority says is their favorite element of a certain aspect of video games; will be included in the game we make. We are not yet finished collecting the data from our survey. We can finish collecting the data by next Friday. The project will be completed on March 13; 2020.

MCS301: Which laundry detergent works best for different types of laundry?

"We decided to conduct the ""What Types Of Detergent Works Best On Which Types Of Fabric"" experiment because a lot of people have trouble getting rid of stains (most of the stains are the ones we experimented with.) We decided to try two different detergents that are very commonly used among people around the United States. We applied multiple substances that according to our mothers; are always a pain to take out. Then; we blow-dried the substances dry and repeatedly scrubbed on them for 2 minutes. Then we dried them again; and provided ""before"" and ""after"" pictures. While we were doing this experiment; we realized that we wash dirty clothes because you don't want to look unsanitized. People should care about clean clothes because there are so many germs that get on your clothing in one day that you need to wash your clothes daily because some germs can get you really sick. So in our experiment we were determined to find out which detergent works better: Tide; or Oxiclean? Our answer: Tide. It removed the stains easily and left the clothing with a fresh scent."

Earth & Environment (MEE)

MEE100: Color Choice in Solar Heaters

Different colors will be evaluated to determine which would be the best choice for a solar air heater.

MEE101: The Effect of N-P-K Fertilizer on Daphnia magna Heart Rate

The purpose of this experiment is to determine if three different elemental nutrients (N-P-K) commonly found in fertilizers effect the heart rate of Daphnia magna. It was hypothesized that potassium would have the greatest effect; nitrogen the second greatest effect; and phosphorus the least effect. To perform this experiment; 50 Daphnia magna were purchased. One Daphnia was placed on a concave microscope slide with one drop of spring water and one drop of a 1% solution of nitrogenous fertilizer. The slide was placed under a light microscope under the lowest magnification and light setting and the Daphnia was allowed to acclimate for 60 seconds. The heart rate was then determined and recorded for 30 seconds multiplied by 2 to get heart rate in bpm. This process was repeated using 11 more Daphnia. The same procedure was used using phosphorus based fertilizer; potassium based fertilizer and spring water (Control). The final results will be available at fair.

MEE102: Oil Pollution Remediation using Mammalian Hair

The purpose of this experiment was to determine if different types of mammalian hair could be used as a possible way to remove oil pollution from aquatic environments. To perform this experiment; samples of cat; dog; horse; sheep; and human hair/fur/wool were collected and cleaned. The cleaned hair samples were observed under the microscope to assess cuticle health; then placed in nylon stockings and massed. A known amount of motor oil was poured into distilled water. The stocking of hair was placed in the polluted water and left to soak for 24 hours. The stockings were then removed and allowed to dry. Once dry; mass was measured and compared to initial mass. Hair types were compared to determine the most effective pollution remediator. Final results available at the fair.

MEE103: Effect Of Metal in Soil On Plant Growth

The purpose of this project was to determine if adding metal to soil would increase the growth rate and size of plants. The metals tested in this experiment were iron; aluminum; copper; and magnesium. To perform this experiment; 10 grams of potting soil were measured and mixed with 1 gram of metal. A control sample of 11g of potting soil was also used. Green onion seeds were planted into 24 cups of each environmental condition. Seed germination day and plant growth were recorded over an 8 week period. At the end of the growing period; plants were removed from their growing cups and dried. A final biomass was calculated for each plant. Final results available at the fair.

MEE104: The Effect of Titanium Dioxide on Aquatic E. coli Inhibition

The purpose of this experiment was to determine the optimal concentration of titanium dioxide (TiO₂) needed to inhibit bacterial growth. It was hypothesized that the higher the concentration of TiO₂; the greater inhibition. To test this hypothesis; E.coli cultures were added to 12 jars of nutrient broth containing varying concentrations of titanium dioxide (3 jars of 1% TiO₂; 3 jars of 5% TiO₂; and 3 jars of 10% TiO₂; and three control jars of 0% TiO₂). The jars were placed under a UV light to activate the TiO₂ and incubated using a heating pad. Samples were taken every 3 days over a 15 day period for optical density of bacteria analysis using a spec 20 machine. Final results available at the fair.

MEE105: What plants most benefit water quality

Plants are one of the most vital factors in a healthy environment. Part of their role in an aquatic ecosystem is to take out waste and pump in oxygen. In this project; different species of plants will be tested on their ability to improve water quality. To conduct this experiment I placed aquatic submerged; floating; and marginal plants each in a container of water dosed with an equal; low amount of ammonia. An additional plant of each type was placed in an unchanged container. There is an extra of each type of water container to keep as the control. The plants were set up with a growing light; and each week the ammonia-doses container was tested for ammonia and the unchanged container was tested for dissolved oxygen. The goal of the experiment is to test which type of plant best improves the quality of water in two different ways. This is determined by comparing the water testing results over the month to the control containers. The project is still ongoing; so data and conclusions will be available on fair day.

MEE106: Testing the Biodegradability of Plastics

Please visit student's exhibit for abstract

MEE107: Renew Your Resources

Fossil Fuels are the main source of energy on the planet; but they are nonrenewable which means they are rapidly disappearing because of our overuse. This carelessness has polluted our atmosphere with a surplus of carbon. For decades scientists have been trying to find an alternative resource to take the place of the nonrenewable fuels. Over the years we have found many resources; such as solar; wind; hydroelectric; and even fuel made from corn and other vegetables. My experiment will test which fuel is more effective; renewable or nonrenewable. First; I will cover a piece of cotton with vegetable oil (my renewable fuel); and light it on fire underneath a can filled with water and a thermometer in a well ventilated area. The thermometer will tell you the amount of heat/energy produced by that fuel. Second; I will preform the exact same procedure; except I will be using motor oil (my nonrenewable fuel). My final results will be available on fair day.

MEE108: Persistent Pollution on the Planet: It's a Problem

Please visit student's exhibit for abstract

MEE109: Cool Down the Planet

The purpose of this project is to determine which landscaping material will cool down the planet the quickest. What landscaping materials can we use to efficiently help with cooling down our planet and help with global warming? The conductor's hypothesis is that after testing 5 different landscaping materials; water will cool down the quickest. The conductor will test five different landscaping materials: water; brick; mulch; gravel and grass to see which material will cool down the quickest after being in a heat source for 30 minutes. The results were after 30 minutes without the heat source; water cooled down the quickest. However; after being without a heat source for 60 minutes; grass cooled down the quickest. To help cool down our planet quickly and efficiently; the conductor's experiment proved using water and grass are the best ways to achieve this goal. The conductor's hypothesis was partially correct.

MEE110: GO GREEN!

Please visit student's exhibit for abstract

MEE111: Wind Power; It's For The Birds

Wind turbines create renewable energy but also harm the environment by killing birds and bats. Fencing was an obvious solution to the problem. Three windmills were built and tested with and without a fence to see which would generate energy better. They were built using balsa wood and tested 80 centimeters away from a box fan. The wind turbine without a fence worked the most efficiently because the wind was not blocked; unlike the fenced turbines during testing.

MEE112: Plants vs Erosion. ..Throw the Earth a Root

Please visit student's exhibit for abstract

MEE113: The Effect of pH on the Rate of Mineral Dissolution

Minerals form an essential component of rocks; man-made structures; corals; and even in food. Climate change and pollution affect the pH of natural water which in turn can affect the dissolution of minerals. This may lead to harmful effects on rocks; man-made structures; corals; and food. The objective of this project was to test the effect of pH on mineral dissolution rate. It was hypothesized that change in pH will affect the rate of mineral dissolution. In order to test this hypothesis; 2 minerals; Iron and calcium carbonate(1; 5; 10; 100) mg were weighed and suspended in phosphate citrate buffers of pH 4; 5; 6.2; 7; and 8. Type time of dissolution was monitored by change in color of the solution; or clarity of the solution. It was observed that the rate of dissolution was dependent on the concentration of minerals; the higher the concentration the concentration of minerals; the lower the dissolution rate. The results showed that the dissolution rate was dependent on the pH of the buffer solution. Both iron and calcium carbonate dissolved faster in the acidic pH while sometimes forming cloudy solutions at basic pH. Thus; change in pH is important in determining dissolution of minerals. This is an important topic of investigation since change in pH of the hydrosphere due to climate change can cause the dissolution of minerals in corals and historical monuments.

MEE114: Home Away from Home

For humans to survive on Mars; we will need basic elements such as Water; Oxygen; and Food. These elements are not readily available on Mars and are not practical to transport from Earth to Mars. Our idea is to generate these elements using the resources available on Mars and transporting some limited resources which are necessary to set up an ecosystem which will sustain for years to come. The basic concept is to set up a Solar and Wind plant; Cryogenic storage facility (to store liquid H₂-hydrogen transported from the earth); and H₂ & CO₂ Reaction plant (CO₂ is readily available on Mars) to generate Water (H₂O) and Carbon (C). The water generated can be used for Agriculture to grow food and is also an immensely important element for human survival. We can also use MOXIE; the machine invented by NASA; which sucks in carbon dioxide from the Martian atmosphere and then pumps out pure oxygen. This can be used to generate the initial or supplemental oxygen for human life. Hence; we can rely on this idea by highlighting the importance of the use in solar and wind power; to create a home away from home". ""

MEE115: To Btk... Or Not To Btk?

To determine the lowest amount of bacillus thuringiensis (Bt) needed to effectively kill dumpy-wing fruit flies; 7 different concentrations of Bt were mixed using Monterey Bt Concentrate and distilled water. 7 plastic bins with lids had holes poked into the lids. Strawberries of equal masses were soaked in the solutions and placed in a bin along with 30 fruit flies. For each different concentration; the time of each fruit fly's death was recorded.

MEE116: BREATHE IN(doors) & OUT(doors): Ozone+PM - AQI

I conducted this experiment to test indoor air quality in various rooms/floors in my house and outdoors; and compare it to reported daily Air Quality Index (AQI); in order to help people with breathing issues. I used homemade color-changing test strips as an indicator for ozone levels; and plastic slides with petroleum jelly to collect Particulate Matter (PM). Measured CO₂+Ozone+PM was highest outside; then ground floor; then main floor; and lastly upstairs. Indoor ozone levels correlated with AQI reported daily 18 days); and PM increased overall (~ 1 month) but could not be correlated to AQI.

MEE117: Coal Beans

16 holes were poked into the bottom of 150 cups. The cups were divided into 5 groups of 30 each containing a different soil to coal dust ratio. The groups were 80g of potting soil; 60 g of potting soil to 20g of coal dust; 40g of soil to 40g of coal dust; 20g of soil to 60g of coal dust; and 80g of coal dust. 4 mung bean seeds were planted per cup and placed under a grow light for 30 days. Once per week I watered the plants with 100ml of distilled water and measured the plants growth during their growth process.

MEE118: Grey water for green thumbs? How does recycled water impact plant growth?

In this experiment you will find out if grey water or if tap water is better for a plant's growth. Grey water is in this experiment because it can be better for a plant's growth because of its nutrients from the items that went into the water. I'm testing this by adding 59 milliliters of water each day and measuring every 7 days with centimeters. The experiment is still continuing at this time.

MEE119: Ground Ozone Levels: Urban vs Rural

I will be testing the effect of urban vs. rural areas on their concentration of tropospheric ozone. This project relates to current life because of the detrimental effects that ground ozone has upon the respiration system. Repeated exposure to ground ozone causes inflammation of the lining of the lungs; worsens emphysema and bronchitis; and triggers other health problems. Aside from the health issues; ground ozone can also destroy crops and other plants by destroying plant tissue; which reduces the chances of survival. My hypothesis is that the levels of tropospheric ozone will be significantly higher in urban areas than rural areas due to the more concentrated population and increased sources of pollution; causing more sources of ground ozone-forming compounds than those found in rural areas. I will test my hypothesis by creating Schoenbein paper; which is filter paper coated in a ground ozone detecting solution. After conducting my experiment; I discovered that urban areas have a much greater concentration of tropospheric ozone than rural areas. With the knowledge that I gained on tropospheric ozone; I now know the importance of limiting our pollution emissions; and the necessary means we need to take to limit the creation of ground ozone. All of my final results; research; and conclusions will be explained during the science fair.

MEE120: How Can Companies Protect Shipments Sustainably

Please visit student's exhibit for abstract

MEE121: Plastics: Breaking it Down

Plastics are polluting our oceans quickly. In fact; according to the United Nations Joint Group of Experts on the Scientific Aspects of Marine Pollution; up to 80% of the Earth's oceans are polluted. Much of this plastic is plastic used to contain foods; one of the most common types being PET; or Polyethylene Terephthalate. My experiment tests whether or not plastics like these; such as PET plastic; can be broken down using acetone. Acetone is a solvent that can clean everything from nail polish to permanent marker. This project tests whether acetone will have any effect on plastic by exposing plastic to acetone for a long period of time and seeing whether anything has changed at the end of the experiment. This experiment is ongoing; and results will be available on the day of the fair. To do this experiment; I plan to use 500 ml of acetone and 50 grams of PET plastic. They will be placed in a glass bowl that is always being weighed. I will find the weight of the bowl without the acetone and plastic before starting; and then the whole weight of the acetone; plastic; and bowl. If the acetone manages to dissolve the plastic; the weight will decrease and it will be clear by how much. If the weight does not change; then I will look at the qualities of the resulting plastic at the end of the experiment and make my conclusions based on that.

MEE122: A Plastic Savvy World

Introduction: Over the recent years; pollution has played a big role in our lives (specifically plastics). As a result; I wanted to test an alternative to plastics which would be more environmentally friendly and yet safe for use. My science project for this year was based on how biodegradable plastics could break down in different climates. I also tested how safe they would be to use. I used oils to test how safe they would be in human contact. Problem Statement: My hypothesis for this experiment was that a for corn based plastic would breakdown the fastest; and yet still safe for use. The reasoning behind this is that the chemicals associated with this plastic are very minimal making it more environmentally friendly and easier to break down. After noticing the material of the plastic; it was thin and flimsy giving more reason to believe it would breakdown the fastest. Procedures: The approach I would take towards my hypothesis is to initially start with testing each plastic individually; and later compare results. Something that maybe key in my success would be the amount of oils I use to test. After; I would attempt to examine each piece of tested plastic to see which was broken down the furthest. Results: None; I have not started testing yet since it has not officially been accepted. If this happens the project will be done around 3/10/20. Conclusions: I hope that this experiment will influence more to use biodegradable plastics in an effort over regular plastics after my testing and results.

MEE123: Combating Nutrient Pollution

Nutrient pollution is one of America's most widespread and challenging environmental problems; and is caused by excess nitrogen and phosphorus in our water. My experiment's purpose is to determine what plants can be used to counter nutrient pollution. Two marine plants; *Aegagropila linnaei* and *Egeria densa*; were put in tanks of water mixed with fertilizer and tested for nitrate levels every day for 3 days. I predict that *Aegagropila linnaei* will generate lower nitrate levels in the water by absorbing nitrates.

MEE124: Sustainable Approach to Rubber Production Utilizing Hedge Balls

This project uses *Maclura pomifera* to create a sustainable alternative to man-made rubber. *Maclura pomifera*'s plant known as; hedge balls; are rich in latex. By developing a natural rubber and performing comparison analysis; this project aims to determine the potential of hedge balls in greener rubber production for the future. An acid will be used to neutralize the latex and make it into a rubber. It will then be put into a series of tests to determine the reliableness of the new rubber. I conclude that the rubber will be able to have some properties of man-made rubber and with further testing and experimentation it will be an alternative to the rubber we use today. The data will be provided at the fair.

MEE125: Balloon Car - 7

In this project I would create a car powered by a balloon and air. The purpose of this project would be for me to learn about trial and error and potential and kinetic energy. The procedure that I will do after I create my balloon powered car is test how long it takes to get to a certain range. The data that I will collect will be me finding how far it will go in a certain amount of time. So far experimentation is continuing; and results will be available on fair day.

MEE126: Under Pressure

Please visit student's exhibit for abstract

MEE127: Dry Wood is Happy Wood

Please visit student's exhibit for abstract

MEE128: Do flowers like hot tubs?

Please visit student's exhibit for abstract

MEE129: The Effects of Climate Change

I am looking at climate change and how it has changed our surroundings. I will also be looking at the evolution of climate change and how its awareness has been raised and become more known and extensive over the years. Finally; I will be looking at what both large corporations and individuals can do to change the almost certain fate the Earth will be facing in the future.

MEE130: The Effectiveness of Aquaponics Versus Other Growing Techniques

As the world population increases; the natural resources such as water; become scares. Additionally; the world needs more food to feed the growing population. Therefore; there is a bigger demand on food and water; so we must find ways to conserve water at the same time as harvesting more food. A number of alternative ways to grow plants have been developed. Two of such ways are hydroponics and aquaponics. Hydroponics is growing food directly in water. Aquaponics is growing food in an ecosystem where the water is recycled from a place with fish. In this project; I wanted to compare how arugula microgreens; a fast growing plant; grow in the three environments: soil; aquaponics and hydroponics. I hypothesized that arugula will grow best is an aquaponic system because it has a stable source of nutrients. However; my results showed that arugula grew just as well in soil as in the aquaponic system. These results suggest that aquaponics can be used as an alternative to traditional farming methods; soil. Further testing is needed to determine which plants are best suited for an aquaponics system.

MEE131: Paper vs Plastic The Last Straw

Plastic straws are extremely harmful to the ocean. According to strawlessocean.org it is estimated that Americans use over 500 million straws everyday and by the year 2050 there will be more plastic straws than fish in the ocean and the most seabirds will have ingested plastic. My project determines if when comparing the decomposition of plastic straws to alternatives; the alternatives decompose faster. I measured the weight of each plastic; bamboo; and paper straw. I placed three plastic straws in separate bags each full of soil. Next; I placed three paper straws in separate bags of soil. Then; I placed three bamboo straws in separate bags of soil. Then I created a compost in a plastic tub. I put mulch on top of the compost and placed three of each straw under the mulch. After 8 weeks i remeasured the straws. I compared the original weights with the ending weights. Through my studies; I was able to discover that paper straws decomposed the fastest. Plastic and bamboo straws did not decompose. My hope through this project is to raise awareness about the harmful effects that plastic straws have on our ocean and ocean life.

MEE132: Do Closed Doors Save Lives?

The purpose of my experiment is to determine if a closed door in a structure fire can provide someone a significant amount of time for safe escape or rescue. My hypothesis is the amount of time for smoke to enter a room with a closed door will significantly less than if the door were open. To test my hypothesis; I performed an experiment where I filled a house with smoke using a fog/smoke machine; on 3 different occasions; to see how fast smoke can permeate through a home depending on whether the doors are open or not. This experiment proved that a closed door slows the spread of fire and reduces the toxic smoke levels.

MEE133: What Filters Purify Multiple Liquids the Best?

The purpose was to determine which of the following (Brita; Platypus; Sawyer; homemade filtration and distillation) best purifies the following liquids (tea; saltwater; and orange juice with pulp). The procedure is as follows: 1: Prepare saltwater 2: Prepare Sawyer; fill; squeeze and test liquid. 3: Prepare Platypus; fill; gravity drain; and test liquid. 4: Prepare Brita Filter; fill; gravity drain; and test liquid. 5: Produce a homemade distillation using stove. Heat until contents boil. Collect water in the ice bath and test liquid. 6: Prepare the homemade filter using four stackable containers filled with sand; gravel; carbon; and filter paper. Pour the liquid through the top collecting in the bottom. Test liquid. The results proved that the most effective purifier was distillation; but it took a long time to boil the water and set up. The most convenient were the Sawyer and Platypus which are very similar in performance and portable. The worst filter was the homemade as it clogged; and it took a long time to set up.

MEE134: Air Pollution

The purpose of this experiment is to find out what area of Pittsburgh has the most particle pollution. This experiment was conducted because it is useful to know what areas of Pittsburgh have more particle pollution than others. The data collected did support my hypothesis. Dormont had more particle pollution than Moon Township because Dormont is closer to the city and near busy roads. Moon Township had much less particle pollution because it is further away from the city. The independent variable did make a difference in this experiment. It made a difference because different areas have different amounts of cars; people; buildings with heaters and stoves and other sources of particulate pollution. The independent variable also made difference because some areas of Pittsburgh are closer to the city and busy roads than others. There were no problems during this experiment. There were no unusual observations made while conducting this experiment. Changes that could be made in this experiment is you could test the amounts of particle pollution in different areas of Pittsburgh. This science project relates to real life and a wider scientific field because the particles in the air are what you breathe in everyday. The results of this experiment apply to society because it contributes to air pollution data in the Pittsburgh area.

MEE300: The Effects of Gravity on Herbs

The purpose of this project is to determine the impact of gravity on herbs. Our hypothesis is growing plants horizontally will cause their rate of growth to slow. For our project; we grew herbs horizontally and vertically. We then measured and tracked the growth of the plants as they grew in our science fair notebook. The results and logs of the plant growth will be available on fair day.

MEE301: Stars and Exoplanets

The purpose of our project is studying how the mass of a star affects the exoplanets orbiting it in the habitable zone. We will collect information on at least twenty different stars and analyze the data to see how the star affects its planets. We are collecting the rotation and orbital periods; age; mass; distance from both earth and its star; temperature; and radius of each individual exoplanet. This project could help humanity in the future to explore our universe and understand how things outside of our solar system work.

MEE302: Sustainable Energy and Waste Management

As said in the overview; we are trying to set an example for our community; Murrys ville. The success of this project would prove that it is possible for the average school to reduce their carbon footprint. We will interview our school officials on the subjects of electrical consumption; waste production; and food management (the questions asked and a summary of the responses given will be available on fair day). Then we will research products to better or replace the current system based on data from said officials and school files. Not only will we calculate the approximate cost for upfront changes; but we will also estimate when said changes will pay themselves off . We are in the process of collecting data for planning; which will begin shortly. Because we are still collecting data; we are unable to provide conclusions for the experiment at this time. Currently; our hope is that the school will take the idea and implement it.

MEE303: Comparing the Effectiveness of Three Commercial Water Filters at Filtering Inorganic Pollutants

Our purpose of this experiment was to analyze if commercial water filters like Brita and Pur are successful in removing contaminants in water. To sum up the procedures; we bought the filters and tests. Then we collected water samples from three different sources around Pittsburgh: one of the students' houses; the students' school; and the Monongahela River. We needed enough water to test six samples from each source. We will test each water sample for levels of fluoride; copper; and chlorine three times before we put it through the filters. Then we will put it through the filters and test the same samples three more times. The experiment is still in progress.

MEE304: Manufactured SAP Vs. Store Bought SAP

Droughts are very common in our world; due to global warming. One way to combat droughts is by using a Super Absorbent Polymer (SAP's). SAP's combat droughts by conserving up to 300 times its mass in water. This can be very useful because; during droughts water can be very hard to come by; so having a way to conserve water there would be a smaller shortage of water. In our experiment we tested a homemade biodegradable Super Absorbent Polymer against a store-bought Super Absorbent Polymer. To begin we added two cups of water to a pot; so they could boil. Then we left an orange peel in for 15 minutes. After this; we covered it in avocado oil and let it bake for 40 minutes under a heat lamp. We completed this process 3 times. We let the superabsorbent polymers absorb 3 cups of water for 45 minutes: 2 hours: 18 hours. After this we took out the superabsorbent polymers and measured the water to see which absorbed more water. In our experiment the store-bought superabsorbent polymer absorbed more water in all three tests. From these results we concluded that the store-bought SAP's absorb more water than the SAP we created. Although they absorbed more water the homemade SAP is much cheaper and better for the environment.

MEE305: Which type of polymer is the most biodegradable?

Everyday people face environmental challenges in their lives. Our approach to this was to conduct an experiment with two different types of polymers (natural and manmade) to find out which ones degrade the fastest. Our experiment will provide information on how to correctly dispose of harmful polymers. We will do this by collecting the data when we put different plastics (polymers) in the ground and see which ones decompose the fastest. We are going to test materials that are usually littered on the ground therefore having the best effect on helping society. Our purpose is to warn people that don't use biodegradable polymers of how harmful the effects are on our environment and how we can be more proactive in our fight against harmful polymers. The way we conducted our experiment was by filling a large tupperware with dirt and dividing it into four sections. From there we buried two man made and two natural polymers in the tupperware for a month where we checked on it after two weeks. Our hypothesis is that the natural polymers will biodegrade faster than the man made polymers. The reason behind this is because since it's natural it will combine with the earth quicker because it was made from the earth.

MEE306: Potato Battery

We will be seeing a potato light a light bulb. We will also be seeing if it can make buzzer buzz. The purpose we wanted to do this project is to see if it's true that a potato can turn a light bulb on and has real electricity we will also be seeing if a potato can make a buzzer buzz. Our procedure will start with cutting a hole in the potato the size of the light bulb; then put the light bulb in it tight. Before we do that will put zinc and copper in the potato connecting the (red) alligator clips to the positive side of the buzzer and the other clip will go on the negative side. We will be recording it in our notebooks. Our data is also being continued. Our result will be available on fair day.

MEE307: Water Pollution in Pennsylvania

The purpose of the experiment is to freshen the water near our houses. As early as May 2019 there was opposition from PA legislature from a water proposal plan. It is the 2nd worst state in waterway industrial pollution. The water pollution affects our health because people fish in the water and chemicals such as zinc; styrene; and Xylene are in the water and getting into the fish's body. We will test the water for contamination using a water test kit and we will take out human pollution such as plastic cans and bags. We will then test the water again and will repeat until all human pollution is gone. A possible research application is how bottled freshwater prices increase because of the lack of unpolluted freshwater.

MEE308: Biodegradable Paper Plates

Is biodegradable paper even good for the environment? Yes; biodegradable paper is perfectly fine for the environment. These paper products are usually made from plant products and is very compostable. These 6 "paper comes from renewable farmed resources". Biodegradable plastics on the other hand; are not good for the environment. They are made from nonrenewable resources such as oil and cause greenhouse effects in the landfills. There are types of biodegradable plastic made using plant based sources; but they are not technically biodegradable because the substance they decompose into is toxic for the environment and landfills they are in. So if we want to keep the air healthy and try to make sure the landfills are not full for as long as possible; using biodegradable paper is the best option. It is eco-friendly and can reduce pollution; unlike biodegradable plastics.

MEE309: The Energy of the Rain

Energy is at a premium so we researched different ways to produce energy without relying on fossil fuels. We decided to use a naturally occurring process; a rainstorm; and convert the kinetic energy of the rain into stored energy. We made a system that would take rainwater; turn it into electricity by a turbine; and then filter and store it for later. It is constructed out of clay so it is eco-friendly. It is baked in a kiln and glazed to make sure it can last through many rain storms.

Engineering / Robotics (MER)

MER100: Increase the Enthalpy!

"Plasma assisted combustion or "P.A.C." is the use of two electrodes to make plasma inside an internal combustion engine. In this project; I will be testing how a P.A.C. System can affect the efficiency of a jet engine. To do this I will be using Carnot efficiency equations where the variables are derived from a small scale jet engine purpose built for this experiment. The Carnot efficiency equation is meant to determine how much of the heat energy produced by the jet engine is being used to do work. I will be using the equation $n(\%) = ((T_h - T_c) / T_h) \times 100$. Where n is the maximum efficiency; T_h is the high temperature reservoir and T_c is the low temperature reservoir. I will be directly changing the T_h value as that will be the temperature while not using the P.A.C. System and vice versa."

MER101: Electromagnetic Crane

Electromagnetism is defined as the generation of magnetic field by motion of electrically charged particles. A piece of metal can be converted into a magnet by passing an electrical current through it. Therefore; the magnetism of the metal can be switched on and off; whenever necessary; by switching on and off the electric current; respectively. It could be used in real-world situations where it could pick up; separate; and move metals from a pile of debris; such as in junk yards or recycling plants. My hypothesis is that the strength of magnetism would depend on the strength of electricity. The objectives of the experiment are 1) to convert a metal into magnet with the help of the principle of electromagnetism and 2) to regulate the strength of magnetism by changing the voltage and/or by changing the number of loops wound on a coil I will be using cardboard to prepare the base; body; and arm of the crane. I would wrap different lengths of insulated wire around 3 similar screws and complete the circuit by adding batteries with different voltages. I would record the numbers of nails the magnets could pick based on the number of coils wound on the screw and batteries with different voltages. The experimentation is ongoing and I would present my final data on Science Fair Day. With the experimental observations and data; I would analyze if my hypothesis is correct and if my objectives would be fulfilled

MER102: Running on Oil

Please visit student's exhibit for abstract

MER103: No Brainer Tennis Ball Reclaimer

The purpose of this investigation is to make an inexpensive machine that re-inflates flat tennis balls. Tennis balls are made of a hollow rubber core; covered in a wool or nylon shell which is known as a nap. When the tennis balls are removed from the pressurized container; whether they are used or not; they will gradually lose pressure over time; causing unrepeatable tennis play. In order to restore the tennis ball to its original play; it must be re-pressurized. To do that you must first collect flat tennis balls and record their bounce height. After doing so; repurpose the ECHO MS-401 Chemical Sprayer. Then; use the pump on the ECHO to fill to 15 PSI (pounds per square inch) and place the tennis balls in the ECHO. You must wait about a week for the flat tennis balls to achieve their original pressure. After waiting a week; release the pressure in the ECHO; unscrew the lid; and remove the newly pressurized tennis balls. Lastly; record all the data.

MER104: Stressed Out

Stressed Out was an experiment that tested the structural designs of beams. This experiment was conducted to see if different beam designs affect load capacity. During the experiment; the bamboo sticks were glued together to make the Sandwich beam; the I-beam; the T-beam; and the Channel beam. Then the beams were put across the steel bars and the scale was attached to the beam. After; pull the scale down and record how much weight the beam held before a fracture formed. Lastly; after repeating those steps for all the beams; the Sandwich beam held the most weight.

MER105: The Construction of an Affordable Nose Guard

Engineering A nasal fracture is the most common fracture of the face. Nasal fractures can occur from many things: falling; sports; getting into a fight; etc. Nose injuries need attention immediately because damage to the cartilage can cause blood to build up in your nose. If the blood is not drained right away it could cause abscess; or a deformity that blocks your nostril from being able to breathe in and out air; or it could even lead to tissue death and cause the nose to collapse. Sometimes; surgery is needed to fix the nose. After surgery a doctor sometimes recommends a nose guard for doing sports; they are usually eighty dollars. The nose guard protects your nose in area where your nose can break. This project is based on the information above; because I will be 3D printing a nose guard. The purpose of this experiment is to learn and observe the nose and where it can break but also I will be making a nose guard for cheaper than eighty dollars. 1. Research where the nose can break. 2. Sketch out where the nose guard will go. 3. Take measurements of your nose (leaving space for padding). 4. Go into a 3D printing website and draw out where it will go and make sure it lines up with your measurements. 5. Print it out. 6. Place it on your face to see how it lines up (with your face and the padding). 7. Modify your measurements. 8. Reprint 9. Place it on your face to see how it lines up (with your face and the padding). 10. Modify your measurements. 11. Reprint 12. Place it on your face to see how it lines up (with your face and the padding). 13. Keep repeating those steps until you get it how you like it. 14. Adhesive the padding onto the nose guard to the places where noses can break. 15. Add elastic so it can stay on (make sure its secure). 16. Analyze and conclude data. Bibliography Nose Fracture: MedlinePlus Medical Encyclopedia". MedlinePlus; U.S. National Library of Medicine; <https://medlineplus.gov/ency/article/000061.htm> Healthline. (2019). Broken Nose: Symptoms; Treatment; and Prevention. [online]. Available at: <http://www.healthline.com/health/nose-fracture>.

MER106: Need a Hand? A Prosthetic Prototype

All over the world; people are missing limbs. It could be from war; or maybe they were born this way; but it would be hard to live with only one leg; or arm; or even missing a finger. But the problem is that prosthetic limbs are not cheap. The purpose of my experiment is to see if I can make a prosthetic hand out of simple objects; like foam; wire; glue; and tape. So far; I have not been able to make a usable hand but have accomplished making a finger. My experiment is not finished yet and results will be available at the fair.

MER107: What method is best to secure shingles during high wind?

Purpose: I was interested in roof damage and high wind; and I wanted to determine what method is best to prevent damage. Hypothesis: Using both a nail gun and adhesive; and a lower roof pitch will prevent the least amount of damage. Procedure: 1. Install shingles 2. Run leaf blower for 5 minutes; checking damage at 1 min.; 3 min; and 5 min; at a 35-degree angle. 3. Take note of damage or lack; and repair any shingles completely un-anchored. 4 Repeat steps 2-3; but place board at a 55-degree angle. Conclusion: My hypothesis was not proven; because of the fact that the nail gun board; and the board with the nails hammered down received little to no damage; while the control(nails hammered down; no heat gun) and the board with the nails hammered down and a heat gun used on it; received moderate damage; while the control board received high damage.

MER108: Don't Bug Me

Many people seek to repel *drosophila melanogaster* or fruit flies using aerosol chemical repellents. However; these toxic aerosol chemicals harm our environment by contributing to holes in the ozone layer; which causes global warming. I will determine if there is a sound frequency inaudible to the human ear that repels and or harms insects; whose range of hearing exceeds the human range. I will obtain fruit flies; separate them to avoid reproduction; and expose groups of them to different frequencies to determine the effect of different frequencies on their lifespan and behavior.

MER109: The Self Driving Car

The purpose of the experiment is to build a car that relies on its sensor and makes a decision to avoid obstacles. I will use a robotics kit and program it in my computer. Then I will make a frame with cardboard and put all the contents inside and I will test it. I will collect the time that the car is working. This experiment is useful for ending accidents that are caused by humans on the roads.

MER110: HVAC Filters: Is it Time to Change Them?

My experiment is to measure the difference in air pressure in the HVAC vent resulting from gradual clogging of filter to detect the optimal time to replace the filter. I will connect a Raspberry PI to a sensor that measures air pressure and code it so it notifies the user on when to change the filter. I will be collecting airflow/pressure information at various stages to determine the threshold. This experiment is useful because it could possibly save homeowners a lot of money because when the filter is clogged; the HVAC system works much harder which increases utility bills.

MER111: Don't Burn Your Bridges

Purpose: To see which of the five major types of bridges can sustain the most mass. Procedure: 1. Build one of the types of bridges. 2. Place canned food on the bridge in 2 kilogram increments. 3. Mark weight at which bridge breaks. 4. Repeat two more times for the same type of bridge. 5. Repeat steps 1-4 for all five types of bridges. 6. Interpret data and draw conclusions.

MER112: Can an Electronic Circuit Detect Different Colored Fruit?

There are many ways to determine if produce is ripe; its color; its smell; or its firmness. Some produce turns from red to green when ripe. The purpose of this project was to build an electronic circuit that can detect when a piece of produce is green or red in color. Tomatoes; peppers; and apples were tested by placing them in front of an LED light. If the photoresistor detected red light being reflected back from the produce an indicator LED would light up. Overall the device detected red produce with 92% accuracy and green produce with 77% accuracy.

MER113: Which bridge design is the strongest?

The purpose of my experiment is to find out which bridge design is the most durable out of the beam; warren truss; tied bowstring arch; and self-anchored suspension bridge. I chose this experiment because knowing which bridges are the strongest is important. Bridges play a key role in society. We use them in everyday life to help us get from Point A to Point B. Having strong bridges can save many lives. If a bridge was too feeble or not durable enough; having it break can have devastating consequences. For example; during the collapse of the eastern deck of the Bay Bridge in 1989; it caused the death of one person. Having strong bridges is important to modern society. With industries expanding; and the usage of online ordering increasing; contemporary society has to have stable and reliable bridges more often than the past. And that is why I chose this experiment; to find out which bridge is the strongest.

MER114: Grip Test of a 3-D Printed Hand

Grip test of a 3D-printed hand A professionally made prosthetic hand can cost ten thousand dollars or more. Organizations such as e-NABLE have created an online global community that uses 3- dimensional (3D) printers to develop and make free and low-cost prosthetic upper limb devices for children and adults in need. Because raw plastic is slippery; different treatments have been formulated to try to improve grip reliability. Readily available coatings have not been compared using activities of daily life; which are most relevant to prosthetic users. I used two common filaments; polylactic acid (PLA) and acrylonitrile butadiene styrene (ABS) to create 3D-printed prosthetic hands using consumer-grade printers. I selected common household items and identified those that were gripped unreliably. I then identified finger treatments commonly used by the e-NABLE community; including Plastidip; nitrile gloves; gel tips; Mad Grab gloves; and guitar finger guards. I hypothesized that fingertip treatments would provide varying degrees of grip reliability. I expected that Plastidip would be the most reliable treatment due to its frequency of use in the e-NABLE community. I tested a tube of caulk; can of La Croix (sparkling water); and a can of glass cleaner 25 times for each finger treatment. Surprisingly; Plastidip was the worst treatment for grip reliability. At the end of the first phase of testing; both nitrile gloves and gel tips were tied. I then added weight to the tube of caulk and tested it again with all five treatment groups. In the end; gel tips were the most reliable; and are thus recommended.

MER115: Waste To Energy Using Thermoelectricity

Eliminating waste is a critical issue that requires immediate attention. Meanwhile; energy demand is increasing; especially in remote and poor areas. To tackle both of these issues; my project involves designing a device that utilizes thermoelectric plates to convert waste into energy in an easy; efficient; and inexpensive way for small scale use. The experiment utilizes thermoelectric plates which are based on the Seebeck Effect in which a temperature difference produces electricity. In my project; this temperature difference is accomplished by exposing the thermoelectric plates to heat from burning waste on one side and cold water on the other; therefore producing power through the circuit. The waste is burned in an aluminum foil container. The thermoelectric plates are glued to the bottom of another aluminum foil container which is placed on a rack above the burning waste. This top container serves as a heat sink with icy cold water. The ten plates are connected to each other through their wires to form a circuit; and the two end wires are then connected to a multimeter to measure the amount of current produced. I will test household waste and observe the amount of electricity produced. Along with this; I will record factors like the temperatures of the hot and cold sides and the mass of the waste burned. The experimentation is continuing; and results will be available on fair day.

MER116: Bibox Distance Sensing Remote Control Car

The project is a voice controlled car which can prevent itself from accidents automatically. The purpose of the experiment to show how the world is going to be before automated vehicles but after steering-wheel drive vehicles. There are a few very expensive vehicle making companies like Bentley have the feature but that is only to start the vehicle. I used the Bibox's speech recognition feature and set a few keywords to move the vehicle. I also used two distance sensors to prevent accidents. This will bring awareness about how many people die due to car-crashing accidents and will also reduce the number of people dying due to this reason. The car will also sustain a lot of damage which will be very expensive to the owner or the owner's family. This method will also be more affordable and therefore be available to budget-end vehicles. Therefore the Bibox's mechanics will protect humans from car crashes; make it easy to drive and it will be cost-efficient.

MER117: T.V. Remote Finder

One issue that millions of people face is losing your T.V. remote. While trying to watch TV; you don't know if your remote is in a different room; stuck in between couch cushions; under a chair; etc. Searching for the remote is tedious action people do. My project is making a Bluetooth TV remote finder which is connected to an app in which you just press a button. Once the button is pressed; then a buzzer will activate; and if the button is pressed again; it will turn off. One problem that is present is the fact that not all people will want to open their entire TV remote and do the work necessary. I will first experiment with implementing a tracker into a television remote; and then from there; I shall make 3d printed sleeves for remotes which will have their own battery and buzzer; making it practical for the common person. My experimentation is continuing and the final product shall be seen at the science fair.

MER118: Art Bot

The purpose of this experiment is to find out what inside of the motor causes it to move across the paper. To find this out; I have to look inside the motor at the parts and find out what is causing the motion. I am not finished with the experiment so results will be available on fair day.

MER119: Increased Efficiency in Electric Cars

A car emits about 4.75 metric tons of CO₂ per year (in the US). If you had an electric car; that CO₂ wouldn't be emitted. This would reduce the greenhouse effect; which would reduce the temperature on the earth.

MER120: Using Sea Perch for Ocean Garbage Collection

There are many problems caused by trash in the ocean. To solve these problems; ways to clean up the trash are needed. SeaPerch is a program in which students can build robots to collect trash in waterways. My project shows the best design of a SeaPerch for the collection of trash in the ocean and to solve possible obstacles encountered during the cleaning.

MER121: Improving Solar Car Design

As pollution gets worse and space gets less; our society is faced with problems on how to deal with these issues; and still gain enough power to support our nation. My design provides more electricity in forms of stacking solar panels. This is done with the use of mirrors reflecting sunlight to provide for the bottom layers. The goal of this design is it take advantage of what space we have in order to maximize the efficiency in this nation. This design can be used in multiple industries. In this case; the probable solar car industry in order to maximize the efficiency of power and usage of space.

MER122: Using a drone system to help remove plastic from bodies of water

The issue of formations of plastic-based products and scraps of plastic-based substance and liquid containers; such as water bottles; polluting our oceans is abundant in any discussions about the safety and livelihood of marine mammals; fish; and some species of birds. Some animals; typically species of birds that inhabit areas around the sea such as seagulls; can get themselves stuck in relatively larger pieces of plastic-based products or accidentally consume the plastic. More often than not; the unfortunate seagulls and seabirds who suffer this fate die of either consumption of plastic or drowning. Currently; the average number of annual seabird deaths exceeds 1 million. It is estimated that by 2050; the percentage of seabirds who ingest plastic will rise to approximately 99%. If some form of efficient widespread removal of plastic from our oceans doesn't become a reality in the upcoming few decades; there is a possibility some species of seabirds will face extinction. This project provides an almost necessary solution for this massive problem on a much smaller scale. Multiple tests for aquatic vehicles with the goal of retrieving and removing plastic have been fairly successful; such as the WasteShark designed; developed; and built by RanMarine technology. However; there is a faster and more efficient manner of completing this task. Water is approximately 784 times denser than the same volume of air; making the density of air at sea level around 0.001275% of the density of an equivalent volume of water. This fact makes it substantially easier for an equally powerful motor to move air than to move water. Therefore an aerial vehicle; such as a quadcopter model of aerial drone; on a much smaller scale is much faster and is able to retrieve more plastic in an allotted time than a traditional aquatic vehicle of a similar scale. Meaning if a removal system was attached to a quadcopter; it could remove plastic at a much faster rate than aquatic devices; and able to use substantially less power. This project provides a solution to the widespread problem of plastic in our oceans on a much smaller scale by providing an optimized quadcopter based removal system for plastic materials and containers.

MER123: Creating a more useful water pitcher for the elderly or handicapped community

The idea of this project is to help the Handicapped and the elderly who can't lift a water pitcher or jug. An average weight water pitcher selling on Amazon weighs 16.69 pounds and the average. A handicapped person can lift is 20 - 25 pounds although google doesn't say how much weight an average elderly person can weigh we can assume it's not much higher than a handicapped person. So a normal water pitcher weighs almost at much weight as a handicapped or old person can lift. We can fix the problem by only moving the mouth of the pitcher up and down allowing water to come out with ease. We can cut a rectangular hole on one side of the pitcher and attach it with a waterproof zipper. Then we can have 2 zipper heads attached on the top and bottom side of the head so it can create a hole in the zipper only if the water head moves there allowing the person who is getting water from this get the water without moving the water pitcher itself.

MER124: Strong Bridges

We expect that bridges will hold a great deal of weight; and that they will last a long time. They have also improved during the years; though bridges are safe; there are occasional accidents; that can lead to great injury; or even death. So what bridges are the best; what do engineers need to improve or take away to make bridges safe and comfortable for people to ride through them.

MER125: Improved Pooper Scooper

The project was an improved pooper scooper. The purpose of this project was to create a pooper scooper that put the poop in the bag on its own. Get two wooden dowels. Attach one dowel to a dustpan with a screw. Attach the other dowel to a laundry detergent container. Attach two Command Strip hooks to each side of the detergent container. Hook the handles of a plastic grocery bag to the hooks. Do 5 trials of scooping poop with pooper scooper. Compare the new pooper scooper to a regular pooper scooper. After testing this; the scooper was improved.

MER126: Drying Rack

This project was made to dry sports gear; specifically hockey gear faster than when it would be stored in its bag. pvc pipe was cut to specific lengths and holes were drilled strategically into the larger trunk piece of pvc; the smaller limbs had smaller holes drilled into them and they were cemented into the trunk holes. The drying rack was an improvement; it decreased the time that it took for the hockey gear to dry by hours.

MER127: A retractable toothbrush

The purpose of the project is a retractable toothbrush that prevents bristles from fraying. The retractable toothbrush can be used and after using; to remove any excess toothpaste on the top. The experimenter tested the toothbrush by bending the bristles for 1 minute then waiting 2 hours retracted to see which toothbrush was more successful. In conclusion the retractable toothbrush was proven to be more successful than a normal toothbrush.

MER128: Dog Toy with a Voice in it

The purpose was to have a dog toy with the owner of the dog's voice inside the toy. For the procedure first; cut open the toy. Then; place the voice recorder in the toy and sew the toy; so the voice recorder doesn't come out. Next; give the toy to the dog and record information about how the dog reacted. The dogs that were using the toy were able to press the toy and two of the dogs didn't have a reaction and three of the dogs did have a reaction.

MER129: Dual Entrance Bag

The purpose of the project was to design a drawstring bag with a bottom entrance that allows for easy access of small heavier items. A bottom entrance was created on the bottom seam of the bag that rolls down and is secured by two plastic clips. The bag was tested by seeing if the experimental items were easily accessible from the bottom entrance. The results show that the project was successful.

MER130: Light Up Charger Cube

The purpose of the project was to make plugging in chargers in the dark easier. First the experimenter super glued the light on top of the charger; next melted plastic around the cube and light; then cut a straw and fit it around the light so that no filler would get on the light; then drilled a hole in the plastic to fit an eraser used as a button; finally put filler in between all the gaps and let it dry. All 5 trials with the light had a much faster time than without the light. The project was successful.

MER131: How Can Kids Be Kept From Dinnerware Disasters?

The purpose of the project was to make a table that has removable dinnerware that are more efficient than the regular dinnerware people use to eat with today. The plates and bowls each have two legs that are inserted into holes in the table; and the cups are placed in holes. The table and dinnerware were tested through three different tests; causing the table to bounce; shift; and shake. The data created was compared to normal dinnerware being tested. The table and dinnerware were successful compared to the normal dinnerware; since they never came out of their slots or holes.

MER132: Ping Pong Paddle Power

Ping pong is an international sport played by all ages and abilities. I wanted to try and even the playing field. By making it so inexperienced players will not need to hit the ball as hard as advanced players; the inexperienced players will be able to focus on the ball placement. The purpose of this project is to determine which ping pong paddle will hit the ball further when swung with the same amount of force. I will make paddles out of three different core materials: fiberglass; plastic; and wood. I will make a rig that will swing the paddle with the same amount of force each time and strike a motionless ping pong ball on a tether suspended above the paddle. The paddle that swings the ping pong ball the highest is the best design. I will use a slow-motion video with a graduated back drop to determine the height reached by the ping pong ball. My hypothesis is that the fiber glass paddle will swing the ball the highest because the material is the hardest and will transfer more energy. The results will show which paddle performs the best. Experimentation is continuing and will be available on fair day.

MER133: Finding a Strong Solution with Shapes

Loads of weight are commonly placed on different structures; like bridges; and geometric 3D shapes help the structures take on the weight. I want to discover which common shape can withstand the most weight; making it a responsible choice in architecture. I will build small replicas of different shapes; like a triangular prism; cube; and a pentagonal prism out of a set amount of toothpicks. Then; I'll put heavy objects on top of the structure until the structure collapses; then I'll weigh (in grams) how much it could hold. According to this data; I'll make a bar graph.

MER300: A Robot That Can Do a Simple Task

The purpose of this experiment is to have fun with the robot and have it do a simple task. We will build a robot and use Tele-op to control the robot. We will be collecting what materials for our robot and building it. And seeing what the best way to build the robot by researching it. This experiment is useful whenever you can't do the task that the robot can do.

MER301: The Great CELLution

The purpose of this engineering project is to build and test a power cell called a voltaic cell. This cell can be very easy to manufacture; and can also be produced cheaply. In this project; we will see what is the maximum power that can be generated and if the cell can power a light bulb. The data that we will be collecting will be the number of volts that are produced; and also if it can power a light bulb. This will be useful as it may be another form of energy that has not been popularized yet.

MER302: Analysis of Wind Turbine Design Efficiency

The purpose of this experiment was to better understand the processes that go into designing a wind turbine. We decided to take a look at the efficiency of different propeller designs and how much energy they produce. Another reason is that renewable energy will soon become a necessity but it is costly to create solar panels; water mills; and wind turbines. Creating the most efficient wind turbines will let us use fewer resources to produce more power; which will help the environment and the economy. We will use a homemade wind turbine made out of 3D-printed blades connected to a dynamo and a voltmeter. We will direct the airflow of a leaf blower to simulate wind and thus generating electricity which we will monitor and analyze to deduct which is the most efficient. We are in the process of 3D-printing our blades now.. We think that wind turbine blades whose angle of attack is closest to 45 degrees; cover the most surface area without overlapping; and weigh the least will spin faster and produce the most energy.

MER303: Plastic Collection

Abstract: The amount of plastic in the world's oceans today is stunning to understand. Many aquatic animals are put at risk as more and more plastic gets holed up every day. The plastic gets stuck in places where animals feed and the animals eat it unknowingly and have a possibility of getting poisoned. For example; fish eat small wrappers and plastic bags; these fish get caught and eaten by humans. Since these fish have been poisoned the person eating can also get poisoned from the fish. For these reasons; we have constructed an idea of a robot that picks up trash. This robot will be fully autonomous and be outfitted to perform many tasks that are challenging for humans to complete. Its main purpose is to pick up garbage thrown into the sea using programs coded by tech engineers. This project will roughly be about \$4;000. Hopefully we can clear the clutter made by us to pave a way for a plastic-free future using this robot.

MER304: LED Dance Glove

The Led dance glove experiment; is a fun way to see how fabric and electronics work together in an experiment. The project is a glove that has LED lights attached to it for the experiment. It has no risk of being unsafe. This project also is inexpensive compared to other projects. This project is also very easy and simple to do. The procedure to start is to have a pair of gloves.(any color) Led lights; any color and any size. Also you can get any shape you want in the Led this project is fun in so many ways. You can get the party started with some fun gloves.

MER305: Dancing Robot

The purpose of the project we chose is to see if we can program a dancing robot to do other things. We will gather all of the materials we need to build the robot. Then we would take the batteries and put it in the battery holder and screw it down. After that; we will use double-sided foam tape and electric tape to connect the motors and the cork with popsicle sticks. After we connect the breadboard on top of the motors we will connect the circuit than program it to dance and do other tricks. The data that we have observed is that it will be a not long but not short project to do. In conclusion we will make it dance and do other things etc.

MER306: Testing lift with different wing shapes

WHAT WE ARE TESTING We are testing the best airfoil or wing design for planes to have a significant amount of lift and are also seeing how different shapes of the wing will affect the lift of the plane. WHY WE ARE TESTING Since we were young; we would wonder how things so big could fly. Now; we want to see if we can build wings that can experience lift. HOW ARE WE TESTING The first step we do is design a wing that we would like to 3D print. The website we use is Tinkercad. After our 3D printed design is finished we attach it to a body and place it on a scale. A fan will be blowing toward our 3D design. If the scale reading is a negative number; this means that the wing is experiencing lift.

MER307: Are Rooftop Gardens a Cool Idea?

Our project is about rooftop gardens. We are trying to figure out if rooftop gardens can be used to grow food as well as making the inside of the house cooler. Besides the beauty of rooftop gardens; there are multiple advantages that consist of taking carbon dioxide out of the air and releasing clean air; in addition to growing food and plants. Can rooftop gardens also lower your energy bill as well as give you fresh food and flowers? This multi-faceted project not only includes an experiment; but also explores the many aspects of rooftop gardening. Results of the experiment will be available the day of the science fair.

MER308: Sensory Cam

After our thorough research on facial recognition; color detection; and object detection; we have acquired an understanding of how these processes work. When a camera is positioned at the colored object; the camera observes the object to figure out the frequency of light of the object. For object recognition; the process involves the computer storing hundreds of different pictures of the same object in different lighting and angles. This process is called machine learning. The computer compares those pictures to the object being scanned. The pictures stored in the computer help the computer find out what the object is. For facial recognition; the process involves the computer measuring the proportions of human facial features. A programming language that can be used for the processes of color recognition; object recognition; and facial recognition is C#

Medicine / Health / Microbiology (MMH)

MMH100: Bacterial Proliferation on Daily; Weekly; and Monthly Wear Contact Lenses

The purpose of this experiment is to determine the bacterial proliferation on daily; weekly; and monthly wear contact lenses. It was hypothesized that daily contact lenses will contain the most bacteria due to the fact that they are not built for multi-day use. To perform this experiment; contact lenses in the stated categories were dipped in an S. epidermidis bacterial solution. They were placed in a container of sterile saline; sealed; and incubated for 2 days at 27 degrees Celsius. The lenses were then swabbed with a sterile cotton swab which was soaked in sterile nutrient broth solution for 3 days at 27 degrees Celsius. Every day of the 3-day incubation period; a sample of broth was extracted and tested for the optical density of bacteria present using a Spectrophotometer set at a wavelength of 686nm. Final results available at fair.

MMH101: Antibiotics' Effect on Pseudomonas Fluorescens

Pseudomonas fluorescens is a bacteria that can cause septicemia; an infection of the bloodstream. Contaminated produce; water; and hospital supplies may lead to septicemia. Tetracycline; Kanamycin; Chloramphenicol; and Streptomycin are antibiotics that commonly treat septicemia. These antibiotics were applied to P.fluorescens to test which would produce the largest zone of inhibition; therefore killing the bacteria most. In multiple studies; Tetracycline was highly effective against P.fluorescens; and so was predicted to produce the highest average. However; in my experiment; Kanamycin produced the largest average zone of inhibition at 12.8 millimeters; thus killing Pseudomonas fluorescens best.

MMH102: Which fitness watch is the most accurate

Please visit student's exhibit for abstract

MMH103: Which hand sanitizer brand eliminates the most E.coli bacteria?

The purpose of the experiment was to discover which brand of mainstream hand sanitizer created the largest zone of inhibition in the E.coli pathogen. This experiment was conducted because it is important for people to know which brand to use to eliminate the most bacteria. The data collected did not support the original hypothesis. The original hypothesis stated that Purell would eliminate the most bacteria; however; the experiment data showed that Babyganics eliminated the most bacteria. Babyganics had an average of 26 centimeters; while Purell had an average of 0 centimeters. The independent variable did make a difference in the experiment; because the results varied. They had different zones of inhibition; because they did not eliminate the same amount of bacteria. No problems occurred throughout the experiment. An unusual observation made during the experiment was that Purell; a very well known brand; did not have a zone of inhibition; which means that it is ineffective against E.coli. The experiment could have been different in that the bacteria could have been given more time to grow. It could have been left to incubate for a longer period of time. Also; a more dangerous pathogen could have been used. This experiment relates to real life because doctors; teachers; and parents all need to know which hand sanitizer brand will better eliminate bacteria. They need to know which brands will keep their patients; students; and children the healthiest. The reason this study is so beneficial is that teachers; healthcare professionals; and food processors need to know which brand of hand sanitizer will keep their students; patients; and consumers safe. If they know that Babyganics eliminates the most E.coli; then the chance of giving others E.coli drastically lowers. This experiment could be continued by letting the E.coli incubate for a longer period of time; or using a different pathogen; perhaps one that is common in hospitals.

MMH104: The effects of fertilizer on cyanobacteria growth.

The purpose of this experiment was to test the effects of fertilizer runoff on algae growth. It was intended to show that fertilizer entering bodies of water causes the algae to grow rapidly; or bloom; which then overtakes the body of water; using up all the natural resources and killing all the other life within and surrounding that body of water. It was designed to show this because many people do not realize that simply fertilizing their yards can harm their local ponds and/or lakes. Another reason for conducting this experiment was to test whether organic or synthetic fertilizer is more harmful to local waters.

MMH105: Detecting Abnormalities in Lung X-Rays

X-rays are a common tool in medicine. They can be used to diagnose a myriad of diseases; however; there are times when there are too few radiologists or too many x-rays. For example; when there is an epidemic situation; doctors need to quickly quarantine people based on their level of sickness. In cases like these; radiologists can get stressed and medical errors may occur. This problem can be solved with technologies such as artificial intelligence or machine learning. This project is about making a machine learning classifier to detect cardiomegaly in lung x-rays. I chose cardiomegaly because it is fairly uniform in appearance and it can be a sign of many diseases. To accomplish this project; I will be using the dataset called ChestX-ray8 from the National Institute of Health. Using the format of a convolutional neural network; I will be building a machine learning model to analyze various abnormalities in lung x-rays. Initially my model to detect cardiomegaly had around 60% accuracy; but now it is at 85% accuracy. I will be able to utilize the information that I gained from this and add capabilities to my program such as the detection of most diseases. Eventually; I will be creating a smart device app that can be used as a screening tool and give many diagnoses.

MMH106: Do sleep schedules improve sleep quality?

Please visit student's exhibit for abstract

MMH107: Cycle to the Top

Exercise and heart health is an important part of being healthy. Staying active as we go about our daily life can be hard. Everyone has a limited amount of time to be active. This experiment is meant to help people see the best use of 45 minutes for calorie burn and heart rates.

MMH108: What is the Effect of Music at Different BPM's on Running Performance?

The purpose of my experiment is to determine the effect of music at different bpm's on running performance. Based on my research of different sports medicine articles; I believe that running with music with a tempo of 150 bpm will improve a runner's time for a distance of 400m. Procedure: 1. In order to determine the effect; I will have a group of runners run a 400 m distance using headphones. 2. Runners will run a 400 m lap without music; and their heart rate and time will be recorded. 3. Runners will run another 400m lap with music with a lower beats per minute (bpm) tempo music a song at 120-130 bps. 4. Runners will run a final 400m lap with a higher bpm tempo song of 150 bpm. 5. Each lap will be timed along with the end heart rate recorded for each runner after they cross the finish line. 6. Runners will do this time trial three (3) different dates. 7. The runners will be given a specific song to listen to using their headphones. They will need a cellphone so the given song can be used by their internet connection. 8. I will chart the results to see which condition gives the best times. My final results are still being calculated.

MMH109: Stopping the Evolution of Resistant Bacteria by Decreasing Sanitizer Use

The purpose of my experiment is to determine the minimum amount of hand sanitizer needed to kill germs. Over-use of anti-bacterial products has contributed to the evolution of some bacteria to become resistant to traditional anti-biotics. My hypothesis is that using approximately 5ml; or 1/2 of one full pump from an anti-bacterial hand sanitizer dispenser; will kill germs on a surface the size of adult hands. Procedure 1. Put on latex gloves. 2. Gather six phones and rub the surfaces together to attempt to homogenize bacteria evenly between the phones. 3. Open 2 petri dishes containing agar. 4. Dip a clean cotton swab in saline solution; swab across all of the phones; and gently rub on a petri dish agar. Label the petri dish. Repeat this step a second time. 5. Rub ~ pump of hand sanitizer on two phones; « pump on two other phones; and one pump on the last two phones. 6. Open six petri dishes with agar. 7. Dip a clean cotton swab in saline solution; swab one of the phones; and rub on the agar of one petri dish. Label the petri dish. Repeat this step for the other five phones. 8. Put all petri dishes and in an incubator set to 32 degrees Celsius for four days. 9. Record the data at the end of four days. 10. Dispose of the petri dishes by soaking in a 10% bleach solution. 11. Final results are still being calculated.

MMH110: The Power of Bacteria

The problem: To determine if soil or sand generate more power in a microbial fuel cell. My hypothesis is that the soil will produce more power because it receives more moisture and holds more moisture; and most likely will have more bacteria. First; obtain soil/mud. Place the dirt in a bin; pour distilled water into bin and mix until a cookie dough consistency. Prepare electros; start with the anode; bend wire 90 degrees at insulated point. Insert wire into center of graphite disk. Repeat for cathode. Place mud into base of vessel to 1-centimeter mark; place anode atop the mud; add more mud to 5-centimeter mark; add cathode to top. Offset the two wires; let stand for 5-10 minutes; then pour out excess water. Obtain lid with green hacker board; insert the orange wire into hole next to (+) sign; and the green next to (-) sign; install lid. Insert orange wire into pin next to (+) sign; insert green wire into pin next to (-) sign. Set up the blinker mode. Take the blue capacitor bend long lead to even; insert into pin 1 and short into pin 2. Take red led; repeat process; insert long lead into pin 5 and short into 6. Repeat process for the sand. Wait one week to test results. Obtain multimeter; plug red prob into port marked V omega. Plug black prob into port marked COM. Set multimeter to 2000m; connect green alligator clip to red prob; repeat same for white alligator clip to black prob. Remove red led and blue capacitor; move the orange wire to pin 3. Take the resistor and bend; insert into pins 5 and 6; attach alligator clips to each side of the resistor. Wait five minutes; read voltage. Repeat for sand.

MMH111: Does stretching daily impact flexibility?

The purpose of this experiment was to determine if one can go from completely inflexible to having a greater amount of flexibility in a range of 4 days. The data collected did support the original hypothesis. The average of the participants did get a smaller measurement; meaning they did get more flexible in the scheduled time range. In the provided graphs of the experiment; it is visible that the "after" stretches of the Experimental Group average was lower; the participants got a lower measurement nearing the end of the experiment. The independent variable did make a difference; stretching in between the test days was helpful towards the results. With stretching in between days; the participants did get a little more flexible. Some problems that occurred during the experiment were: having to gather everyone; getting materials because they belonged to the school being used for the experiment; and lastly the complaints of the participants while stretching. Something that could have been done differently was choosing a different week so Friday could be included in the testing range. Friday was not available for testing that week. The experiment does relate to society and the scientific field because being flexible is very important to your health. By doing this experiment people gained flexibility which usually results in lengthening of muscles; a positive state of mind and greater strength.

MMH112: Cardiac Stents: Comparing the Strength of Cardiac Stent Designs

Please visit student's exhibit for abstract

MMH113: The 5 Second Rule

I will test to see whether or not time plays a rule on how much bacteria is on an object such as food; that falls on the floor. I will set up a multi-tier experiment that records the time an object is on the floor and the amount of bacteria that is present to see if the 5 second rule is accurate.

MMH114: Normal Diet versus Vegetarian Diet

The purpose of this experiment was to determine if a person follows a vegetarian diet for 7 days; then they will have more protein in their body; because going vegetarian would be healthier for your body and it would be better for the environment if we don't eat livestock. The participants will fill out a daily food log and then their protein intake will be calculated to determine if a vegetarian diet allows for more protein.

MMH115: Using Memory to Fight Off Disease: Salt and Iron Fillings

My project is about how the immune system uses memory to fight off diseases. The immune system is a very complex piece of machinery that is essential to our existence. The purpose of this experiment is to study the immune system and figure out how it uses memory to fight off diseases in the human body. To do this; I will be using salt representing the healthy cells in the human body; and iron filings to represent the unhealthy cells in the human body. I will then use magnetic tape to represent the antibodies the body creates to stop the disease. Depending on how many iron filings the magnetic tape attracts; that shows how the immune system uses memory because the magnetic tape attracted them. Truly understanding the immune system can help mankind in so many ways. By understanding what the immune system's full capability is; we can find new and more innovative ways to help cure diseases. With the information collected from this experiment; we can create man-made antibodies and use them to fight off diseases. This experiment can help us understand how antibodies truly work and how the immune system creates and uses memory cells to fight off infection. I have great interest in the medical field and hope to continue on into my career. As for data; the experiment is still ongoing; and the results will be available on fair day. Thank you.

MMH116: Effect of Antioxidants on Tumor Growth in Planaria

An estimated 1.73 million new cases of cancer were diagnosed in 2018 in the United States and 610,000 people were estimated to die from the cancer. Antioxidants are supposed to reduce the risk of getting cancer. People have begun to use turmeric as an antioxidant as it is 5 to 8 times more potent than antioxidants in Vitamin E. Turmeric products are available over the counter as a supplement claiming it provides protection against tumors; cell mutation; and therefore cancer. Planaria worms are well known in stem cell research for their regenerative properties. The purpose of this research project is to identify if the presence of turmeric within the planaria exposed to a carcinogen would suppress the tumor growth in them. Data will be available on the day of the science fair event. Appropriate statistical analysis will be used to analyze the data.

MMH117: What part of school is the dirtiest?

The purpose of doing this project was students and staff know what's clean and what needs. People will know and won't get sick as much. While conducting my experiment I swabbed the object and put it on the dish. I put the dishes in the incubator and waited 3 days. My results of this experiment are the tables are the dirtiest. The Chrome Book had the least colonies. My results mean the tables had the most colonies. I can't compare my results to anything. My results give the idea to swab other objects in school as a future project.

MMH118: Book Germs for Book Worms

The purpose of this project was to determine if the number of circulated items affects the number of bacteria and mold colonies on adult and children's library books. For this experiment; popular books from three area libraries were tested: Northland (with the most cardholders and circulated items); Northern Tier; and Hampton (with the least cardholders and circulated items). The hypothesis was that children's books from Hampton would have the most bacteria and mold. Hampton has the fewest available circulated items; so each book is likely to be checked out more often; and since children check out more books than adults; children's books should have more bacteria and mold. In this experiment; two trials were conducted. For each; 5 adult and 5 children's books from each library were swabbed; and the samples plated on nutrient agar and monitored for one week. Colonies were counted every two days. The results showed that adult books from Northern Tier had the most bacteria; adult books from Hampton the most mold; and children's books from Northern Tier the least bacteria and mold. Overall; adult books had more total colonies than children's; and Hampton had the most total colonies of the libraries tested. The hypothesis was refuted. Since there are fewer copies of adult books at both Hampton and Northern Tier Libraries; perhaps these books are checked out more often. Also; since adults bring books to many different locations; while children tend to keep books at home; this might explain why adult books collect more microorganisms.

MMH119: Shelf Life of Plant Versus Animal Protein

The purpose of this project was to determine whether uncooked plant-based or animal protein grows more bacteria after the product expiration date. For this project, "Beyond Meat" vegan burgers served as the plant-based protein; and ground beef burgers served as the animal protein. Plant-based protein can be stored for up to 3 days after opening; and animal protein can be stored for 1-2 days after opening. The hypothesis of the project was that plant-based protein would grow less bacteria than animal protein; since the plant-based burgers contain pea protein and no animal products and are considered by many to be a healthier food source. To conduct the experiment; samples of plant-based and animal protein (with similar expiration dates) were stored in the refrigerator until the expiration date. Once the expiration date passed; three swabs were taken from each protein (per trial); plated on nutrient agar; and monitored for nine days. Bacteria and mold colonies were counted and observations were recorded daily. An unswabbed petri dish served as the control. Two trials were conducted in total. The results showed that the hypothesis was confirmed. The animal protein samples had 37% more bacterial colonies on average than the plant-based protein samples. The control group had no mold or bacteria at all. Bacterial colonies on the animal protein were much smaller in size than those on the plant-based protein; suggesting that different types of bacteria might be present on each.

MMH120: Basketball vs Volleyball Germs

The purpose of my project was to see which had more bacteria on it; a volleyball or basketball. I took both balls and wiped them with a Clorox wipe before the game. Then took a cotton swab and rubbed it on the ball before and after the game; then wiped them in 4 separate petri dishes. After my experiment was done a lot of bacteria grew over the days in the dishes from after the game. The players should wash their hands immediately following a game to avoid illness. This help schools so kids don't spread it through the school.

MMH121: The Effects of Mint Extract on E. coli Survivorship

The purpose of this experiment was to find out if mint extract has a significant effect on E. coli bacteria. To conduct this experiment I used petri dishes in a liquid pulse test which showed the amount of E. coli colonies that survived as a result of different exposures of mint extract. My results show that mint extract does have a significant on E. coli. This shows that the null hypothesis was rejected and the alternative hypothesis was accepted. Information I learned is that mint extract has a significant effect on E. coli and mint may be useful in antibiotics.

MMH122: ADHD Medication Safety

Are ADHD Medication Safety Risks on the FDA Adverse Event Reporting System Different from the Label? Attention Deficit Hyperactivity Disorder (ADHD) is a neurodevelopmental disorder that is most common in children. An estimated 1 out of 20 kids have ADHD. Many kids take ADHD medications that have serious side effects. The medication label provides information on safety risks or side effects. The FDA Adverse Event Reporting System (FAERS) is a database that contains information on adverse events and medication error reports. FAERS can be used to learn about the safety risks associated with ADHD medications. The following hypothesis was studied. If the FDA Label provides information on safety risks for ADHD medications; then reports in FAERS should be similar to the label. The following methods were used. First; the Warnings and Precautions section of thirty ADHD medication labels were reviewed. Then; the similarities of the safety risks in the six ADHD medication classes were analyzed. Next; a search on FAERS was conducted for 26 ADHD medications which provided information on reported adverse events. Lastly; the reports in FAERS were analyzed to see if they were similar to the labeled risks. Data analysis is in progress. A preliminary observation is that the FAERS reports differ from the safety risks that are listed on the Warnings and Precautions section of the ADHD medication label. Final results will be shared on fair day.

MMH123: The Nutritional Difference

The Nutritional Differences in Canned and Fresh Fruit as Seen on *Drosophila melanogaster*: Abstract Canned fruits are often cheaper than real fruits. However; my mother always chose to buy fresh fruits from our local grocery store because according to her; they were healthier. Are canned fruits healthier than real fruits? As fruit flies eat mostly fruits; I decided to base my experiment on them. The experiment was set up so that there was one group of fruit flies eating canned fruit and one group of groups eating fresh fruit. I observed both groups; took notes daily; and took pictures weekly. As the experiment progressed; as the fruit flies started to multiply. Both groups; the one eating canned fruit and fresh fruit both; multiplied at the same rate and weigh the approximately the same. I conclude that canned fruit and fresh fruit are equally healthy.

MMH124: Fitness Level in Relation to Age

Purpose: The purpose of my experiment; The Relationship Between Age and Healthy Eating; is to figure out which age group tends to eat healthier than the others. After that is completed; I must then use the information to promote healthy eating more in the age groups that may not have many people eating healthy in it. Procedures Used: I began by asking random people around my neighborhood their age and the amount of time they tend to eat raw vegetables and fruits. I need to make sure that I have enough data to form a reasonable conclusion. Lastly; I need to create a graph that shows which age group tends to eat healthier than the other. Data: As I'm not completed with this project yet; I do not have much data. Conclusions: As I'm not completed with this project yet; I do not have a reasonable conclusion yet.

MMH125: The Effect of Different Anti-Fungals on Mold Growth

There are many different kinds of fungi in the world that cause disease and spoil food. There are limited ways that we can prevent the growth of fungus and some are used in medications or as household cleaners. In this study; bread was used to grow mold and different antifungal agents were used to prevent the growth of mold. One of the antifungals used is a medication (fluconazole). The other treatment is an anti-mold household cleaner. If an antifungal agent is added to bread; then the mold will not grow as rapidly as untreated bread. The results showed that the antifungal agents did slow the growth of the mold on bread. There was also different colored mold on the fluconazole treated bread.

MMH126: Water Purification through Distillation and Iodine

In my experiment; I tested two methods of water purification against river water; Distillation; and Iodine. For distillation; I boiled water in a covered pot and heated it; then I put a tube in the cover; the steam slowly came in and I cooled it with wet rags. The water dripped down and I was done. For the Iodine I put two tablets into a container full of river water; then I waited for 35 minutes and it was finished. After that; I put a sample of each group in Petri dishes making three groups; control; distillation; and Iodine. My hypothesis was that the distillation would kill more bacteria than iodine because you are boiling it and that already kills bacteria then you are collecting the steam which separates bacteria for water. The results were close. Distilled averaged 0; Iodine averaged 1; and control averaged 87 bacterial colonies. In conclusion; I think my experiment went well; and I think that if I had more time I would have let the bacteria grow for 5 to 7 days instead of 3.

MMH127: To Bleed or Not To Bleed

The purpose of my experiment was to determine the effect of increasing amounts of sodium citrate on a model of blood clotting. First; I made the sodium alginate solution representing the blood. Then I made three different calcium chloride solutions that make the blood coagulate. I made one with 0% sodium citrate; one with 1% sodium citrate; and one with 1.5% sodium citrate. Sodium citrate represents the anticoagulant. I then made the sodium alginate balls by placing a drop of the sodium alginate solution into each calcium chloride mixture. I let the drops sit in the mixture for about 60 seconds. I did this 5 times for each calcium chloride mixture. Lastly; I measured them and analyzed the data. In my data; I found that the higher the percentage of calcium chloride; the bigger the drops were. The average height ranged from 4.2 -6.0 (mm). In conclusion; I found out that my hypothesis was right and wrong. I hypothesized if the amount of sodium citrate increases; the solution representing the blood will not coagulate as well because sodium citrate is an anticoagulant. Most of the balls all came out as perfect spheres and got bigger as the amount of calcium chloride increased; just like I hypothesized. However; I also hypothesized that the balls in the solution with sodium citrate would not form.

MMH128: Teeth Whitening Toothpaste vs. Baking Soda and Hydrogen Peroxide

With the use of 6 hollow eggs; as examples of teeth; each egg will be placed in a stain for one minute every day for seven days. Two eggs will be stained with berries; two with soda and two with coffee. The progress of the stain will be charted each day. At the end of the seven days; each pair of eggs with the same stain will then be cleaned and compared. One egg of the pair will be cleaned with the teeth whitening toothpaste and the other egg with baking soda and hydrogen peroxide. The progress of the whitening will be charted every day after each cleaning. At the end of seven days of treatment; the eggs will be compared to see if the higher priced toothpaste had better results than the lower cost baking soda and hydrogen peroxide.

MMH300: Bacterial Proliferation on Various Musical Instruments

The purpose of this experiment is to determine which musical instrument mouthpiece will allow for the greatest amount of bacterial growth. It was hypothesized that the clarinet would have the greatest amount of growth (due to the wooden reed and small mouthpiece circumference; and the flute would have the least (due to the least amount of direct mouth contact). To perform this experiment; mouthpieces were sterilized; then; each instrument was played for one 40-minute period. Each mouthpiece was then swabbed a second time and each swab sample was grown in a nutrient broth that was incubated for 48 hours at 37 degrees C. Amount of bacterial growth was determined using an optical density test via spec-20 machine. Final results available at fair.

Physics & Astronomy (MPA)

MPA100: The Effect of Bolt Mass on Crossbow Bolt Penetration

The goal of this experiment is to discern if adding weight to a crossbow bolt increases its penetration when shot at ballistic gel. It was hypothesized that an increase in mass will be correlated with an increase in penetration up to a limit of 50g. To test this hypothesis; a bolt was shot into a 1L block of ballistic gel from 5 meters away. This process was then repeated for each weight of bolt tested. Final results available at the fair.

MPA101: Does stride length affect pitch speed?

The purpose of my experiment is to see if different stride lengths affect the speed of a pitch in fastpitch softball. When a pitcher puts momentum into a pitch; she pushes off the rubber forcefully which generates speed. I am a pitcher and want to test this to see if it would help me pitch faster. In the experiment; two pitchers and I pitched a certain amount of pitches with different stride lengths. The data displayed; that different stride lengths do affect the speed of a pitch. When a pitcher does a larger stride length the pitch is faster. The reason for this is that having a larger stride causes the pitcher to push off the rubber with more momentum.

MPA102: Can You Hear Me Now

Please visit student's exhibit for abstract

MPA103: What Floats Your Boat?

The purpose of this experiment is to find out how much weight each type of boat hull can hold. In this experiment; the investigators used pennies as weights. The investigator's hypothesis is that the flat hull will hold the most weight because it wouldn't tip over or go out of balance and fall. The procedure of this experiment is that you have to put the 3-D printed boat hull design on water and one at a time put pennies until it tips over. The investigator's results was that the hypothesis was correct. The flat design held an average of 31.6 pennies. So the conclusion is that the flat bottom held the most; then the hydroplane held 25.3 pennies and the shallow-V held 23 pennies and lastly the deep-V held 14.3 pennies. All these numbers are on average because the investigators did three trials.

MPA104: Bye Bye Wi-Fi

My project is seeing which material will block the most WIFI. I will create a box out of three different materials; then I will cover the router with each box. I am going to be using four different devices to test the signal. I will do that for each material for four days. Once I conduct the experiments; I will record the data for each day and graph it. That is an overview of my project.

MPA105: Watch it Bounce!

Watch It Bounce! Have you ever gone outside to play kickball after it was cold the day before; only to find that the ball would not travel as far? The purpose of this project was to find the reason behind why temperature affects some sports balls more than others. The investigative question of this project is; "How does temperature affect the bounce of a ball?" The investigator hypothesized that the balls filled with the greatest amount of air will be affected the most by the cold temperature environment. This is because when the temperature is decreasing there is less pressure inside the ball as a result of the gas molecules shrinking. In order to test the hypothesis; the sports balls were heated or chilled; dropped from the same height; and then their bounce was measured. The end results showed that the balls filled with the most air were affected more by the change in temperature. However; the balls filled with air seemed to bounce higher on the room temperature and construction spotlight tests. Therefore; the investigator's hypothesis was supported by the evidence of the experiment.

MPA106: Batter -Up: Which Baseball Bat Hits the Farthest?

Please visit student's exhibit for abstract

MPA107: EV3 Torque Test

Please visit student's exhibit for abstract

MPA108: Star Jobs

Please visit student's exhibit for abstract

MPA109: Loading

For this experiment; Loading; the strength of an IEEE 802.11x standard; or WIFI; signal was tested. Then; the connection was tested when traveling through different materials. I hypothesized that if a birch wood stump; brick; glass; a ceramic tile; drywall; plywood; a drop ceiling panel; shingles; corrugated tin siding; and vinyl flooring are tested for the disruption that they cause to an IEEE 802.11 signal; then brick will cause the greatest amount of disruption. This hypothesis was supported. By the data; the average signal strength traveling through the brick was -45.57dBm while the control trials had an average of -28.14dBm.

MPA110: Light It Up!

In the experiment; Light It Up; red; blue; and green colored LED lights are tested for the illuminance. The control is white LED light. The dependent variable is LUX measured with a photometer. The independent variable is the light color: red; green; and blue. Blue LED light produced the most LUX; 815. Green LED light produced was 665 LUX. Red LED light produced 351 LUX. The blue light had the most LUX because it had the shortest wavelength. Red LED light had the least LUX because it had the longest wavelength.

MPA111: Does the speed of a runner affect the height they get off of a vaulting spring board?

The purpose of the experiment is to determine whether the speed a gymnast runs affects how high they get off a vaulting springboard. Some gymnasts get better vault scores and they seem to get very high off the springboard; many scientists questioned if the speed is correlated with the height off the springboard. The data collected did not support my original hypothesis. The data shows that speed does not affect the height you get off a springboard. The reason speed did not affect height through the experiment may have been because the gymnasts did not do a skill off the springboard; they just jumped; therefore they did not need as much power from the run. If the gymnasts had been doing a skill off ; the speed may have impacted the height. The averages of each gymnast showed that even with a slower speed some gymnasts could still get a greater height. The independent variable did make a difference. This is demonstrated by the control study; because there was a big difference from when they ran and when they did not. The gymnasts got a lot higher when they ran; compared to when they did not run and just jumped. There were a few problems that occurred during the experiment.

MPA112: Model Rockets

Please visit student's exhibit for abstract

MPA113: The Relationship between Density and Displacement

Purpose: Explore density and displacement; and the relationship between the two; through experimentation.

Procedure: 1. Collect various solids and liquids. 2. Research properties of the materials collected and predict relative density. 3. Place items in equal volumes and weigh to determine densities. Compare results to expectations. 4. Place individual solid items in water and compare what happens what happens with expectation. Do the items sink or float? Do they displace water and; if so; how much? 5. Float items on water using a flotation device. Do items displace water and; if so; how much? How does this compare to expectations and the results of step four? 6. Place multiple liquid items in water and compare what happens with expectation.

MPA114: Revolving A-Mung us

After gathering materials; wooden blocks were taped to the turn table on 3 record players. On top of the wooden blocks was a plastic container containing cups; water; and lettuce seeds. Inside the water hydroponic solution was put in to give the lettuce the nutrients it would get from soil. As a control; lettuce was grown without a turntable. The record players and my control were set under grow lights. The record players were turned on to different speeds. After a week the plants were measured to see how much they grew. After 6 weeks; I dry-biomassed the lettuce to see at what speed the lettuce grew the most.

MPA115: Vices of Devices

The purpose of my project was to find out how much energy is being wasted by keeping household appliances plugged in. To determine the answer I plugged each of the chosen devices that are commonly found in houses into a self made test fixture which included a Fluke 87 and Fluke 111. The Fluke 87 and 111 showed how many volts and amps were being used. As I had hypothesized the appliances that I chose to test did use energy when not turned on. After completing this project I realized that all appliances should be unplugged when not in use.

MPA116: Capturing Lightning

When electricity strikes; severe damage can be caused. How can the path of lightning be determined; if no one witnesses the strike? My experiment was to discharge electricity into a dielectric material to capture the movement of electrons trying to escape. Using a Van de Graff generator; I discharged electricity into acrylic; and sprinkled toner powder on it to see what shapes were produced. I produced negative shell-shaped Lichtenberg figures; but could not produce positive tree-branching figures. This experiment showed that a non-conductive material traps electricity and the discharge path was able to be uncovered with the conductive toner powder.

MPA117: Infinity Mirror

I wanted to see if I could trick my brain into thinking there were an infinite number of lights contained in a box; when there were really only a specific number. I assembled four infinity mirrors; each blocking different degrees of light. I created a tunnel of light using 85% and 90% light blocking tint; but could not create a tunnel of light using 100% light blocking tint or no tint at all. My results showed me that the tint was the biggest factor in creating an infinity mirror. The experiment shows how the eye and the brain miscommunicate sometimes.

MPA118: The Heat is On

In this experiment; I wanted to see what color would absorb the most heat. This could help people determine what materials to use based on climate. This was conducted by placing water in 5 jars wrapped in colored paper. A heat lamp was placed in front of each jar and the temperature noted every 15 minutes for 120 minutes. Results showed that the black jar absorbed the most heat. In conclusion; dark colors on the visible light spectrum absorb more heat than light colors. This is consistent with other experiments. For a future experiment; I could use stronger heat bulbs.

MPA119: Tesla Coil Conductivity

My experiment is based on Nicola Tesla's famous Tesla coil and its conductivity towards different types of light bulbs. I will do this by using fluorescent; incandescent; and halogen bulbs. I will test the reaction using the coil and using standard in home 3 wire service. I hypothesize that all of the different types of light bulbs will react in many ways and some may light-up and some may do something completely unexpected; like not light at all; or become a plasma ball. I also hypothesize that some may light at different rates of speed due to different frequencies

MPA120: What Temperature does a Golf Ball will Bounce the Highest?

The purpose of the experiment is to determine whether different temperatures effect the height of a golf ball's bounce. In order to conduct this experiment; first gather all materials. Then; place 5 golf balls in 3 different temperatures. Room Temperature is the control. Lastly; drop the balls one by one at 20 cm and record the highest peak for each ball. In conclusion; the hot temperature golf balls bounced higher than the other temperatures because the hot golf balls have more elasticity.

MPA121: Which color of light creates the most energy on solar panels?

The purpose of this experiment was to find which color light produces the most energy on solar panels. It is useful because solar panels are another source of energy that do not use any fossil fuels. Solar panels do not pollute the environment. This is a big issue right now because pollution is affecting the earth's climate. Solar panels are getting used more and more because of that reason. The data collected was very interesting. There were three colors of light used. There were also three trials for each light. There was one solar panel that was used for all the colors. The three colors were red; green; and white. White produced the most amount of energy. Red produced the second most amount of energy. Green produced the least amount of energy. There were independent variable that affected this experiment. The totals would have been affected if you didn't put the light on the same area each time. The light always had to be directly in the middle or it wouldn't get a good read. The light would have to stay on for a certain time to get a read. The time varied for each color. There were a couple of problems that occurred in this experiment. There was going to be cellophane tape that was to be used originally; but the tape cost twenty dollars a color. That is why a multi colored flashlight was used instead. Some of the colors switched; for example: yellow to green and blue to white. It was easy to find the solar panels. There was only one weird observation. The only weird observation was every color got the same reading on each trial. Other than that nothing weird really happened at all. There was nothing in the experiment that could have been done differently. This science fair project is very practical because solar panels are going to be used more and more in society. Part of the reason why is because solar panels do not use any fossil fuels. Fossil fuels don't burn cleanly and contribute to climate change. Solar panels can be used to help decrease the effects of climate change. Solar panels are also another source of energy. The color of light will help get more energy.

MPA122: Seeing into Space

Use oxbay data from NASA to create amazing colorized images of objects in space.

MPA123: Creating Green Energy Using Assorted DC Motors

In this project I tested to see which motors have a better and easier voltage output. I did this to find a good way to create green energy. I first decided the speed at which I would bike at. I used the voltmeter to see the energy output. I tested at these speeds then graph approximately at what voltage it was creating when at that speed. I compared these results with 3 different types of motors. I believe that the scooter motor would create the most energy and I was correct. We were unable to spin the gear motor because of the resistance in the gears. I was wrong when I said permanent magnet motor would create close to the scooter motor but I was incorrect.

MPA124: Basketball Surface Bounce

After you push the ball to the floor; the ball meets the floor or court and then returns; but it doesn't necessarily return to the same height. What does the surface of the floor have to do with how a ball bounces when dribbled; how much effort a player has to use to keep the ball dribbling uniformly; and what is going on with the energy of the ball in motion? Put it to the test with this sports science project that lets you observe and measure how balls bounce differently as a result of what's on the ground.

MPA125: Make Some Noise!

What makes the most resonant soundboard? In other words; what material amplifies the most sound. Different instruments have different intensities of noise; and this project is to find which material is the loudest. In this project I will be testing four different materials' resonance. After testing; I think that pine wood will make the most resonant soundboard because it is soft and responds well to vibrations. In order to test my hypothesis; I tested four different materials to use as soundboards: pine wood; hardwood; vinyl tile; and ceramic tile. The sound was provided using a music box that was placed on each material and played. I then took readings with a sound level meter in decibels. Pine resonated the least sound; then vinyl tile; next was ceramic tile. Hardwood resonated the most sound; therefore; it would make the best soundboard material.

MPA126: Will You Get A Strong WiFi Signal Behind Cement

The purpose of the project was to see how cement affects WiFi signals. Experimenter added bricks then measured the strength of the WiFi signal; and had 3 layers of bricks. The results were that the WiFi signal went down slightly; but not very much; surprisingly.

MPA127: The Project That Crashed and Burned

The purpose of this project was to see which material would be greatest for designing car parts. The three tests conducted in this project are a pressure test; a collision test; and a heat test. Chromoly steel resisted the most damage in two of the three tests; the pressure and collision tests. Galvanized steel resisted the most damage in the heat

MPA128: Does Temperature Matter?

The purpose was to determine if the temperature of the alto saxophone would affect the note that is being played. First; the saxophone was put outside for forty minutes to equilibrate to 0%. Second; the alto saxophone was played ten times; for five seconds; with five second pause in between. The note that was played was a D#. Then; each note was recorded. This was the same procedure when done inside except that it was equilibrated at 21.1%. At 0% the notes sounded more flat compared to the notes inside.

MPA129: Does the temperature of a magnet impact its strength?

The purpose of the experiment "Does the temperature of a magnet affect its strength" is to figure out if the temperature of a magnet affects how far away the magnet will affect a compass and its magnetic field. The original hypothesis stated that that the hotter magnet would have a weaker magnetic pull; the data collected did support the hypothesis. The room temperature magnet's average was 19.431 cm.; and the hot water magnet had an average of 14.8695664 cm. The cold water magnet had an average of 19.9495664 cm.; while the dry ice magnet had an average of 18.415 cm away from the compass.

MPA130: How Does the Intensity of Light Change with Distance?

For my Science Experiment; I tested the effect of distance on the intensity of light. I tested my experiment by attaching photoresistors to the front of a 6 « by 7 inch box and turning on a light bulb at varying distances. I would make sure that there was no outside lighting coming in the room. I was testing it to make sure I got a reading of only the light coming from the bulb. I recorded the intensity of the light with a multimeter from 3 different distances. I tested from 12 inches; 24 inches; and 36 inches. For each distance; I performed three tests to ensure I achieved a consistent reading. I then calculated an average of each reading. I predicted that as the distance of the light got greater; the intensity of the light would lessen. I was correct in my prediction in saying that it went from 1.73 at 12 inches; to 1.98 at 24 inches; and then finally to 2.79 at 36 inches.

MPA131: What is the Effect of Temperature on a Tennis Ball's Bounce Height

Please visit student's exhibit for abstract

MPA132: Do-Re-Mi with Straws

Please visit student's exhibit for abstract

MPA133: Strength of Glues

For my science fair project this year I will test the strengths of glues. I will use research from at least 5 different sources to test this.

MPA134: playing with the thermostat

The purpose of this experiment is to see if temperatures affect a magnet's strength. The procedure used was to put a magnet in ice water and boiling water an then see how many washers it would collect. The data I collected was that the warm magnet collected 2 washers and the cold magnet collect 5 washers. in conclusion cold magnets are better and a magnet's strength is changed by its temperature.

MPA300: Do Shoes Effect Jump Height

Do you think that your shoe will help you jump higher? Well; that's what our project will determine. For our test; we will have four different tests; Nike Airs; running shoes; crocs; and socks.