



85th Pittsburgh Regional Science & Engineering Fair

Junior Division

Student Project Abstracts

April 2, 2024

Notes to Judges

Students prepare Abstracts 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: J-Junior Division (6th grade)
- YY: Category Name
 - BC - Behavioral and Consumer Sciences
 - BI - Biological Sciences
 - CH - Chemistry
 - PE - Physical Sciences & Engineering
- ABC: Project number
 - 1xx or 2xx - Individual student projects
 - 3xx - Team projects (2 or 3 students)

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Behavioral and Consumer Sciences (JBC)

JBC100: Textile Trial

Many different clothes are often worn as shirts each day. The most popular ones to wear are Cotton, Polyester, and Nylon. People sweat in these types of clothes for many reasons throughout the day. The Textile Trial is to see how fast each of these three fabrics dries and who is the fastest. The long-term purpose of this experiment is to notice what is better to wear on a hot day or just in general. For testing, I put 1 cup of water on each fabric and timed them by checking every 15 minutes. If the clothes were dry, I would label the approximate time. In conclusion, the cloth that had dried the fastest was. So, people should switch to the summer for sweaty activities such as running, going to the gym, or just going daily.

JBC101: What Baby Snack is Safest?

Introduction: Parents all around the world wonder about what baby snack is best for their child. The literature doesn't look at which snack dissolves fastest. My experiment tested which baby snack dissolves the fastest. Problem Statement: Which baby food dissolves the fastest in water that is the temperature of a baby's mouth? Procedure: Taking water the temperature of a baby's mouth (95-98 degrees Fahrenheit), 4 different brands each of baby puffs and melties were dropped into separate containers. Each sample was timed to see how long it took for it to get waterlogged and to dissolve. The sample was stabbed with a toothpick at 5 minutes. The procedure was concluded at 10 minutes at which point the sample was gently stirred. The procedure was repeated 3 times for each sample. Results: The average time for waterlogged meltie brand #1 was 37 seconds; brand #2 was 36 seconds; brand #3 was 30 seconds; brand #4 was 130 seconds. At 10 minutes, all melties fully dissolved when gently stirred. The average time for waterlogged puff brand #1 was 40 seconds; brand #2 never got waterlogged; brand #3 was 26 seconds; brand #4 was 129 seconds. At 10 minutes, brands #1 and #3 fully dissolved when gently stirred. Brand #2 was floating and hard. Brand #4 was floating and soft. Conclusions: Melties overall dissolve faster than puffs. It was surprising that brands were so different in their time to get waterlogged. Puff brand #2 never dissolved and may be the least safe for young children.

JBC102: Wash Out

People are buying detergent formulas that don't work and wasting their money. My experiment shows people what they should buy and what detergent formulas work for stain removal. I wanted to see what detergent formula works the best. To achieve this, I created a stain with ketchup on each white shirt. I let it soak, then hand-washed it for five minutes. After washing and soaking three times with each shirt, I measured how much the stain came out. The stains were unique; the powder stain was still there but faded. The liquid and pods looked alike, but the pods came out better. Lastly, water didn't work well; I could still see the stain. Rejecting my hypothesis that the powder would work the best. After doing this project, the pods worked the best out of all the formulas. This will help people spend their money on working detergents instead of using bad, expensive detergents that don't work.

JBC103: Can People Identify Their Dogs By the Sound of Its Bark?

This experiment's purpose was to find out if a dog owner can recognize their dog by its bark among other dogs. I first rang the doorbell while the owner was inside. The owner recorded their dog barking for 5 seconds. After the 5 seconds were up the participant sent the video to me to play for them later. I repeated this 4 times for each participant. Then for the control dogs, we first got out of sight of the dog while one of us went and rang the doorbell then one of us recorded the dog barking, we repeated this 2 times for the two dogs. Then when 2 weeks were up, we drove to the participants' house again, this time to test them. We got the speaker and my phone and connected them so the participants could focus on the recordings. I played dog barks in 1,2,3,4,5,6 order and asked the participant if they identified their dog, they would express this by telling me the number of the dog they thought was theirs. Then I would play the dog barks in 6,1,2,3,4,5 order then 5,6,1,2,3,4 order then 4,5,6,1,2,3 order then in 3,4,5,6,1,2, order then in 2,3,4,5,6,1 order and then in 6,5,4,3,2,1 order. After I played the bark recordings in the correct order the participant would guess which dog was theirs then I jotted down which dog they thought was theirs. The data collected supported the hypothesis, the dog owners recognized their dog more than 50% of the time.

JBC105: Perfume Preferences

I am producing perfumes at home that are non-toxic and researching how my school community reacts to the scents. This is safe for the environment. I am trying to figure out people's preferences for different scents of perfume. Knowing people's preferences might help other perfume makers with scents and how people react to different scents. We will use a randomized, double-blind experimental design and have volunteer participants rate each perfume on a Likert scale. I will average all of the data up together and figure out the most popular scent of the options. The project is still in progress.

JBC106: Globbs of Glue: Which Adhesive is Strongest?

Many adhesive brands claim to be the strongest. I tested 5 different types of glue from 4 different brands, representative of the four major chemical wood glues. Gorilla Wood Glue- a Polyvinyl Acetate, Titebond Polyurethane Glue, Starbond Medium Cyanoacrylate Glue, and J. B Weld- Epoxy glue. The last glue I used is a homemade glue made of water, vinegar, flour, and sugar. My first idea was to use 2x4x4 pieces of wood. I glued them together using 2 tablespoons of adhesive. After 2 tests, I realized that the commercial glue would only break with incredible amounts of weight. I then did more research to solve this problem. To make the adhesives break at reasonable weights I glued the wood on a 90 angle and used « of a teaspoon of glue. Then I retried the experiment. The connections broke at reasonable weights. The results were Gorilla polyvinyl acetate Wood Glue in first with a 32.5-pound average. J.B Weld epoxy in second with a 29-pound average, closely followed by Starbond Cyanoacrylate with a 28-pound average. Liquid Nails polyurethane had a 17-pound average and the natural homemade wood glue came in last with a 9-pound average. This shows that natural glue is not good for any projects that require strength. All chemical glues have dangerous chemicals that can pollute the soil when put in a landfill. The chemicals can also seep into ground water. Humans will need to strike a balance between environmental conservation and strong adhesives.

JBC107: What helps you sleep the best? ASMR, Music or White Noise

Please visit student's exhibit for abstract

JBC300: Oh Snap! I Lost My Focus

Our project Oh Snap, I lost my focus is a behavioral science experiment to find out what music is better for students' concentration. We will be giving five sixth grade students two sixth grade spiral quizzes. During one spiral quiz, popular pop music will be playing in the background. During the other, popular rap music will be playing. We will then calculate the differences in the scores between the two tests. Then, we will be able to compare each of the student's scores to one another and come to a conclusion on which music helps students concentrate to their best ability. Results will be shared on Fair day.

JBC301: The Bubbler

Please visit student's exhibit for abstract

JBC302: Keep Them Out Spray

The question we will be asking is What essential oil, peppermint or lavender, would keep a stink bug away? We think that the peppermint will do the best at keeping a stink bug away because it has a stronger smell. Stink bugs are a bug with a brown gray color and hard shell. They are not supposed to live in Pittsburgh, PA. Also, we wanted a homemade way that would not hurt them to keep stink bugs out of houses, schools, and more. Also, the spray would not hurt people unless they were allergic to it. In this experiment we found a stink bug and put it in a tube in the middle. We sprayed the outside of the one end of the tube with a water and essential oil scent. The water bottle had half water and five drops of the essential oil. And we put light on the side with the oil and made the other side dark so that the stink bug would want to go to the light. We feel like the stink bugs are destroying crops and invading homes. This costs people money and we want a friendly way to stop this.

JBC303: Prevent Fires

The questions we will be answering is What is the fastest way to put out a candle cooling, starving, or smothering? We think that starving a candle fire would put it out fastest. We think this is important because if you have to go somewhere fast or move away from a candle fast you want to make sure the candle is out all the way. If it is not it can cause a fire. The way we are going to experiment is by lighting a candle then we are going to pour water on the candle and time how long it takes for the candle to go out. We will do this three times. Then, we will light the candle and put the lid on the candle to put it out. We will time how long it takes to put out. We will test this three times each. Finally, we will use a snuffer on the candle fire and time how long it takes to put out the candle. We will do this three times. During all the experiments will we take pictures. Candle fires still cause fires in houses and we feel our experiment can help prevent this problem from happening.

JBC304: Prevent Cauliflower Ear

For the science fair, I will be telling you about what head gear is best for protecting Cauliflower Ear. Cauliflower Ear stays forever and it makes your ear look different. Cauliflower ear is a problem with the loss of blood flow of a part of the ear from getting slammed hard. We will be testing a soft headgear and a hard headgear to see what protects a mannequin head best from getting Cauliflower Ear. We will test each head gear type four different ways on a mannequin head. The head gear will be pushed straight down, to the left, and to the right on a mat. We will also push one hand on the gear to see what happens. Afterwards we will take pictures and make notes to see if the ear would be affected. If it is affected in a negative way the mannequin head will be broken or pushed in in the ear part. It is important to do this experiment because we both wrestle. Also, Cauliflower Ear can affect you for life. It can burst and leave you with hearing problems. We think that the harder headgear will project from Cauliflower ear the best.

Biological Sciences (JBI)

JBI100: Propagation Problems

How to Have a Healthy Plant: Plants quickly die. It is something every beginner botanist has discovered. A leading cause of the plant's death is the inability to keep the roots thriving, so the researcher wanted to find a way to save your wallet AND your plants. The researcher is doing this by taking six different potting materials consisting of pon, LECA, vermiculite, sphagnum moss, sand, and just water and testing one spider plant in each to see which material grows the healthiest root and plant. On Thursday of every week for six weeks, I measured each plant from the start of the root to the tip of the tallest leaf. Every week, each plant grew an inch. In the end, the pon did the best.

JBI101: How much bacteria is in wet areas compared to dry areas and how much is their survival rate?

First, my question for this experiment was Where is bacteria more prevalent? Some focal points of research for this experiment was where bacteria showed up more, which was moisturized areas, how they survive and what they live off of, and their defense mechanisms. Next, my hypothesis was that out of 8 environments, my hands would have the most as bacteria can live for years on peoples hands - an example of that is Salmonella and E. coli 0157. However, the water fountain had the most with an average of 71.5 and the carpet and the inside of the bathroom door knob were close runner-ups with 21 for the carpet and the doorknob with 17.5. Meanwhile, my right hand had 0 and my left hand had 7. I collected the data by swabbing these different areas and then swabbing them onto the petri dishes. In conclusion, the data tells me that places where people interact more with their bodies are more prone to having bacteria. For example, people's hands affected the doorknob, and peoples mouths and hands had an effect on the water fountain.

JBI102: Does ice, pouring water, or spraying water result in a radish growing faster?

My testable question was how does watering with ice, water, or the spraying of water affect Radish's growth. My research included the following facts: Radishes need six hours of sunlight a day, they need one inch of water per week and should be watered five to seven times a week, they are easily susceptible to parasites. My hypothesis was that if I planted three different plants and watered them three different ways, one with ice, one with water and the final one with the spraying of water then ice would do the best because it is the hardest to overwater. Water did the best with a growth of six inches, ice also achieved six inches but took longer to do so, and spray did the worst reaching a height of three inches and one quarter before dying on day twenty six. My hypothesis was incorrect as water did the best overall.

JBI103: Does gravity have an effect on plant growth?

Understanding the effect of gravity on plant growth is important for space agriculture and supporting human life in space. My experiment examines how gravity influences plant development, particularly root growth. I soaked beans and grew them under standard gravity levels. Results showed the plant exhibits positive root gravitropism and negative shoot gravitropism. Now, I aim to replicate the experiment under low or no gravity using a centrifuge.

JBI104: The Effect of Daily Food Amount on Feline Weight

The purpose of this project was to learn about what factors may affect a cat's weight. The study surveyed cat owners asking them to provide their cat's weight and daily amount of food intake. The study also asked for basic information about the cat such as its sex, age, and activity level. The survey results were compiled into a table and charts were created to show the correlation between the amount of daily food and weight. My hypothesis was that cats that eat more than « cup of food or greater will be a fat cat and weigh more than the average cat. Most of the cats in the study weighed between 8 and 12 lbs. The data showed cats who ate more than « cup of food generally weighed more than the average range. The data also showed that other factors are affecting the cat's weight. I expected to see that the cats who were fed the most daily amount of food would weigh the most and, conversely, that cats who were fed the least daily amount of food would weigh the least. Here, the cat who was fed the least daily amount of food weighed the most. The cats who were fed the most daily amount of food had weights that varied. This shows that other factors are also affecting the cats' weight along with the daily food amount.

JBI105: Fast Food Restaurants: How Dirty is their Ice?

Please visit student's exhibit for abstract

JBI106: Terrarium Ecosystems

My project will demonstrate how a terrarium works as a mini ecosystem. I think that plants and animals will work together to create an ecosystem. I will construct a terrarium and plant native plants, insects, and soil. I will record how they do, and how the ecosystem works. I am still collecting data, and I will share my results during the competition.

JBI107: Can Dead Leaves Improve the Health of your Garden?

Every year many people rake their leaves and either bag them up or burn them. My project will test whether or not leaving the leaves on the ground is beneficial to the soil, specifically if bean seeds will grow better with leaf cover.

JBI108: Elephants' Behavior in Captivity Vs. a Preserve

I wanted to do this project because i always loved animals and i kind of felt bad to see them in inclosed spaces. I wanted to see their behaviors to see if they were more happy and active. My hypothesis is that elephants in their zoo enclosures will be generally more active. To acquire data, I will first observe general behaviors of elephants in these 2 areas. I will put this data in the data table. I will also research using books and different websites. My method of accomplishing this research is simple. First, I will observe elephants in both the enclosures at the zoo and their natural habitat at the reserve. I will the compare to see the differences. I will also find similarities. Since I have not yet completed the project, I don't have many findings, but I will share them on the day of the competition.

JBI109: How Do Leaves Breathe?

This project is about how leaves breathe. He submerged leaves in different temperatures of water to see if bubbles would appear demonstrating the presence of oxygen. The project showed through pictures that bubbles decreased over time depending on the water temperature.

Chemistry (JCH)

JCH100: Fecal Matter Matters

I performed this experiment to prove that we should all start using natural gas bricks as heat for our houses. Without gas and natural heat, you can use an alternative to keep your fire going without air pollution or horse manure. First, I made the bricks with three different kinds of manure. Then, I burned them and recorded the times. Last, I wrote down all of the data that I got. For the data, the hay manure burned. The results of this experiment are essential to the world because instead of using harmful gas that pollutes the air, you can use natural gas and horse manure bricks.

JCH101: Which biodegradable plastic decomposes the fastest?

Please visit student's exhibit for abstract

JCH102: Does the Temperature of Water Affect the Ammonia Content in Hair Dye?

The purpose of this experiment was to determine if the temperature of water affects the longevity of hair dye. I dyed the hair strips, waited three days then filled the bowls with hot water and cold water. I dipped the dyed hair into both bowls for ten minutes. Then, dipped the ammonia test strips into the bowls for 30 seconds. The experiment was repeated with permanent hair. How much more ammonia was released in the hot versus the cold? Semi -Permanent 0.5. How much more ammonia was released in the hot versus the cold water? - semi-permanent hair dye. This experiment's purpose was to find out if the temperature of water affects the amount of ammonia content in your hair after it is dyed. The data collected supported my hypothesis because more ammonia was found in the hot water versus cold water.

JCH103: Which moisturizer is most effective at keeping skin hydrated?

The purpose in my experiment was to figure out which moisturizer gives the best hydration. My procedures were I placed 10mls of distilled water in baby jars. Then I applied the moisturizer to the filter which was applied to the baby jars. Then 72 hours (about 3 days) later I measured how much moisturizer was left. The data I collected supported my hypothesis. The difference between all the moisturizers was B-hydra was the greatest. Why did B-hydra have the greatest hydration? Because it has more oil and better hydration than all the others.

JCH104: Electric Fruit

The experiment's purpose was to determine which citrus fruit will produce the highest voltage. How I conducted this experiment was to cut the fruit so the copper, and the nail can go in. Next, I connected the multimeter terminals so the voltage could be measured. The data showed that orange produced the highest voltage with an average of 1.004 and lemon was the lowest with .957 there is a .47 difference between them. My hypothesis was not supported because it stated that the lemon would produce the highest voltage due to its acidity. The independent variable made a difference because the fruits had different voltages.

Physical Sciences & Engineering (JPE)

JPE100: Wood on Wheels

The purpose of this experiment was to test which wheel size on a skateboard is the fastest. There are 3 standard wheel sizes for a skateboard, and they include park wheels (50-54mm), cruiser wheels (54-60mm), and longboard wheels (60-75mm). The subject (one 11 y/o male) rode a skateboard on a concrete surface on a slight decline for 15 meters between 2 cones. There were 3 trials with each of the 3 wheel sizes. In 8 out of the 9 trials, the skateboard with the wheels with bigger diameter had a faster time than the skateboard with the wheels of smaller diameter. Only once was the speed the same for both wheel sizes. The average time in seconds for each wheel size was used to calculate the average speed (speed = distance / time). My hypothesis was supported that a skateboard with wheels with a bigger diameter would have a faster time than a skateboard with wheels with a smaller diameter. This was because a wheel with a bigger diameter requires fewer rotations, covers more ground, and has better shock absorbance. Determining which wheel size is faster will help skateboarders choose the best wheel if speed is the goal.

JPE101: Coin Sense

This project interests me because I used to collect coins and I am curious if you could identify a coin by the sound it makes. I was always curious what coins are made of. I am also interested in what sound is and how we hear it. I also like the famous astronomer, Galileo. I dropped the coins on a block of granite from the height of 18 centimeters. The participant tried to guess the total score. Then it was divided by the total participants to get the percentage of correct guesses for each coin. If it was greater than 75% then the coin was identified by its sound. The data supports my hypothesis because the quarter was detected the most times. The quarter was detected 94% of the time. The nickel was detected 78% of the time.

JPE102: How Does a Person's Age Affect Reaction Time?

The purpose of this experiment was to determine if age affects reaction time. To conduct this experiment, I dropped a playing card above the subject's hand and stopped the timer when it was caught. The data collected did not support my hypothesis which is that the 11-year-old test subject will have the fastest reaction time because reaction time gets slower with age. The fastest time was .15 seconds which was caught by the 75-year-old. The slowest time was .56 seconds which was caught by the 74-year-old. The difference between the two was .31 seconds. The 75-year-old was in the army, and research shows that army training is associated with motor time training. That is why he had the fastest time. My independent variable did not make a significant difference because the reaction time of the youngest age group had significantly slower reaction time than the older age group. One problem that occurred was that it took a few tries before the test subject caught the card. An unusual observation was that the oldest male had the fastest reaction time.

JPE103: The Effect of Hand Size on the Distance a Football is Thrown

The purpose of my experiment was to figure out if a person's hand size affects the distance a football is thrown. I conducted my experiment by having five people throw the football as far as they could. Then I measured how far they threw the ball and repeated this process three times. In my experiment I found that subject 4 threw the ball the farthest at 1520 cm. Subject 3 threw the ball the closest at 720 cm. Subject 4 threw the ball 800 meters farther than subject 3. In conclusion, the data did not support the original hypothesis because the person with the smallest hand size threw the furthest due to experience. The independent variable didn't make a difference because the distance a football is thrown is determined by skill and experience.

JPE104: What Baseball Bat Hits the Farthest?

The Purpose of my experiment is to find out what type of baseball bat will hit the ball the farthest. The three types of baseball bats that I tested were composite, aluminum, and wood. I used the following procedure to conduct my experiment. I first set up the tee on home plate. I placed one ball on the tee. I used the wood bat first and hit the ball. I then measured the distance the ball traveled in meters and recorded the data. I repeated these steps for 5 balls using the wood bat. I then completed each of these steps again using a composite bat next and then finally the aluminum bat. My data showed that the wood bat distances were 39.9m, 35.1m, 40.2m, 41.8m, and 41.5m. The distance the balls traveled with the composite bat were 44.4m, 46.7m, 48.6m, 45.5m, and 45.8m. Finally, using the aluminum bat the distances were 43.8m, 42.2m, 43.2m, 44.2m, and 42.9m. These results showed that a composite bat is going to make the ball travel the farthest. The composite bat has the best trampoline effect out of the 3 bats making the composite bat go the farthest.

JPE105: Go Go Golf Balls

There are so many golf balls and brands that it is hard to find the best ball to use at an affordable price. An average amateur golfer wants to improve their game as much as possible, so they need the best ball. While this project is being conducted, three different skill-level golfers will hit the ball: a young amateur, an experienced amateur, and a professional. All of these people will hit three different balls from three different brands. The balls are the Titleist ProV 1, the Callaway Supersoft, and the Taylor-made Distance+. All of these balls are in different price ranges. The Taylormade Distance+ is the lowest at about \$20. The Callaway Supersoft is about \$25, and the Titleist ProV 1 is about \$50. This project will find out which golf ball is the best to use and will improve a lot of golfers' games. The experiment results show that the Taylormade Distance+ is the best ball. The ball is the least expensive, but you get a good ball for cheap. The ball gets plenty of distance. It is the hardest ball, so it goes the farthest. The Taylormade Distance+ is the best ball to use at a cheaper price.

JPE106: Uh Oh! What's the Weather?

My Science Fair project is a comparison of 2 different ways to predict the weather. I will be comparing the IOS weather app for iPhones and iPads, and a barometer used from the weather lab science kit that I have. I will be comparing them by the precipitation and air pressure predictions. I decided to do this project because I like to watch the weather. I thought knowing what the weather will be like would be really cool. And it still is, even after making the project. I'm using only a barometer for the building part. To make the barometer, I will be using a food coloring cup, a barometer base card, 5 bag ties, a tubing with a stopper, a rubber ring, a balloon. I am recording the information by making a graph that I will record every day's prediction and actual forecast from February 21st to March 21st. While I think the barometer will be more accurate, I am hoping the IOS weather app will be more accurate because I use it and look at it a lot, and many, many people use it along with me. The reason I don't want the barometer to be more accurate is because it sits outside, I can't really bring it inside, it could be blown away by wind, it could even be soaked by rain, and it could be covered by snow.

JPE107: What is the best way to fix a sinkhole?

My project is testing whether deforestation will affect the frequency of sinkholes. I will model sinkholes by first creating multiple trays, each containing a bottom layer of gravel, with scattered patches of salt. The top layer will be made of soil. Half of the trays will contain plants in the soil. After letting the plants settle into the soil, I will model rain by drizzling it over the trays, monitoring the time it takes for each sinkhole to form, if it does. This experiment is important because deforestation has become a major problem across the world, and we know it is affecting the animals and plants where it is happening. This project could confirm that it will also affect geological phenomena, such as sinkholes.

JPE108: Traffic light control optimization to reduce vehicle wait times and carbon emissions

Idling vehicles at the traffic junctions waste fuel up to 3 billion gallons and generate 30 million tons of carbon dioxide annually in the U.S according to the US Department of Energy. Waiting in a car at the traffic lights can also causes unnecessary stress to the drivers and wastes productive time. My experiment involves collecting wait time data from local traffic intersections. I will then explore 3 different methods of traffic light control such as Fixed-timed, Pre-timed, and Adaptive control. Based on the data, I will propose an optimized method for the experimented traffic intersections. The experimentation is continuing, and results will be available on the science fair day.

JPE109: Effects of Weather Conditions on LiDAR scans

My project is to measure the effect of weather on the accuracy of LiDAR. (Light Detection and Ranging). I got interested in this topic when looking for ideas on NASA Techrise projects for rocket powered landers. I think this research could help the safety of self-driving cars because they use LiDAR to drive, but could be dangerous in different types of weather. I will be comparing tape-measure measurements of my car to the LiDAR measurements from a Leica BLK 360 LiDAR Scanner in different weather conditions and create an average to determine the accuracy. The research is still in progress.

JPE110: Recycling Pencils into New Pencils

The project goal is to engineer a machine that can quickly and efficiently up-cycle classroom pencil shavings along with thermoplastic into new pencils. This will be a closed loop as the new pencils are able to be sharpened into shavings that will be recycled in the machine. The only added materials will be pencil graphite sticks and erasers. There are many challenges involved including placing the pencil lead in the plastic and finding the best ratio of pencil shavings to plastic, extrusion speed, and cooling time. An additional challenge will be preserving quality over time in this closed-loop environment.

JPE111: Converting a battery-controlled remote-control car to solar power

My project is about converting a remote-controlled car to solar power. I am going to see how many rotations the wheels can make in one minute at full throttle. Then I am going to take out the batteries and solder the positive and negative wires to their respective sides on the battery pack. Then I will run the same test to see how many rotations the wheels can make in the time of one minute. Now that I have got both rotations for battery and solar power, I am going to compare and see which one is faster.

JPE112: Henry

Each day, modern households consistently consume water and electricity. In fact, we use it from the moment you hit the button on your alarm clock to brushing your teeth at the end of the day. Due to climate change and depletion of nonrenewable resources, we need to find better ways to harness clean energy. Unfortunately, in Western Pennsylvania, renewable resources such as wind and solar energy are not reliable options. The purpose of this project is to investigate if household water consumption can generate enough energy to power an electronic device. The Environmental Protection Agency states that a family of four uses up to 800 gallons of water per day. If households efficiently harness wastewater to generate electricity, we will decrease our carbon footprint while saving utility costs. To gather data, I used a 2-gallon bucket and timer to determine gallons per minute from a household faucet. Next, I attached a hydroelectric generator to the faucet. I then used a voltmeter to determine volts and milliamps generated from a running faucet. I used this data to calculate watts. Upon comparing my generated electricity to typical energy needs of household appliances, my data does not suggest that wastewater would prove an effective source of electricity. In conclusion, although the home hydroelectric generator did produce electricity, it is not a viable source in its current form.

JPE113: Propeller Shape vs. Boat Speed: What's the Relationship?

The purpose of the project is to figure out how the shape of a propeller changes the speed of a boat. My research question is: How does the shape of a propeller affect the speed a boat can travel? To get results I plan to first design the boat and propellers and then build them. I will use a 3D printer to make the propellers. After we finish assembling all of the electronics and make sure to waterproof them, we will start testing. For testing I will set up a small area on Carnegie Lake and time each trial over a set distance. I'm still testing so I don't have any findings yet but I will share my results on the day of the science fair.

JPE114: Will Structures Built from Knock-Off Lego Bricks get Knocked Over?

Many people build with Legos. But most people take it for granted that the knock-offs are worse. If the knock-offs are actually better then people could save a lot of money. I want to know whether different types of bridges built from knock-off Lego Bricks stand more weight than the same bridges built from the official brand. I think that the official Legos will stand more weight than structures built from knock-off Lego bricks because the official bricks have been around for longer. I will buy different brands of knock off Lego bricks and weights. Then, I will design an arch and beam bridge. I will then individually build each combination of bridge type and brick type. Then, after I build each bridge I will add increasing amounts of weight onto the center of the bridge and when it collapses, I will record the final weight and how badly the bridge was damaged. I will use this information to deduce which brick type is the strongest.

JPE115: Stronger Grasp: Comparing Efficiencies of Hydraulic & Servo Motor Driven Prosthetic Fingers

Please visit student's exhibit for abstract

JPE116: Why Wing Shape Matters

Please visit student's exhibit for abstract

JPE300: Melting Mania

Our project name is Melting Mania. We are trying to find ways to slow down the melting of glaciers. We will be adding different additives to ice, such as glitter and wood chips, and seeing how they affect the ice's melting time. The different materials use different methods to slow down the melting of ice. Some of these methods include insulation and the reflecting of light. We will put all of the cubes under a lamp and record each cube's melting time using a laboratory timer. We believe glitter will slow down the melting time of ice the most, as it uses the reflecting of light, which we believe is the best method. The results of our experiment will be available on fair day.

JPE303: Look Out Below!

We will be presenting what would be best to stop a landslide from destroying a house. Our question we will be asking is Which method protects a house against a landslide best: plant roots, a metal cage, or a stack of rocks?. We think the plant roots will protect the house best because the roots hold up the dirt more. The roots spread out more throughout the dirt and the other methods do not. The way this experiment will be tested is by first taking a plant out of dirt and laying the plant with all its roots on its side. Then, we will put a 3D printed house on top of the hill that was made from the dirt and roots. Next, we will pour a bottle of water on the house to show a heavy rain storm. We will take pictures before and after the water is poured. Then, we will take notes of our data. Second, we will make a pile of dirt and place a metal cage to hold the dirt in. Then, we will put a 3D printed house on top of the hill made of dirt. Next, we will pour a bottle of water on the house to show a heavy rain storm. We will take pictures before and after the water is poured. Then, we will take notes of our data. Finally, we will complete the same steps shown above but make a stone stacked wall to hold the dirt up. Landslides are when a bunch of rocks and dirt come down a hill or mountain. Landslides are caused by heavy rain, earthquakes, and poor house construction. Landslides are a problem because they can hurt you if you are on top of them or below them. They can make a house collapse too. We have this problem in Pittsburgh and that is why we are experiencing it.