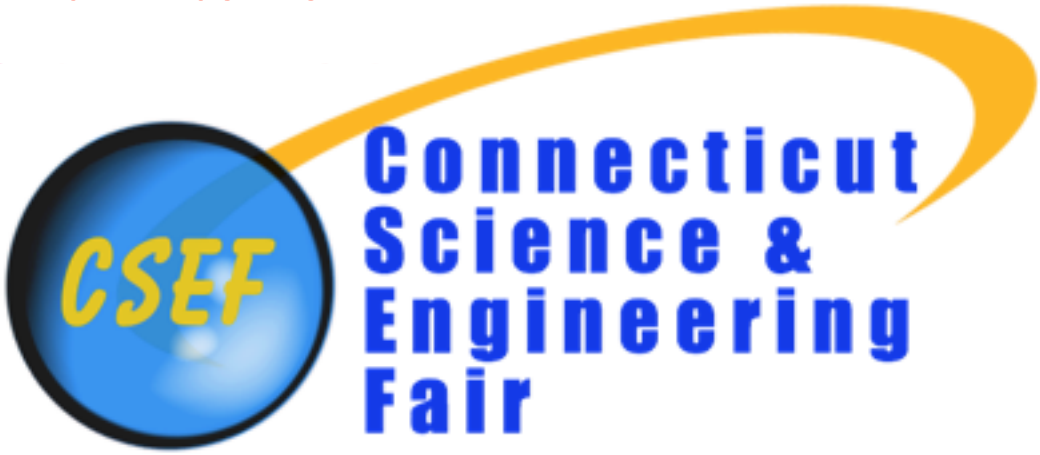
72nd Annual Fair



March 9 - 14, 2020

Student Abstracts

Fair Categories

	Life Sciences	Physical Sciences
7th & 8th Grade Team	LT (1001 – 1999)	PT (4001 – 4999)
7th Grade	L7 (2001 – 2499)	P7 (5001 – 5499)
8th Grade	L8 (2501 – 2999)	P8 (5501 – 5999)
High School	LS (3001 – 3499)	PS (6001 – 6499)
High School Team	LST (3501 – 3999)	PST (6501 – 6999)

Special Categories

AT = Applied Technology	EE = Engineering: Electrical & Mechanical
AS = Animal Science	ET = Energy & Transportation
BE = Behavioral & Social Sciences	EV = Environmental Analysis
BI = Biochemistry	EM = Environmental Management
CB = Cellular & Molecular Biology	MA = Mathematical Sciences
CH = Chemistry	ME = Medicine & Health Sciences
CS = Computer Science	MI = Microbiology
EA = Earth Science	PH = Physics & Astronomy
EN = Engineering: Materials & Bioengineering	PS = Plant Science

Special Category Composites

Biotechnology	AS, BI, CB, EN, ME, MI, PS
Environmental	EV, EM
Engineering	EN, EE
Sustainability	EA, EN, EE, ET, EV, EM

CSEF Official Abstract and Certification

Word Count	Fair Category	Project Number
97	LT	1001

Title: Slippery Slopes

Student Name(s): J. Carrero, F. Rose, G. Rose

Abstract:

The purpose of the project was to predict how much destruction would occur if a landslide happened on a slope. The hypothesis stated that if the angle of the slope is greater, then more destruction would occur because of increased momentum. Different angles were tested to measure the amount of destruction. The results showed that the slope of 75 degrees caused the most damage, which did not support the hypothesis. The greatest slope of 90 degrees did not cause the most damage. In conclusion, the greatest slope did not build enough momentum to cause the most damage.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project) EA

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

☐ human subjects ☐ potentially hazardous biological agents
☐ vertebrate animals ☐ controlled substances

2. Student independently performed all procedures as outlined in this abstract. ☒ Yes ☐ No
3. This project was conducted at a Registered Research Institution. ☐ Yes ☒ No
4. Is this project a continuation? ☐ Yes ☒ No
5. My display board includes photographs/visual depictions of humans (other than myself or my family):

☒ Yes ☐ No

CSEF Official Abstract and Certification

Word Count	Fair Category	Project Number
240	LT	1002

Title: Does smell affect taste?

Student Name(s): M. Rodrigues, L. Rivera

Abstract:

The purpose for doing our science fair project was that we wanted to investigate if a person could identify a food without the sense of smell or sight. Does your nose really know? To do this, we were asked to taste something without the sense of smell and sight. We predicted that smell does affect the way things taste because when we are sick and can't smell, the taste isn't identified. For the test, We took a sip of water. Then, we put on a blindfold and used a nose plug so they couldn't smell. Before we could take a sip of water or unplug their nose they had to identify the food. The teacher would then write yes or no depending on if their answer was correct. After the without smell test, the volunteer would take off their nose plug and take a drink of water.The data we collected shows that smell does in fact does affect your taste. Both of our total average of correct answers with smell were correct . When our noses were plugged the correct answers were mainly wrong. We learned that smell does have a huge impact on your taste. When our nose was unplugged we answered mainly all correct. On the other hand, with our noses plugged little to no foods were guessed correctly. Our hypothesis was correct because the average data proved that people didn't recognize the food without smell but did with.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project) BE

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

☒ human subjects ☐ potentially hazardous biological agents
☐ vertebrate animals ☐ controlled substances

2. Student independently performed all procedures as outlined in this abstract. ☒ Yes ☐ No
3. This project was conducted at a Registered Research Institution. ☐ Yes ☒ No
4. Is this project a continuation? ☐ Yes ☒ No
5. My display board includes photographs/visual depictions of humans (other than myself or my family):

☐ Yes ☒ No

CSEF Official Abstract and Certification

Word Count	Fair Category	Project Number
252	LT	1003

Title: Hand Sanitizers and Disinfecting Wipes V.S. Bacteria

Student Name(s): M. Riggs, C. Baptiste

Abstract:

The purpose for conducting this experiment is that many people become ill due to bacteria and often use the wrong hand sanitizers, wipes, or general disinfectants.

Our hypothesis was that the wipes containing hydrogen peroxide and the hand sanitizers non-plant based ethyl alcohol will be most effective in eliminating the bacteria.

We conducted this experiment by testing six (6) disinfectant wipes and four (4) hand sanitizers including Palmolive® soap/water against bacteria. We tested them using three (3) different surfaces for each. For the wipes, we used a muddy surface, toilet seat, and restaurant table. For the hand sanitizers, we used a muddy surface, basketball, and TV remote. We grew the bacteria in petri dishes, which were placed in a laboratory oven for four (4) days at 90°F.

We observed that hydrogen peroxide wipes were eliminating bacteria the best and Method® was performing the worst. We observed that for the hand sanitizers Purell® was eliminating bacteria the best and the Palmolive® soap/water was eliminating bacteria the worst.

We concluded that hydrogen peroxide is the best disinfectant to use in your home for things

Technical Disciplines Selected by the Student (Listed in order of relevance to the project) BE CH

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☐ human subjects ☐ potentially hazardous biological agents
☐ vertebrate animals ☐ controlled substances

2. Student independently performed all procedures as outlined in this abstract. ☒ Yes ☐ No
3. This project was conducted at a Registered Research Institution. ☒ Yes ☐ No
4. Is this project a continuation? ☐ Yes ☒ No
5. My display board includes photographs/visual depictions of humans (other than myself or my family):

☐ Yes ☒ No

CSEF Official Abstract and Certification

Word Count	Fair Category	Project Number
247	LT	1004

Title: Soil Erosion

Student Name(s): B. Brown, S. Miller

Abstract:

In this experiment we tested what would stop soil erosion more effectively. Our hypothesis stated it would be the cress plant because the plants grow closer together and denser. Our independent variable was the material used to prevent soil erosion while the dependent was the amount of soil erosion. Our results showed that the cress plant stopped soil erosion the most effectively and averaged to ¼ of a teaspoon. Next, we tested soil which averaged out to 7 teaspoons. The leaf debris averaged to 4 ⅓ teaspoons and the wheatgrass averaged to 2 ⅔ teaspoons. The first step of our experiment was filling the bread pans with packed soil. We filled one with soil, one with soil and leaf debris, one with a wheatgrass plant and lastly a cress plant. We made vertical cuts down the shorter side and folded it downwards. Then placed the container next to the cake pan and propped it up on a 20 degree angle. We filled the watering can and poured until it all drained out. Then measured the leftover soil and repeated it for the other materials. The real world applications states that soil erosion is a problem in agriculture and to prevent it we need successful farming. The leaf debris, cress and wheatgrass plant all have intricate root systems which hold the soil in place and made it more difficult for the soil to erode. However the cress had the most intricate root system therefore our hypothesis was correct.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project) PS

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

☐ human subjects ☐ potentially hazardous biological agents
☐ vertebrate animals ☐ controlled substances

2. Student independently performed all procedures as outlined in this abstract. ☒ Yes ☐ No
3. This project was conducted at a Registered Research Institution. ☐ Yes ☒ No
4. Is this project a continuation? ☐ Yes ☒ No
5. My display board includes photographs/visual depictions of humans (other than myself or my family):

☐ Yes ☒ No

CSEF Official Abstract and Certification

Word Count	Fair Category	Project Number
216	LT	1005

Title: The Use of Charcoal to Mitigate the Effects of Climate Change

Student Name(s): J. Asapokhai, A. Croal, J. Roy

Abstract:

The addition of charcoal to gardens is an effective way to help plants with water and nutrient absorption. The reason for this investigation was to mitigate climate change effects, which is causing dryer conditions and drought and making growing crops more difficult.

In order to prove the hypothesis that charcoal helps with absorption and consumption of water and nutrients, an experiment in which Raphanus sativus (radish) were planted in four planters with sand and different soil amendments was conducted. Each planter included sand to mimic arid and semi-arid climates -- planter 1. sand, planter 2. sand, miracle grow; planter 3. sand, charcoal, miracle grow; planter 4. sand and charcoal. Each planter was given 100ml water every ten days. At the end of the 30 day experiment time frame the planters with the most growth, planters 3 and 4, were those that had charcoal as a soil amendment.

In conclusion, the addition of charcoal helps the seeds grow by binding the nutrients to the soil and increasing water absorption. Charcoal can be useful in arid and semi-arid climates to increase plant growth and if used on a global scale, people who suffer in arid and semi-arid conditions will have a better chance of creating a more sustainable agriculture practice, which in turn could reduce hunger.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project) PS CH

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☐ Yes ☒ No

CSEF Official Abstract and Certification

Word Count	Fair Category	Project Number
149	LT	1006

Title: The affect of Magnetism on Plant Growth

Student Name(s): G. Genger, A. Rosovsky

Abstract:

The purpose of this experiment is to see if increased magnetic field near a plant will affect its germination. Previous studies suggested that placing a plant near its north pole would slow it's germination and growth. So what would happen if you put a plant near one of the strongest north pole magnets on earth?

Research shows that magnetic fields increase the amount of nitrogen, phosphorus, potassium, calcium, magnesium, and trace elements in plant tissue. If this were true all plants exposed to high levels of magnetism could germinate and grow quicker. Magnets have north and south poles. North pole exposure can make a cell dormant or slow down its reproduction. And south pole exposure can do the exact opposite. According to these researchers, cells react by multiplying faster when exposed to a magnet's south pole. The molecules grow due to static electric effects around atoms. This triggers reproduction.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project) PS

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

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☐ vertebrate animals ☐ controlled substances

2. Student independently performed all procedures as outlined in this abstract. ☒ Yes ☐ No
3. This project was conducted at a Registered Research Institution. ☒ Yes ☐ No
4. Is this project a continuation? ☐ Yes ☒ No
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☒ Yes ☐ No

CSEF Official Abstract and Certification

Word Count	Fair Category	Project Number
250	LT	1007

Title: There's a Plastic-Eating Fungus Among-Us

Student Name(s): A. He, A. Xu

Abstract:

According to National Geographic, only 9 percent of the 448 million tons of plastic produced each year is recycled. The other 91 percent is either sent to landfills or find their way to the ocean, never able to decompose. This harms animals, land, and us.

Aspergillus tubingensis is a fungus that is already known to eat plastic. The objective of this project was to modify other types of common fungi to make them capable of doing the same. The result was meant to be a natural way to cut down waste. To accomplish this, different types of common fungi (armillariella mellea, arthrobotrys conoides, aspergillus flavus, and aspergillus niger) and 7 different types of plastic were needed. The fungi were combined with each other by using sanitized tools to transfer bits of two types of fungi to a new agar plate. After 1-3 weeks of fungi growth, the sanitized plastic was cut into different shapes and placed into the fungi combinations. The decomposition of the plastic was determined by using a magnifying glass to observe the growth of fungi on the plastic. In addition, pictures were taken every week for a deeper examination.

Over the course of the experiment, the pictures have shown fungi growth on the plastic bits. Though the growth was not significant enough to show a reduction of plastic waste at this time, the result was still promising. With further research and development, this idea has the potential to be implemented into everyday lives to help the environment.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project) PS EV EN

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

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☐ vertebrate animals ☐ controlled substances

2. Student independently performed all procedures as outlined in this abstract. ☒ Yes ☐ No
3. This project was conducted at a Registered Research Institution. ☐ Yes ☒ No
4. Is this project a continuation? ☐ Yes ☒ No
5. My display board includes photographs/visual depictions of humans (other than myself or my family):

☐ Yes ☒ No

CSEF Official Abstract and Certification

Word Count	Fair Category	Project Number
227	LT	1008

Title: Sniffing Science

Student Name(s): S. Lombard, O. Szczerba

Abstract:

This project is called Sniffing Science. The guiding question was "Does age and gender affect scent preference?" If girls and boys from the ages of 9 to 13 are tested, then the girls and boys altogether will have different scent preferences because the age gap is fairly small and the genders of the children are complete opposites. It turns out that gender and age does affect the scents that a person may prefer. This experiment is important because it helps the community understand stereotypes. Also, say somebody wanted to buy a child a perfume or air freshener, they would be able to possibly guess the scent that they would like. They could guess it based on the person's memories associated with a certain scent, understanding how they are growing and maturing, and recalling what they learned from this experiment. The scents that were used are cinnamon, cedar, vanilla, mint, evergreen, and lemon. Nine out of twenty males chose cinnamon as their favorite scent while thirteen out of twenty females chose vanilla as their favorite scent. Three out of ten 5th graders chose A (cinnamon) as their favorite while another three chose D (mint). 6th grade chose A (cinnamon) as their favorite scent. Lastly, 7th and 8th grade both chose C (vanilla) as their favorite scent. In conclusion, the experiment was a success and the hypothesis was correct.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project) BE

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

☒ human subjects ☐ potentially hazardous biological agents
☐ vertebrate animals ☐ controlled substances

2. Student independently performed all procedures as outlined in this abstract. ☒ Yes ☐ No
3. This project was conducted at a Registered Research Institution. ☐ Yes ☒ No
4. Is this project a continuation? ☐ Yes ☒ No
5. My display board includes photographs/visual depictions of humans (other than myself or my family):

☐ Yes ☒ No

CSEF Official Abstract and Certification

Word Count	Fair Category	Project Number
146	LT	1009

Title: Which Yeast Makes Bagels Grow More

Student Name(s): C. Froehlich, R. Webb

Abstract:

In our experiment we tested which type of yeast made bagels grow/rise the most. We believed that the instant active dry yeast would make the bagels grow more because it would be easier to mix into the dough. To make the bagels we made the dough, shaped the bagels, boiled the bagels, and then baked them in the oven. After the bagels baked we took them out of the oven and recorded or results. The fresh yeast ended up making the bagels grow more than the active dry instant yeast, so our hypothesis was proved incorrect. The average growth in height for the fresh yeast was 1.4 inches when the average growth in height for the instant yeast was only 0.3 inches. The average growth in width for the fresh yeast was 1.3 inches when the growth was only 0.5 inches for the instant yeast.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project) MI

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- ☐ human subjects
- ☐ potentially hazardous biological agents
- ☐ vertebrate animals
- ☒ controlled substances

2. Student independently performed all procedures as outlined in this abstract. ☒ Yes ☐ No
3. This project was conducted at a Registered Research Institution. ☐ Yes ☒ No
4. Is this project a continuation? ☐ Yes ☒ No
5. My display board includes photographs/visual depictions of humans (other than myself or my family):

☐ Yes ☒ No

CSEF Official Abstract and Certification

Word Count	Fair Category	Project Number
176	LT	1010

Title: "Sweet Seeds"

The Effects of Sucrose Solution on the Growth of Marigold Seeds

Student Name(s): M. Winarsky, S. Weisel

Abstract:

According to different sources, adding sucrose to plants has shown various results. We wanted to see the effects of too much, or too little sugar on the growth of the seeds. The seeds were placed by the windows in natural sunlight, and in a room with a temperature of 70 degrees Fahrenheit. We activated our peat pots with warm water as per the directions on the peat pots. We planted two marigold seeds into each of our peat pots. We made 4 different water/sucrose solutions with 16 ounces of distilled water, and with 1 tablespoon, 2 tablespoons, and 4 tablespoons of sugar. We watered each peat pot with 2.5 milliliters of the different water solutions daily. We took pictures and measurements of the samples to record our findings. Our results showed that the sucrose solution did not help our marigold seeds to grow, and the plants which did not receive any additional sugar grew better. This proved that marigold seeds do not need additional help from humans to produce sucrose and do fine by themselves.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project) PS

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

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☐ vertebrate animals ☐ controlled substances

2. Student independently performed all procedures as outlined in this abstract. ☒ Yes ☐ No
3. This project was conducted at a Registered Research Institution. ☐ Yes ☒ No
4. Is this project a continuation? ☐ Yes ☒ No
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☐ Yes ☒ No

CSEF Official Abstract and Certification

Word Count	Fair Category	Project Number
164	LT	1011

Title: Algae Water Vs. Tap Water

Student Name(s): A. Monaco-Belden, K. Cordoliani

Abstract:

We think that algae water will make plants grow faster than city tap watered plants. In our abstract paper, we will explain to you about how algae water helps plant growth. The plant was a chlorophytum comosum, and it dislikes direct sun, so we kept it behind white vinyl shades for indirect sunlight. Inside of the algae water there was fish feces, although there was feces, the feces dissolved into the algae water as protein. We watered every plant with ⅓ cups of water every three days. There were three plants that were watered with tap water and three plants with algae water. The two variables were algae water and (city) tap water. The constants were the same plants, soil and amount of soil, amount of water, and indirect sunlight. We chose this experiment because we wanted to see if using water with protein that is natural (algae water) is more beneficial than water with chemicals that take out the proteins (city tap water).

Technical Disciplines Selected by the Student (Listed in order of relevance to the project) BI

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

☐ human subjects ☐ potentially hazardous biological agents
☐ vertebrate animals ☐ controlled substances

2. Student independently performed all procedures as outlined in this abstract. ☒ Yes ☐ No
3. This project was conducted at a Registered Research Institution. ☐ Yes ☒ No
4. Is this project a continuation? ☐ Yes ☒ No
5. My display board includes photographs/visual depictions of humans (other than myself or my family):

☒ Yes ☐ No

CSEF Official Abstract and Certification

Word Count	Fair Category	Project Number
223	LT	1012

Title: Egg-xtraordinary Brine Shrimp

Student Name(s): S. Maconochie, I. Tiberi

Abstract:

For the Science Fair this year, Shannon and I decided to test the effect of caffeine on Brine shrimp. Our hypothesis was if caffeine was added to a Brine shrimp living environment, then the hatching rate would be sped up. We wanted this experiment to help us understand the effect of caffeine on life by testing it on Brine shrimp. If we are able to understand the effect on Brine shrimp, we also can relate it to humans and see what the effect of caffeine does to humans that is also found in the Brine shrimp. This experiment would help in life because caffeine is something not many people understand and we hope this experiment helps them to understand by seeing the effect of caffeine on Brine shrimp and then using it to relate it to human life. We started off by placing two beakers in a tank; one beaker had 0.050 grams of caffeine added to the water, and the other one didn't have any caffeine but just regular water. We then timed each one by setting up a clock next to the tank that held the two beakers and a camera at the 18 hour mark to get the hatching time precise. After performing our experiment, we realized our hypothesis was correct and that caffeine did indeed affect the hatching rate.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project) AS

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

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☐ vertebrate animals ☐ controlled substances

2. Student independently performed all procedures as outlined in this abstract. ☒ Yes ☐ No
3. This project was conducted at a Registered Research Institution. ☐ Yes ☒ No
4. Is this project a continuation? ☐ Yes ☒ No
5. My display board includes photographs/visual depictions of humans (other than myself or my family):

☐ Yes ☒ No

CSEF Official Abstract and Certification

Word Count	Fair Category	Project Number
207	LT	1013

Title: How to make salt water drinkable

Student Name(s): K. Dominguez, A. Galicia

Abstract:

For our group project, we were working on how to distill saltwater and make it drinkable.First, we made saltwater by adding 7 teaspoons of salt into 1 liter of water. After making the saltwater, we made a total of 2 liters of saltwater. Once we had our saltwater ready, we put a bit of saltwater into the distilling flask. We put the flask over the flame and in about 4 minutes the sides of the flask were covered with water droplets. The droplets formed together into bigger droplets and dripped out of the flask into the water glass. After making a satisfying amount, we recorded our observations. We made a chart of how the fresh water smelled and looked like and measured salt levels in water with a hydrometer. We continued the steps and recorded observations with saltwater and distilled water. We then moved on to using fig leaves. At first, the fig leaves didn't really work. We decided to position the leaf over the pot of boiling water. The water evaporated and made it's way to the leaf. The water dripped off at the end of the leaf into a separate glass. We recorded observations and filled our chart. In the end, Our hypothesis was proven.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project) EA EM EV

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

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☐ vertebrate animals ☐ controlled substances

2. Student independently performed all procedures as outlined in this abstract. ☐ Yes ☒ No
3. This project was conducted at a Registered Research Institution. ☐ Yes ☒ No
4. Is this project a continuation? ☐ Yes ☒ No
5. My display board includes photographs/visual depictions of humans (other than myself or my family):

☐ Yes ☒ No

CSEF Official Abstract and Certification

Word Count	Fair Category	Project Number
249	LT	1014

Title: Effects of Fertilizer on Algae Growth

Student Name(s): I. Paschalidis, S. Gregory

Abstract:

Our goal was to devise a solution to growing amounts of hypoxia in Long Island Waters. To do this, we did research on how everyday fertilizers potentially seep into our bodies of water. We learned that fertilizers play a huge role in chemical run-off. We also learned that most fertilizers contain three main elements: Nitrogen, Potassium, and Phosphate. The three fertilizers we found were Diammonium (phosphate), Urea (nitrogen), and Potash (potassium.) Our hypothesis that Potassium would cause the least amount of algae growth. Out of the three elements, our research showed Nitrogen would stimulate algae growth the most while Potassium would stimulate it the least.

After the planning stages, we began to develop the experiment. We purchased four bins and created a slope of dirt that transitioned into water collected from the Norwalk River. Also, we added grass seeds to represent plant life and gravel to represent beaches. We sprayed fertilizer on the dirt every Monday to represent the spraying of fertilizer on plants. We would water the plants three days a week with rainwater to represent rainfall. We eventually added in a lamp over the algae to increase growth. To measure the algae, we shined a fluorescent light on the algae and measured the surface area. We also plan to measure the amount of Deteriorated Oxygen in the river water using a probe. When analyzing our primary set of data, we found that the results met our hypothesis and Potassium caused the least amount of algae growth.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project) EV EM PS

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2. Student independently performed all procedures as outlined in this abstract. ☒ Yes ☐ No
3. This project was conducted at a Registered Research Institution. ☐ Yes ☒ No
4. Is this project a continuation? ☐ Yes ☒ No
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☐ Yes ☒ No

CSEF Official Abstract and Certification

Word Count	Fair Category	Project Number
117	LT	1015

Title: Filtration Nation

Student Name(s): N. Merritt, A. Tallaksen, K. Sherry

Abstract:

Many people do not have access to clean drinking water. The purpose of this experiment was to help people obtain clean drinking water. This experiment was performed to see the difference in the pH of unfiltered lake water compared to filtered lake water. The hypothesis for this experiment is if 1 ½ cups of lake water is filtered with 1 cup of activated carbon, then the filtered water will have a pH of 7. The filter removed some contaminants from the lake water and raised the pH from 6.5 to 6.75. However, it did not filter the water to a perfect pH of 7. Therefore, the hypothesis was disproven. The objective of this experiment was not met.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project) EA EV

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☐ Yes ☒ No

CSEF Official Abstract and Certification

Word Count	Fair Category	Project Number
133	LT	1016

Title: It's Raining Acid

Student Name(s): B. McNamara, K. Dunne

Abstract:

The problem addressed in this experiment is the effect of acid rain on plant growth.

Acid rain is a form of rain that has elevated levels of hydrogen ions.

It can cause many problems with plant life.

By using a mixture of apple cider vinegar and lemon juice, the PH levels of acid rain were

recreated.

The plants were watered each day to obtain results.

In order to see the difference between the seeds affected by acid rain, they were dug up.

The goal of this experiment was to inform people about how emitting too

much gas in the air can cause acid rain.

This would cause many plants to die which would be very dangerous.

Studying this topic can help encourage others to reduce their carbon footprint and be more economically aware.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project) PS

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☐ vertebrate animals ☐ controlled substances

2. Student independently performed all procedures as outlined in this abstract. ☒ Yes ☐ No
3. This project was conducted at a Registered Research Institution. ☐ Yes ☒ No
4. Is this project a continuation? ☐ Yes ☒ No
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☐ Yes ☒ No

CSEF Official Abstract and Certification

Word Count	Fair Category	Project Number
249	LT	1017

Title: Fending off the Fast Fade of Flowers: What solution will keep YOUR flowers happy?

Student Name(s): S. Zhang, K. Tan

Abstract:

Have you ever wondered how to preserve a beautiful bouquet of flowers? Our experiment investigates what solution best preserves cut roses. We used several simple home solutions (sugar, soda, vodka, pennies, and flower food, mixed with water to keep the roses in) and then compared them to the effects of water only. At first, we thought that roses supplemented with flower food would stay the freshest because flower food is specifically crafted to nourish the roses and prevent bacteria. We thought the second best would be the roses in the soda solution because the acid and sugar in it kills bacteria and nourishes the flower, but it is not specifically designed to do so. After observing them for 12 days, noting the petals and leaves lost for each group, the coloration of each group, and the droopiness of the blossoms, we concluded that the most effective way to preserve cut roses turned out to be soda, because it opened up considerably but did not loose petals or leaves, and retained its color. This partially supports the hypothesis because we predicted the soda and flower food would work best, only in the wrong order. If we did this experiment again, we would keep all the variables constant and alter the amount of substance for each solution. We could have further expanded this experiment by doing a modified version of the experiment with different types of flowers or other factors to see if the results are uniform all across the board.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project) PS

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

☐ human subjects ☐ potentially hazardous biological agents
☐ vertebrate animals ☒ controlled substances

2. Student independently performed all procedures as outlined in this abstract. ☐ Yes ☒ No
3. This project was conducted at a Registered Research Institution. ☐ Yes ☒ No
4. Is this project a continuation? ☐ Yes ☒ No
5. My display board includes photographs/visual depictions of humans (other than myself or my family):

☐ Yes ☒ No

CSEF Official Abstract and Certification

Word Count	Fair Category	Project Number
244	LT	1018

Title: Artificial Pancreas

Student Name(s): C. Salgado, S. Barahona

Abstract:

Our project is the Artificial pancreas. The problem we are trying to solve is finding a new method to help people with diabetes normalize their pH levels. The purpose of the artificial pancreas was to automatically normalize the pH levels in your blood by combining an acid solution with an alkaline solution to make a neutralized solution. The procedure for the project is to first connect the jump wire, N channel Mosfet, three protimeter, and 8 battery holder to the bread board. Then to connect the alligator clips to the liquid pump and sensor, which is made up of styrofoam, copper wire, and a straw. After you're done connecting everything together you'll put vinegar in one container, baking soda in a second container, and baking soda, vinegar and water together in a third container. For the last step, you're putting the sensor and tubes that are connected to the pump in the vinegar and baking soda solution for the device to turn on. The results for trial 1 and 2 were that baking soda had a pH level of 13 (alkaline), vinegar had a pH level of 3 (alkaline), and the mixture had a pH level of 7 (neutral). In conclusion, our device was successful in normalizing the pH level of people with diabetes. Right now our device works well, but would like to improve the portability by making it smaller so that you are able to carry it in your pocket or purse.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project) ME

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

☐ human subjects ☐ potentially hazardous biological agents
☐ vertebrate animals ☐ controlled substances

2. Student independently performed all procedures as outlined in this abstract. ☒ Yes ☐ No
3. This project was conducted at a Registered Research Institution. ☒ Yes ☐ No
4. Is this project a continuation? ☐ Yes ☒ No
5. My display board includes photographs/visual depictions of humans (other than myself or my family):

☐ Yes ☒ No

CSEF Official Abstract and Certification

Word Count	Fair Category	Project Number
207	LT	1019

Title: Wave Bye to Gasoline!

Student Name(s): D. Sutton, S. Johnson

Abstract:

Many people like to ride their boats on nice summer days out by a lake, but has anyone thought about the effect it's having on the ecosystem? Take Candlewood Lake as an example, due to the extreme levels of gasoline, it's ecosystem is rapidly dying. The fish are horribly mutated, unfit to eat, and dying at a speedy pace. Candlewood Lake and many other lakes like it are dying at a rapid pace, and it must be stopped. But what can be done about it? That was the goal of this experiment is to find a way to decrease gasoline in waters, and according to numerous sources, the most helpful methods to remove gasoline from water are using charcoal pellets, a horse sponge, and gasoline absorbing oil. All 3 of these were tested with a starting ratio of 400:25 (water:gasoline), the goal being for the water ratio to stay the same and for the gasoline ratio to go down. According to the data, the polymer did best at achieving the overall goal. Now that there is a known solution to this problem, something must be done about it! And now that there is a solution, lakes all across the world can be changed for the better.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project) EM EV EA

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

☐ human subjects ☐ potentially hazardous biological agents
☐ vertebrate animals ☐ controlled substances

2. Student independently performed all procedures as outlined in this abstract. ☒ Yes ☐ No
3. This project was conducted at a Registered Research Institution. ☐ Yes ☒ No
4. Is this project a continuation? ☐ Yes ☒ No
5. My display board includes photographs/visual depictions of humans (other than myself or my family):

☐ Yes ☒ No

CSEF Official Abstract and Certification

Word Count	Fair Category	Project Number
241	LT	1020

Title: From Country Roads to Take Five: Testing the Effect of Music on Memory.

Student Name(s): H. Rugemer, J. Jessen

Abstract:

We are trying to figure out if music helps the brain focus and memorize images and if so, if one genre of music helps more than others. The test subjects took a memory test via the computer with noise cancelling headphones on and no sound playing. Then, the subjects took a variation of the same test listening to a song. He/She did this with 7 different songs. Six of the seven songs represented a distinct genre of music such as jazz or metal. The 7th catagory of song, confusing, was a catagory that we made up. It is a mash up of several different songs in one song. All test subjects listened to the same songs at the same volume and took the same exact tests. Also, all test subjects are between the age of 10 and 14 so we can see what the best learning environment is for students in middle school.

The materials used in the test were headphones, our lab notebook, a computer, a pen, a phone and a chair. The headphones were washed thoroughly with a wipe before the test subject put them on so that no germs were passed on. Some other things that we kept constant were the length of the songs and the location of the experiment. Thirteen subjects were tested. After doing this experiment, we find that test subjects scored highest with no music playing and scored lowest with confusing music playing.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project) BE CS AS

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

☒ human subjects ☐ potentially hazardous biological agents
☐ vertebrate animals ☐ controlled substances

2. Student independently performed all procedures as outlined in this abstract. ☒ Yes ☐ No
3. This project was conducted at a Registered Research Institution. ☒ Yes ☐ No
4. Is this project a continuation? ☐ Yes ☒ No
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☒ Yes ☐ No

CSEF Official Abstract and Certification

Word Count	Fair Category	Project Number
239	L7	2001

Title: Algae Purification Technique to Improve the Conditions of Third World Nations

Student Name(s): B. Grimm

Abstract:

Many nations in Latin America are faced with the issue of poverty, crime, and diseases. The most prominent of which is Cholera, this was the main focus of the project. This project is to aim at all of these issues. This can be used as an environmental tool indirectly affecting poverty and crime.

Many nations that are faced with the battle of Cholera have many aquatic areas perfect for growing algae. But, if under a controlled environment, certain types of algae (i.e. Chlorella and Scenedesmus) can be used to do many good things. The most useful use of these is the ability to filter water using algae. Furthermore, algae are common, especially in specific regions in Latin America. Meaning, this also has economic uses, such as jobs.

The production of algae, etc. and the environment. For instance, large swathes of land in the Amazon rainforest are currently being burned down. If this were to be seen on a massive scale it would shift the economy away from such forms of agriculture to jobs like this which would be plentiful. The Cholera Epidemic which is affecting so many nations would start to die down with massive water purification. Those who would not have been previously able to afford such would soon find a job allowing them to afford clean water. Thus solving the Cholera Epidemic; For these reasons, this should be in the interests of many nations suffering from Cholera.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project) EN MI EM

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

☐ human subjects ☐ potentially hazardous biological agents
☐ vertebrate animals ☐ controlled substances

2. Student independently performed all procedures as outlined in this abstract. ☒ Yes ☐ No
3. This project was conducted at a Registered Research Institution. ☒ Yes ☐ No
4. Is this project a continuation? ☐ Yes ☒ No
5. My display board includes photographs/visual depictions of humans (other than myself or my family):

☐ Yes ☒ No

CSEF Official Abstract and Certification

Word Count	Fair Category	Project Number
150	L7	2002

Title: Rhythm of my Heart

Student Name(s): A. Eneh

Abstract:

You probably listen to music, but have you ever thought about how certain songs either excite you and others calm you down? This project looks at whether the tempo of a song will affect the listeners heart rate. I measured 16 test subjects' heart hate while they listened to nothing (as a control), a song (Trampoline by SHEAD was used for the purpose of this experiment) played at 126 bpm, and the same song played at 170 bpm (beats per minute). My hypothesis was that their heart rates would be the fastest when listening to the song at 170 bpm. The experimental results supported my hypothesis by showing that while listening to the song at 170 bpm the heart rate is on average 3.125bpm higher than is listening to the song 126 bpm. I think this shows that faster music will energize you more because it stimulates your heart more.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project) ME

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

☒ human subjects ☐ potentially hazardous biological agents
☐ vertebrate animals ☐ controlled substances

2. Student independently performed all procedures as outlined in this abstract. ☒ Yes ☐ No
3. This project was conducted at a Registered Research Institution. ☐ Yes ☒ No
4. Is this project a continuation? ☐ Yes ☒ No
5. My display board includes photographs/visual depictions of humans (other than myself or my family):

☐ Yes ☒ No

CSEF Official Abstract and Certification

Word Count	Fair Category	Project Number
174	L7	2003

Title: Carbonated water VS. Flat water

Student Name(s): M. Miranda

Abstract:

In my project, I compared carbonated water to flat water to see which one would be best for the plants. I measured which day the plants germinated, the amount of leaves, and the height of the plants. I believe the project is important because this experiment shows which type of water is best for watering plants.

In my experiment, I planted 12 bean plants and split them into two groups. One group I watered the plants with carbonated water and the other with flat water. I continued to water the plants for a couple weeks and gathered all my results.

In my data that I collected, I found that flat water is the best for watering plants because it kept the plants alive the longest, had the most leaves, and had the tallest plants. I found out that the height of the flat water plants all together is 12.5 inches more than the carbonated water plants. Also the amount leaves of the flat water plants were 9 more leaves than the carbonated water plants.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project) PS EM EV

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

☐ human subjects ☐ potentially hazardous biological agents
☐ vertebrate animals ☐ controlled substances

2. Student independently performed all procedures as outlined in this abstract. ☒ Yes ☐ No
3. This project was conducted at a Registered Research Institution. ☐ Yes ☒ No
4. Is this project a continuation? ☐ Yes ☒ No
5. My display board includes photographs/visual depictions of humans (other than myself or my family):

☐ Yes ☒ No

CSEF Official Abstract and Certification

Word Count	Fair Category	Project Number
259	L7	2004

Title: Hydroponics

Student Name(s): L. Lines

Abstract:

I choose to conduct this experiment because of the many environmental benefits of hydroponics including the use of less space for growing, reduced use of water, easier harvesting, reduced bug infestations and pesticide use, and reduced waste and pollution from soil run off. I compared the rate of growth and vigor for hydroponically-grown plants given nutrient-rich water to those given nutrient-poor water. I hypothesized that if hydroponically-grown plants are given nutrient-poor water then the amount of roots and leaves produced by these plants will be much less than hydroponically-grown plants that are given nutrient-rich water. To perform this experiment, I used a nutrient solution and growing medium connected by a wick. The plants given the nutrient-poor solution grew at a similar rate, and had a similar average number of leaves as the plants given the nutrient-rich solution. The most significant difference between the two sets of plants was the length of their roots, with the roots of the plants grown from the nutrient-rich solution being significantly longer. The amount of growth time, location of the plants, temperature, humidity level and the size of the containers used for growing were all variables which contributed to the mixed growth results. The variable that had the greatest impact on growth rate was the use of the Wick System. I recommend future experiments use a more effective hydroponic system that provides a continuous flow of nutrient solution over plant roots while allowing plant roots to absorb more oxygen to ensure better growth rates.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project) PS

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

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☐ vertebrate animals ☐ controlled substances

2. Student independently performed all procedures as outlined in this abstract. ☒ Yes ☐ No
3. This project was conducted at a Registered Research Institution. ☐ Yes ☒ No
4. Is this project a continuation? ☐ Yes ☒ No
5. My display board includes photographs/visual depictions of humans (other than myself or my family):

☐ Yes ☒ No

CSEF Official Abstract and Certification

Word Count	Fair Category	Project Number
206	L7	2005

Title: The Effect of Soaps on Plants

Student Name(s): G. Scalzo

Abstract:

If you have ever thought about detergent and soap, did you ever think of plants? Most likely not. This experiment was conducted to find out the effect that detergents and soaps have on plants. It is important to know that pollution, which is also found in the ground, can cause plants anywhere to wither and possibly die. Most detergents and soaps will take away the nutrients needed for the plants to grow healthy and strong. The height of the plants (dependent variable) can be affected by the types of the detergents and soaps (independent variable). But in this experiment, I used distilled water as well as the remaining four detergents and soaps to water the plants and reach the conclusion. My hypothesis was that the distilled water mixed with the Palmolive Dish Soap would cause the plants to wither, deteriorate and possibly die. The results supported my hypothesis because the plants that were watered with the mixture of distilled water and the Palmolive Dish Soap, did wither and became unhealthy. This experiment also showed the effects on all the plants, showing water as the best liquid to grow plants. Yes, I did meet the objective that I set out to do. This was an interesting experiment.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project) PS

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

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☐ vertebrate animals ☐ controlled substances

2. Student independently performed all procedures as outlined in this abstract. ☒ Yes ☐ No
3. This project was conducted at a Registered Research Institution. ☐ Yes ☒ No
4. Is this project a continuation? ☐ Yes ☒ No
5. My display board includes photographs/visual depictions of humans (other than myself or my family):

☐ Yes ☒ No

CSEF Official Abstract and Certification

Word Count	Fair Category	Project Number
155	L7	2006

Title: HUMIDITY IMPACT

Student Name(s): S. Atehortua

Abstract:

The purpose of my project was to see if humidity is truly affected by the time of day and the month of the year if tested at different times of the day to prevent, health problems, sleep discomfort, mold to grow, allergy and asthma flare-ups, and harmful bacteria that can be caused by high humidity in houses. To do so I made a wet and dry bulb humidity hygrometer which was made using an ordinary drinks bottle, two identical thermometers, electrical tape, some jay cloth to make one of the thermometers a wet bulb thermometer, ordinary string and a little bit of water. Humidity is an important factor in our daily human lives. Having a humidity hygrometer at hand is not only important but also convenient for those that are not as wealthy and is reusing plastic in a way that has a great impact health-wise and a great impact on pollution awareness.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project) EV EM EA

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

☐ human subjects ☐ potentially hazardous biological agents
☐ vertebrate animals ☐ controlled substances

2. Student independently performed all procedures as outlined in this abstract. ☒ Yes ☐ No
3. This project was conducted at a Registered Research Institution. ☐ Yes ☒ No
4. Is this project a continuation? ☐ Yes ☒ No
5. My display board includes photographs/visual depictions of humans (other than myself or my family):

☐ Yes ☒ No

CSEF Official Abstract and Certification

Word Count	Fair Category	Project Number
255	L7	2007

Title: The Effectiveness of Bio-organic Polymers in the Purification of Wastewater by Removal of Microplastics via Coagulation and Flocculation

Student Name(s): S. Mohanraj

Abstract:

Our water may look clean, but actually, many pieces of microplastics have contaminated it. Microplastics, which are an environmental hazard, are small, nondegradable pieces of plastic that are harmful to many organisms. Due to their size, they go undetected through water purification processes. In this project, the efficiency of three natural bio-organic coagulants were tested in removing microplastics. Natural coagulants are relatively inexpensive, effective, and environmentally friendly. The water-soluble proteins of the natural coagulants are considered to act similarly to synthetic, positively-charged polymer coagulants. The positively-charged hydrophilic natural coagulants would neutralize the negatively-charged microplastics, causing them to become hydrophobic. They can then floc and settle, allowing their removal. The three coagulants my project was designed to test were Strychnos potatorum Linn (Nirmali) seeds, Caridea (Shrimp) shells, and Manihot esculenta (Cassava) peels. Nirmali seeds are used for water purifying processes in my native country. So, it was hypothesized that the "Strychnos potatorum Linn" seeds would work as the best coagulant out of the three being tested. The tests were conducted by using four different samples of microplastics: HDPE, LDPE, Polypropylene, and Polystyrene. This project analyzed their efficiency by using three processes: microscoping (counting microplastics), turbidity tube testing (tests how turbid the sample is), and using a spectrometer (analyzing the spectral components). After the experiment was finished, the data collected showed that the Manihot esculenta peels actually worked as the best coagulant out of the coagulants being tested. These samples were less turbid and had least number of microplastics remaining in them.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project) BI EV EM

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

☐ human subjects ☐ potentially hazardous biological agents
☐ vertebrate animals ☐ controlled substances

2. Student independently performed all procedures as outlined in this abstract. ☒ Yes ☐ No
3. This project was conducted at a Registered Research Institution. ☐ Yes ☒ No
4. Is this project a continuation? ☐ Yes ☒ No
5. My display board includes photographs/visual depictions of humans (other than myself or my family):

☐ Yes ☒ No

CSEF Official Abstract and Certification

Word Count	Fair Category	Project Number
199	L7	2008

Title: The Effect of Common Water Additives on Plant Perfusion

Student Name(s): E. Bilenker

Abstract:

Research suggests that capillary action is part of the reason that water rises in a plant stem. Lowering the surface tension of water by adding various solutes increases capillary action and could therefore increase overall water delivery to the plant. I studied whether fresh cut flowers were healthier if exposed to plain water (control), or water with high concentrations of sucrose, sodium chloride or sodium bicarbonate. I measured hydration using blue food coloring, and overall plant health measuring bloom diameter and the tilt of the flower. The control flowers were the most healthy, followed closely by the flowers exposed to sucrose. The sodium chloride and sodium bicarbonate flowers did poorly. These results were confirmed under the microscope, looking at cross sections of the stems. It is possible that less osmotic difference, and therefore less water flow, decreased and offset the capillary action effects. Also, it is possible that the extreme concentrations of salt and sodium bicarbonate actually caused cell death or reduced plant cell function. Adding different materials to the water may have unintended consequences and harm your plants or flowers, like we saw here. Future experiments could look at less extreme and more complex combinations of water additives.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project) PS CB

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

☐ human subjects ☐ potentially hazardous biological agents
☐ vertebrate animals ☐ controlled substances

2. Student independently performed all procedures as outlined in this abstract. ☐ Yes ☒ No
3. This project was conducted at a Registered Research Institution. ☐ Yes ☒ No
4. Is this project a continuation? ☐ Yes ☒ No
5. My display board includes photographs/visual depictions of humans (other than myself or my family):

☐ Yes ☒ No

CSEF Official Abstract and Certification

Word Count	Fair Category	Project Number
235	L7	2009

Title: A Helping Hand

Student Name(s): F. Friscia

Abstract:

This year, my experiment was to try to make a prosthetic hand. Wondering, what world problems can be solved? What makes your hand move? Can household items be used to make a prosthetic? are things that interest many people around the world. I think that the muscles in your hand make your hand move and I believe I can make a prosthetic hand with household items. In your hand, there are 27 bones, which are all connected by joints and ligaments. There are groups of bones in your hand called the carpus, metacarpus, and fingers. However, to move those bones you need the motor cortex, which is the part of the brain responsible for movement. In order to do the experiment of building a prosthetic hand, I took rubber straws to represent the fingers, clay to secure the fingers to the hand, a toilet paper roll to make the "palm", fabric to make the palm stronger, string to attach to the hand to make the hand move, a hot glue gun to glue it all together, and washers to tie to the string to pull it down. My hypothesis was partly correct because I did make a prosthetic hand, but not only muscles make your hand move. The different bones, joints, ligaments, parts of your brain, etc, make your hand move. I learned a lot from this project and I hope other people will too.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project) EN ME

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

☐ human subjects ☐ potentially hazardous biological agents
☐ vertebrate animals ☐ controlled substances

2. Student independently performed all procedures as outlined in this abstract. ☒ Yes ☐ No
3. This project was conducted at a Registered Research Institution. ☐ Yes ☒ No
4. Is this project a continuation? ☐ Yes ☒ No
5. My display board includes photographs/visual depictions of humans (other than myself or my family):

☒ Yes ☐ No

CSEF Official Abstract and Certification

Word Count	Fair Category	Project Number
96	L7	2010

Title: Quantification of caffeine in coffee using different brewing methods

Student Name(s): A. Allenky

Abstract:

The purpose of this project was to find the coffee brewing method that contained the least amount of caffeine. Three types of brewing methods were examined: the French press, the aeropress, and the pour over. One tablespoon of coffee was used with one cup of water to brew the coffee. An ethyl acetate extraction was performed to determine mass of the caffeine. In addition, a spectrophotometric analysis was performed. It was determined that the french press method contained the most amount of caffeine. And the least amount of caffeine was contained by the pour over method.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project) BI

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

☐ human subjects ☐ potentially hazardous biological agents
☐ vertebrate animals ☐ controlled substances

2. Student independently performed all procedures as outlined in this abstract. ☒ Yes ☐ No
3. This project was conducted at a Registered Research Institution. ☐ Yes ☒ No
4. Is this project a continuation? ☐ Yes ☒ No
5. My display board includes photographs/visual depictions of humans (other than myself or my family):

☐ Yes ☒ No

CSEF Official Abstract and Certification

Word Count	Fair Category	Project Number
232	L7	2011

Title: The Effect of Temperature on the Number of species of Macro-invertebrates in the Pootatuck River

Student Name(s): R. Sweeting

Abstract:

The purpose of this experiment is to test whether temperature affects the number of species of the macro-invertebrates in the Pootatuck River. Since the data was accurate, the hypothesis was correct that, the colder the temperature the fewer number of macro-invertebrates will be present in the river. So, how to set it up is to first put on waterproof boots and rubber gloves, then begin kick sampling on the river bottom, about 30 cm from the net. Then sweep the river bottom with foot back and forth about 10 times.

After allowing anything that is kicked up to shore, pick up and rub off all of the rocks between your foot and the net. Carefully carry net full of contents to the shore. Next, dump the contents of the net into white bin and remove detritus. Identify and sort the macro-invertebrates so that each species is in its own ice cube tray cell, and finally after completing steps 1-11, repeat the steps and perform them again, on December 6th and January 6th. It was predicted that, the colder the temperature it was in the river, the fewer number of macro-invertebrates were discovered. The hypothesis showed that the data was correct. To make this experiment better, I could have done more trials. It is concluded that temperature effects the number of species of macro-invertebrates in the Pootatuck River.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project) EV AS

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

☐ human subjects ☐ potentially hazardous biological agents
☐ vertebrate animals ☐ controlled substances

2. Student independently performed all procedures as outlined in this abstract. ☒ Yes ☐ No
3. This project was conducted at a Registered Research Institution. ☐ Yes ☒ No
4. Is this project a continuation? ☐ Yes ☒ No
5. My display board includes photographs/visual depictions of humans (other than myself or my family):

☐ Yes ☒ No

CSEF Official Abstract and Certification

Word Count	Fair Category	Project Number
249	L7	2012

Title: Now You Sea It

Student Name(s): I. D'Agostino

Abstract:

I have always enjoyed tracking and predicting the effects of hurricanes and tropical storms. There have been many hurricanes in my lifetime including Hurricane Irene and Sandy that devastated the East Coast. I wondered about the effects these storms have on Long Island Sound. I even went to the Napatree Point Conservation area in Westerly Rhode Island and learned that the piece of land I was standing on used to be connected to Stonington, CT. The land was farmland until the 1938 New England Hurricane hit. I want to show the people of Connecticut that there is an effect on water quality in Long Island Sound due to the presence of tropical activity. To show that the water is affected, I tested 3 beaches weekly before and after Hurricanes, Tropical Storms and Tropical Depressions hit Long Island Sound. I focused on testing the pH, Ammonia and Salinity. After analyzing my results I found the average ammonia level before the storms is 0ppm and after it is .25ppm. The average pH before the storm is 8.4ppm and after the storm it is an average 8ppm. The average Salinity before the storm is about 32.2ppt and after the storm the average is about 33.6ppt. This shows that hurricanes have an effect on Long Island Sound that should be monitored as it can lead to negative effects. Any abrupt changes in these readings can have an affect on the marine animals and plants that call the Long Island Sound Estuary their home.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project) EV EA EM

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

☐ human subjects ☐ potentially hazardous biological agents
☐ vertebrate animals ☐ controlled substances

2. Student independently performed all procedures as outlined in this abstract. ☒ Yes ☐ No
3. This project was conducted at a Registered Research Institution. ☐ Yes ☒ No
4. Is this project a continuation? ☐ Yes ☒ No
5. My display board includes photographs/visual depictions of humans (other than myself or my family):

☐ Yes ☒ No

CSEF Official Abstract and Certification

Word Count	Fair Category	Project Number
138	L7	2013

Title: The Effects of Chlorine on Plant Growth

Student Name(s): C. Prieto

Abstract:

Abstract for C. Prieto

Everyone is trying to make their lawns flawless by using fertilizers and special solutions to help the grass grow, but have you ever thought of adding chlorine? This experiment looks at how different water and chlorine solutions would affect plants the most. The plants were watered everyday with a .625 ml chlorine solution(lowest), 2.5ml chlorine solution(medium), 10ml chlorine solution(largest) and plain water, then observed to see how each plant was affected by the solution. My hypothesis was that the fern being watered with the lowest concentration of chlorine will show the most growth. The results supported my hypothesis by showing that the fern being watered with only water stayed healthy while all the others molted and died. The experiment was an overall success and I was able to prove my predictions.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project) PS EV BI

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

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☐ vertebrate animals ☒ controlled substances

2. Student independently performed all procedures as outlined in this abstract. ☒ Yes ☐ No
3. This project was conducted at a Registered Research Institution. ☐ Yes ☒ No
4. Is this project a continuation? ☐ Yes ☒ No
5. My display board includes photographs/visual depictions of humans (other than myself or my family):

☐ Yes ☒ No

CSEF Official Abstract and Certification

Word Count	Fair Category	Project Number
252	L7	2014

Title: Beverage Stains on Teeth

Student Name(s): C. Doran

Abstract:

Do certain beverages have more of a tendency to stain teeth worse than others? Certain foods and drinks have been shown to stain the enamel on your teeth, thus making it difficult for the enamel to protect our teeth from damage. In theory, a hard-boiled eggs shell works similarity to the enamel on a tooth. Both an egg and our tooth's enamel are made up of calcium. Tannins, which are commonly found in coffee, tea and wine are a type of polyphenol that break down in water and cause color compounds to stick to your teeth. When these compounds stick, they can leave an unwanted yellow hue behind. This experiment demonstrates how our beverage choices can impact our teeth.

I hypothesize that if a certain beverage is darker than it would stain darker. Hard-boiled eggs were soaked in ten different beverages at 5, 15, 30, 60 and 120 minutes. The amount of beverage and the time that the eggs soaked in the beverage were constant.

No changes in color appeared when the egg was soaked in water. Coffee displayed the greatest color change within 60 minutes, followed by diet coke at 120 minutes as seen on the Dental Shade Guide. Tea, Orange Juice, and Apple Juice had more moderate changes in color. Red wine, blue and red Gatorade stained the effs so deeply that they could not be measure with the shade guide. Beverages with a lighter shade tend to be the better choice to prevent staining of your teeth.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project) ME

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

☐ human subjects ☐ potentially hazardous biological agents
☐ vertebrate animals ☐ controlled substances

2. Student independently performed all procedures as outlined in this abstract. ☒ Yes ☐ No
3. This project was conducted at a Registered Research Institution. ☐ Yes ☒ No
4. Is this project a continuation? ☐ Yes ☒ No
5. My display board includes photographs/visual depictions of humans (other than myself or my family):

☐ Yes ☒ No

CSEF Official Abstract and Certification

Word Count	Fair Category	Project Number
242	L7	2015

Title: The effect of the amount of charcoal in a water filter to prevent detergent in fresh waters

Student Name(s): C. O'Rourke

Abstract:

Abstract

The Effect Of The Amount Of Charcoal In A Water Filter To Prevent Detergent In Fresh Waters

The purpose of this experiment is to use different amounts of charcoal in different filters, to see which one takes out the most detergent. It is predicted that the filter with the most charcoal is going to remove the most detergent.

I took 3 plastic bottles and layered different amounts of charcoal in each filter. Filter 1 had the most charcoal (340 grams), Filter 2 had the middle amount (227 grams), and filter 3 had the least amount (170 grams). I had 3 bottles for each amount of charcoal resulting in 3 trials. Then I took three clear glasses and poured water and detergent in each glass. I poured the mixture through the filter. Lastly, I tested the pH levels of each solution once it went through the filter. My data showed that the filter with the most charcoal in it, took out the most detergent as measured by the pH. My average pH level for Filter 1 (with the most charcoal) was 8, for Filter 2 (middle amount of charcoal) it was 8.3, and for Filter 3 (Least amount of charcoal) it was 9.3.

I could make my experiment better by getting a mentor that would have a professional pH meter like one made by PCE Instruments. Therefore it is concluded that the filter with the

Technical Disciplines Selected by the Student (Listed in order of relevance to the project) EV

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

☐ human subjects ☐ potentially hazardous biological agents
☐ vertebrate animals ☐ controlled substances

2. Student independently performed all procedures as outlined in this abstract. ☒ Yes ☐ No
3. This project was conducted at a Registered Research Institution. ☐ Yes ☒ No
4. Is this project a continuation? ☐ Yes ☒ No
5. My display board includes photographs/visual depictions of humans (other than myself or my family):

☐ Yes ☒ No

CSEF Official Abstract and Certification

Word Count	Fair Category	Project Number
197	L7	2016

Title: The Irony of Iron

Student Name(s): C. Wilhelm, C. Wilhelm

Abstract:

I was really interested in learning more about iron and the iron in foods. I wanted to know if the amount of iron in certain foods affects how fast the iron absorbs into the cell. I thought that if there would be a higher amount of iron, it would result in quicker absorption. I discovered while doing my tests that the amount of iron in certain foods doesn't affect how fast it absorbs into the cell. I found this out through my project which was a two-step process. Step 1: I took different foods, ground them (if needed), mixed them with water, put the mixture on a magnetic stirrer plate, and inserted a magnetic stirrer "stick" into the mixture. This way I was able to measure the amount of iron in the foods. Step 2: I cut pieces of dialysis tubing, put iron indicator solution inside, and put a tube into each of the mixtures. Then, I timed how long it would take for the iron to absorb into the cell. After testing all of this, I discovered that the amount of iron in certain foods does NOT affect how quickly it absorbs into the cell.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project) CB ME

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

☐ human subjects ☐ potentially hazardous biological agents
☐ vertebrate animals ☐ controlled substances

2. Student independently performed all procedures as outlined in this abstract. ☒ Yes ☐ No
3. This project was conducted at a Registered Research Institution. ☐ Yes ☒ No
4. Is this project a continuation? ☐ Yes ☒ No
5. My display board includes photographs/visual depictions of humans (other than myself or my family):

☐ Yes ☒ No

CSEF Official Abstract and Certification

Word Count	Fair Category	Project Number
110	L7	2017

Title: Natural Preservation Methods that Impede Bread Mold Growth

Student Name(s): M. Nascimento

Abstract:

The purpose of my project was to examine if natural preservatives prevented bread mold growth. Six loaves of homemade bread were baked. Natural additives of ginger, garlic, clove, honey, and cinnamon were added to each respective loaf. One had no natural additive and was the control. The loaves were left in a dark moist environment where mold would start to grow onto the loaves. After letting the mold grow for 14 days, I measured the percentage of the bread that had mold on it using a grid-area method. It was determined that the honey and cinnamon were the most effective natural preservatives because the loaves had no mold growth.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project) MI

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

☐ human subjects ☒ potentially hazardous biological agents
☐ vertebrate animals ☐ controlled substances

2. Student independently performed all procedures as outlined in this abstract. ☒ Yes ☐ No
3. This project was conducted at a Registered Research Institution. ☐ Yes ☒ No
4. Is this project a continuation? ☐ Yes ☒ No
5. My display board includes photographs/visual depictions of humans (other than myself or my family):

☐ Yes ☒ No

CSEF Official Abstract and Certification

Word Count	Fair Category	Project Number
162	L7	2018

Title: The Effects of Fertilizers on the Density of Soil Bacteria

Student Name(s): R. Montanez

Abstract:

The purpose of this experiment was to investigate how fertilizers affect the growth of soil microbes. It was hypothesized that the soil surrounding the plants growing with the assistance of fertilizers will have a increased density of microbes as compared to the soil surrounding the plants growing without the assistance of fertilizers. Lettuce plants were grown with three different types of fertilizers over a two-week period, plus a fourth group with no fertilizers that served as the control. The plants were watered daily with diluted fertilizers solution. Every four days, 1g soil samples were collected from each group and diluted in increments of 10. Samples were streaked onto nutrient agar plates and placed in the incubator for 24 hours at 37˚ C. Colonies from the 10-2 dilution were counted and CFUs (colony forming units) recorded. Results from the four collection days were compared. It was concluded that the hypothesis was proven correct due to increased CFUs in soil treated with fertilizers.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project) MI EV PS

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

☐ human subjects ☒ potentially hazardous biological agents
☐ vertebrate animals ☐ controlled substances

2. Student independently performed all procedures as outlined in this abstract. ☒ Yes ☐ No
3. This project was conducted at a Registered Research Institution. ☐ Yes ☒ No
4. Is this project a continuation? ☐ Yes ☒ No
5. My display board includes photographs/visual depictions of humans (other than myself or my family):

☐ Yes ☒ No

CSEF Official Abstract and Certification

Word Count	Fair Category	Project Number
154	L7	2019

Title: Ocean acidification vs. Mussel filtration

Student Name(s): J. London

Abstract:

I wanted to know how the pH of saltwater could affect the amount of algae filtered by blue mussels. This is important because it can help people become aware that ocean acidification is a threat to wildlife, and this can help determine what the pH level should be at for heathy seafood. I placed live mussels in 4 different bins, each bin containing different levels of pH seawater solutions. I monitored them to see in which pH level the mussels would filter the best in. My hypothesis was correct after testing which pH level muscles can filter best i, I used a colorimeter to measure the amount of algae in the water. The more algae that was filtered, the clearer the water became. My result showed that mussels can filter best when they are in the pH of 8 in my data it shows how the the clarity increases when the pH gets higher.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project) AS EV EM

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

☐ human subjects ☐ potentially hazardous biological agents
☐ vertebrate animals ☐ controlled substances

2. Student independently performed all procedures as outlined in this abstract. ☒ Yes ☐ No
3. This project was conducted at a Registered Research Institution. ☐ Yes ☒ No
4. Is this project a continuation? ☐ Yes ☒ No
5. My display board includes photographs/visual depictions of humans (other than myself or my family):

☒ Yes ☐ No

CSEF Official Abstract and Certification

Word Count	Fair Category	Project Number
199	L7	2020

Title: Cookie Diameter

Student Name(s): K. Nesmith

Abstract:

The purpose of my experiment was to find out if changing the amount of ingredients would change the size of a cookie. To do this I changed the amount of butter in 3 batches of cookies to see the difference in the size. I made three batches of cookies changing the amount of butter each time. After baking them at the same temperature, using the same amount of cookie dough, for the same amount of time and on the same type of cookie sheet, I let them cool and measured their diameter at the widest point. I measured how wide the cookie was in centimeters. I found out that the batch of cookies I made with 1 cup of butter had a diameter of 8.7 centimeters. The second batch of cookies I made with 1 ¼ cup of butter had a diameter of 9.2 centimeters. The last batch of cookies I made with 1 ¾ cup of butter had a diameter of 9.5 centimeters. This supported my hypothesis because I predicted if the amount of butter is increased then the cookie will have a greater diameter. To conclude, the amount of butter does affect the diameter of a cookie.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project) CH EN

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

☐ human subjects ☐ potentially hazardous biological agents
☐ vertebrate animals ☐ controlled substances

2. Student independently performed all procedures as outlined in this abstract. ☒ Yes ☐ No
3. This project was conducted at a Registered Research Institution. ☐ Yes ☒ No
4. Is this project a continuation? ☐ Yes ☒ No
5. My display board includes photographs/visual depictions of humans (other than myself or my family):

☐ Yes ☒ No

CSEF Official Abstract and Certification

Word Count	Fair Category	Project Number
249	L7	2021

Title: do forest fires benefit plant growth?

Student Name(s): N. Divon

Abstract:

For the natural forest ecosystem, forest fires may be beneficial because they increase the availability of macronutrients to plants. I sought to investigate how burned this may happen. I wanted to determine if forest fire ash layered on top of soil versus mixed with soil has a differential effect on plant growth. I hypothesised that ash mixed with soil would be more beneficial to plant growth because the nutrients from the ash would be more available to the seeds and roots. To conduct this experiment, dry forest materials were burned and ash was either layered on top of soil or mixed with soil at a concentration of 12 or 25% ash. Soil alone served as the control. There were three pots of soil for each condition. Ten wheat grass seeds were planted in the soil in each pot. Seed germination and growth was observed daily. The 25% ash on top of the soil group showed the most proliferous growth, with the highest germination rate, and the tallest plants of any group. This was followed by the 25% ash mixed in group. The 12% ash mixed supported approximately the same amount of growth as the 12% of ash layered on top, which was more than the controls. This experiment demonstrated a direct relationship between the amount of ash and the amount of plant growth. My results indicate that ash layered on top of soil, as would be seen after a natural forest fire, results in the most proliferous plant growth.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project) PS EM

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

☐ human subjects ☐ potentially hazardous biological agents
☐ vertebrate animals ☐ controlled substances

2. Student independently performed all procedures as outlined in this abstract. ☒ Yes ☐ No
3. This project was conducted at a Registered Research Institution. ☐ Yes ☒ No
4. Is this project a continuation? ☐ Yes ☒ No
5. My display board includes photographs/visual depictions of humans (other than myself or my family):

☐ Yes ☒ No

CSEF Official Abstract and Certification

Word Count	Fair Category	Project Number
241	L7	2022

Title: My Plastic Place

Student Name(s): S. Bettegowda

Abstract:

The My Plastic Place website and app were both created to make it simpler and interactive for people to log plastic. Plastic pollution has been on the rise and from calculations done around 91% of all plastic is not recycled. My procedure initially was to create an app that logged plastic. I soon decided to instead build a website that also logs plastic instead. The website will be accessed through the app. I started my procedure by making an app flow chart. All the components from the flowchart were not used because I was instead building a website, not an app, but most were. I used the chart as a guide when creating the website. Wix is the website program that I used and Thunkable is the program used to code the app. I tested out the app by inputting test data to ensure that it worked. By inputting test data I saw what I could improve on and eventually change. When creating the app and website, I went through many trials and errors because of the complexity of building the app and the function that I wanted to happen. The main issue, in the end, was the survey attached to the website. The survey does not display the data in the way that I would prefer it to be, so if I can tweak and modify the app and website I would make it easier to display and input data.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project) EM AT CS

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

☐ human subjects ☐ potentially hazardous biological agents
☐ vertebrate animals ☐ controlled substances

2. Student independently performed all procedures as outlined in this abstract. ☒ Yes ☐ No
3. This project was conducted at a Registered Research Institution. ☐ Yes ☒ No
4. Is this project a continuation? ☐ Yes ☒ No
5. My display board includes photographs/visual depictions of humans (other than myself or my family):

☐ Yes ☒ No

CSEF Official Abstract and Certification

Word Count	Fair Category	Project Number
104	L7	2023

Title: Ready Set Grow

Student Name(s): N. Falcao

Abstract:

I thought of the project idea by searching through the internet. This project is investigating the effects of different lights on plants. Artificial light maybe necessary for growing crops in different places like space. The initial prediction was that sunlight would be far superior to artificial light. The hypothesis was proven wrong because the desk lamp LED was the superior. The plants were enclosed in boxes with mazes to guard against external light sources except the one that's supplied. The maze added an extra challenge to the plants. The project is very important to humanity because all of our food requires some plant life.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project) PS

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

☐ human subjects ☐ potentially hazardous biological agents
☐ vertebrate animals ☐ controlled substances

2. Student independently performed all procedures as outlined in this abstract. ☒ Yes ☐ No
3. This project was conducted at a Registered Research Institution. ☐ Yes ☒ No
4. Is this project a continuation? ☐ Yes ☒ No
5. My display board includes photographs/visual depictions of humans (other than myself or my family):

☐ Yes ☒ No

CSEF Official Abstract and Certification

Word Count	Fair Category	Project Number
130	L7	2024

Title: Does Age Affect Memory?

Student Name(s): V. Matkowski, L. Matkowski

Abstract:

I was interested in doing this experiment because I wanted to learn how the human brain works. Does age negatively or positively affect a persons' memory? In this study, l tested the short-term memory capacity of people in different age groups and examine the data to determine if younger people really have a better memory than older people. To perform this experiment I asked people age ranged for 6-60 to remember 15 random objects. I then had them write down which objects they remembered and recorded the results. My results showed that people on the higher end of the age scale remembered more. Overall everyone tended to remember smaller objects over the bigger objects. The results of this experiment show that there is a link between age and memory.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project) BE

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

☒ human subjects ☐ potentially hazardous biological agents
☐ vertebrate animals ☐ controlled substances

2. Student independently performed all procedures as outlined in this abstract. ☒ Yes ☐ No
3. This project was conducted at a Registered Research Institution. ☐ Yes ☒ No
4. Is this project a continuation? ☐ Yes ☒ No
5. My display board includes photographs/visual depictions of humans (other than myself or my family):

☐ Yes ☒ No

CSEF Official Abstract and Certification

Word Count	Fair Category	Project Number
248	L7	2025

Title: Explorations in Flower Freshness

Student Name(s): L. Johndreau

Abstract:

Capillary action explains how water is able to move upward, against the law of gravity, providing hydration for plants. Diffusion explains an ability to spread what a flower needs more widely. Capillary action and diffusion work together to keep flowers fresh. What if flower freshness could be changed by improving capillary action and the concentration of solutes to affect diffusion? My hypothesis is to see if 1cc of sugar in solution with water will result in the freshest flowers because the flowers will respond to a slightly hypertonic solution with red food coloring indicating the effect of capillary action and diffusion of the hypertonic solution on the flower.

Observed data was collected every 7 to 12 hours over 5 days. Many different solutes in solution with water as a common solvent were used to see if patterns could be observed. Red food coloring successfully allowed observations in hydration (capillary rise) to be documented for each of the various flowers and solutes.

The most telling data was that of the final volumes after 5 days. Sugar 1cc and the control were the best at keeping the flower hydrated and fresh. Sugar 1cc was slightly more effective in keeping the daisies and carnations fresher as observed in the wilting data.

In Conclusion, there are ways for capillary action and diffusion to work together keeping

Technical Disciplines Selected by the Student (Listed in order of relevance to the project) PS

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

☐ human subjects ☐ potentially hazardous biological agents
☐ vertebrate animals ☐ controlled substances

2. Student independently performed all procedures as outlined in this abstract. ☒ Yes ☐ No
3. This project was conducted at a Registered Research Institution. ☐ Yes ☒ No
4. Is this project a continuation? ☐ Yes ☒ No
5. My display board includes photographs/visual depictions of humans (other than myself or my family):

☐ Yes ☒ No

CSEF Official Abstract and Certification

Word Count	Fair Category	Project Number
247	L7	2026

Title: Correlation Between Fertilizer Use and Grass Groth

Student Name(s): N. Torres

Abstract:

The overuse of lawn and garden fertilizers has recently been identified as one of the single worst non-point pollution sources affecting our local waterways. It provides the needed nutrients to trigger algae blooms, and ultimately dead zones, which can cause major problems for local fisheries. Most people use excess fertilizers because they are lead to believe it will cause lawns to grow and develop more fully, and faster. This study was designed to evaluate the validity of the claim. Replicated trials of grass seed were exposed to either no fertilizer, a scripted (per manufacturer's specs.) amount of fertilizer, or excess fertilizer. Upon monitoring these samples until germination and examining the biomass that resulted, a consistent and clear pattern emerged ($p<0.05$) that no fertilizer use, or even the scripted amount, produced both the fastest and most dense grass growth. In addition, leachate collected below the samples revealed that the treatments using excess fertilizer not only did not grow as expected, but also showed the highest levels of nitrogen run-off which has the potential to cause algae blooms. It is thought that the background levels of nutrient in the soil are plenty for fast growth and development, and that the most likely factor in reduced growth mave have been a drop in soil pH caused by excess nitrogen as this has been shown in some studies. The role of soil pH in this production mechanism should definitely be the subject of further studies in my opinion.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project) EM EV PS

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

☐ human subjects ☐ potentially hazardous biological agents
☐ vertebrate animals ☐ controlled substances

2. Student independently performed all procedures as outlined in this abstract. ☒ Yes ☐ No
3. This project was conducted at a Registered Research Institution. ☐ Yes ☒ No
4. Is this project a continuation? ☐ Yes ☒ No
5. My display board includes photographs/visual depictions of humans (other than myself or my family):

☐ Yes ☒ No

CSEF Official Abstract and Certification

Word Count	Fair Category	Project Number
230	L7	2027

Title: The Effect of Connecticut and Massachusetts Farmland Water Samples on the Chromogenetic Reagents and Density

Student Name(s): P. Bryan

Abstract:

Pesticides are substances used to destroy and kill other organisms harmful to plants or animals. There are many different kinds of pesticides, including herbicides, insecticides, bactericides etc. Overtime, as pesticide popularity grew as they have become more dangerous, they have begun to start affecting non-targeted organisms. Because of this, many states have begun enforcing pesticide laws, for example, Connecticut. Compared to Massachusetts, Connecticut's laws are much stricter, especially concerning the insecticide Neonicotinoids. To test if these laws are effective, four water samples from four different corn farms in Massachusetts and Connecticut were collected. It was hypothesized that the water samples in Connecticut would have less pesticides compared to the water samples in Massachusetts. Three tests were performed on the water samples: two at home pesticide tests and one density column test. For example, in one density column test, it was concluded that the Karas Farm water sample (Massachusetts) had more pesticides than the Misty Farm's water sample (Connecticut). However, in two separate at home tests, Karas Farm's tested positive and negative for the presence of pesticides. If the procedure were to be developed further, the system for testing should be more accurate. More density tests should also be performed, as only one density column test was fully completed. Overall the hypothesis was proven partially correct, but in the end the results were unclear, and ranged in many different directions.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project) EV EA

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

☐ human subjects ☐ potentially hazardous biological agents
☐ vertebrate animals ☒ controlled substances

2. Student independently performed all procedures as outlined in this abstract. ☒ Yes ☐ No
3. This project was conducted at a Registered Research Institution. ☐ Yes ☒ No
4. Is this project a continuation? ☐ Yes ☒ No
5. My display board includes photographs/visual depictions of humans (other than myself or my family):

☐ Yes ☒ No

CSEF Official Abstract and Certification

Word Count	Fair Category	Project Number
250	L7	2028

Title: Zodiac signs,stress,and puzzles

Student Name(s): K. Elliott

Abstract:

I wanted to see if people's zodiac signs were an indicator of their ability to solve puzzles and handle stress. to do this, I tested people of different zodiac signs to see if they could do a puzzle within 10 minutes. I counted how many pieces they could assemble and measured their heart rate as a stress indicator. I tested 5 of the different zodiac signs with the same puzzle. I let them lay out the puzzle pieces before they had to start to solve the puzzle, when they started to solve the puzzle most of the different zodiac signs hands were fidgeting or shaking and that's how I knew they were stressed. After the 2 minutes I check their heart rate, for most of the zodiac signs it increased, by checking the heart rate this helped me see the amount of stress they got from being rushed into taking the puzzle, also tracking the heart rate helped me know which zodiac sign got more stressed than the other. So, my hypothesis was correct I thought if people of different zodiac signs take the same puzzle then people from specific zodiac signs will show levels of stress and an increase in heart rate, all the zodiac signs were stressed and did feel rushed due to the time limit. This project helped me see that different zodiac signs do not appear to have an affect on stress and being rushed to organizing and finishing anything constructive in an amount of time.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project) BE

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

☒ human subjects ☐ potentially hazardous biological agents
☐ vertebrate animals ☐ controlled substances

2. Student independently performed all procedures as outlined in this abstract. ☒ Yes ☐ No
3. This project was conducted at a Registered Research Institution. ☐ Yes ☒ No
4. Is this project a continuation? ☐ Yes ☒ No
5. My display board includes photographs/visual depictions of humans (other than myself or my family):

☐ Yes ☒ No

CSEF Official Abstract and Certification

Word Count	Fair Category	Project Number
223	L7	2029

Title: SHOWDOWN OF THE SUGARS: EFFECT OF SUGAR SUBSTITUTES ON YEAST GROWTH

Student Name(s): E. Baltrukonis

Abstract:

The purpose of my project was to determine what sugar substitute worked best for fermenting yeast for bread. The sugars I used are Stevia and Coconut palm sugar. Granulated sugar was my control, as it what is used in most recipes. Granulated sugar is 60% fructose, 20% glucose, and 20% water. Stevia is dextrose with Maltodextrin and Stevia Leaf Extract. Finally, organic Coconut Palm is made of the dehydrated sap of the coconut palm which contains 70-80% sucrose. The yeast I used is Red Star Baker's Yeast. I measured how much CO2 the yeast produced with each sugar by putting a balloon over the mouth of the bottle. I measured the circumference every 5 minutes for 45 minutes. The yeast that produced the most carbon dioxide was with granulated sugar while Coconut Palm sugar and low calorie Stevia produced less carbon dioxide. The results of the Coconut Palm sugar runs were very inconsistent with only one out of the three runs activating the yeast fully. The other two did not appear to grow and no foam appeared. The conclusions from this study are that Coconut palm and Stevia are not as effective is activating and growing yeast as granulated sugar. If you were to bake bread with these substitutes you would likely need to add more of these sugars or use more yeast.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project) MI BI CB

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

☐ human subjects ☐ potentially hazardous biological agents
☐ vertebrate animals ☐ controlled substances

2. Student independently performed all procedures as outlined in this abstract. ☒ Yes ☐ No
3. This project was conducted at a Registered Research Institution. ☐ Yes ☒ No
4. Is this project a continuation? ☐ Yes ☒ No
5. My display board includes photographs/visual depictions of humans (other than myself or my family):

☐ Yes ☒ No

CSEF Official Abstract and Certification

Word Count	Fair Category	Project Number
163	L7	2030

Title: Calcium's Effect on Bone Decay

Student Name(s): L. Fagan

Abstract:

Doctors always advise people with decaying bones or osteoporosis (a condition which makes one's bones brittle and weak) to eat more calcium-rich foods, or even consume calcium supplements, but are they actually effective at delaying bone decay? This project puts those calcium tablets to the test by soaking chicken leg bones in vinegar and varying doses of calcium tablets. Cooked chicken bones were separated into groups of 3. The bones were soaked in vinegar, and either 1, 2, or 3 calcium tablets were added as well. The hypothesis stated that the bones soaked in more calcium would weigh more and also be more dense. The experiment's results supported that hypothesis, and showed that adding more calcium helped delay bone decay. This was true because they weighed more and were still rigid while the ones without as much calcium were rubbery. In conclusion, people suffering from osteoporosis, or have weak bones, should consume calcium tablets to stave off bone decay, and stay healthy.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project) ME AS

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- ☐ human subjects
- ☐ potentially hazardous biological agents
- ☐ vertebrate animals
- ☒ controlled substances

2. Student independently performed all procedures as outlined in this abstract. ☒ Yes ☐ No
3. This project was conducted at a Registered Research Institution. ☐ Yes ☒ No
4. Is this project a continuation? ☐ Yes ☒ No
5. My display board includes photographs/visual depictions of humans (other than myself or my family):

☐ Yes ☒ No

CSEF Official Abstract and Certification

Word Count	Fair Category	Project Number
250	L7	2031

Title: Preventing Cross Contact of Food Allergens

Student Name(s): S. Averaimo

Abstract:

My experiment is about cross contact of food allergens and the best way to avoid it. I am highly allergic to milk/dairy and can have an anaphylactic reaction if I ingest it. This means I can have symptoms that are serious and life threatening. In order to keep people with food allergies safe, they must avoid their food allergens. Cross contact is when a food allergen is accidentally transferred to a normally safe food. My experiment shows how quickly and easily food allergens can spread if hands are not washed properly. My hypothesis is if hand washing is not done properly then food allergens will spread to 15 or more people. I used glitter to represent the food allergen and asked people to shake hands. My results were recorded after people did not wash their hands, washed hands with sanitizer, and washed hands with soap and water. My hypothesis was proven incorrect because the average number of people that the food allergen spread to was between 10-14 people. However, it still shows the dangers of cross contact when hands are not washed properly. When comparing hand sanitizer versus soap and water, the food allergen spread significantly less when using soap and water. The average number of hands left with glitter after hand sanitizer was 5-10 compared to 1-3 when washed with soap and water. I feel that my experiment made more people aware of food allergies, the dangers of cross contact and the simple step of proper hand washing.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project) ME BE

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

☒ human subjects ☐ potentially hazardous biological agents
☐ vertebrate animals ☐ controlled substances

2. Student independently performed all procedures as outlined in this abstract. ☒ Yes ☐ No
3. This project was conducted at a Registered Research Institution. ☐ Yes ☒ No
4. Is this project a continuation? ☐ Yes ☒ No
5. My display board includes photographs/visual depictions of humans (other than myself or my family):

☐ Yes ☒ No

CSEF Official Abstract and Certification

Word Count	Fair Category	Project Number
248	L8	2501

Title: Concentration of Microplastics In Four Farmington River Locations

Student Name(s): L. Marze

Abstract:

Plastic has become a universally used material with impacts spanning the entire globe. Our riverways have become inundated with plastic pollution that will stay in our ecosystems for centuries. My project studied this plastic problem in Connecticut's Farmington River, a waterway with great economic and geological significance. My research strived to find the region of the Farmington River most concentrated with microplastics. I predicted that the lower section of the Farmington River would be the most inundated with microplastics due to movement of particles downstream and retention of microplastics from the preceding river sections. I collected data from four sections of the river: the beginning section above Colebrook Reservoir, the upper section below Colebrook Reservoir, the middle section, and the lower section. I took 12 total 1 liter water samples and filtered them onto 47mm, 0.45um gridded filters using a vacuum chamber. I analyzed the filters and counted the microplastics under the microscope. As predicted by my hypothesis, the location on the lower section of the Farmington River contained the greatest amount of microplastics. This location totaled 13 microplastics across my three samples in October, November, and February respectively. The upper sections of the Farmington River contained a lower amount of 9-10 microplastics. The high amount of microplastics in my lower location was influenced by the retention of microplastics from waste water treatment plants (WWTP), the high recreational use of the location, and the proceeding volume of water that released accumulated microplastics from the banks of the river.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project) EV

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

☐ human subjects ☐ potentially hazardous biological agents
☐ vertebrate animals ☐ controlled substances

2. Student independently performed all procedures as outlined in this abstract. ☒ Yes ☐ No
3. This project was conducted at a Registered Research Institution. ☐ Yes ☒ No
4. Is this project a continuation? ☐ Yes ☒ No
5. My display board includes photographs/visual depictions of humans (other than myself or my family):

☐ Yes ☒ No

CSEF Official Abstract and Certification

Word Count	Fair Category	Project Number
85	L8	2502

Title: Tumor Suppression on Agrobacterium tumefaciens in Daucus carota

Student Name(s): M. Sousa

Abstract:

The purpose of this project is to determine if three herbs and spices (turmeric, rosemary, ginger) impacted cancerous tumor growth in carrots. Sterile carrot slices were inoculated with Agrobacterium tumefaciens and grown on agar plates. A (1) negative control (carrot only), (2) positive control (carrot and A. tumefaciens), (3) turmeric, (4) rosemary, and (5) ginger were grown. Results indicated that ginger was most effective at reducing cancer growth. Rosemary was also effective, however tumeric did not impact growth and was similar to the positive control.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project) MI

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

☐ human subjects ☐ potentially hazardous biological agents
☐ vertebrate animals ☐ controlled substances

2. Student independently performed all procedures as outlined in this abstract. ☒ Yes ☐ No
3. This project was conducted at a Registered Research Institution. ☐ Yes ☒ No
4. Is this project a continuation? ☐ Yes ☒ No
5. My display board includes photographs/visual depictions of humans (other than myself or my family):

☐ Yes ☒ No

CSEF Official Abstract and Certification

Word Count	Fair Category	Project Number
251	L8	2503

Title: The Effects of Three Macro-nutrients on the Reaction Time of Human Subjects

Student Name(s): I. Shelbaya

Abstract:

Diets low in carbohydrates are very popular among people trying to lose weight. Some low carb diets emphasize eating large amounts of protein; others emphasize eating large amounts of fat. People claim these diets have health, fitness, and mental benefits. But traditionally, health and fitness professionals have said that carbohydrates are actually best for your health and performance.

One experiment that was done with 661 people showed that the people who ate a majority of fat and protein had slow brain functions. However, the people in the study who ate more carbohydrates had normal brain functions.

I wanted to see for myself what nutrients increase and decrease a person's reaction time. I decided to evaluate the reaction times of seven subjects after eating a specific food with one predominant macro-nutrient: simple carbohydrates, complex carbohydrates, fat, or protein. I chose to measure reaction time because reaction time has a relationship both to brain function and muscle control. I used an online test of reaction time to determine their reaction time from 30 minutes till two hours after eating each food. Further trials were repeated to increase accuracy.

I hypothesized that simple carbohydrates would decrease a person's reaction time and that the complex carbohydrates would increase a person's reaction time the most. My results were partially as I expected. For the second set of trials, complex carbohydrates gave the fastest results at all time points; however, for the first set of trials, simple carbohydrates gave the fastest results at all time points.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project) ME BI AS

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

☒ human subjects ☐ potentially hazardous biological agents
☐ vertebrate animals ☐ controlled substances

2. Student independently performed all procedures as outlined in this abstract. ☒ Yes ☐ No
3. This project was conducted at a Registered Research Institution. ☐ Yes ☒ No
4. Is this project a continuation? ☒ Yes ☐ No
5. My display board includes photographs/visual depictions of humans (other than myself or my family):

☐ Yes ☒ No

CSEF Official Abstract and Certification

Word Count	Fair Category	Project Number
250	L8	2504

Title: Cigarettes vs Vaping

Student Name(s): N. Belinski

Abstract:

Have you ever wondered what your lungs look like after you smoke? I sometimes wonder because my father smokes, so I decided to do my project on cigarettes vs vape pens in hopes to find which one would be better for your lungs. For my experiment, I used two jars both filled with cotton balls. Both jars had a hole made in the lid with a NPT fitting and tube attached. I then connected the pump and the second tube. Next I secured a cigarette to one jar and the vape pen to the other jar. The pump will pull the smoke in as if you were smoking. As the jar fills with smoke it will show you what would happen to your lungs by observing the cotton balls. For my hypothesis, I stated that I thought the cigarettes would make the cotton turn brown and the vape pen would make the cotton turn wet. During my experiment I started with one cigarette and the cotton started to change immediately. I continued with ten more followed by 20. The cotton continued to get more brown. With the vape pen I did 50 Puffs and nothing happened, followed by 50 more puffs and still nothing, I continued with 200 puffs and the cotton became wet with condensation in the jar. In conclusion, My results were as I expected. What I ultimately learned from this project is If you are thinking about smoking just say No! Your body will thank you later.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project) ME

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- ☐ human subjects
- ☐ potentially hazardous biological agents
- ☐ vertebrate animals
- ☒ controlled substances

2. Student independently performed all procedures as outlined in this abstract. ☐ Yes ☒ No
3. This project was conducted at a Registered Research Institution. ☐ Yes ☒ No
4. Is this project a continuation? ☐ Yes ☒ No
5. My display board includes photographs/visual depictions of humans (other than myself or my family):

☐ Yes ☒ No

CSEF Official Abstract and Certification

Word Count	Fair Category	Project Number
176	L8	2505

Title: soil vs water; is hydroponics a new alternative way to garden

Student Name(s): a. addepalli

Abstract:

Is it possible to grow plants without soil? How will they get the nutrients they need if plants are grown only grown in water? Well there is another way to grow plants in a faster and more efficient way. Its is called hydroponics. Hydroponics is the method of gardening where you use only nutrient filled water to grow plants.Even though my hypothesis was proven wrong, the hydroponically grown plants did not grow taller than the plants grown in soil, it is scientifically proven that hydroponics helps plants to grow taller and faster because the right blend of nutrients are directly delivered to the root system. I tested this by making a hydroponic system out of PVC pipes and and a large container, filling it with water and adding sprinklers to distribute it even to the set of plants being hydroponically grown. I also had a set of plants in soil, having light and being watered. Although hydroponics is not a popular method of gardening, it is a future alternative source that is helpful for our economy.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project) PS

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

☐ human subjects ☐ potentially hazardous biological agents
☐ vertebrate animals ☐ controlled substances

2. Student independently performed all procedures as outlined in this abstract. ☒ Yes ☐ No
3. This project was conducted at a Registered Research Institution. ☐ Yes ☒ No
4. Is this project a continuation? ☐ Yes ☒ No
5. My display board includes photographs/visual depictions of humans (other than myself or my family):

☐ Yes ☒ No

CSEF Official Abstract and Certification

Word Count	Fair Category	Project Number
172	L8	2506

Title: What's The Tea?

Student Name(s): P. Kalidasan

Abstract:

In my project I used compost tea that was soaked for different time periods to see which one worked the best to increase a plants growth and number of leaves. Compost tea is a blend of water and compost that creates an organic and beneficial mixture to help a plants growth and its health. In order to see how it affected a plants growth, I soaked water in compost for 1 hour, 1 day, 4 days, 1 week and control that received just water. My hypothesis was that the plants that received the compost tea soaked for 4 days would work the best because it has enough time for most of the compost to blend in and won't over fertilize the plants. After I collected my data, I found out that the plants that received the 1 hour tea had the most growth, 8.833 centimeters. The plants also had the highest increase in leaves, 30.66 leaves. From this I concluded that plants that receive the 1 hour tea will thrive the best.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project) PS EA EV

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

☐ human subjects ☐ potentially hazardous biological agents
☐ vertebrate animals ☐ controlled substances

2. Student independently performed all procedures as outlined in this abstract. ☒ Yes ☐ No
3. This project was conducted at a Registered Research Institution. ☐ Yes ☒ No
4. Is this project a continuation? ☐ Yes ☒ No
5. My display board includes photographs/visual depictions of humans (other than myself or my family):

☐ Yes ☒ No

CSEF Official Abstract and Certification

Word Count	Fair Category	Project Number
200	L8	2507

Title: Beans and Leaves

Student Name(s): L. Onyia, J. Tanguay

Abstract:

The purpose of the project was to see how different types of liquids affect the growth of a plant and how the different liquids affect the overall outcome of the beans. Caffeine is a chemical stimulant that not only increases the biological processes of a human, but plants as well. Salt, consists of 40% sodium and 60% chloride (by weight). This experiment not only shows how different liquids affect the growth of a plant, but it proves that caffeine truly does speed up the growing time of beans. To improve this project, there could have been at least two months of growing the beans to see how much it could have grown. There could also have been more attention to the plants to understand how and what was going on with the growing. Overall the coffee watered plant had shown excellent growth by the time it was observed during the first week. The salt watered plant did not grow at all but formed salt crystals on the soil and cup. The control plant grew at its natural speed and the hypothesis was supported since the caffeinated plant germinated faster than the control and the salt water plant did not grow.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project) PS

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

☐ human subjects ☐ potentially hazardous biological agents
☐ vertebrate animals ☐ controlled substances

2. Student independently performed all procedures as outlined in this abstract. ☒ Yes ☐ No
3. This project was conducted at a Registered Research Institution. ☐ Yes ☒ No
4. Is this project a continuation? ☐ Yes ☒ No
5. My display board includes photographs/visual depictions of humans (other than myself or my family):

☐ Yes ☒ No

CSEF Official Abstract and Certification

Word Count	Fair Category	Project Number
237	L8	2508

Title: Cabbage Patch Kids

Student Name(s): N. Radliff

Abstract:

Purpose:

The purpose of my experiment is to determine which part of a cabbage plant regrows, or clones, the best. My hypothesis was, "If I test the regrowth of different sections of cabbage plants, then the bottom portions and tops of the plant sections will grow the most."

Procedure Used:

To conduct my experiment, I cut three cabbage plants each into three sections and then placed them in bags with damp paper towels. Finally, I blew into the bag to supply the plant sections with carbon dioxide and sealed the bags. I opened them once every week to observe the plant sections' progress.

Results:

I found that the bottom sections of the cabbage plants had grown the most and the top sections had grown the least. The middle sections grew slightly less than the bottom sections.

Conclusions:

Based on my experiment, I found that the bottom sections of cabbages cloned the best, just as was predicted in my hypothesis. Contrary to my hypothesis, the top sections grew the least. Since the cabbage sections remained in the bags for the entire experiment, a suggestion for further experiments is to remove the plant sections from the sealed bags once roots have formed in order to prevent the plant sections from rotting due to excess moisture. A couple of

Technical Disciplines Selected by the Student (Listed in order of relevance to the project) PS

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☐ vertebrate animals ☐ controlled substances

2. Student independently performed all procedures as outlined in this abstract. ☒ Yes ☐ No
3. This project was conducted at a Registered Research Institution. ☐ Yes ☒ No
4. Is this project a continuation? ☐ Yes ☒ No
5. My display board includes photographs/visual depictions of humans (other than myself or my family):

☐ Yes ☒ No

CSEF Official Abstract and Certification

Word Count	Fair Category	Project Number
117	L8	2510

Title: Testing Escherichia coli's Resistance to Bacteriophage Coliphage T4 and Coliphage T4r

Student Name(s): S. Serpa-Smith

Abstract:

The purpose of this project was to determine how bacteriophage T4 and T4r impacted the growth and plaque formation Escherichia coli. Different phages (T4, T4r) at different concentrations (102, 104) were infected into E. coli to observe the formation of plaques. The results came back as the T4 104 having 1240 plaques, the T4r 104 having 203, T4r 102 having 71, and lastly the T4 102 having 33 plaques. Overall the E. coli plates showed that when bacteriophage T4 104 and T4r 104 was introduced to the E.coli more plaques grew, showing that the E.coli could not resist the bacteriophage as well as they did for the T4 102 and T4r 102 bacteriophage, which were lower concentrations.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project) MI

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

☐ human subjects ☐ potentially hazardous biological agents
☐ vertebrate animals ☐ controlled substances

2. Student independently performed all procedures as outlined in this abstract. ☒ Yes ☐ No
3. This project was conducted at a Registered Research Institution. ☐ Yes ☒ No
4. Is this project a continuation? ☐ Yes ☒ No
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☐ Yes ☒ No

CSEF Official Abstract and Certification

Word Count	Fair Category	Project Number
250	L8	2511

Title: A Big Fan of Turbines

Student Name(s): J. Lacasse

Abstract:

Have you ever wondered if there was a wind turbine blade that could create more energy? Is the long turbine blade you most commonly see today the best one? That is what I wanted to find out, my question was will the shape of the turbine impact the DC output? My hypothesis was if the turbine has a bigger quantity of blades that are bigger in size then it will create more energy. During my experiment I tested four different turbine blade shapes; a short blade, a claw blade, a knife blade, and a long blade, I tested these blades because they are all different shapes and styles to see the impact on energy output. To test my project I used a multimeter, which conected to the motor, to find the DC output.

At the end of my project I collected my results and found out that the knife blade was the best turbine blade out of the ones I tested. I think that the knife blade did the best because it was long and the tip was curved, which helped it to cut through the air better. The long blade picked up a lot of air which lead to the second highest output. The claw blade came in third because it is hooked and scooped more energy that the shortest blade. The short blade came in last place due to the fact that is not long or curved and did not pick up as much wind as the others.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project) EN

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

☐ human subjects ☐ potentially hazardous biological agents
☐ vertebrate animals ☐ controlled substances

2. Student independently performed all procedures as outlined in this abstract. ☒ Yes ☐ No
3. This project was conducted at a Registered Research Institution. ☐ Yes ☒ No
4. Is this project a continuation? ☐ Yes ☒ No
5. My display board includes photographs/visual depictions of humans (other than myself or my family):

☐ Yes ☒ No

CSEF Official Abstract and Certification

Word Count	Fair Category	Project Number
168	L8	2512

Title: Heart Rate Monitor for Autism Spectrum Disorder

Student Name(s): J. Wang

Abstract:

This paper proposes a heart rate monitoring system that can detect and alarm others that the Autism Spectrum disorder (ASD) patient will take some abnormal actions. The patient's parents will also get the alarm on their phone through an App to prevent the unnecessary injury to the patient. Through the Computer data visualization, the parents can detect their children's physical condition at home as well. Other similar products can only get the heart rate collection of the patient but can't do the real time data processing and transmission to the patient guardian. Also compared with similar products, our product is low-cost and user-friendly. The pulse sensor uses photoplethysmography (PPG). PPG is a non-invasive method of measuring the variation in blood volume in tissue using a light source and detector. When a heartbeat happens, blood volume inside artery changes. The detector can sense the change in blood volume with the help of the LED light. And our testing outputs show that all proposed functions are realized.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project) ME EE CS

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

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☐ vertebrate animals ☐ controlled substances

2. Student independently performed all procedures as outlined in this abstract. ☒ Yes ☐ No
3. This project was conducted at a Registered Research Institution. ☐ Yes ☒ No
4. Is this project a continuation? ☐ Yes ☒ No
5. My display board includes photographs/visual depictions of humans (other than myself or my family):

☐ Yes ☒ No

CSEF Official Abstract and Certification

Word Count	Fair Category	Project Number
248	L8	2513

Title: THE EFFECT OF FIRE DURATION ON REFORESTATION RATE

Student Name(s): A. Cristaudo

Abstract:

The objective of my experiment was to see if the amount of time that grass is on fire affects how tall the grass grows back. How I conducted this experiment is, I had three planter boxes and used two cardboard separators in each planter box to create three separate trials for the different amounts of time. I put the grass seed and soil into each section(same amount). After I did that, I held a blow torch over the one minute sections five centimeters above the grass. Then I did the same exact thing for the two and the three minute one, just different amounts of time. I then let it remain undisturbed and untouched for two weeks. After the two weeks were over, I planted the same amount of grass seed I planted in the beginning over the burnt grass and grew it for another two weeks, watering it everyday

It was predicted that the grass that was burned for one minute would grow back almost all the way, the grass that was burned for two minutes would grow back to five cm and the grass that was burned for three minutes would grow back to only three cm.in the end was the grass that was burned for one minute grew to three cm less than it started, the grass that was burned for two minutes grew back to about eight cm and, the grass that was burned for three minutes grew back to only two cm.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project) EM EA PS

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

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☐ vertebrate animals ☒ controlled substances

2. Student independently performed all procedures as outlined in this abstract. ☒ Yes ☐ No
3. This project was conducted at a Registered Research Institution. ☐ Yes ☒ No
4. Is this project a continuation? ☐ Yes ☒ No
5. My display board includes photographs/visual depictions of humans (other than myself or my family):

☐ Yes ☒ No

CSEF Official Abstract and Certification

Word Count	Fair Category	Project Number
234	L8	2514

Title: Fertilized plant effect

Student Name(s): K. Philoche

Abstract:

In my project the fertilized plant effect, I made a homemade fertilized plant house in which I used a plastic bag to cover a bucket, as my layout. The buckets were full of not fertilized and fertilized pre-planted and planted plants. I wanted to do this project to see if an actual affects the way plants grow with and without fertilizer. My hypothesis was disproved because I thought the fertilizer will help the plants that I used. The fertilizer killed the vegetable, flowers, and killed the pre-planted flower that was fertilized. In conclusion, my project the Fertilized Plant Effect thee out of five plants did not survive throughout the process. The pre-planted Aloe and Spider plants grew with and without fertilizer throughout my experiment. I think that the fertilizer was too strong of an effect for the Coleus, Basil, and Forget me not plants. One thing I would've done differently in this experimental project is the fertilizer i used on my plants. I think that i will use a (organic) fertilizer, because I used jacks plant food fertilizer to see whether or not it'll help the plants grow faster, and mass height. In particular, heat will exert a strong force on the plants growing process. Overall my project turned out very well for two out of three of the pre-planted plants that are desert plants to grow a various amount.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project) PS EV EN

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

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☐ vertebrate animals ☐ controlled substances

2. Student independently performed all procedures as outlined in this abstract. ☒ Yes ☐ No
3. This project was conducted at a Registered Research Institution. ☐ Yes ☒ No
4. Is this project a continuation? ☐ Yes ☒ No
5. My display board includes photographs/visual depictions of humans (other than myself or my family):

☐ Yes ☒ No

CSEF Official Abstract and Certification

Word Count	Fair Category	Project Number
109	L8	2515

Title: The Effect of Habitat loss on a Cockroach's stress and well-being.

Student Name(s): K. Salvatore

Abstract:

The purpose of this project is to see how habitat loss affects a cockroach's stress and well-being. How does habitat loss affect cockroach's stress and well-being? If there is plant reduction in their habitat then the cockroaches will become stressed. 2 tanks with 10 plants were set up, every day one plant was taken away from one enclosure. The heart rate was measured every day. From the data, it was observed that as the number of plants decreased the heart rate, in my cockroaches increased. The hypothesis of If there is plant reduction in their habitat then the cockroaches will become stressed was supported by my data.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project) AS BE EV

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

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☐ vertebrate animals ☐ controlled substances

2. Student independently performed all procedures as outlined in this abstract. ☒ Yes ☐ No
3. This project was conducted at a Registered Research Institution. ☐ Yes ☒ No
4. Is this project a continuation? ☐ Yes ☒ No
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☐ Yes ☒ No

CSEF Official Abstract and Certification

Word Count	Fair Category	Project Number
139	L8	2517

Title: The Sweet Life of Yeast

Student Name(s): B. Peterson

Abstract:

I believe yeast in an anærobic environment will create more CO2 due to the fact that it will consume more sugar. I will research and experiment to answer the question I have asked. In my experiment I will attempt to find the amount of CO2 produced by both of the environments. The results hopefully will show which environment to put the yeast into to allow it to let bread and dough and batter to rise. This is useful in real life for people like breadmakers and master bakers. According to my research, yeast can switch between breathing air and eating. during the time when it is consuming air, it is less focused on consuming the sugar than when there is no air in the environment. The experiment will show whether this is true and if my hypothesis is correct.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project) BI

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

☐ human subjects ☐ potentially hazardous biological agents
☐ vertebrate animals ☐ controlled substances

2. Student independently performed all procedures as outlined in this abstract. ☒ Yes ☐ No
3. This project was conducted at a Registered Research Institution. ☐ Yes ☒ No
4. Is this project a continuation? ☐ Yes ☒ No
5. My display board includes photographs/visual depictions of humans (other than myself or my family):

☐ Yes ☒ No

CSEF Official Abstract and Certification

Word Count	Fair Category	Project Number
237	L8	2518

Title: The Effect of Vinegar on Plants' Resistance to Drought

Student Name(s): T. Fahey

Abstract:

Drought conditions are increasingly more common and a major concern for the survival of staple food sources and the farming industry. In pants, acetate (a salt formed by acetic acid, and the main component of vinegar), has been found to enhance plants tolerance to drought. The use of vinegar is safe and can be an inexpensive means to help plants and food sources better survive drought. The hypothesis for this experiment was "If seeds are exposed to a 0.5% vinegar solution, a 1% vinegar solution, a 2% vinegar solution, a 5% vinegar solution, a 10% vinegar solution, and a control solution, then a 2% vinegar solution will increase the plants' resistance to drought the most." Garden cress seeds were soaked in different concentrations of vinegar solutions along with a control solution of tap water for 24 hours, then transferred to soil and watered each day for 11 days until watering stopped to simulate drought conditions. The plant growth was observed and measured over 30 days. The hypothesis was not supported because the plants grown from the 1% solution maintained the most height for the longest duration after the onset of drought, but it did demonstrate that low concentrations of vinegar (up to 1%) helped the plants maintain their height during drought conditions better than no vinegar, but that higher concentrations of vinegar (greater than 1%) adversely affected the growth of the plants and percentage of seeds sprouted.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project) PS

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

☐ human subjects ☐ potentially hazardous biological agents
☐ vertebrate animals ☐ controlled substances

2. Student independently performed all procedures as outlined in this abstract. ☒ Yes ☐ No
3. This project was conducted at a Registered Research Institution. ☐ Yes ☒ No
4. Is this project a continuation? ☐ Yes ☒ No
5. My display board includes photographs/visual depictions of humans (other than myself or my family):

☐ Yes ☒ No

CSEF Official Abstract and Certification

Word Count	Fair Category	Project Number
219	L8	2519

Title: Road Salt vs. Eco-Friendly Ice Melt

Student Name(s): J. Murphy

Abstract:

How does sugar affect plant life compared to road salt? I am doing this project because every winter, road salt harms aquatic life. Last year, I created model ponds, added different amounts of road salt, and recorded its effects on aquatic plants over a two-week period. This year, I set up three model ponds for each of my three trials, with varying amounts of sugar placed on a stone slab. For two weeks, every other day, I sprayed the sugar 60 times and the water dripped into the ponds. Results after the two-week test period were on average, the same across all three trials. The model with no sugar had plants that thrived. The model with ¼ cup sugar, had plants with roots and leaves that were green but began to curl and discolor. The model with ½ cup sugar had plants that were brown and the roots were damaged. I was able to test how sugar affects plant life. Last year, I found that road salt negatively affects plant life. I compared those results to see how sugar affects plant life, and they both affect our wildlife in a negative way. The sugar had slightly better outcomes. If I were to continue this experiment, I would use different plants to test how road salt affects them.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project) PS EV

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

☐ human subjects ☐ potentially hazardous biological agents
☐ vertebrate animals ☐ controlled substances

2. Student independently performed all procedures as outlined in this abstract. ☒ Yes ☐ No
3. This project was conducted at a Registered Research Institution. ☐ Yes ☒ No
4. Is this project a continuation? ☒ Yes ☐ No
5. My display board includes photographs/visual depictions of humans (other than myself or my family):

☐ Yes ☒ No

CSEF Official Abstract and Certification

Word Count	Fair Category	Project Number
119	L8	2520

Title: Citric Acid Synthesis Using Aspergillus niger

Student Name(s): A. Amatulli

Abstract:

The purpose of this project is to optimize the microbiological synthesis of citric acid. Citric acid is a highly-valued industrial food chemical. This will be tested by using Aspergillus niger in combination with different sugar sources (cane, corn syrup, honey, molasses). Samples were grown in a 28oC controlled environment with a homemade sterile growth medium made from potatoes. pH strips were used qualitatively to indicate the presence of acid. Then, to quantify the results, a standard curve was created using known concentrations of citric acid titrated with NaOH using phenolphthalein as a color indicator. Cane sugar (sucrose) and honey produced the highest concentrations of citric acid and corn syrup and molasses produced similar, lower concentrations of citric acid.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project) MI

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☐ vertebrate animals ☐ controlled substances

2. Student independently performed all procedures as outlined in this abstract. ☒ Yes ☐ No
3. This project was conducted at a Registered Research Institution. ☐ Yes ☒ No
4. Is this project a continuation? ☐ Yes ☒ No
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☐ Yes ☒ No

CSEF Official Abstract and Certification

Word Count	Fair Category	Project Number
245	L8	2521

Title: The Effects of Magnesium Chloride on Water Quality

Student Name(s): A. Pandalai

Abstract:

For ten consecutive weeks, I tested the pH and salinity levels in three locations in Stamford, CT. The Rippowam River flows through suburban and high populated areas in Stamford, hence runoff from houses, pollution, excess nutrients, and road salts can disrupt/affect the water. During the colder times of testing, mid-December to January, the pH, and salinity levels reached such as 9.42 and 51 parts per thousand respectively. I saw that pH levels would fluctuate between levels that were safe for organisms and dangerous to them. The salinity levels too would reach amounts that aren't safe to some aquatic animals and plants.

When completing my ten weeks' worth of research, I tested out a hypothesis on fast-growing plants for the month of February. I wanted to know the amount of impact magnesium chloride/road salts had on water quality and its effect on plants. Using three of the same type of plant, I had multiple constants, except for the quality of the water. Plant A was grown with freshwater, whereas Plants B and C were grown with water that contained varying amounts of salts. Plant B received 1/2 spoon of salt in its water every day, and Plant C received 3/2 spoons of salt in its water every day (seeds are small, and growing area is small - hence, calling for only spoons and not cups of salt).

In the future, I foresee testing more locations along the Rippowam river along with nitrate levels.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project) EV PS

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2. Student independently performed all procedures as outlined in this abstract. ☒ Yes ☐ No
3. This project was conducted at a Registered Research Institution. ☐ Yes ☒ No
4. Is this project a continuation? ☒ Yes ☐ No
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CSEF Official Abstract and Certification

Word Count	Fair Category	Project Number
250	L8	2522

Title: Anti-Bacterial Packaging For Foods Sourced From Natural Bee Propolis

Student Name(s): Z. Agirman

Abstract:

The purpose of this study is to discover if it is possible for bee propolis to slow down the process of decomposition in food products. In this experiment, sheets of uniform tissue paper were soaked into bee propolis solution. After letting the tissue paper dry, it was wrapped around oranges that were going to be tested for rate of decomposition. Each set of oranges were wrapped in tissue paper containing different concentrations of propolis: 0%, 5%, 10%, and 15%. According to "Propolis: a wonder bees product and its pharmacological potentials", bee propolis has the ability to kill viruses, bacteria, and fungi, ultimately explaining why bees use it in their hives. This property of bee propolis is what could potentially slow down the rate of decomposition. The propolis will discard the decomposers that are trying to break down the oranges, which normally would make them rot. In addition to this, it has a cytotoxicity characteristic to it, making it toxic to any living cells, particularly bacteria. This means that there is a huge possibility that the oranges with the bee propolis will have no other type of cells and bacteria living on it or entering it. This experiment tested whether the properties found in bee propolis slow down decomposition in food products by eradicating natural decomposers such as bacteria. The test results show that the oranges wrapped in regular or 0% bee propolis solution have more deformation and weigh less due to decomposition than the oranges wrapped in 15% bee propolis.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project) CH EV

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3. This project was conducted at a Registered Research Institution. ☒ Yes ☐ No
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CSEF Official Abstract and Certification

Word Count	Fair Category	Project Number
202	L8	2523

Title: The Effect of Detergent on Plants

Student Name(s): H. Poklemba

Abstract:

Who doesn't want to grow healthier, stronger plants? I wanted to see what would happen if I watered and fed my plants different detergent mixtures. My experiment solved the question – How does detergent affect the growth of plants? I started by carefully inspecting five plants to make sure they were healthy and in the same condition. I chose a control plant and then labeled the four additional plants as laundry, bath, dish and hand. I mixed 1tsp. of each detergent with ¼ cup of distilled water and watered each plant at the same time every day for 7 days (the control plant only received water). I then measured the height and width of each plant daily and recorded those results, and noted the overall condition of the plants as well. I found that the plants continued to grow by ¼ - 1in. in height and width even though they received detergent and water. I was most surprised to find that the decline was most visible in the deteriorating condition of the plants as 4 out of the 5 plants all showed dead and wilting leaves. I now know that only using water will result in a plant that will grow healthy and strong!

Technical Disciplines Selected by the Student (Listed in order of relevance to the project) PS

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☐ vertebrate animals ☐ controlled substances

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3. This project was conducted at a Registered Research Institution. ☐ Yes ☒ No
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CSEF Official Abstract and Certification

Word Count	Fair Category	Project Number
213	L8	2524

Title: Roots' Response to Sound

Student Name(s): T. Curtiss

Abstract:

In The Hidden Life of Trees, Peter Wholleben says he believes that roots will point towards a sound of 220 hertz with minimal testing. Monica Gagliano has also proved they move towards the vibration of water. I began testing the audio-tropism with basil plants; I wished to prove that Wholleben is correct and show that they do this to connect to each other and communicate via roots. My testing included putting two basil plants in two separate cups filled with water next to each other, and see where the roots go, and putting two more basil plants with an iPad playing a non-stop 222 herts sound between them. To my surprise, the basil plants' roots pointed away from the sound and, to a lesser degree, from each other. I cannot definitely say why this was, perhaps it was the small difference from 220 herts to 222, or basil compared to the plants Wholleben used. I will have to perform more experiments to understand if one of these things is causing this phenomenon, or maybe something else. Nomatter the reason, this method of root repellent can be extremely useful for keeping a patio, for example, safe from root wedging; or if it works on branches, to keep trees away from power lines.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project) PS EA EV

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3. This project was conducted at a Registered Research Institution. ☐ Yes ☒ No
4. Is this project a continuation? ☐ Yes ☒ No
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☐ Yes ☒ No

CSEF Official Abstract and Certification

Word Count	Fair Category	Project Number
235	L8	2525

Title: How colorful is your memory?

Student Name(s): R. Szeghy

Abstract:

Everyday teachers ask me why I take the time and the energy to color and highlight my notes. This experiment will show the results of having your notes be taken in color and highlighted. According to The National Institute of Health, paying more attention to writing things down in color and highlighting will benefit someone's memory (A. Dzulkifli). In this experiment I took five different test subjects and I tested them on how well they recalled the words in color, highlighted, and printed in black & white. I tested each of the participants with a piece of paper and told them to memorize them as well as they could. I let each of the participants have time to memorize for thirty seconds for each trial. After each participant had the time to memorize the words on the paper, I asked them what they recalled from those thirty seconds. After I calculated the results I noticed that out of the three different ways the words were presented the one that the majority of the participants recalled was the highlighted words. The second most recalled, were the words presented in color ink. Lastly, the words presented in black and white ink were the least recalled by the participants. As you can see by my results by writing and seeing words in color ink can and will help someone recall the information more effectively, than black or white ink.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project) BE

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3. This project was conducted at a Registered Research Institution. ☐ Yes ☒ No
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☒ Yes ☐ No

CSEF Official Abstract and Certification

Word Count	Fair Category	Project Number
245	L8	2526

Title: Augmented Reality in Education

Student Name(s): L. Esposito

Abstract:

According to MIT Media Lab, early experiments conducted with an augmented reality prototype suggest that the long-term memory recall accuracy of sequences of items is nearly tripled compared to paper-based memorization tasks. In most schools, however, traditional teaching methods are still being utilized. Because many young children in elementary school are easily bored by traditional teaching methods, less information tends to be retained. The need for new, innovative teaching methods is crucial.

It was hypothesized that teaching an elementary school class by using augmented reality rather than with traditional teaching methods, such as a paper-based model and a physical model, would improve the overall performance of students when given a written assessment.

To test this hypothesis, an AR image was created on ROAR Augmented Reality Platform. It was then used to teach a lesson about the solar system to an elementary school class. Using customary methods of teaching, physical models and physical matching games, a lesson was given to another class about the solar system. After the lessons were given, both classes took the same written assessment on the concepts taught with the differing methods. The results were then analyzed and compared. The hypothesis was disproved. The average score for the students who were taught using AR was 7.58/16. The average score for the students who were taught the lesson using traditional teaching methods was slightly higher: 8.88/16. It can be concluded that students learn better when taught with traditional teaching methods.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project) BE AT CS

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3. This project was conducted at a Registered Research Institution. ☐ Yes ☒ No
4. Is this project a continuation? ☐ Yes ☒ No
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☐ Yes ☒ No

CSEF Official Abstract and Certification

Word Count	Fair Category	Project Number
113	L8	2527

Title: Testing and Design of a Novel Hydrogel Kombucha - based Medicated Bandage to Prevent Infection

Student Name(s): E. Brown

Abstract:

The purpose of this project was (1) to examine the potential of SCOBY biofilms as an antiseptic; and (2) devise a slow-release delivery system. The optimal growing conditions were determined and used to grow the biofilms. Both wet and dry films were tested to see if a zone of inhibition would form when grown with E.coli. Both successfully formed zones. Next, hydrogels were made by mixing water (control) and SCOBY (test) sodium alginate solutions into calcium chloride solution to create hydrogel beads. The "bandage" beads were tested similar to the films and were also effective at impeding E. coli growth. Using hydrogels would be the most practical way to deliver the product.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project) MI

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2. Student independently performed all procedures as outlined in this abstract. ☒ Yes ☐ No
3. This project was conducted at a Registered Research Institution. ☐ Yes ☒ No
4. Is this project a continuation? ☐ Yes ☒ No
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CSEF Official Abstract and Certification

Word Count	Fair Category	Project Number
142	L8	2528

Title: What's The Melting Point?

Student Name(s): X. Pierre

Abstract:

The purpose of my project was to help people save money on the candles that they purchase. People who buy candles are usually unaware of the conditions and melting points of the wax. My goal is to inform the buyers on what wax they should be looking for. The result ended up being the original candles I bought from IKEA or the Paraffin/Vegetable wax lasted the longest. Therefore, this wax had the best melting point out of all the waxes including Soy wax, Paraffin wax and Beeswax. My guess for why the wax did the best is that the vegetable wax which has vegetable oil inside and the oil helped the wax take a longer amount of time to dissolve. In order to do this experiment, I had to melt out candles, pour out the wax then pour in new wax.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project) CH

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3. This project was conducted at a Registered Research Institution. ☐ Yes ☒ No
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☐ Yes ☒ No

CSEF Official Abstract and Certification

Word Count	Fair Category	Project Number
134	L8	2529

Title: How does your water measure up?

Student Name(s): G. Rodrigues

Abstract:

In this experiment I measured the TDS (Total Dissolved Solids) of water. TDS is the total concentration of dissolved minerals like Calcium, Magnesium, Potassium, ect. Too much TDS is not a health hazard, but it does leave water stains in your water. Water stains are patches of minerals suspended in your water. This leaves a bad taste and smell in your water. I measured different brands of water including Brook water and my control group, Distilled Water. My hypothesis was that Brook Water would be the worst of all, and Aquafina would be the best brand of water. I was incorrect! Fiji turned out to be the worst brand of water with a level of 145 TDS. Aquafina, did turn out to be the best brand of water with a level of 2 TDS.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project) EA

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3. This project was conducted at a Registered Research Institution. ☐ Yes ☒ No
4. Is this project a continuation? ☐ Yes ☒ No
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