
RocheS²TEM
SUSTAINABILITY · SCIENCE · TECHNOLOGY · ENGINEERING · MATHEMATICS
SUN'S DECLINATION PROJECT
Objective: Explain and understand how the sun's declination happens over time in Rochester School, also analyzing how knowing the sun's incidence in a specific area can be used to advantage.
AP ENVIRONMENTAL
Methodology:
1. Collect data on the sun's inclination for one month. The Measurements were carried in a website named "Sun-Earth Tools" which has information on the trajectory of the sun in Bogotá for the month of February and so far in March of this year.
2. Graphing the data for the following months.
3. We make an interactive model based on the collected data to show the trajectory of the sun from our own perspective.
SUN-PATH
AT ROCHESTER SCHOOL
Sun Project

RocheS²TEM

SUSTAINABILITY · SCIENCE · TECHNOLOGY · ENGINEERING · MATHEMATICS

Bianual journal with a sustainability, sciences, technology, engineering and math productions focus from the community of Rochester School in Chía, Cundinamarca, Colombia

ISNN 2422-4413 ROCHESTER

EDITORIAL

Ramiro Londoño
Mathematics Coordinator 4th to 12th

Dear community,,

Welcome to this edition of our school ROCHESTEM 10th Edition, where we celebrate the power of collaboration, innovation, and sustainability. We are proud of the remarkable projects undertaken by our students that bridge multiple scientific disciplines and shed light on the importance of sustainable practices.

In the realm of biology, our students have embarked on an integrated project to simulate different environments, emulating the conditions of exoplanets. By programming Arduinos to measure variables and collect data, they aim to determine the resilience of plants under extreme conditions. This innovative approach not only combines biology, chemistry, physics and technology, but also opens up possibilities for future interplanetary agriculture, expanding our understanding of sustainable food production.

Taking a closer look at nutrition, our biology enthusiasts have germinated lentils and designed a recipe book featuring protein-rich sprout-based recipes. By understanding the significance and function of proteins in the body, they emphasize the importance of a balanced diet for everyone. Encouraging family involvement in the cooking process, they put in practice the kindness and service from our SHICKEL acronym about virtues.

In the realm of physics, our students have ingeniously harnessed the power generated by elliptical machines at our bio-healthy park. By transforming kinetic energy into a usable form, they have developed a project that creates a cell phone charger. This integration of physics and sustainable technology showcases our students' ability to find practical solutions to everyday problems, while promoting clean and renewable energy sources.

In the realm of mathematics, we encounter the ever-fascinating concept of carbon-14 dating. While this may already be familiar to many, its inclusion reminds us of the indispensable role mathematics plays in dating historical artifacts. With precision and accuracy, carbon-14 dating enables us to uncover the secrets of the past and make informed decisions for the future.

Venturing into the world of technology, we stumble upon Swift, a programming language that remains mysterious to some. While its specific applications may elude us, this serves as a reminder of the ever-evolving nature of science and technology. It encourages us to embrace curiosity and explore new frontiers, knowing that innovation is boundless and constantly reshaping our world.

All these projects, and many more were shown during Pi Day, celebrated on March 14, where through engaging activities, our students showcase the relevance and versatility of this mathematical constant, highlighting its significance beyond the confines of the classroom.

You can see in this magazine a virtual museum with some of the projects that were presented. Sadly, the happiness, enthusiasm and feeling of proudness cannot be seen in an image, so you need to come and live this day with us.

I hope you'll enjoy the magazine, it is always our pleasure to write for you and collect interesting articles to show a little of what we do every day with love and discipline.

CONTENTS

SUN´S INCLINATION PROJECT: ANALYZING GEOSCIENCE DATA AND EARTH SYSTEMS.

Catalina Guerrero, Mariana Vasquez and Santiago Bernal.
12th Grade

Introduction

The objective of this project is to explain the advantages of knowing the Sun's incidence in a specific area through geoscience data. We were expected to recollect information from the Sun's inclination day by day, to identify certain patterns and positions.

Solar declination and insolation, Earth's rotation, and seasons are all connected, playing a crucial role in determining the planet's climate and ecosystem. The Earth rotates in a tilted axis, which causes Sun's rays to hit different parts of the Earth at different angles throughout the year, leading to seasons.

There are different effects from this relationship that are significant such as the length of days and nights, the amount of solar energy absorbed by the Earth, and the resulting temperature, precipitation and wind patterns.

Earth's Rotation

The Earth is always moving, each day making one complete rotation on its tilted axis (tilt of 23.5°). The axis is an imaginary line in the Earth that passes through both poles, North and South. Through this tilt the Earth spins everyday, taking approximately 24 hours to make a full rotation, a day. This causes the alternation of day and night, as well as sunlight assimilation during the day. While the Earth rotates on its axis, it also orbits around the Sun, taking approximately 365.25 days to make a complete trip.

The Earth's rotation causes some observable patterns, such as day and night. The Sun lights out half of the Earth at a given time, making that side much warmer and brighter, while the other side will be facing away from the Sun, you can see the moon, it's dark, and much colder. Another pattern is the length of our shadows, we can see shadows are longer in the afternoon than at noon.

Effects from rotation of the Earth:

1. Coriolis Effect: air is constantly moving towards a particular direction, and its principal cause due to pressure difference. Also, the rotation for the Earth affects this direction, when rotation on its axis, wind cannot move in a straight line from one pole to the other. This pressure is known as the Coriolis force which deflects the wind to the right in the northern hemisphere and to the left in the southwest hemisphere. Also the Coriolis force builds a pressure belt which defines weather on Earth.

2. Cyclones: Tropical storms with winds that blow in a large spiral near the equator move in an anticlockwise direction in the northern hemisphere, and clockwise in the southern hemisphere.

3. Ocean currents: Wind blows the ocean currents, and the Earth's rotation affects the movement of such currents thanks to the Coriolis effect.

4. Changes in day-night duration: Earth is supposed to rotate every 24 hours, making up a day. Due to the Earth's tilt it causes a difference in days, making them shorter or longer. A solstice is what we call the time or date when the Sun reaches a maximum or minimum declination, indicated when having longer or shorter days. During winter solstice, happening around December 21st, the northern hemisphere is tilted aways from the Sun, resulting in the shortest day and longest night of the year. In the southern hemisphere it happens the other way, we experience the longest day and the shortest night of the year. During the summer solstice, which occurs around June 21st, the northern hemisphere is tilted towards the Sun, resulting in the longest day and shortest night of the year, the opposite occurs in the southern hemisphere.

Solar declination and insolation

We can understand declination as solar times measured in degrees during the day. There's an angle between the Sun's rays and the plane of Earth's Equator, but its value depends on Earth's position when it orbits the Sun. Solar declination can be seen during the solstices. For example, during the summer solstice the declination is 23.5°, and during the winter solstice the declination is -23.5°. Declination indicates the latitude with the most intense sunlight at local noon on a certain day. In an equinox the solar declination is 0°. This means the Sun is directly overhead for someone standing on the Equator during equinox.

Almost all Earth's energy comes from incoming solar insolation that reaches any spot on the Earth's surface according to its latitude and season. Due to the Earth's shape, Sun's rays can hit different locations of the Earth at the same time but with different intensities.

• Latitudes near equator (0°): Earth's surface is almost perpendicular to the Sun's rays. Solar radiation is very intense in these areas , but energy is concentrated in a specific small area. We can experience hot temperatures in places near the equator.

• Mid latitudes (23°-66°): Here Sun's rays hit Earth's surface with a certain inclination, so solar radiation is more spread or more evenly over a large area, and is less intense. We can experience seasonal warm and cool temperatures during the year.

• Polar latitudes (66°-90°): Sun's rays hit Earth with a higher inclination than in mid latitude, having less intensity in solar radiation. In polar latitudes sun rays become more scattered, where we can experience cold temperatures over the year.

Seasons

As the Earth orbits the sun, its tilt causes seasons, and we can see divisions in temperatures, weather and daylight hours. Also, during seasons the intensity of insolation may vary, certain locations will receive more radiation during a specific season, for example, in summer. Or less radiation, such as in winter.

Summer occurs when a hemisphere is tilted towards the sun, making sun rays closer and reaching Earth's surface with more intensity. A location on Earth's surface that receives the most solar radiation could be when the summer solstice happens, where summer days tend to be longer, receiving more sunlight. During winter, it happens all the way around, it occurs when an hemisphere is away from the sun. It becomes more difficult for Sun rays to reach the Earth's surface with high intensity. During the winter solstice is when there's less solar radiation, since days are shorter, then Earth receives short periods of sunlight.

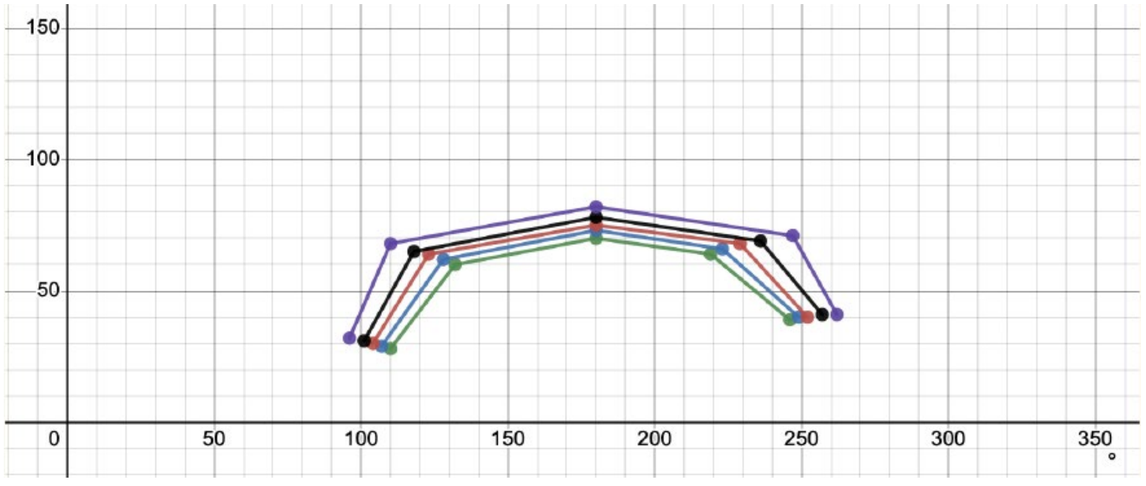
Sun's Path

The sun's path refers to the path the sun follows across the sky as the sun rotates around the sun and itself. The path the sun follows is similar to an arc, this arc affects the lengths of a day and the amount of sunlight received during a season. Some important parts to take into account when discussing the sun's path are the dawn, sunrise, solar noon, sunset and dusk. In Bogota, Colombia the dawn which is the moment where the sun is below the horizon but the light is visible. This happens at approximately 5:47 am, then the sunrise happens at 6:08am. The solar noon happens when the sun is the highest in the sky at around 12:09pm. The sunset happens at 18:06 and the dusk happens at 18:31. In bogota the sun can be in different paths depending on the time of the year. Due to the rotation of the earth the sun's path changes and that results in the sunrise being earlier of days having less daylight.

We were expected to collect the information for a month from the sun's inclination during certain hours of the day, by measuring its degrees at a certain location at school. After doing this, we were expected to graph such results and see how the angles of the sun changed during the month. Click to see data table

Dates	8:15 a.m. heading (x)	8:15 a.m. altitude (y)	10:40 a.m. heading (x)	10:40 a.m. altitude (y)	12:10 p.m. heading (x)	12:10 p.m. altitude (y)	1:15 p.m. heading (x)	1:15 p.m. altitude (y)	3:20 p.m. heading (x)	3:20 p.m. altitude (y)
Feb. 08	110°	28°	132°	60°	180°	70°	219°	64°	246°	39°
Feb. 15	107°	29°	128°	62°	180°	73°	223°	66°	249°	40°
Feb. 23	104°	30°	123°	64°	180°	75°	229°	68°	253°	40°
Mar. 03	101°	31°	118°	65°	180°	78°	236°	69°	257°	41°
Mar. 13	96°	32°	110|°	68°	180°	82°	247°	71°	262°	41°

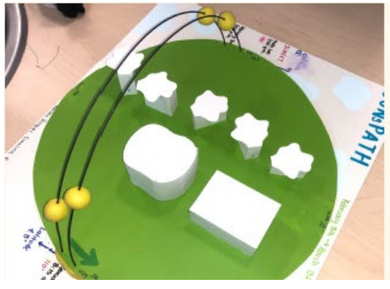
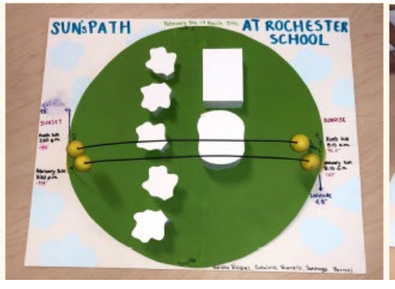
Table 1. Five (5) chosen dates from February to March 2023 with time marks, presenting heading and altitude.

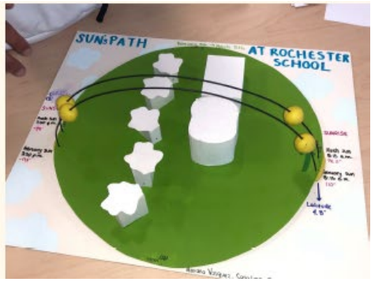


Graph 1. Graph shows information from Table. 1 with corresponding color coding for each day.

This model is based on the collected data, which is useful to explain how the sun changes position during a period of time, showing different shadows along the day.

● We used the following link to do our model: https://drajmarsh.bitbucket.io/sunpath3d.html



● Why does the sun reflect differently in every country of the world, in different moments of the year?
This happens because, when carrying out its rotation and translation movement, the Earth receives the incidence of sunlight in different angles, having regions of the planet be more or less illuminated by the Sun.

● What are the benefits of knowing where the sun is going to hit for agriculture and constructions?
For agriculture it is important to save where the sun is going to shine because with that information they can locate the crops correctly. When the crops are located somewhere where the sun hits better and where they receive appropriate sunlight they will be able to benefit from this as well as grow healthier. For constructions like residential buildings it is important to take into account where the sun rises and its path in order to build the windows. In Bogota, which is a very cold city, having windows where the morning sun hits is very good as it warms up the apartment. Apartments with natural light can sell better and are more requested due to the warmth and views. But it is also important in warm cities to know what kind of materials they should implement on the roof so the building doesn't warm up.

● Describe the bioclimatic study done before Rochester's site was built.
Before Rochester School was built there was bioclimatic research done regarding the location of the terrain that was going to be used for the construction of the school. This research was done with the purpose of analyzing the thermal behavior of the future location of the school in order to come up with designs and proposals like natural ventilation, thermal control and natural lighting. Also, bioclimatic architecture that basically means making buildings and spaces that will have low impact on the environment. These green buildings had as a goal to be efficient with water and energy use, as well as with materials needed for construction. This bioclimatic architecture research also allows for the school to cut expenses during construction and with maintenance. With this research they saw the importance and how the implementation could work in order to have natural light. It was expected to have lower cost of energy, an improvement on the environmental quality of the spaces and the contribution to environmental education. Some of the factors that were studied in this research were:

Temperature, relative humidity, wind, precipitation. These meteorological data was very important as they were able to see the lowest and highest temperatures of the location, registering a highest temperature of 22 degrees and a lowest of 0.6 degrees. A very big part of this research is the solar study that was done for the solar panels. Here they studied the trajectory of the sun with the angles and shadows at different times of the year. This study took into account May, June and December. With the help of this report the school was able to construct buildings and spaces that took into account the environment and made use of all of the resources available, for example the natural light for the classrooms and the sun's trajectory for the solar panels. With the temperature research they were able to build the natural ventilation and temperature control for the classrooms so the environment the students are in is the most adequate for learning.

→ Inclination and location of solar panels

In Rochester School the solar panels are located on the rooftops of every building. On the classroom buildings and administrative building, there are photovoltaic panels and on the 6th building rooftop there are the panels that heat up the pool. The panels that we analyzed are the ones located on the first buildings. These panels are located towards the south one after the other with an inclination of 7°. We consider that the direction the panel is facing is correct due to Colombia being located more towards the northern part of the equator, rather than the south. As we are more towards the north, panels should face south in order to receive the best sunlight. Regarding the location of the panels at school it is a very adequate location. As there is no shadow apart from the clouds that could block the sunlight.

Scan and watch the video.

References:

1. Khan Academy. (2023). Solar radiation and Earth's seasons. Khan Academy. https://www.khanacademy.org/science/ap-college-environmental-science/x0b0e430a38ebd23f:earth-systems-and-resources/x0b0e430a38ebd23f:earths-seasons/a/solar-radiati_on-and-earths-seasons#:~:text=A%20location%20receives%20its%20most,temperatures %20tend%20to%20be%20warmer.

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3. NASA. (2023). Basics of Space Flight. Solar System Exploration NASA. https://www.toppr.com/guides/physics/astronomy/speed-of-earths-rotation/

SPROUTS PROJECTS

María del Pilar Tunarroza S.
High School Biology Teacher

In Biology class, students from 9th grade learned all about proteins, from the chemical structure and how they are built in the cells to what type of proteins are important in a diet.

Students had the visit of Erika Antolines, our nutritionist at school. Erika explained everything about a balanced diet for kids their age and solved all their doubts regarding eating habits.

As a result, students researched about lentils and how the sprouts are a high protein source. Students invented recipes with lentil sprouts and cooked them for their families as part of a plan to spend more quality time with them. This was part of their plan to connect their findings on proteins with integral health according to the definition given by Dr. William Glasser.

I leave you with two booklets about proteins and how to make sprout lentils, and are some examples of recipes you can try at home.

Juan Sebastián Aranguen
9th Grade

PROTEINS

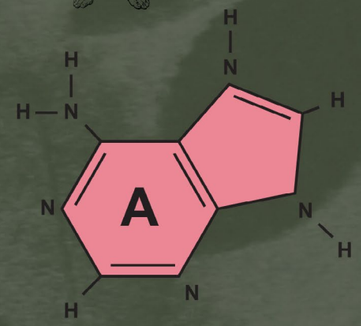
Proteins are needed for the body to function properly. They are made up of amino acids and they are present in living organisms like animals, humans vegetables, fruits, etc. Proteins are the bases of the human body structure such as hair, skin and nails.

WHY ARE PROTEINS IMPORTANT FOR YOUR BODY?

All the cells in our body contain protein. Proteins are essential to our body because every human in their diet needs proteins to help your body by repairing cells and produce new ones. Also, proteins are essential for the growth and development of your body. Also by eating proteins you can boost your energy throughout the day and your dopamine.

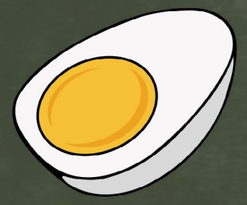
HOW THE BODY CREATES THEIR OWN PROTEIN?

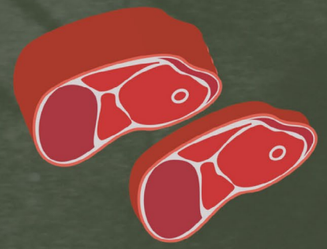
Proteins are produced in a two-step process in all organisms called protein synthesis. First the DNA is transcribed into RNA, then the RNA is translated into protein. Transcription structures in the cell identify the start and the end of a gene and reads the DNA sequence between them. A molecular message or an mRNA molecule is produced that echoes the sequence of the gene itself. mRNA looks similar to a single stranded piece of DNA. Translation happens when a ribosome receives the mRNA molecule and starts to build a chain of amino acids and that is a protein, then it matches instructions within the mRNA. The ribosome reads the mRNA sequence as a series of three base chunks or codons. Each codon tells the protein-making machinery which amino acid to add next.



WHAT FOOD INCLUDES PROTEIN?

- Eggs
- Cow Meat
- Chicken
- Peanuts
- Almonds
- Sunflower seeds
- Salmon
- Shrimp
- Sardines
- Milk
- Cheese
- Lentils
- Beans
- Peas
- Pork





RECIPES

Sprouted Lentil Slaw

Simple and delicious!

Course	Lunch, Main, Salad
Cuisine	American
Prep Time	5 minutes
Servings	5 people
Calories	565 kcal
Author	Erin Vander Lugt

★★★☆☆
3 from 10 votes

Print

Ingredients

- 2 cups veggies *chopped, such as tomatoes, avocados, green onions, and grated carrots*
- 3 cups raw sprouted lentils *see above for instructions*
- 1/2 cup salad dressing of choice *see options below*

Instructions

Add chopped veggies to raw sprouted lentils.

Toss with a salad dressing, such as our lemon-garlic vinaigrette, homemade ranch dressing, or creamy sunflower seed dressing.

Enjoy!

Recipe Notes

Use your favorite veggies! Such as tomatoes, avocados, green onions, and grated carrots.

Nutrition Facts
Sprouted Lentil Slaw

Amount Per Serving (1 Cup)	
Calories 565	Calories from Fat 126
	% Daily Value*
Fat 14g	**22%**
Saturated Fat 3g	**19%**
Sodium 41mg	**2%**
Potassium 1254mg	**36%**
Carbohydrates 80g	**27%**
Fiber 38g	**158%**
Sugar 3g	**3%**
Protein 32g	**64%**
Vitamin A 3742IU	**75%**
Vitamin C 13mg	**16%**
Calcium 83mg	**8%**
Iron 9mg	**50%**

RECIPES

Spicy Sprouted Lentils

So many options for this tasty dish!

Course	Lunch, Main, Salad
Cook Time	10 minutes
Servings	4 servings
Calories	298 kcal
Author	Erin Vander Lugt

★★★★☆
3.19 from 11 votes

Print

Ingredients

- 3 cups sprouted lentils *see above for instructions*
- 1/4 cup extra virgin olive oil
- 2 to 3 cloves garlic *chopped*
- 1 teaspoon ground cumin
- 1 teaspoon ground coriander
- 1 teaspoon lemon juice *or more if you prefer*
- sea salt *to taste*
- ground black pepper *to taste*
- 2+ tablespoon fresh cilantro *chopped (optional)*

Instructions

Steam sprouted lentils until al dente.

Pour into a bowl.

Over medium high heat, add olive oil to a skillet.

Toss in garlic.

When garlic begins to sizzle, add cumin and coriander.

Stir for about 30 seconds.

Take off heat and drizzle over your waiting lentils.

Add lemon juice.

Stir.

Season with salt and pepper.

Nutrition Facts

Spicy Sprouted Lentils

Amount Per Serving (0.75 Cup)	
Calories 298	Calories from Fat 126
	% Daily Value*
Fat 14g	**22%**
Saturated Fat 2g	**13%**
Sodium 5mg	**0%**
Potassium 557mg	**16%**
Carbohydrates 31g	**10%**
Fiber 12g	**50%**
Sugar 3g	**3%**
Protein 14g	**28%**
Vitamin A 13IU	**0%**
Vitamin C 3mg	**4%**
Calcium 39mg	**4%**
Iron 5mg	**28%**

* Percent Daily Values are based on a 2000 calorie diet.

RECIPES

Sprouted Lentil Tacos

Use in place of meat for tacos, burritos, enchiladas, taco salads, and more!

Course	Lunch, Main
Cuisine	Mexican
Cook Time	10 minutes
Servings	3 servings
Calories	330 kcal
Author	Erin Vander Lugt

☆☆☆☆☆
0 from 0 votes

Print

Ingredients

- 3 cups sprouted lentils *see above for instructions*
- 1 onion *diced*
- 2 tablespoons extra virgin olive oil
- 2 tablespoons pure water
- 2 tablespoons homemade taco seasoning blend *adjust to taste*
- homemade tortillas *see options below*
- toppings of choice *such as avocado, tomato, shredded cheese, fresh herbs, salsa, olives, etc.*

Instructions

In a skillet, saute an onion, if desired, in olive oil.

When soft, add lentils and a bit of water.

Sprinkle in taco seasoning.

Stir frequently, letting the lentils steam gently until cooked as soft as you prefer.

Taste every now and then to adjust seasoning if necessary. Feel free to add more water to help lentils and spices combine.

Once cooked, add to homemade tortillas with taco toppings of choice, and enjoy!

Nutrition Facts

Sprouted Lentil Tacos

Amount Per Serving (1 Cup)	
Calories 330	Calories from Fat 90
	% Daily Value*
Fat 10g	**15%**
Saturated Fat 1g	**6%**
Sodium 141mg	**6%**
Potassium 784mg	**22%**
Carbohydrates 44g	**15%**
Fiber 17g	**71%**
Sugar 5g	**6%**
Protein 18g	**36%**
Vitamin A 156IU	**3%**
Vitamin C 6mg	**7%**
Calcium 46mg	**5%**
Iron 7mg	**39%**

RECIPES

Quick and Easy Lentil Quesadillas

★ ★ ★ ★ ★

4.9 from 71 reviews

Author: Pinch of Yum Total Time: 6 hours 20 minutes Yield: 8 quesadillas 1x

Beautiful, yummy, vegetarian... QUESDILLAS! Crispy golden brown tortillas wrapped around melted Pepperjack cheese and a spicy lentil and brown rice filling!

INGREDIENTS

UNITS US M SCALE 1/2x 1x 2x

FOR THE SAUCE

- one 28 ounce can diced tomatoes
- half a yellow onion
- 2 cloves garlic
- 1 1/2 teaspoons cumin
- 2 teaspoons chili powder
- 1 teaspoon salt
- 1 tablespoon oil

FOR THE QUESADILLAS

- 1 cup uncooked brown or green lentils, rinsed
- 1 cup uncooked brown rice, rinsed
- 2 1/2 cups vegetable broth
- 16 flour tortillas
- 3–4 cups shredded Pepperjack cheese
- a few tablespoons butter (optional)

INSTRUCTIONS

1. **Sauce:** Blend all the sauce ingredients together in a blender or food processor until mostly smooth.
2. **Filling:** Place the rice, lentils, sauce, and broth in a slow cooker. Cover and cook on high for 4-6 hours or low for 6-7 hours until soft. (Brown rice takes a long time to cook – when in doubt, let it cook longer!)
3. **Assemble:** Heat a skillet over medium high heat. Layer the following: tortilla, 1/4 cup cheese, 1/2 cup filling, 1/4 cup cheese, tortilla. Spread the outsides of the tortillas with butter and fry on each side for 3-5 minutes until golden brown. Remove from heat and let stand for a few minutes (they'll hold together better). Cut and serve! May I suggest topping with Magic Green Sauce?

NOTES

If you have any extra filling, it freezes really well.

If you don't have a blender, just cut the onions and garlic into small pieces and stir all the sauce ingredients together.

If you want, you can make this on the stovetop or in a rice cooker. Just simmer or cook until the rice and lentils are soft. It took me two or three rounds in the rice cooker to get the brown rice cooked, so if you want it to be done faster, I'd use white rice.

For more spice, add a jalapeño or a chipotle pepper to the sauce! I did that a few times. Yummy.

Find it online: *https://pinchofyum.com/quick-and-easy-lentil-quesadillas*

LINK VIDEO

https://youtu.be/SabJQxJJNyk

HOW TO SPROUT LENTILS?

1. In the evening, rinse the lentils under running water and discard any irregular or discolored lentils.

2. Place the rinsed lentils in a large mixing bowl and fill with about a half-gallon of water. The measurement of water here isn't an exact science, but you want to make sure there is plenty of water for the lentils to expand and increase in size overnight and not become dried or uncovered by the water.

3. Cover with a cloth or towel. Allow to soak a minimum of 7 to 8 hours, but preferably up to 12 hours or overnight, or as much as 24 hours.

4. In the morning, drain, rinse, and re-drain the lentils well with a colander. You want to repeat this process until the water runs clear.

5. With the lentils still in the colander, place a plate underneath to collect any excess water dripping out.

6. Cover with a kitchen cloth and let sit all day. Rinse and drain with cool water again in the evening.

7. Repeat every 12 hours, or every morning and evening, until the lentils have shoots that are 1/4 inch in length or longer, according to preference. If the temperature is warmer than room temperature, such as during the summer months, add a third or fourth rinse daily.

8. The maturing of the sprouts is a matter of preference. Generally, I sprout beans for around 3 to 5 days, until the first leaves have just appeared and are green.

9. Once sprouted, give them a final rinse. Store in an airtight container in the refrigerator for up to 1 week.

10. In the refrigerator, they will continue to grow, but much more slowly. Rinse again as needed to keep fresh, about every 2 days.

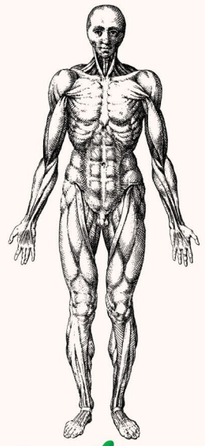
HEALTH COMPETENCE

01 NUTRIENTS OFFERED BY SPROUT LENTILS

sprouting the legumes are great for your body. First is that sprouted legumes are easier to digest, also neutralizes phytic acids. Facilitates the bioavailability of nutrients like B vitamins and vitamin C. And on top of being good for you.

02

THE FIRST DEFINITION OF HEALTH IN THE DICTIONARY IS TO BE WELL IN BODY, MIND, AND SPIRIT. THE SECOND IS TO BE FREE FROM PHYSICAL ILLNESS OR PAIN.



- PHYSICAL: From monday to fiday i tran soccer in a profesional academy after school. This is improving my healh.
- MENTAL: I organize my schedule for removing some stress and i read sometimes in my free time.
- SOCIAL: Having friends has imroved my confidence for talking and social activities.
- SPIRITUAL: Every sunday i go to the church and i trust good in all my situationsin life.

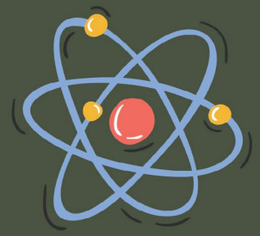
03 WILLIAM GLASSER

William Glasser explains that for having a good mental health you need to enjoy the time you pass with the persons that are especial for you and the ones you consider impontant in your life. Also in choice theory you choose your actions and you drive your own car. That means that you decide what are the actions your going to take in life and you choose to be happy or sad. Finally Glasser tells us that we need to create our own quality world, where is a representation of a persons beliefs, values and relationships.

PLAN

PHYSICAL	ME: I WILL CONTINUE TRAINING.	OTHERS: I WILL INVITE SOME FRIENDS TO THE GYM.	CONTEXT: BY SEEING HOW MY TEAMATES IMROVE I WILL WORK HARDER.
MENTAL	ME: I WILL LOWER MY FEARS.	OTHERS: I WILL ASK HELP TO MY DAD.	CONTEXT: THE PERSONS WITH FEARS WILL SEE ME LEAVING MY FEARS AND THE WILL TRY TO LOWER THEIR FEARS.
SOCIAL	ME: I WILL KEEP IMPROVING MY SOCIAL SKILLS.	OTHERS: MY FRIENDS CAN INTRODUCE ME SOME NEW PEOPLE.	CONTEXT:I WILL MEET SOME GREAT PERSONS.
SPIRITUAL	ME: I WILL KEEP GOING TO THE CHURCH EVERY SUNDAY.	OTHERS: I WILL ENCOURAGE MY FRIENDS TO GO TO THE CHURCH.	CONTEXT: THE PEOPLE WILL BELEIVE MORE IN GOD.

SCIENCE



RESPONSABILITY OF SCIENTIST

Science requires freedom of movement, collaboration, and communication, as well as equitable access to data and resources. It requires scientists to conduct and communicate scientific work for the benefit of society, with excellence, integrity, respect, fairness, trustworthiness, clarity, and transparency.

FEATURES OF A GOOD LEADER IN SCIENCE

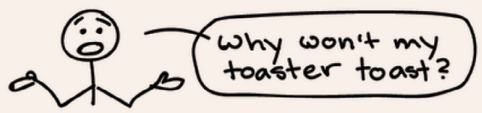
Positive leaders make creating a supportive and affirming environment an explicit priority. They make time to build trust and develop healthy working relationships. They communicate openly, listen effectively and show empathy. They treat people with respect to bring out their best.

SCIENTIFIC METHOD

① Observation:

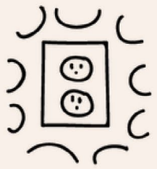
The toaster won't toast!

② Question:



③ Hypothesis:

Maybe the outlet is broken.



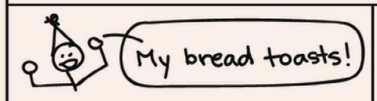
④ Prediction:

If I plug the toaster into a different outlet, then it will toast the bread.

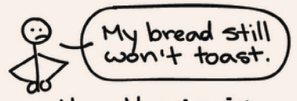
⑤ Test of prediction:

Plug the toaster into a different outlet & try again.

And the result is...

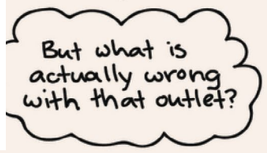


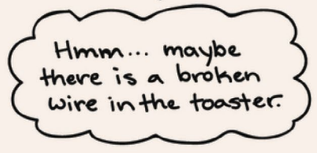
Hypothesis is supported.



Hypothesis is not supported.

⑥ Iteration time!





Cooking lentils with Jacob

Jacobo Becerra
9th Grade

Proteins

What are proteins?

Is a molecule made up with amino acids that has nutrients important for the body.

Why proteins are so important for your body?

Protein is an important nutrient that provides essential amino acids that helps the body in many ways like building and repairing muscle, tissue, skin, nails and hair. Protein also helps to build hormones, enzymes and a healthy immune system.

What food has proteins?

Animal proteins: eggs, milk, cheese, cow meat, chicken, fish, pork, etc.

Vegetable proteins: spinach, kale, lentils, broccoli, beans, peas, etc.

How the body creates his own proteins?

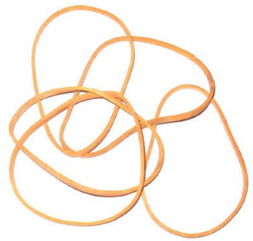
Once a cell makes a protein, it is called protein synthesis. The two essential phases in the production of a protein are called transcription and translation. In the first instance, in the process, DNA is first transcribed into RNA, then the RNA is translated into protein, and then the human body uses that protein.

How to make sprouts

Materials

One glass of 360 or 500 mL

Gauze to cover the opening of the glass



Rubber band

A handful of lentils (50 grams)

A bowl

Procedure

First wash the lentils.

Pour them in the jar

Measure 2 centimeters from the lentils

Fill them with water till the mark of the 2 cm

Cover the bottle with the gauze and seal the bottle with the rubber band

Then shake the bottle with the lentils and pour the water out

Then put the bottle in the bowl inclined and let them rest for 12 hours. Put them in a place we're they don't get direct sun light. Repeat the last 4 steps for 5-6 days and if you do it right you germinated lentils.

For more info: https://www.youtube.com/watch?v=Mi1AcGtv10g&t=312s

Recipes

Spiced Lentils with Mushrooms and Greens

Ingredients

- 1/2 cup brown or green lentils
- 3 tablespoons extra-virgin olive oil
- 1/2 pound shiitake mushrooms, stems discarded and caps sliced 1/4 inch thick
- Salt
- 1 garlic clove, minced
- 1/4 teaspoon ground cumin
- 1/4 teaspoon ground coriander
- 1/4 teaspoon freshly ground black pepper
- 1/8 teaspoon turmeric
- 1 tablespoon chopped parsley
- 1/2 pound Swiss chard or other tender greens, large stems discarded and leaves coarsely chopped

Directions

1. In a small saucepan, cover the lentils with 2 1/2 cups of water and bring to a boil. Cover and cook over low heat until the lentils are tender, about 30 minutes.
2. Meanwhile, in a medium saucepan, heat 2 tablespoons of the olive oil. Add the shiitake and season with salt. Cover and cook over moderate heat, stirring, until the mushrooms are tender and starting to brown, 5 minutes. Add the remaining 1 tablespoon of olive oil along with the garlic, cumin, coriander, pepper and turmeric and cook, stirring, until fragrant, 1 minute. Add the greens and cook, stirring, until wilted, 2 minutes.Meanwhile, in a medium saucepan, heat 2 tablespoons of the olive oil.
3. Add the shiitake and season with salt. Cover and cook over moderate heat, stirring, until the mushrooms are tender and starting to brown, 5 minutes. Add the remaining 1 tablespoon of olive oil along with the garlic, cumin, coriander, pepper and turmeric and cook, stirring, until fragrant, 1 minute. Add the greens and cook, stirring, until wilted, 2 minutes.

More info: food$wine

Tortilla Soup with Lentils

Ingredients

- 1/4 cup extra-virgin olive oil
- 1 medium onion, finely chopped
- 2 bell peppers, finely chopped
- 1 jalapeño, seeded and chopped
- 1 clove garlic, minced
- 1 tablespoon chili powder
- 1 teaspoon cumin
- 1 teaspoon unsweetened cocoa powder
- 1/2 teaspoon Mexican oregano
- 1/2 teaspoon paprika
- 1/2 teaspoon cayenne pepper
- Pinch of crushed red pepper
- 1/2 teaspoon kosher salt
- Fresh ground black pepper
- 1 pound pork sausage, casings removed
- One 28-ounce can diced tomatoes
- 4 cups chicken stock
- 1 cup lentils, rinsed
- Vegetable oil, for frying
- Six 4-inch corn tortillas, cut into 1/2-inch strips
- 2 lime wedges, plus 4-6 more for serving

Directions

1. Heat the olive oil in a large pot. Add the onion and peppers and cook, stirring occasionally, over moderately high heat until the onions are soft and translucent, 5 to 7 minutes. Add the jalapeño and garlic and cook for 1 minute. Add the chili powder, cumin, cocoa, oregano, paprika, cayenne, red pepper, 1/2 teaspoon of salt, a few turns of black pepper, and the sausage; cook, breaking up the sausage with a wooden spoon, until the sausage is browned and cooked through, about 7 minutes.
2. Stir in the tomatoes and the chicken stock and bring to a boil. Stir in the lentils, reduce to a simmer and cook until the lentils are tender, 30 to 35 minutes.
3. Meanwhile, heat 1/2 inch of vegetable oil in a skillet over moderate heat until shimmering. Fry the tortilla strips in batches for 3 minutes, until crispy. Transfer to a paper towel and immediately sprinkle with salt and squeeze with lime.
4. Ladle into bowls and serve with tortilla strips, lime wedges, diced avocado, sour cream, fresh cilantro and shredded Monterey jack or crumbled fresh cheese.

More info: food$wine

Lentejitas Colombianas 🇨🇴

Ingredients

- Rice - large Onion - Oil - salt
- Meatballs - Oil - Salt
- Potato - milk
- Germinated Lentils - water
- Guiso - large Onion - tomato - Color - garlic - cumin

Directions

1. First star doing the rice that needs more time to cook, put in a cooking pot put 2 cups of water, a head of large onion, a little bit of oil, salt and when the water is hot put the 1 cup of rice.
2. Put in another cooking pot 3 cups of water and the lentils.
3. Now do a guiso, in a pan put tomato (chopped), onion (chopped), color, a little bit of garlic, and a bit of cumin, let the, cook for 5 min and then put the meatballs in the pan with the guiso. Put salt and a little bit of oil in the meat.

4. Now smash some potatoes and put a little bit of milk in the smashed potatoes and also cook them a little bit.
5. Finally if you did it right, just put everything in a plate and enjoy.

More info: Cooking lentils with Jacob

Spicy Sprouted Lentils

Ingredients

- 3 cups sprouted lentils (s*ee above for instructions)*
- 1/4 cup extra virgin olive oil
- 2 to 3 cloves garlic *chopped*
- 1 teaspoon ground cumin
- 1 teaspoon ground coriander
- 1 teaspoon lemon juice *or more if you prefer*
- sea salt *to taste*
- ground black pepper *to taste*
- 2+ tablespoon fresh cilantro *chopped (optional)*

Directions

1. Steam sprouted lentils until al dente.
2. Pour into a bowl.
3. Over medium high heat, add olive oil to a skillet.
4. Toss in garlic.
5. When garlic begins to sizzle, add cumin and coriander.
6. Stir for about 30 seconds.
7. Take off heat and drizzle over your waiting lentils.
8. Add lemon juice.
9. Stir.
10. Season with salt and pepper.

More info: cookingschool

Lentils nutrition

Lentils are not only tasty: they're full of nutrition benefits and are inexpensive to buy! So this lentil soup is not only good for your pocketbook, it's healthy too. Here are a few of the major nutritional benefits of lentils:

- Protein & Fiber: Lentils have a large amount of plant-based protein. 1 cup of cooked lentils has about 18 grams of protein and 15 grams of fiber.
- Low in Fat & Calories: Lentils have virtually no saturated fat and are low in calories.
- Protect Against Heart Disease: Lentils are rich in polyphenols, micronutrients thought to help protect against cardiovascular disease.

More info: acouplecook

INVESTIGATE COVALENT BONDS HOW TO ASSESS STUDENT'S' CHEMICAL STRUCTURE REASONING?

Mariana Arango y María Paula Acuña 12th grade, Ana María Campos Rosario- Chemistry teacher, Karla Varela-Physics teacher.

Learning to think about the chemical structure and chemical bonding of matter is considered an important skill of chemistry education at the high school level. A major part of chemical reasoning concerns are related with the structure-property reasoning and switch to macroscopic properties. Therefore, this type of reasoning is included in standards for chemistry education in many countries.

Usually abstract models are used to explain and predict the properties of substances and those models are not easily understandable for students then, the experiments to switch between macroscopic properties e.g. melting point or conductivity and chemical structure are essential to improve the level of thinking in the classroom. One of these models is related to chemical bonding and intermolecular forces, especially with covalent bonds.

Covalent bonds are defined as the net attractive forces resulting from pairs of electrons that are shared between atoms (the shared electrons are attracted to the nuclei of both atoms in the bond). A group of atoms held together by covalent bonds is called a molecule. Covalent compounds have different physical properties than non-covalent compounds because the strengths of the interactions between molecules are weaker than the strengths of the interactions between the particles that make up ionic compounds, for example. Also, when covalent compounds dissolve in water they do not break up into ions, or atoms. They maintain their molecular structures.

How can we design and experiment to compare the strengths of the chemical bonds or interparticle forces present in two different types of compounds by observing some of their physical properties?

With this question in mind the students of AP-Chemistry and AP-Physics designed and worked on an experiment to correlate circuits with the ability of the chemical substances to conduct electricity. Students carry out an investigation to identify the covalent compounds, from a group of four compounds, based on the compounds' physical properties. Ionic compounds (non-covalent compounds in this lab) will have high experimental melting points and will conduct electricity in aqueous solutions if soluble whereas covalent compounds will have relatively low melting points and relatively low or no conductivity in aqueous solutions.

A circuit is a system of electrical components that allow the flow of electrical current through a closed path. In parallel circuits, the current is divided between the components, while the voltage is constant. In this circuit a 9V battery was used, a green LED connected to a 100 Ohm resistor and a red LED connected to a 1K resistor. These two LEDs allow you to compare the conductivity of strong and weak electrolytes. The green LED requires more current than the red LED (Figure 1).

The path of the green LED has a higher resistance opposing the flow of electrons that decreases the current that indicates that the energy available in the green LED is less.

When opening the circuit, the electrolytes act as electrically conductive solutions, for this reason a weak electrolyte will cause only the red LED to shine, since the conductivity of the electrolyte causes the current to be lower compared to a strong electrolyte. When the electrolyte is strong it is a good conductor and allows the red and green LEDs to glow.

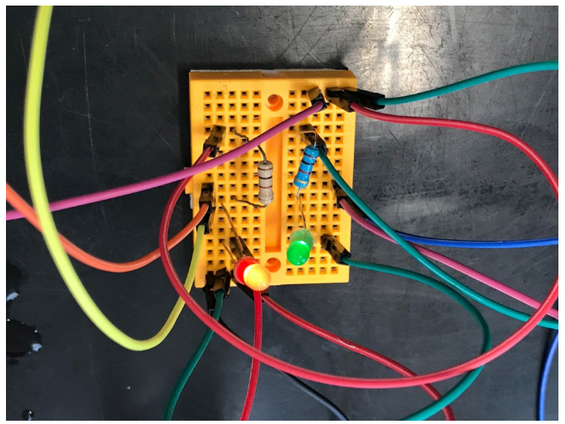


Figure 1. Circuit to measure conductivity in aqueous solutions

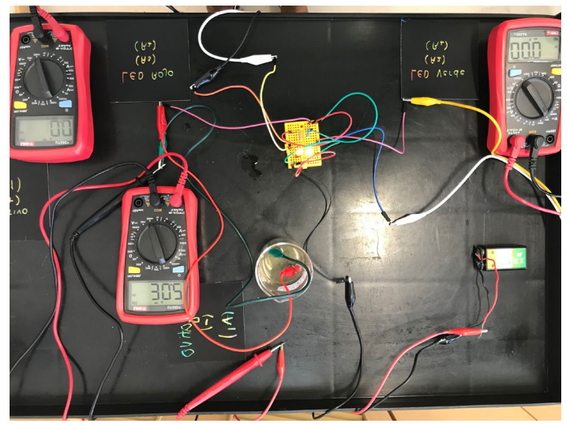


Figure 2. Measurement of strong electrolyte

Scientific skills worked

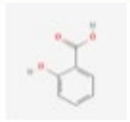
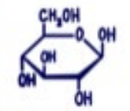
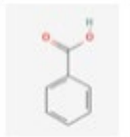
Planning and Carrying Out Investigations
Analyzing and Interpreting Data
Using Mathematics and Computational Thinking

Procedure

1. To test the melting point of a substance, first place a small amount of each solid in the capillary.

A sample in a sealed capillary, attached to a thermometer with a copper band, is immersed in the tube. Heating is commenced, and the temperature ranges at which the sample melts can then be observed. During heating, the point at which melting is observed and the temperature constant is the melting point of the sample.

2. To determine whether the compound conducts electricity in water, first dissolve about 2 g of solid in 20 mL of distilled water. Immerse the ends of the conductivity tester in the solution. Record observations.

Sample	Structural Formula	Conductivity in Aqueous Solution	Melting Point (Celsius	Conductivity in Aqueous Solution (conductimetro)	Conductivity in Aqueous Solution (AP-Physics circuit)	Expected results Melting point
Salicylic Acid		3.43	160 °C	111	Red Led	157°C - 159 °C
Glucose		0.02	150 °C	61.3	Red Led	146°C - 150 °C
Benzoic Acid		2.20	120 °C	50.6	Red Led	121 °C - 123°C
Sodium Chloride	Na^+ Cl^-	7.40	- -	13.4	Green and Red Led	801 °C

Questions

1. Analyze and Interpret Data Based on your results, which of the compounds have the weaker interparticle forces? What is the difference between the compounds with the weaker interparticle forces relative to the compounds with the stronger interparticle forces?

- The benzoic acid can be seen through its melting point as it is the lowest point in the chart. (Melting point determination Figure 1)

- The compounds have the ability to create hydrogen bonds for compounds to create hydrogen bonds. This is an exception of salicylic acid. Although the ability to form a hydrogen bond is less capable, it is a kind of aromatic compound and a cycle of double bonds, which makes it very strong and makes the melting point higher.

- As bond strength increases, the amount of energy needed to break the bonds increases and melting temperature rises.

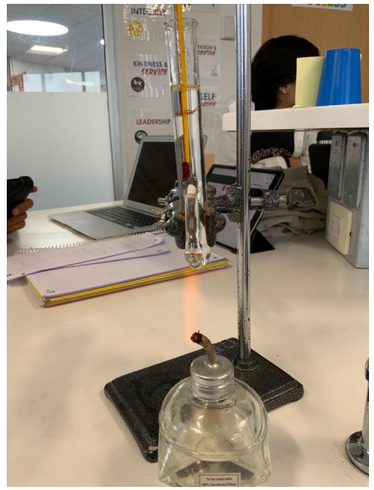


Figure 1. Melting point determination in Thiele Tube

Figure 2. Conductivity in aqueous solution (Conductometer)

2. Construct Explanations Describe and explain one factor that you think prevents some molecules from conducting electricity strongly in a solution of water?

- Dissolved ion concentration. Dissolved ions are charged and can move through water. Because each ion can carry an electrical charge, water with more ions can conduct a greater amount of current.

- The polarity of the molecule will also affect how the molecule conducts electricity in aqueous solution. If the molecule is polar,it dissociates easily, and if it dissociates, it conducts electricity more easily.

Conductivity in aqueous solution (Circuit)

In AP Physics, electrical conductivity refers to the ability of a material to conduct electrical current. It is a property that describes the ease with which electric charges move through matter. Conductivity is usually expressed by the symbol σ (sigma) and the units are Siemens per meter (S/m) or Siemens per centimeter (S/cm).

In the context of AP Physics, electrical conductivity is often associated with materials classified as conductors, insulators, or semiconductors.

- Conductors: Conductors are materials with high electrical conductivity that allow electrical charges to flow through them easily. Metals such as copper and aluminum are examples of good conductors. In conductors, the outermost electrons of atoms are loosely bound and move freely, forming a "sea" of mobile charges that facilitate the flow of electric current.

- Insulator: An insulator is a material that has low electrical conductivity and does not allow charges to move easily. Materials such as rubber, glass, and plastic are common insulators. In an insulator, the outermost electrons are tightly bound to the corresponding atoms, making it difficult for charges to move through the material.

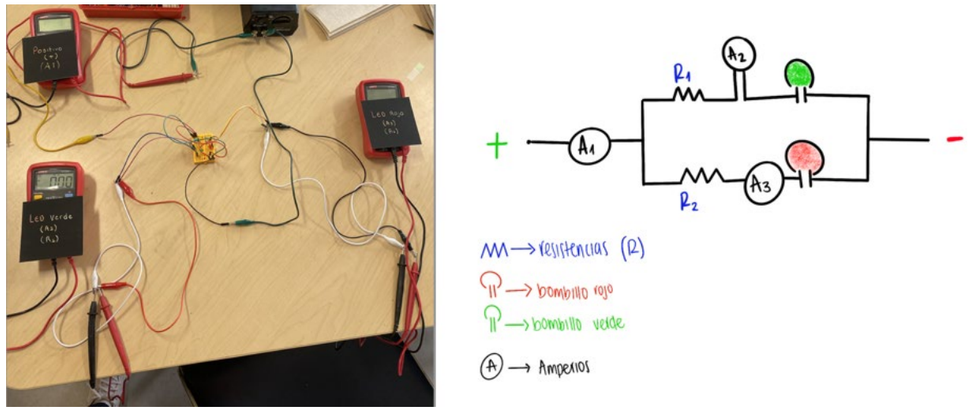


Figure 3. Conductivity in aqueous solution (Circuit)

- Semiconductor: The electrical conductivity of a semiconductor is between a conductor and an insulator. They can be modified to display different levels of conductivity, making them suitable for use in electronic devices. Silicon and germanium are examples of widely used semiconductors.

In AP Physics, understanding the concept of conductivity and how it relates to electric current is important to topics such as electric circuits, Ohm's Law, and the behavior of various materials in an electric field.

Conclusions

Taking into account the experiment we made, we analyze in detail how conductivity travels through the different substances mixed with water, as: Glucose, Salicylic Acid, Benzoic Acid and Sodium Chloride. First we need to understand that conductivity is the ability of a material to let pass electrical current. Seeing further, the conductivity depends on the ions, temperature, concentration of the 4 substances and mobility. We can conclude that sodium chlorine is the substance that conducts more electricity because the two lights (red and green) turn-on, and the melting point is the highest. The other substances are harder to dissolve, that's why the conductivity and the melting points are lower.

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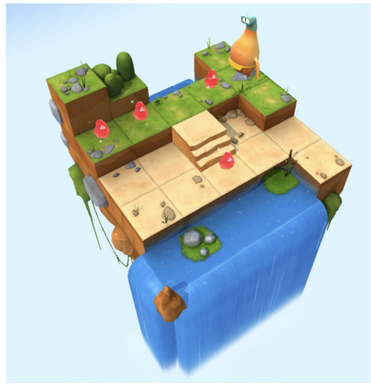
COMPUTER SCIENCE SWIFT AND STEAM

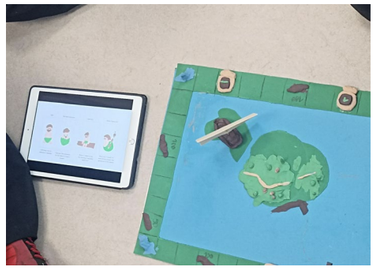
By Miguel Salek

The 4th and 5th students worked during the quarter on developing computational thinking skills, but at the same time used their artistic, mathematical and logical skills in the creation of board games whose purpose is to practice the commands applied in Swift Playground such as functions, loops, conditionals and robotic movement commands.

Board Games

The board games created denote creativity in each of the processes, use of spaces, language in the wording of the instructions and challenges according to the Swift Playground commands. This is a STEAM project due to the application of skills from each of the areas such as mathematics in the planning process, use of spaces, numerical thinking, arts with the creation, design, colors used for the development of this game, technology and engineering with all the skills of algorithmic logic, computational thinking, use of technological and digital tools.





DEVELOPING HEALTHY HABITS THROUGH THE USE OF BOARD GAMES

By: Matthew Reis, Environmental Sustainability High School Teacher, and Sustainability Curriculum Coordinator

The use of Choice Theory defines a Glasser quality school. Choice theory is a theory of internal behavior control that stresses seven positive and connecting (caring, contributing, befriending, listening, encouraging, trusting, and supporting) habits while teaching students to avoid seven harmful practices (judging, nagging, rewarding to control, criticizing, blaming, complaining and punishing) (Table 1).

William Glasser - Choice Theory

7 Caring Habits	7 Deadly Habits
Supporting	Criticising
Encouraging	Blaming
Listening	Complaining
Accepting	Nagging
Trusting	Threatening
Respecting	Punishing
Negotiating Differences	Bribing or Rewarding to Control

Glasser, W. (2013). *Take Charge of Your Life: How to Get What You Need with Choice-Theory Psychology.* Bloomington, USA: iUniverse.

Table 1. Choice Theory Caring and Deadly Habits

There are many applications and opportunities in the classroom where connecting habits can be modeled. One example is board games. Research has found that making time to play games together supports more effective, open communication and a greater sense of togetherness. Playing games has also proven to help children develop academic skills like mathematical reasoning and reading. In addition to amplifying academic abilities, playing games is associated with social, mental, and emotional benefits for children. Games require us to take turns, cooperate, learn systems of rules, and persist through setbacks. These are all skills that help to develop the seven connecting habits.

Students in High School Environmental Sustainability were assigned the challenge of creating a board game to teach Middle School students about how carbon moves through biogeochemical cycles and, simultaneously, develop connecting habits. The guiding question was the following.

"How can we use our understanding of human activity and cycling of carbon to develop quality relationships through the development of connecting habits?"

The High School students used the NASA design cycle (Figure 1) as a guide to constructing their final product, which was a functional board game. The cycle included a phase where students asked questions and researched existing board games. This involved the students playing various board games and completing game reviews. Students then created a portfolio with drawings, diagrams, and plans demonstrating their thought processes.

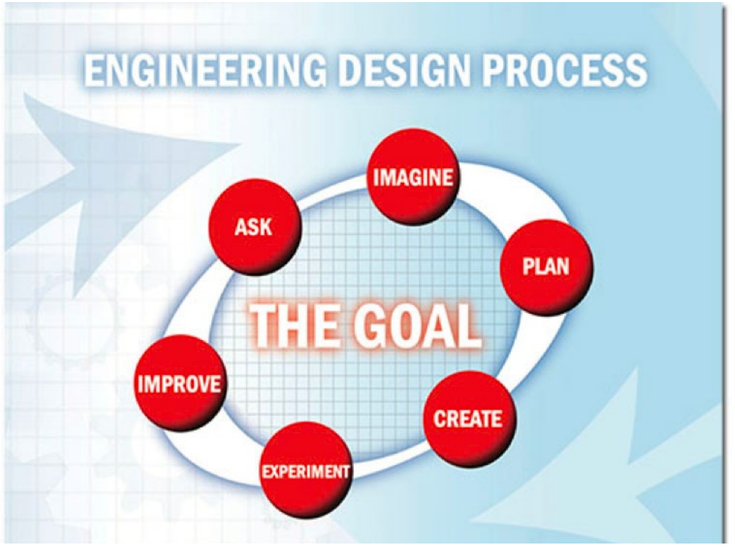


Figure 1. NASA engineering design cycle

Working collaboratively with the middle school math teacher (Felip González) and his students, the high school students played their board games. The high school students observed how the middle schoolers interacted during this phase. At the end of the gameplay, the high school students interviewed the middle schoolers about gameplay, retention of the content, and development of healthy habits. The high schoolers then used this feedback, testimonials, and data to construct an improvement plan.

The feedback from students was positive. Here are some testimonials from students that participated:

Sophia from 7th grade said,

"I learned that in one day, a tree can provide enough oxygen for four people, and I developed my listening skills because I had to carefully listen to the questions when someone was reading aloud."

Emilio from 7th grade said,

"I learned that most carbon dioxide is produced by transportation and that in major cities like Mexico City, 80% of carbon emissions come from automobiles.

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SECCIONES CÓNICAS EN 3D

Javier Tobo, Alejandra Varona y Gabriel Sánchez
Grado Décimo

Resumen

Durante este proyecto los estudiantes de grado décimo pondrán en práctica los conceptos vistos en la clase de pre AP de cálculo, tales como son las secciones cónicas. Los principales objetivos de este proyecto fueron: Por medio de herramientas de modelado construir un cono tridimensional y realizarle a partir de un plano; los cortes respectivos para generar figuras cónicas impresas. Calcular y encontrar matemáticamente los respectivos centros, focos, directrices, etc. según corresponda la figura. Y finalmente ensamblar una maqueta relacionando los cálculos matemáticos en cada figura.

Introducción

En este proyecto, se intenta recrear por medio de herramientas de modelado construir un cono tridimensional y realizarle a partir de un plano; los cortes respectivos para generar figuras cónicas impresas. A través del uso de la tecnología, se construirá un cono virtual y se imprimirá en 3D, sin embargo, también se demostrarán las ecuaciones canónicas para cada una de las secciones cónicas conseguidas en los cortes sin ningún tipo de herramienta de medición. Utilizando conceptos tales como la ley del seno y coseno, teorema de Pitágoras, ángulos complementarios y suplementarios, el cono y las secciones cónicas, se obtendrá como resultado un cono físico con cortes y secciones cónicas perfectas con sus respectivas ecuaciones canónicas.

Marco Teórico

Este proyecto se basa en las secciones cónicas, estas son todas las curvas resultantes de las diferentes intersecciones entre un cono y un plano, cuando ese plano no pasa por el vértice del cono. Existen cuatro tipos de secciones cónicas: la circunferencia, la elipse, la parábola y la hipérbola. También se usaron los conceptos de Ley del seno que es la relación entre los lados y ángulos de triángulos no rectángulos (oblicuos). Simplemente, establece que la relación de la longitud de un lado de un triángulo al seno del ángulo opuesto a ese lado es igual para todos los lados y ángulos en un triángulo dado. La ley de coseno que es usada para encontrar las partes faltantes de un triángulo oblicuo (no rectángulo) cuando ya sea las medidas de dos lados y la medida del ángulo incluido son conocidas (LAL) o las longitudes de los tres lados (LLL) son conocidas.

El teorema de Pitágoras que es una premisa matemática que nos permite calcular la longitud de la hipotenusa de un triángulo rectángulo. Los ángulos complementarios que son cuando la suma de dos ángulos es 90 grados, y suplementarios cuando la suma de dos ángulos es 180 grados.

Desarrollo experimental

1. Dibuja el cono como un triangulo en 2D (20 unidades de alto y un diámetro de 20 unidades)
2. Dibuja una línea 5 unidades desde la punta del cono y 7 unidades hacia la izquierda (vamos a llamar a este punto punto “O”)
3. Desde el punto “O” mida 30 grados y se traza una línea
4. Desde el punto “O” mida 60 grados y dibuje una línea
5. Desde el punto “O” mida 90 grados y dibuje una línea
6. Encuentra los ángulos correspondientes con trigonometría
7. Para encontrar la circunferencia necesitamos encontrar la relación entre la altura y el radio (2r=h)
8. Sabiendo que la circunferencia es de 5 unidades desde la punta del cono sabemos que el radio es de 2.5
9. Establecimos que la coordenada (0,0) es el punto donde la generatriz del lado izquierdo del cono pasa por la línea de la circunferencia que establecimos antes (5 unidades desde la punta, 7 unidades hacia la izquierda)
10. Luego se identifican los valores para la ecuación de la circunferencia y da: (x- 2.5)^2 + y^2=2.5^2
11. Necesitamos encontrar la distancia entre el punto A y el punto B para encontrar la ecuación de elipse, para ello creamos el triángulo OCD y encontramos sus ángulos internos
12. Usando el teorema de Pitágoras encontramos la hipotenusa del triángulo EFG que sería la generatriz del cono (22.4)
13. Necesitamos encontrar la distancia del punto E para que sea el punto B y restar ese valor de 22. 4 para obtener la distancia del punto B al punto F, podemos hacer esto con la ley del seno
14. Luego encuentra el resto de los ángulos internos y externos y usando la ley del seno encuentra el lado BC
15. Luego encuentra el lado opuesto del ángulo 117 en el triángulo OHB (15.54)
16. Ahora encuentra el lado opuesto al ángulo de 63 grados en el triángulo OIA (4.01)
17. Resta el valor del punto 16 del valor del punto 15 y resuelve para encontrar la ecuación de puntos suspensivos
18. Encuentra la longitud del lado opuesto del ángulo de 90 grados en el triángulo ODJ (17.32)
19. Encuentra la longitud del lado opuesto del ángulo de 27 grados en el triángulo OKL (4.87)
20. Resta el valor del punto 19 del valor del punto 18 y resuelve para encontrar la ecuación de la parábola
21. Encuentra la ecuación de la hipérbola con las herramientas utilizadas para encontrar las ecuaciones de elipse y parábola
22. Ya que, el cono impreso tiene una escala diferente a la del triángulo 2D se ajustan las ecuaciones a esta escala.

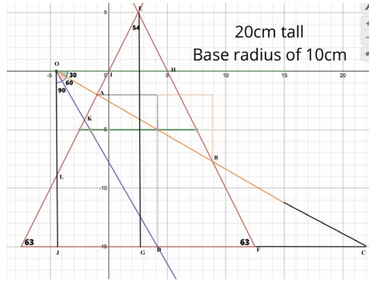
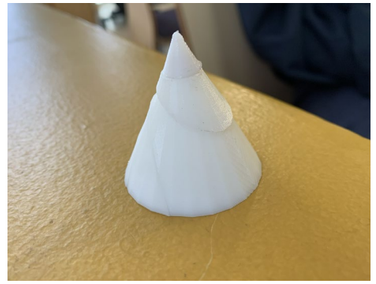


Imagen 1. Triángulo 2D (20x20)



Imágenes 5. Cono real (Escala 5:1)

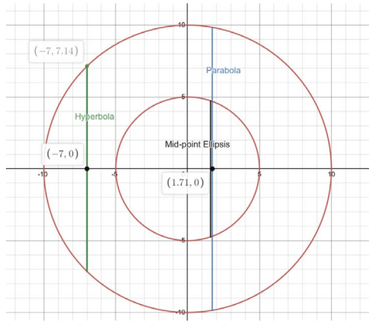


Imagen 2. Vista desde arriba de las secciones cónicas (Cono ideal)

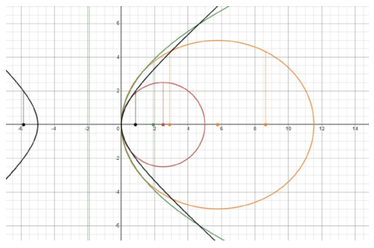


Imagen 3. Secciones cónicas con sus respectivos focos (cono ideal)

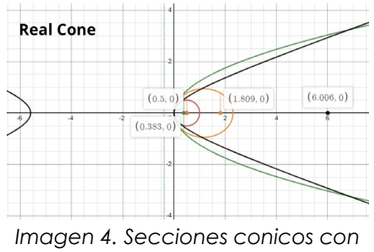


Imagen 4. Secciones conicos con sus focos (Cono real)

Ecuaciones del cono ideal (Triángulo 2D)

$$(x-2.5)^2+y^2=6.25$$

Ecuación 1. Circunferencia cono ideal

$$\frac{(x-3.763)^2}{5.763^2}+\frac{y^2}{4.737^2}=1$$

Ecuación 2. Elipse cono ideal

$$y^2=7.663328518(x)$$

Ecuación 3. Parábola cono ideal

$$\frac{(x+14)^2}{14^2}-\frac{y^2}{2.1975^2}=1$$

Ecuación 4. Hipérbole cono ideal

Ecuaciones del cono real (3D)

$$(x-0.5)^2+y^2=\frac{2.5\,2}{5}$$

Ecuación 5. Circunferencia cono real

$$\frac{\left(x-\frac{5.763}{5}\right)^2}{\frac{5.763\,2}{5}}+\frac{y^2}{\frac{4.737\,2}{5}}=1$$

Ecuación 6. Elipse cono real

$$y^2=4j(x)$$

Ecuación 7. Parábola cono real

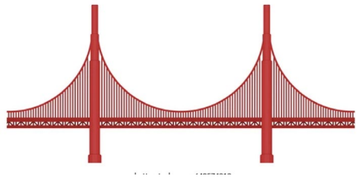
$$\frac{\left(x+\frac{14}{5}\right)^2}{\frac{14\,2}{5}}-\frac{y^2}{\frac{2.1975^2}{5}}=1$$

Ecuación 8. Hipérbole cono real

Aplicaciones a la vida real y problemas modificados

Parábola

El puente Golden Gate muestra secciones parabólicas



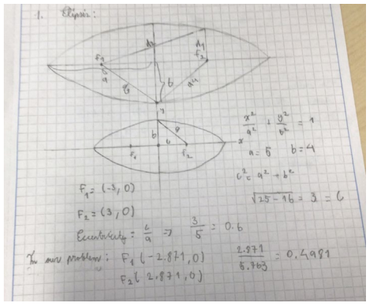
Circunferencia

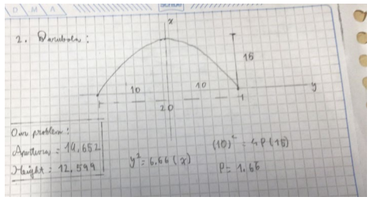
Los neumáticos de los automóviles son un ejemplo perfecto de un círculo de la vida real.

Hipérbola

Los relojes de arena muestran parábolas verticales

El logotipo de Hyundai muestra puntos suspensivos horizontales





En esta modificación, el lado menor es mucho más pequeño que el lado mayor en comparación con los puntos suspensivos del cono. Se puede ver que el foco está más alejado del centro de la elipsis y la excentricidad es mayor que la de nuestro problema debido a que el lado menor está más cerca del lado mayor.

En esta modificación vamos a suponer que el 0,0 en el cono no va a estar en la parte superior del cono sino 5 cm más abajo del cono, es decir en la altura donde se encuentra el círculo pequeño.

En este caso la distancia desde el punto donde la hipérbole comienza a ser el 0,0 será menor por lo tanto el valor de a será menor y de esta manera al encontrar la "b", el valor de "b" será menor. ser también inferior.

Esto sucede porque si algún valor de la ecuación cambia, el otro valor cambiará en la misma proporción para tener el resultado "1" en la ecuación y esto significa que las ecuaciones asíntotas serán iguales al problema original.

En esta modificación la apertura es muy similar a la del cono pero la altura de la parábola es mayor. Debido a esto, los focos y P son más pequeños. La modificación de la altura cambia significativamente los focos.

Conclusiones

En conclusión, la trigonometría fue crucial para encontrar las medidas de todas las figuras.

En la imagen 2D del cono, los ángulos externos le dieron al equipo nuevos triángulos que nos ayudaron a encontrar los ángulos internos para encontrar la longitud de los cortes horizontales que representaban: el diámetro (en el círculo), la longitud total de la elipsis (2 lados mayores), la altura de la parábola y el lado menor de la hipérbole. Era necesario que los ángulos externos fueran de 30 grados cada uno para crear las figuras sin asimetría.

Si los ángulos de cualquier figura fueran más altos o más pequeños, habría creado otra figura. Sin las medidas de las longitudes de los cortes horizontales, el equipo no habría podido encontrar el lado menor (elipsis), la apertura (parábola) y el lado mayor (hipérbole).

La longitud de los cortes horizontales de la elipsis y la parábola son muy similares debido a la similitud de sus ángulos internos. Finalmente, en este cono se comprobó en tres ecuaciones (circunferencia, base y proceso para encontrar el lado menor de la elipsis) que en cualquier parte del cono, el diámetro será siempre igual a la altura.

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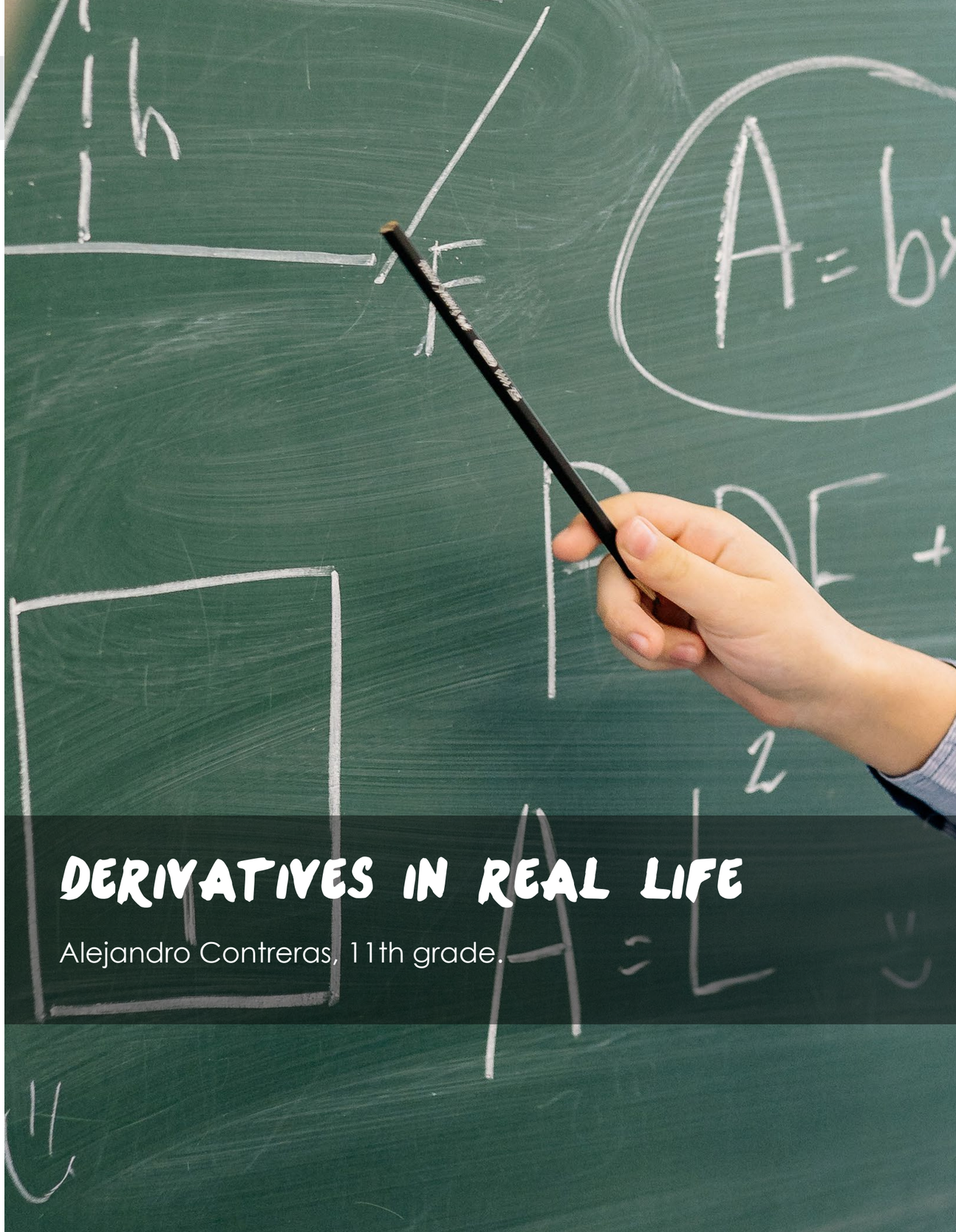


The use of Isotope Carbon-14 for Carbon Dating and Radioactive Decay

Radiocarbon dating, also known as carbon dating, is a method used to determine the age of organic materials based on the decay of the radioactive isotope carbon-14 (C-14).

This technique relies on the principles of radioactive decay, series and sequences, as well as limits and derivatives in mathematics. In this article, we will explore how these mathematical concepts play a role in understanding carbon dating and its applications.

Understanding Radioactive Decay:

Radioactive decay is the process by which unstable atomic nuclei release energy or particles, transforming into more stable nuclei.

This decay occurs at a predictable rate, characterized by a half-life—the time it takes for half of the radioactive substance to decay. In the case of carbon dating, the isotope carbon-14 undergoes radioactive decay.

Carbon-14 Production:

Carbon-14 is produced in the Earth's atmosphere when cosmic rays collide with nitrogen-14 atoms, resulting in the formation of carbon-14 and hydrogen.

This carbon-14 then combines with oxygen to form carbon dioxide, which is incorporated into plants through photosynthesis. As animals consume plants or feed on other animals, they also acquire carbon-14.

The Ratio of Carbon-14:

Living organisms have a constant ratio of carbon-14 to carbon-12 isotopes due to the ongoing exchange of carbon with the environment. However, once an organism dies, it no longer exchanges carbon with the surroundings. The carbon-14 within its remains undergoes radioactive decay while the carbon-12 remains stable. By measuring the ratio of carbon-14 to carbon-12 in a sample, scientists can estimate the age of the organic material.

Series and Sequences in Carbon Dating:

To determine the age of a sample using carbon dating, scientists need to know the initial amount of carbon-14 in the organism when it died.

This initial amount can be estimated by comparing the ratio of carbon-14 to carbon-12 in the sample with that of a living organism.

This process requires understanding series and sequences, as it involves establishing a baseline or reference point.

Limits and Derivatives in Carbon Dating:

Limits and derivatives come into play when we consider the half-life of carbon-14. The half-life of carbon-14 is approximately 5,730 years, meaning that after this time, half of the carbon-14 in a sample will have decayed. By measuring the amount of remaining carbon-14 and knowing the half-life, scientists can calculate the time that has passed since the organism's death.

Furthermore, derivatives can be used to determine the rate at which carbon-14 is decaying in a sample. By analyzing the change in the amount of carbon-14 over time, scientists can calculate the rate of decay, providing valuable information about the age of the sample.

Using all this information in Math Foundations class different projects were designed in order to use the concepts of derivatives and the basics to get there, the main understanding of real Life situations.

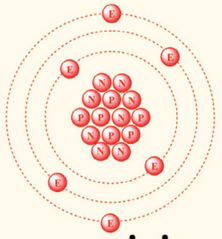
Chemistry

Alejandro Contreras

The use of Isotope Carbon-14 for Carbon Dating and Radioactive Decay

Background Information

Carbon-14 is one of the most important isotopes discovered in the last decades. As the name states, Carbon-14 is a type of radioactive isotope of Carbon, that has 6 protons and 8 neutrons. While there are many isotopes of the many elements in the periodic table, Carbon-14 has a special use in determining the age of the organisms long after their death. This process is called Carbon dating. Cosmic rays from the Sun or other stars in the galaxy crash into our atmosphere, and they end up sending neutron cascades. The clash between these neutrons and nitrogen in the atmosphere creates Carbon-14. The combination of Carbon-14 and oxygen creates radioactive carbon dioxide which is absorbed by plants and later eaten by animals. These plants contain traces of Carbon-14, so when an organism dies, the absorption of Carbon-14 stops and the process of radioactive decay starts. Knowing Carbon's-14 half-life we can estimate the date of death of an organism.



Finding ^{14}C radioactive decay

We can represent the situation of the half-life of Carbon-14 with the following equation:

$$a_n=a_0(\frac{1}{2})^n$$

- Considering the following:
- a_n= amount of carbon-14 in the organism
- n = amount of half-life's occured
- a_0= amount of carbon-14 in the organism at the moment of death

The situation of half-life of Carbon-14 can be represented by a geometric sequence. This is because the amount of Carbon-14 in an organism will decrease by a factor of one half everytime a new half-life occurs. While this equation is useful, we need to consider the amount of time it takes for a half-life to occur.

Graph 1. Amount of Half-life's occured vs grams of Carbon-14 (For a hypothetical situation of an organism that at death has 100 grams of Carbon-14 in his body)

Knowing that the decay of Carbon-14 is presented as a half-life situation, we can determine the equation. We know that the half-life of Carbon-14 is of 5700 years, and with the equation of exponential decay, we can find the equation.

$N(t)=N_0e^{kt}$

$N(5700)=N_0e^{k(5700)}$

$\frac{N_0}{2}=N_0e^{k(5700)}$

$\frac{1}{2}=e^{k(5700)}$

$\ln\frac{1}{2}=\ln e^{k(5700)}$

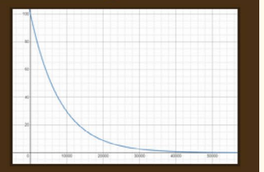
$k=\frac{\ln\frac{1}{2}}{5700}$

$k=-0.0001216$

Final Equation:

$$N(t)=N_0e^{-0.0001216t}$$

It is important to mention that the carbon dating can only be done with organisms that are dead for no more than 50000 years, as after this time, the values for Carbon-14 reach a point where the precision is not good enough.



Graph 2. Amount of years passed since organism's death vs grams of Carbon-14 (For a hypothetical situation of an organism that at death has 100 grams of Carbon-14 in his body)

Real-Life Situation

In a hypothetical situation, a living tree has an amount of 250 grams of Carbon-14. There is a branch found of the same species of tree with an approximate value of 57 grams of Carbon-14 in its trunk. What is the age of this trunk? If scientists want to know how much Carbon-14 it will have in 45000 years, what would this value be?

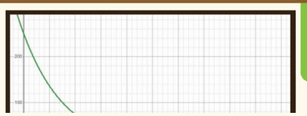
$t = 45000$ $N_0 = 250$ grams

$N(t)=N_0e^{-0.0001216t}$

$N(t)=250\,e^{-0.0001216(45000)}$

$N(t)=250\,e^{-5.472}$

$N(t) = 1.050$ grams



$N_0 = 250$ grams $N(t) = 57$ grams

$N(t)=N_0e^{-0.0001216t}$

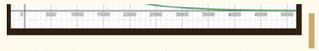
$57=250\,e^{-0.0001216t}$

$\ln(\frac{57}{250})=\ln e^{-0.0001216t}$

$\frac{\ln(\frac{57}{250})}{-0.0001216}=t$

12157.97 years $= t$

Graph 3. Amount of years passed since tree's death vs amount of Carbon-14 in the organism considering its



Knowing this new Half-life we can get an equation representing the Isotope Uranium-238

$N(t)=N_0e^{kt}$

$N(4.5)=N_0e^{k(4.5)}$

$\frac{N_0}{2}=N_0e^{k(4.5)}$

$\frac{1}{2}=e^{k(4.5)}$

$\ln\frac{1}{2}=\ln e^{k(4.5)}$

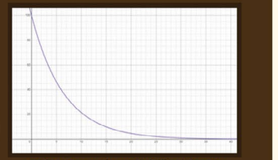
$k=\frac{\ln\frac{1}{2}}{4.5}$

$k=-0.154$

Final Equation:

$$N(t)=N_0e^{-0.154t}$$

(For time in billion of years)



Graph 2. Amount of years(in billions) since the formation of the matter vs grams of Uranium-238 in its composition (For a hypothetical situation of a resource that at start had 100 grams of uranium-238)

Problem Modification

The main problem that is presented with Carbon Dating is the fact that after 50000 years, the amount of Carbon-14 in an organism is undetectable, making it impossible to measure using Carbon Dating. For this type of case, other Isotopes may be used that have a much longer Half-Life than Carbon-14. One of the principal Isotopes used is Uranium-238, which has a Half-Life of 4.5 billion years. This type of Isotope measures the age of rocks and other material resources. This process is called radiometric dating.

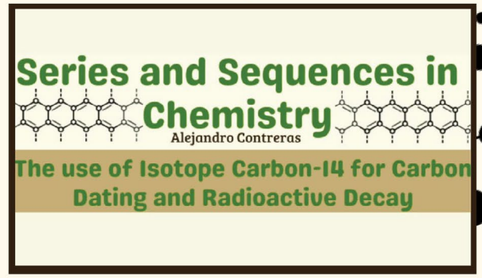
Check this Qr code to see Real-Life Testing of different Isotopes in radiometric dating.

Check the Qr for more information about Carbon Dating

Conclusion

Considering the use of Carbon-14 as a way to investigate the age of many organisms, it can be a way to establish with some precision the age of more recent fossils, rather than giving it a large range of years. It could be seen how Carbon-14 represents a Half-life situation, which is presented by a geometric sequence, but it could also be seen how its behavior can be seen in an exponential decay, as it is with all other isotopes in the environment. While this is a very effective way to find the age of fossils when the range of years exceeds 50000 years, the method becomes inefficient, but there are other alternatives with other Isotopes with the same process. One of the most common ones is Uranium-238, which is normally used in radiometric dating, a process similar to Carbon dating that can give us the age of much older rocks, materials, or resources in our world, dating back to the creation of the Earth.

Video Explanation



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Dating

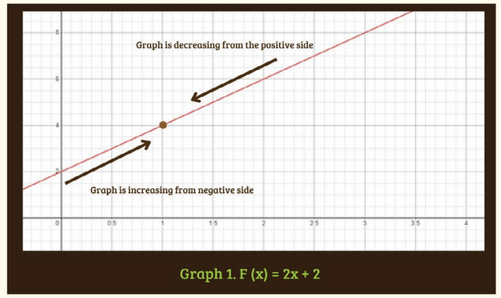
Concept of Limits

The definition of a Limit is the value that a function approaches the output for the given input values. More than anything, the concept of Limits analyzes the behavior of a graph when it gets really close to a value that we decide to evaluate. The equation components of a Limit are:

$$\lim_{x \to a} f(x) = L$$

- L: the value that the function approaches for the input value given
- $f(x)$: the function that is going to evaluate the input value
- $x \to a$: the value for our variable (x) as it approaches the input value (a)

The thing is that a Limit can be seen between the positive side (from right to left) or from the negative side (from left to right). This allows for the graph to be analyzed at a much better precision, and allows for the concept of continuity to be analyzed as well.



Graph 1. F (x) = 2x + 2

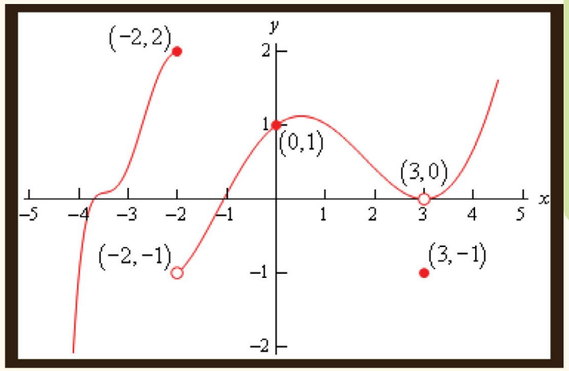
For Example, in this equation we can analyze how the graph can be analyzed from the left or from the right.

$\lim_{x \to 1^+} 2x + 2 = 2(1) + 2 = 4$

$\lim_{x \to 1^-} 2x + 2 = 2(1) + 2 = 4$

When analyzed mathematically, the values for a simple function like this one don't vary at all. But graphically, we can see how the function behaves from the positive and the negative side.

For a simple function such as the one above, it is really easy to analyze continuity, as we can see the function at that point exists, and the limits of both the negative and positive exist and are the same as the value function at that point, but for a case such as the one below, continuity needs to be analyzed at each point.



Continuity

Continuity is a function that varies with no abrupt breaks or jumps. This means that a function can't have points where there is no value for the output or a sudden leap from one value to another. For a function to be continuous, it has to comply with these three rules:

1. The function is defined at x = a, meaning that when analyzing the limit, the function presents a real output value for that input value we are examining.
2. The limit from both sides of the value analyzed exists.
3. The limit from both sides as it approaches our input value is the same as the actual value of the function at that point.

If we analyze this graph, it is important to indicate that a dot filled is the indicator that the value where the filled dot is in, is the value of the function at that point, while the empty dots show where there is no value of the function, but show where the graph is cut off or displaced.

For the graph at -2, we analyze the 3 rules. The function at this point exists and it 2, becasue we take the value that is filled. The limit from the negative side is 2 as well, but the limit from the positive side is -1, as indicated by the empty dot. Because of this, while the first 2 rules are met, the third one isn't, so the function isn't continuous at -2.

For the graph at 0, the value of the function at this point exists and is 1. The limit from the negative side approaches 1, and from the positive side, it also approaches 1. Therefore, the third rule is met, which proves that at 0, the function is continuous.

For the graph at 3, the value of the function exists, indicated by the filled red dot, which is -1. The limit from the negative side approaches 0, and the limit from the positive side also approaches 0. Because of this difference between the limits and the actual value of the function at 3, the graph is not continuous at 3.

Limits for Carbon Dating

For the function given already, in a hypothetical situation, there will always be traces of Carbon-14 in the organism, as the graph shows that it has a vertical asymptote at 0, but realistically, this doesn't work like that. Measuring traces of Carbon-14 is really difficult, as the precision of every gram can cause a huge change in the years of that organism's death date. Realistically, scientists have decided that the value where the measurement of Carbon-14 becomes unreliable is approximately at 50000 years. For this analysis we will assume that the organism has an initial value of Carbon-14 of 100 grams.

$$\lim_{t \to 50000} (100)\, e^{-0.0001216\,(50000)} = 0.228 \text{ grams}$$

As seen in the limit, as t approaches 50000 years, the value of grams of the function approach 0.228 grams. This is king of the indicator where the values for Carbon-14 start becoming unreliable to measure both because of the difficulty of measuring such low values, and because the little changes in values right here present huge changes in the years estimated. We could also analyze the limit of the function as it approaches infinity in the following steps:

Relation to other topics

The concept of limits can be seen in multiple other areas of knowledge. The limit concept evaluates the tendencies of a function when approaching a certain value, especially the value of 0 in realistic situations. Because of this, limits can be seen in physics in motion, as the motion of the object approaching a 0 value for time or height can show us the final speed or velocity of that object. In chemistry, it can also be seen in chemical reactions, when the value of the concentration of a reactant approaches 0, or the values of the energy released reach 0 as well or infinity. Even in Biology, the limits are evaluated in the amount of population a certain ecosystem can sustain, or in real life, the amount of stress railroads can resist, or a phone vibration that damages the battery.

Conclusion

To conclude, the concept of limits can be used in many areas, not only in scientific spaces, but in things that we face each day. More in-depth, the relationship between limits and the concept of Carbon dating occurs when the measurement of Carbon-14 becomes unviable or impossible to measure. This is approximately when the amount of years passed since the death of the organism reaches 50000 years or when the value of Carbon-14 in the organism is around 0.228 grams.

$$\lim_{t \to \infty} (100)\, e^{-0.0001216\,(\infty)}$$

$$\lim_{t \to \infty} (100)\, e^{-\infty}$$

$$\lim_{t \to \infty} (100)\, \frac{1}{e^{\infty}}$$

$$\lim_{t \to \infty} (100)\, \frac{1}{\infty}$$

$$\lim_{t \to \infty} (100)\, 0$$

$$\lim_{t \to \infty} 0$$

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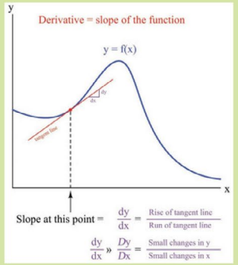
Watch the video here

Use of Derivatives in Carbon Dating

What are Derivatives?

A derivative is the change of the Y values with respect to the X values at a certain point in a function. The derivative gives us the instant rate of change at a certain point. Because of this, we can actually say that the derivative of a function is the slope value for the tangent line situated at that point of the graph. This tangent line being represented by the equation: Y=mx+b



To find the value of the derivative of a function, there are many rules and ways to approach it. It is important to point out that for a function to be derivated, the function must be continous at all points.

Differentiation

Differentiation is the process of finding the derivative of any function. This process has the following approaches:

1. Definition of Derivative

$F(x) \longrightarrow F'(x) = \lim_{h \to 0} \frac{F(x+h) - F(x)}{h}$

This method can also be called the limit definition of the derivative

2. Power Rule

If we have a function such as:

$F(x) = ax^n$

Then the derivative would be:

$F'(x) = anx^{n-1}\,dx$

Taking into consideration that the value of "dx" is the internal derivative of the function

3. Product Rule

$\frac{dx}{dy} f * g = f' * g + f * g'$

4. Quotient Rule

$\frac{dx}{dy} \frac{f}{g} = \frac{f' * g - f * g'}{g^2}$

5. Reciprocal Rule

$\frac{dx}{dy} \frac{1}{f} = \frac{-f'}{f^2}$

6. Constants Rule

The rule for all constant values in a function states that the value of the derivative of any constant will be 0.

7. Chain Rule

$\frac{dx}{dy} f(g(x)) = f'(g(x)) * g'(x)$

Derivatives in Carbon Dating

For the situation presented in Carbon dating, because the graph analyzes the grams of Carbon-14 in the organism and years, the derivative function will give us values of the rate of change in this function. This means that the values presented by the derivative equation will be shown in the rate at which the grams of Carbon-14 decrease at a certain year.

Initial Equation:

$N(t) = N_0 e^{-0.0001216t}$

For a hypothetical situation where the organism has 100 grams of Carbon 14 at death.

$N(t) = 100\, e^{-0.0001216t}$

Consider that the derivative of euler is:

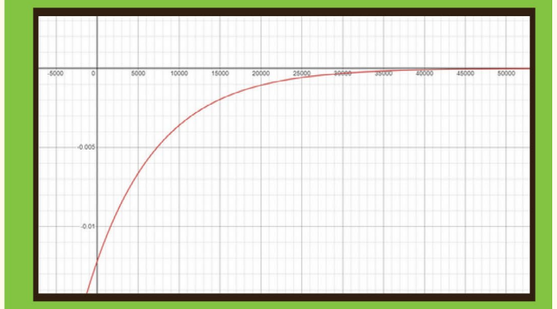
$y = e^x \qquad y' = e^x\,dx$

$N'(t) = 0 * e^{-0.0001216t} + 100 * e^{-0.0001216t} * -0.0001216$

$N'(t) = -0.01216\, e^{-0.0001216t}$ ← Final Derivative

Now that we have our equation above, what is most important to analyze is the rate of decrease of Carbon 14. We can easily identify that the derivative is telling us the rate of decrease because of the negative value presented besides Euler. After this, we can also add that the rate is not constant, but it presents a radical function behavior, increasing at a high rate at first, but eventually decreasing past the 50000 years mark. Additionally, we can analyze two points in our graph to see the rate of decrease in Carbon-14, those points being at 10 years and at 50000 years, because they represent the two extremes of our function.

Graphical Representation



Graph 1. Derivative function for original Carbon-14 decay for a hypothetical situation of an organism with 100 grams.

$N'(10) = -0.01216\, e^{-0.0001216(10)}$ $\qquad$ $N'(50000) = -0.01216\, e^{-0.0001216(50000)}$

$N'(10) = -0.012145222243$ $\qquad$ $N'(50000) = -2.78 \times 10^{-5}$

Now, we can compare these values, and at first glance, we can already say that the difference among these numbers is evident. In the first years since the death of the organism, the rate of decrease of Carbon-14 can be considered quite low, but we need to take into account that this is a process that lasts over 50000 years. Even tho this is a large process, at 50000 years, the rate of decrease in Carbon-14 is almost unnoticeable. With the values we have now, we can actually say that we have the slope of the tangent line of our point, so we are missing the values of y and the value of b to complete our function.

$N(10) = 99.878$	$N(50000) = 0.228$
$y = mx+b$	$y = mx+b$
$99.878 = -0.01214522243\,(10) + b$	$0.228 = (-2.78 * 10^{-5})\,(50000) + b$
$99.878 = -0.1214522243 + b$	$0.228 = -1.39 + b$
$99.75654778 = b$	$1.618 = b$
$y = -0.01214x + 99.75654778$	$y = (-2.78 * 10^{-5})\,x + 1.618$
Tangent line equation for 10 years	Tangent line equation for 50000 years

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Conclusion

To conclude, the use of derivatives aids us to determine the rate of change of a certain value we decide to analyze. This can be very helpful in many ways, such as the one presented in this project. The derivative helped us to determine how the rate of decay of Carbon-14 changes over time, such as the original function. The uses of derivatives go far beyond Carbon dating. The principal use of derivatives is in the area of physics, where they can be used to determine the velocity and acceleration of a distance vs time function. In other areas of science, it can be used to find Optimization and analyze profit and cost functions in Economics, or model drug concentrations by analyzing their consumption and elimination in Medicine.

Video Explanation

Check the Qr for more information about Derivatives and how they are present in our daily lives

GENERATING CLEAN ENERGY AT SCHOOL

Juan Diego García, Emmanuel Melgarejo,Nicolas Bejarano,
Samuel Imbacuan
12th Grade

DEDICATION:

This article is dedicated to professor Matthew D. Reis for always helping caring and working hard to accomplish such an enormous task, even lending the tools to develop the project and sacrificing his own time. "thanks Matt"

ABSTRACT:

In this project, the generation of energy via mechanical movement of the user is sought. It is wanted that the use of the machines with uniform circular movement in the sustainable park generate energy when a student uses them. For this, concepts explored in the AP® Physics C: Electricity & Magnetism class are used to later create circuits that make it possible to charge small devices such as a cell phone. Similarly, this project seeks to demonstrate how daily living activities can help defray climate change and reduce energy costs.

INTRODUCTION:

In recent years, the importance of renewable energy has become increasingly apparent as the world faces pressing concerns regarding climate change and energy security. One area of interest in the field of renewable energy is the development of methods for harnessing energy from human activity. Exercise machines, such as treadmills and stationary bicycles, are a common feature in fitness facilities around the world, and their use generates significant amounts of energy. This has led to interest in the possibility of using biohealthy machines as means of generating electricity at Rochester school. In this report, we will explore the science behind how exercise machines could produce electricity, using the principles of electromagnetic induction and the use of generators. And finally we will also discuss the potential ways these ideas could be adapted to the machines at school and the benefits and limitations of this design.

THEORETICAL FRAMEWORK

The concepts the project used through the project are the following.

Alternate current: Alternate current (AC) is a type of electric current that constantly changes its direction. Unlike direct current (DC), which flows consistently in one direction, AC moves back and forth in a cyclic pattern. This change in direction occurs at a regular interval, typically referred to as the frequency, measured in Hertz (Hz). AC is generated by power stations using devices called generators. These generators use mechanical energy, such as steam, water, or wind, to rotate a coil of wire within a magnetic field. As the coil rotates, it induces a changing magnetic field, which in turn generates an alternating current in the wire.

Sprocket: A sprocket is a wheel-like component with teeth or cogs evenly spaced around its circumference. It is commonly used in machinery and mechanical systems to transmit rotational motion or power. Sprockets are often paired with a chain or a belt. When the chain or belt wraps around the sprocket's teeth, the rotation of one sprocket causes the linked sprocket to rotate as well. This creates a mechanical connection that transfers power or motion between the two sprockets.

Pulley: A pulley is a simple machine consisting of a wheel with a groove along its circumference. It is used to change the direction or magnitude of a force, making it easier to lift or move heavy objects. A pulley typically has a rope or a cable threaded through its groove. When you pull on one end of the rope, the pulley rotates, creating a mechanical advantage.

Direct current: Direct current (DC) is a type of electric current that flows consistently in a single direction. It maintains a constant polarity, meaning the positive and negative charges always flow in the same way. DC is commonly produced by sources such as batteries, solar cells, or certain power supplies. When you connect a device or component to a DC power source, the flow of electrons remains steady, moving from the negative terminal to the positive terminal. Unlike alternating current (AC), which periodically changes direction, DC provides a continuous and stable flow of electricity. This characteristic makes DC suitable for powering devices that require a consistent and unidirectional current, such as many electronic devices like laptops, smartphones, and LED lights.

Regulator: A regulator is a component in an electrical circuit that helps control and maintain a specific voltage or current level. It ensures that the output of the circuit remains stable, even if there are changes in the input voltage or current. Think of a regulator as a "traffic cop" for electricity. It monitors the flow of electrical energy and adjusts it as needed to keep things running smoothly. When the input voltage or current fluctuates, the regulator steps in to provide a consistent and reliable output.

Capacitor: A capacitor is an electronic component that stores and releases electrical energy in a circuit. It consists of two conductive plates separated by an insulating material called a dielectric. Imagine a capacitor as a temporary battery that can quickly charge and discharge. When a voltage is applied across the plates, the capacitor stores electric charge. This charge remains trapped between the plates until it is needed.

Chain step: In the context of a mechanical system, a step refers to a specific point or link in a chain. A chain consists of a series of interconnected links, and each link is considered a step. Imagine a necklace made of small individual beads. Each bead represents a step in the chain. The beads are connected in a sequence, forming the chain.

Diode rectifier bridge: A diode rectifier bridge, also known as a bridge rectifier, is an electrical component used to convert alternating current (AC) into direct current (DC). It consists of four diodes arranged in a specific configuration. The diodes in a bridge rectifier allow current to flow in only one direction. They act like one-way valves for electricity. The arrangement of the diodes ensures that current can flow through the circuit in the same direction regardless of the polarity of the input AC signal.

DC to DC converter: A DC to DC converter is an electronic device that takes an input of direct current (DC) at one voltage level and converts it to a different DC voltage level. It allows you to change the voltage of a DC power source to match the requirements of a specific device or circuit. These concepts will then be further used and marked.

EXPERIMENTAL DEVELOPMENT

● MATERIALS

1. Wires
2. Protoboard
3. Nuts
4. Gears
5. Electric motor
6. Capacitors/batteries
7. regulator
8. wood
9. belt

Figure 1.

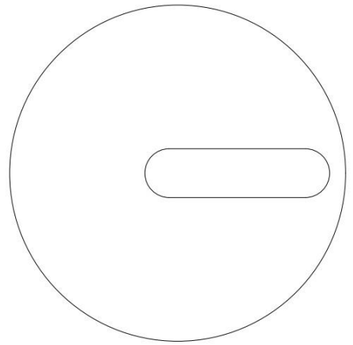

Figure 2.

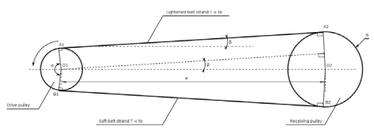

Figure 3.

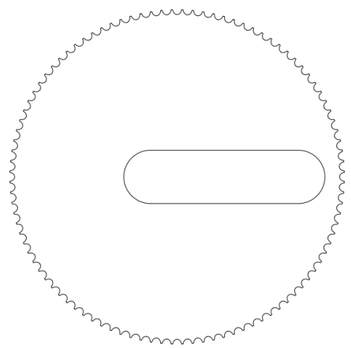

Figure 4.

3a. DESIGN

Throughout the design stages the project faced one of their most complex challenges, converting any movement in the biohealthy into circular motion finally the movement was found on the elliptical machine as shown in the red segment of figure 1.

The red segment is able to move in circular motion so in order to take advantage of that we made a wheel with a radius equivalent to the red segment then added a hole big enough for the wheel to fit into the red segment this can be seen in figure 2 Finally to transfer the energy to a motor to then create electricity like in figure 3.

3b. BUILDING

The first thought in the building process was to build it around a bicycle chain for that a sprocket was developed first by nailing a round circle. This method didn't prove useful; this made the project shift towards the development of a gear. gear shown in figure 4.

the gear although much more complete and precise it was not capable of aligning and turning effectively. This thanks to the deteriorated state of the chain that made the chain step fluctuate even by 1 mm and this little error made the whole system collapse. Finally after brain storming the project shifted towards creating a pulley with a belt making a system like that one initially thought of in figure 3. This is a system that finally proved to work and was capable of generating voltage and current.

3c. CIRCUIT

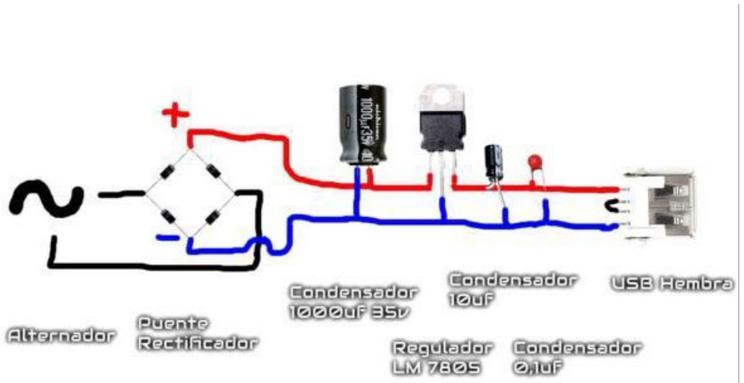

Figure 5.

The circuit was made in base of the diagram on figure 5. The diagram shown was taken from a video on generating electricity with a bike so in simple terms making electricity with a sprocket. So first of all the motor when spinning stars creating voltage and current. This current is alternate current or (AC) so in order to employ it towards charging a phone we need to transform it into direct current or (DC), for this we employ the diode rectifier bridge and connecting the positive and negative coming from the motor to either poles of the bridge now we use the capacitors to equilibrate the current and voltage passing through the circuit, without these the circuit would have many problems charging the phone. And finally the one in charge of not letting our phones battery burn is the regulator that stabilizes the voltage introduced. Then everything outputs towards the female usb which is in charge of changing the phone.

4. RESULTS

The results didn't quite live to the expectations although it worked like shown in figure 6. it was just able to produce around 4 volts and 0.33 amps. capacitor was disconnected to the negative on the board. Also it was later discovered that the motor used during the project is a DC motor this means that there never was the need for a rectifier bridge.

5. ANALYSIS

Looking into the results we can see that the project is still lacking by around 1 volt and 0.77 amps since the minimum needed to charge a phone is 5 volts and 1 amp. That difference that we are lacking may be due to 2 factors the first of those being the tension on the belt not being enough thus limiting what the motor can generate and second, an error on the circuit where a capacitor was disconnected to the negative on the board. Also it was later discovered that the motor used during the project is a DC motor this means that there never was the need for a rectifier bridge.

Figure 6.

6. CONCLUSIONS

Finally we can take from this project that both having the mechanical and electrical part working poses challenges that only with patience can be solved. Taking a break from time to time while thinking on the problem in a second plane are the ways in which ideas and solutions come to mind. Talking concepts, everything talked about in the theoretical framework was learned from scratch and used actively throughout the project. The results gave mixed opinions. It wasn't able to charge the phone, but it was able to generate electricity and turn a LED on. But looking it from a perspective on how much value did it bring the school there is a great step, being able to use school infrastructure to further create sustainable options shows that thinking sustainably is something teached an though thoroughly at school, other possibilities for the machine could be for class assignments like laboratories, serving as a device to record data and develop practical and interesting projects like "how much does it take to charge a phone to the max just by using the machine?".

Improvements for the projects are already thought of and being developed for the first issue a belt tensor is being developed and expected to accomplish the mission of the project and for the second issue it just requires some soldering and the possible implementation of a DC to DC converter. Finally for next projects it would be ideal to carry on with the idea of making the biohealthy park fully able to generate electricity through students' inventions.

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IS THERE LIFE OUT THERE?

By: Maya Aristizabal (10th), Hanna Isaza (9th),
Paula Romero (10th), Diego Sierra (9th)

Research Question

Under what conditions and circumstances are diverse living organisms able to survive and grow within the possibility of finding life elsewhere?

Introduction

The project aims to comprehend what the basic needs for flora and fauna are, taking real and actual data every week to understand the growing process of the species with different variations, based on temperature, light, water, pH and conductivity. Based on the information, an analysis of the concept of "extremophiles" shall be taken into account.

Over the years, there has been a crisis regarding climate change and global warming. The amount of pollution and contamination has been growing exponentially over the years, due to different factors that contribute to the harming of planet Earth, and thus harming flora and fauna as well. The issue, as a whole, is not a future problem. This is happening now. Changes to Earth's climate are constantly driven by increased human emission of heat trapping greenhouse gases.

On the other hand, as humans, one of the most asked questions of all time is the possibility of life on other planets. Is there life out there? The definition of "habitable zone" is the distance from a star at which liquid water could exist on orbiting planets' surfaces. Habitable zones are also known as Goldilocks' zones, where conditions might be just right – neither too hot nor too cold – for life. Scientists, and even David Bowie, have been curious given the possibility of sustainable life on other planets. The Universe is tremendous, as there are trillions of planets with different conditions and atmospheres; actually, NASA hosts an exoplanet program to find unmistakable signs of current life on a planet beyond Earth.

The analysis of light shot by a star through the atmosphere of a distant planet is understood as spectroscopy. The slices missing from the light spectrum show the chemicals or gasses present in the unknown atmosphere. The NASA program demonstrates the Exoplanet Travel Bureau, as an ironic but possibly true Tour Around The Galaxy. Life on Earth, specifically, is characterized by four requirements: energy carbon, liquid water and various other elements. Thus, the limits for human life and Earth organisms, is a pH of 0-12.5, a radiation of 50 Gh/h, a lower temperature of around -15°C and an upper temperature of 122°C.

As Rochester School students, we learn to take charge of our lives with the world in mind; we want to choose a sustainable world. The correlation among the learning of the different sciences-Physics, Chemistry, Biology and Sustainability- made it possible for the project to demonstrate the different concepts of life.

With all these information in our minds, we wanted to give continuity to last year's project about finding which extreme conditions could plants resist, simulating different planets. In this opportunity, we want it to include another type of plant aside form the lettuce: the succulent, in order to have additional results and for this project to be complemented.

Methodology

For this project we used an experimental and correlational type of design. The project started with a qualitative approach to select the type of plants, nutrients, and type of light in which plants will grow, simulating extreme conditions in exoplanets. Based on the conclusions of the qualitative approach, quantitative data collection started for the second and third phases of the project. The measured variables are pH, conductivity (figure 1), temperature, humidity, foliar area (figure 2) and CO2, which depends on the type of light (IR, UV, natural light and white light) and the substrate (different concentrations of Potassium, Copper, and three different pH concentrations) for each plant. The population is 30 individuals divided in a control group and nine different extreme condition environments (figures 4 to 6) . All variables are controlled and measured with arduins programmed by Diego (figure 2), with the help of our Physics teacher Karla Varela, and our laboratory assistant Julieth Lara. . This data collection allows a temporal analysis of the variables and correlation maps to test the initial hypothesis.

Figure 1. Measuring conductivity.

Figure 2. Measuring the foliar area of each plant.

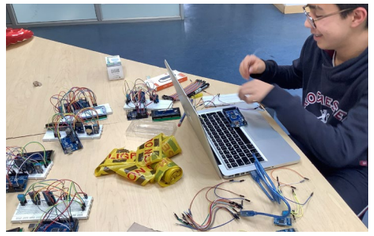


Figure 3. Diego Sánchez building and programming arduins.

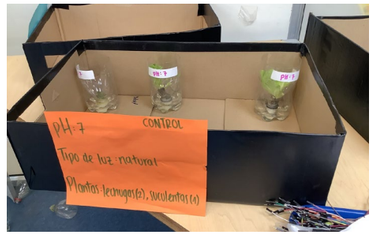


Figure 4. Control group.

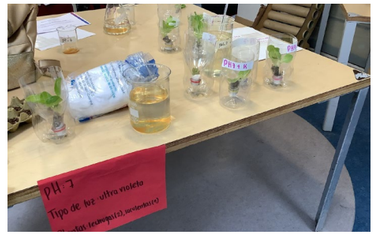


Figure 5. Preparing substrate for the plants.

Figure 6. Monitoring planets.

Each of out fictional planets were named after our teachers and our selves, as follows:

KVARELA-2405

Conditions: about 83% hydrogen, 15% helium, 2% methane and traces of acetylene. The orbital radius is 0.01598AU, the orbital period of 0.7 days.

Characteristics: a gas giant exoplanet, with an approximate of 30 million years of age. The planet is around 700 light-years away. The planet is twice the density of Earth. It has a significant gravity that retains the atmosphere of hydrogen and helium. The temperature of this is relatively cool. The temperature varies between (enter data of the plants)

Life: On this planet, the conditions for life are quite unlikely, it has no substantial surface. However, microbial life may be seen on this planet as well as some sort of floating plants.

Solar System: within the Earth's solar system, orbiting a G type star.

History: The KVARELA-2405 was found in 2020 by NASA's Transiting Exoplanet Survey Satellite (TESS). The TESS surveys the entire sky using four cameras, which collect light from stars; it looks for periodic dips as planets cross in front of the stars. This planet is demonizándole as a Gas Giant as it was found in the 24 of May regarding an air sign for the horoscope.

Sustainability: This planet does not share a very sustainable hosting of life, however with the right adaptations more life could be found regarding the characteristics that may suit adaptable living organisms that could breathe in hydrogen.

If we were to travel to this planet with light speed it would take around 737 years with a speed of 671 million miles per hour.

ACAMP-0603

Conditions: The conditions on this planet would be considered similar to Earths'.

Characteristics: The planet is about 1.3 times the mass of Earth and is located in the habitable zone of its star. It has a year length of only 11.2 Earth days. It is likely tidally locked to its star, meaning one side is always facing the star while the other is in permanent darkness. The planet's surface temperature is estimated to range between -30 to 30°C, depending on its atmosphere.

Life: Life here would be nice as this planet has really similar characteristics to planet earth. Maybe conditions would be a little bit rougher but life would be good.

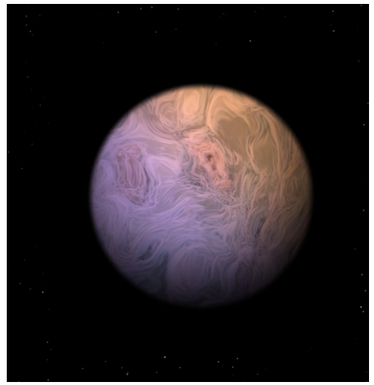
Solar System: Located in alpha-centauri star system

History: Was discovered in 2016 by astronomers using the radial velocity method, which detects the wobble of a star caused by the gravitational pull of an orbiting planet.

Sustainability: Humans would need to develop sustainable technologies and practices that could mitigate the effects of the star's rough conditions and help create a self-sustaining environment.

PITUNA-2801

Conditions: The conditions of this planet could be considered dangerous because of the extremely humid the air is, this planet has a lot of water and it rains almost daily, the soil is hardy good for harvesting and the atmosphere has a very low level of heat, this extreme conditions could only be livable with the right equipment and areas for human life.



Characteristics: a very humid medium expo planet, with approximately 18 million years. The planet is 245 light years away from Earth. It is an exoplanet with a radius just under twice that of Earth.

Life: Only unicellular organisms similar to protists.

Solar System: is in the Virgo constellation and it orbits its star every six days
History: Orbiting a star slightly smaller than the Sun with a period of 4.9 days, PITUNA-2801 measurements indicate that it may have lost its atmosphere or be an ocean-covered water world. The heat from its closely orbiting star might be evaporating the exoplanet's atmosphere, possibly leading to its eventual transformation into a small, bare rock.

Sustainability: Humans must develop new technologies and telescopes to study its atmosphere.

ANDPOL-0105

Conditions: Is an extreme and inhospitable environment, with conditions that make it impossible for life as we know it to exist.

Characteristics: It is a gas giant planet that orbits very closely to its host star, with a period of just 2.2 Earth days. This close proximity causes the planet to intense radiation from the star, and the temperatures on its surface can reach up to around 900 °C. It is tidally locked, meaning that one side of the planet always faces the star, while the other side is in perpetual darkness. The planet's atmosphere is thick and contains clouds of silicate particles that give it a blue color. Scientists believe that the atmosphere is turbulent, with high winds and temperature variations.

Life: Life in this planet is mostly impossible. It is a gas giant meaning there is not a hard surface. Also, due to the intense uv radiation temperatures are very high for life to exist.

Solar System: It is located in the constellation Vulpecula

History: It was discovered in 2005 by a team of Swiss astronomers using the radial velocity method.

Sustainability: The study of the planet's atmosphere, which can provide insights into the chemical composition and physical processes that affect planetary environments.

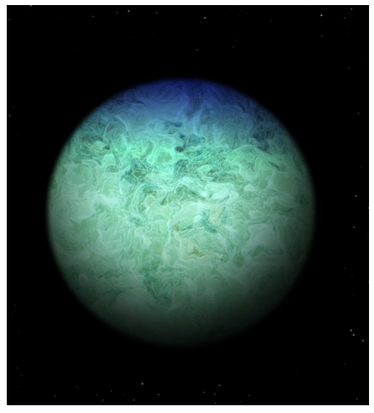
EARTH

Conditions: Earth's atmosphere is roughly 78 percent nitrogen and 21 percent oxygen, with trace amounts of water, argon, carbon dioxide and other gasses. No other planet in the solar system has an atmosphere loaded with free oxygen, which is vital to one of the other unique features of Earth: life.

Characteristics: Our home planet Earth is a rocky, terrestrial planet. It has a solid and active surface with mountains, valleys, canyons, plains and so much more. Earth is special because it is an ocean planet. Water covers 70% of Earth's surface.

Life: It is the right distance from the Sun, it is protected from harmful solar radiation by its magnetic field, it is kept warm by an insulating atmosphere, and it has the right chemical ingredients for life, including water and carbon.
Solar System: Milky Way galaxy.

History: Earth formed around 4.54 billion years ago, approximately one-third the age of the universe, by accretion from the solar nebula. Volcanic outgassing probably created the primordial atmosphere and then the ocean, but the early atmosphere contained almost no oxygen.



Sustainability: It's the perfect and only planet for humans to live on so far.

JULARA-3103

Conditions: habitable temperatures, with light and darkness for half a year each.

Characteristics: a super- Earth exoplanet 635 light years away. It has 2.4 times the Earth's radius, may be covered in water and habitable. The orbital radius is 0.849AU, and an orbital period of 289.9 days. The mass is 26 times the Earth's mass. It would take around 635 years if we were to travel

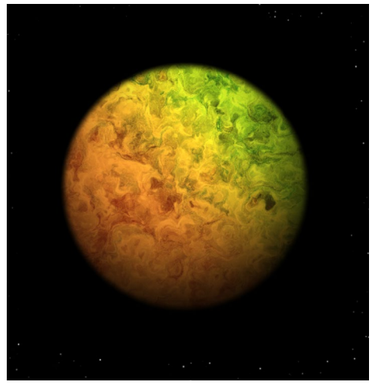
at light speed with a travel speed of 671 million miles per hour. It is said to be rocky, thus reminiscent of the actual Earth's life.

Life: life on this super earth is quite interesting, if it was ejected from its star system it would have a dense atmosphere and a watery surface, thus the organisms of the planet are aliens adapted to life Earth's organisms. If human life terms, super Earths are the most habitable planets as they could sustain life far longer than Earth. Life on this planet is beautiful with diverse plant life found.

Solar System: found within our solar system

History: this planet was found by observing its transit between its star and us. If we were to live in it, the growing population might be interesting. The gravity of this planet is quite dense. It was found in 2012 on August 24 which resembles the Earth element of virgo.

Sustainability: the stretchy and amount of gravity would be incredibly huge. A greater force would be constant. Earth pressure and water would be affected due to the energy needed to evaporate on this planet.



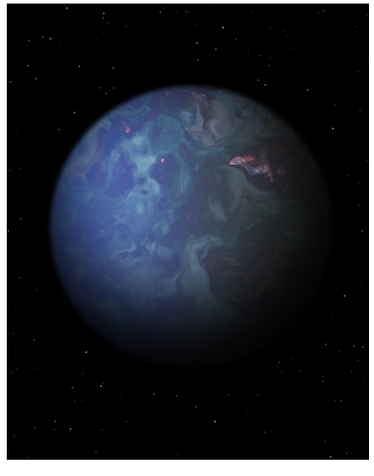
HldG-263008

Conditions: Very high temperatures, with light everyday of the year

Characteristics: a non earth compatible exoplanet 423 light years away. Our estimated radius is 3.3 times the Earth's radius, it might only have co2 particles and dirt with some inhabitable characteristics. The orbital radius is 0.849AU, and an orbital period of 289.9 days. The mass is 34 times the Earth's mass. It is estimated that it would take around 423 years if we were to travel at light speed with a travel speed of 671 million miles per hour.

Life: on this planet life would be very difficult considering humans are not used to the very high temperatures that this planet has, but with the right equipment humans would be able to survive and sustain life on this planet.
Solar System: found within our solar system

History: this planet was found by scientists when looking for asteroids that were relatively close to our solar system.
Sustainability: In this planet there would be almost no type of liquid resources, the solid would be dry and it would be very difficult to harvest plants, it is estimated that the conditions of the planter could change in about 1300-1500 light years, and in this amount of time the water resources could be much greater.



PAMAYs-0724

Conditions: about 12% hydrogen, 10% helium, 5% methane, 63% oxygen, with traces of potassium. The orbital radius is 0.07693 AU, the orbital period is 100 days.

Characteristics: an exoplanet with different conditions from earth, yet still able to grow lettuce and succulents, 856 light years away. The mass is 3.56 times Earth's mass.

Life: It is unlikely for humans to survive in PAMAYs-0724 because of its gravity of 59.07 m/s, but perhaps with the right equipment we could survive and live on this planet.

Solar System: found in Magellanic Galaxy.

History: this planet was found by NASA in 2019 when exploring for life in other galaxies.

Sustainability: It has been proven that lettuce and succulent plants grow in great condition and at a steady pace on this planet.

RESULTS

The results indicate a high correlation in the frequency of the type of light used and growth and development of the plants.

High concentration of Potassium in the substrate is not affecting negatively the growth of the plants. Copper affects negatively the growth of plants. There's evidence of the correlation of the substrate and growth of lettuce plants. The basic pH helps the growth of the plants, while acid pH affects them negatively.

The correlation between conductivity and growth of the plant does not show so far a clear correlation and will be tested in the fourth phase of the experiment.

High temperatures (IR light)have an important effect on the development of the plants, making its life span to be shorter.

Succulent plants are more resistant than lettuce to extreme conditions, they resist UV and IR light, although they do not grow as much as the ones under natural light.

Conclusions

The understanding of sustainable condition for life was observed due to diverse variables that allowed the plants to adapt to their environment.

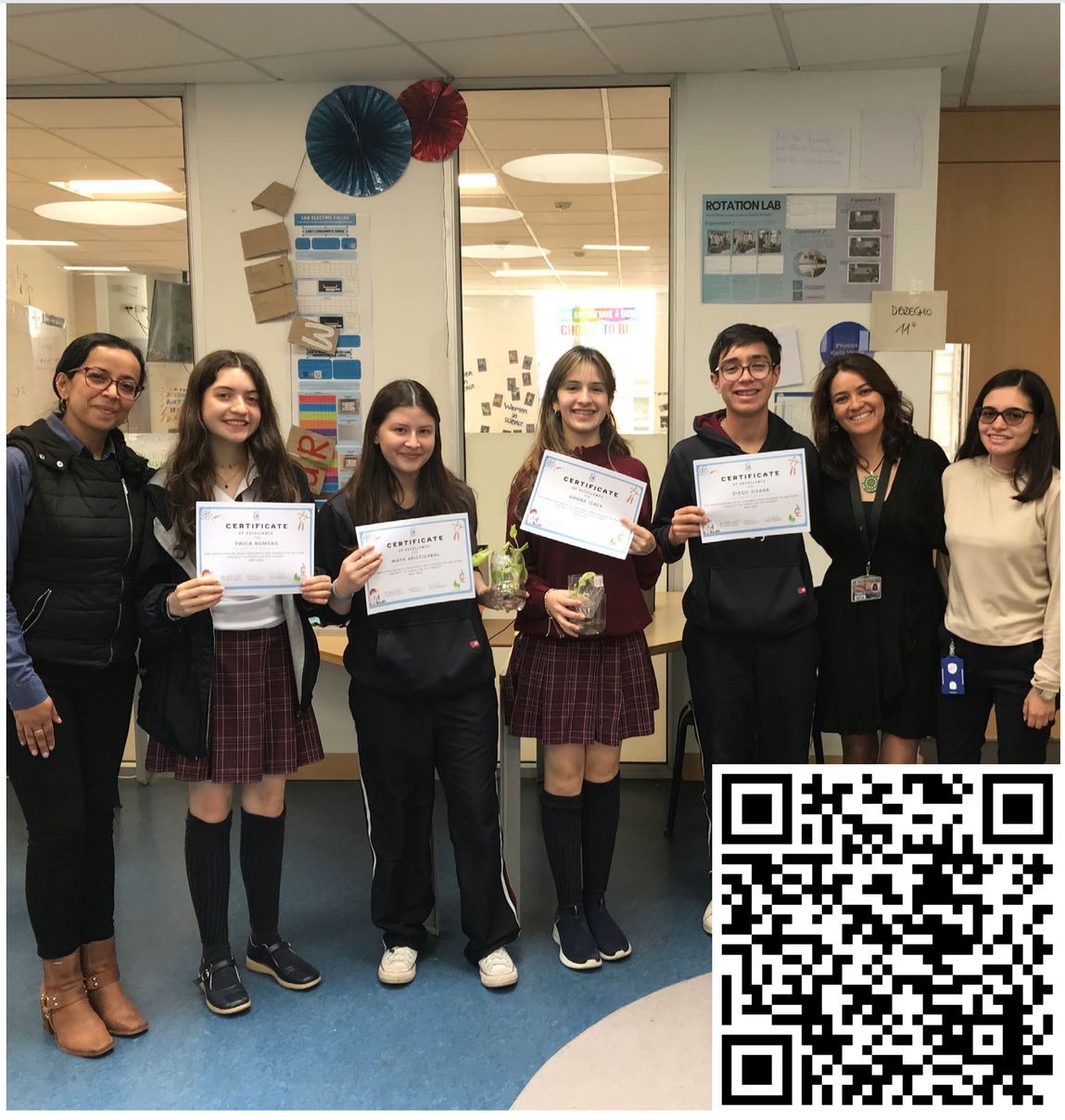
We were able to demonstrate that the temperature can variate using lights with different wavelenght.

The growth of the plant and the temperature have a direct correlations.

There's a difference between the plants and their growth according to the different ions in each planet. The most successful growth was the planet with potassium. It has a role in the plant's enzyme activation, which has an impact on the production of protein, starch, and adenosine triphosphate (ATP). The rate of photosynthesis can be regulated through ATP synthesis.

The conditions of succulents and certain conditions such as potassium, allow plants to adapt in terms of their environment.
The data collected (temperature, humidity, Foliar area, Photosynthetic rate, CO_2 ,Type of light, Different concentrations of Potassium, Copper, Iron, and three different pH concentrations) showed how the understanding natural selection and adaptation are an essential part of Biology and necessary for studies about evolution and life in other planets.

Physics is a crucial part of the project as it relates to its concept and background of it. The main product was to understand the different life conditions that could apply to a habitable exoplanet. Additionally, various concepts regarding the conditions, light, temperature, pH, and conductivity use methods to analyze the data. In terms of optics, light allows the plants to grow and photosynthesize, optics explains the behavior of light through waves and the electromagnetic spectrum as these waves flow through the plants allowing them to grow. In addition, two of the boxes (planets) had the variable of UV and infrared light which are related to the frequency and spectrum of the growth of the planets thus, explaining the habitable conditions of each planet. On the other hand, astronomy and the concept of understating circular motion and the movement of the hypothetical planets based on NASA and their research allowed us to understand the distance and the importance of finding life out there.



"There may be aliens in our Milky Way galaxy, and there are billions of other galaxies. The probability is almost certain that there is life somewhere in space."
- Buzz Aldrin

PI DAY AT ROCHESTER SCHOOL

By: Miguel Salek, Ramiro Londoño, Ma.del Pilar Tunarroza

Greater global awareness of mathematical sciences are vital to addressing challenges in areas such as artificial intelligence, climate change, energy and sustainable development, and to improve the quality of life in both the developed and the developing worlds. UNESCO's 40th General Conference proclaimed 14 March of every year International Day of Mathematics in November 2019 (40C/ Resolution 30). In many countries, 14 March (3/14) is already celebrated as Pi Day because π, one of the world's most widely-known mathematical constants can be rounded to 3.14. At Rochester, we celebrate Pi Day as the day students show to the community interesting and innovative projects in Mathematics, Computer Sciences and Natural Sciences done by them in the classes during the year.

Pi (Greek letter "π") is the symbol used in mathematics to represent a constant — the ratio of the circumference of a circle to its diameter — which is approximately 3.14159. Pi Day is an annual opportunity for math enthusiasts to recite the infinite digits of Pi, talk to their friends about math, and eat pie. The unique holiday was founded in 1988 by physicist Larry Shaw. The unique holiday is one that is discussed by math teachers in schools across the United States and bakeries and grocery stores often sell pies at a discount that day. In March 2009, the U.S. House of Representatives designated March 14 as Pi Day.

Scientists knew for centuries that, regardless of the size of a circle, the circumference and diameter always had the same exact ratio but were unsure of how to calculate it. The Greek mathematician Archimedes is considered the first person to accurately approximate pi in 250 B.C. after he created an algorithm, which is why pi is sometimes called Archimedes' constant. Over the next several years, Chinese and Indian scientists made invaluable contributions to the study of pi, adding more digits, and scientists are still trying to learn more digits of pi to the present day. But pi has significance outside of mathematics. According to UNESCO, mathematics is everywhere in science and technology, the organization of our societies, are essential to meet the UN Sustainable Development Goals, and in our everyday lives—art and music, games of strategy, budgeting and finance, geolocation techniques and navigation systems, etc.

At Rochester School, we want to promote and develop in students their skills and abilities to innovate, create, communicate, collaborate, and think analytically through math, computer science, and natural science projects. This event provides an organized space for our students to satisfy their basic needs (power and recognition, fun, freedom, and love and belonging) as well as communicate and deepen their learning by making presentations for others in the community.

This year we had different activities from 4th to 12th grade: around 100 presentations of Rochester students, three invited schools: Colegio La Salle, José Max León and Cambridge, a chess tournament, 11 workshops in which the public could create and play, the Pi Olympiads, and a fun contest of trusses in which students and teachers tested, with their own weight, which was the most resistant structure.

All projects presented during the day were prepared by the students with dedication and followed four quality criteria: 1) to show creativity to solve problems, 2) to have an organized and attractive model or computer design that shows the best effort of the students 3) to communicate using adequate and applicable scientific or technical language and make connections with other subjects, real life situations and Choice Theory; and 4) To be able to answer any question from the audience related to the project.

The public voted for the projects they considered deserved an extra recognition, these projects were: Goldberg machine in 6th grade, Truss structures in 7th grade, Chemical recipes in 12th, A Sustainable Town in 12th grade, Farmers Market in 4th grade and Robotics in 11th grade.

At the Pi Olympiads students and parents had the engineer challenge of building a marshmallow shooter with some given materials. The marshmallow that reached the farthest distance was the winner. It was a fun activity in which creativity and cooperative work was evident.

We want to congratulate the teachers that prepared their students with love and discipline to achieve all the expected skills and the students that presented during this day with pride and happiness.

In the following link you can find a multiverse museum to see some videos and photos of the Day:

https://www.spatial.io/s/Mialsaros-Next-Scene-6414b903511d86f5b912a500?share=8243778632563252655

Sustainability

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SUSTAINABILITY · SCIENCE · TECHNOLOGY · ENGINEERING · MATHEMATICS

OUR SUSTAINABLE SCHOOL IN ITS PERMANENT LEADERSHIP PATH

Liliana Medina LEED & Sustainability Adviser

The Sustainability team wants to share with the Rochester community the main actions we have developed in relation to activities for the strengthening of strategic alliances, consolidation of the school's recognition in its integral commitment to sustainability and our mechanisms for communicating performance and sustainable education.

1. Socialization of Performance as a Sustainable Campus:

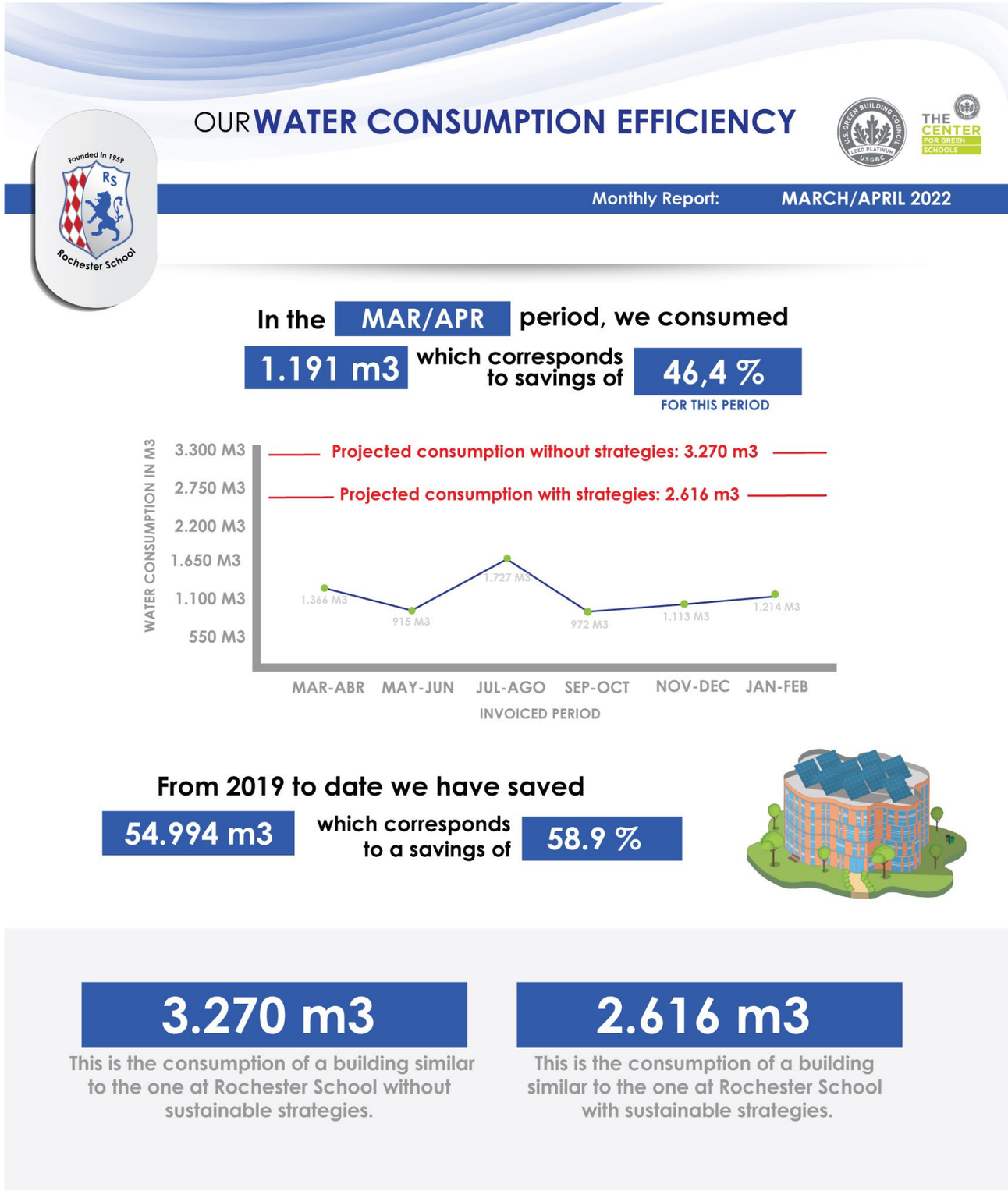
The infographic below shows information about our water footprint and energy efficiency. The information collected was based on the information consolidated with the Infrastructure Department, which is reported monthly through the Arc Skoru platform to Green Business Certification Inc, with the collaboration of the communications area. The Sustainability Team invites you to read it and know more about our results below.

2. Strengthening alliances:

As members of the Colombian Sustainable Building Council in the framework of the events referred to as "Friday of Sustainable Solutions ", we accompanied Stephanie Barger, Director, Market Transformation & Development - TRUE, a zero waste program of the US Green Building Council, in the webinar "The program to achieve Zero Waste goals". The school socialized the waste management actions it represents for the school's LEED OMv41 certification, specifically, 8 out of 8 possible points in this aspect of the certification.

As part of this collaboration with Stephanie Barger, the sustainability team attended the second visit of Stephanie and Jill Donello, Manager of Educational Programs at GreenEducation.US, Founding Board Member, U.S. Zero Waste Business Council, who on June 5, evaluated together with the sustainability team, the TRUE certification aspects.

Stephanie and Jill did a tour around the campus, learned about Rochester's philosophy and had working



OUR WATER CONSUMPTION EFFICIENCY

Monthly Report: MARCH - APRIL 2022

The Water Footprint is the indicator of the total volume of fresh (potable) water used.

In the case of Rochester School, our water footprint is the result of the sum of the bimonthly billed consumption (blue footprint) plus the volume of water treated in the Wastewater Treatment Plant (WWTP) (gray footprint).

Projected consumption without strategies bimonthly	3270 m3
Projected consumption with strategies bimonthly	2616 m3
Blue footprin for march/april	1214 m3
Gray footprint for march/april	1268 m3
Water Footprint for march/april	2482 m3

Our water footprint since 2018 has been

69.641 m3

The water footprint for the month of **MARCH/APRIL - 2023** is

2802 m3

OUR ENERGY EFFICIENCY

Monthly Report: MAY 2023

In **May** we consumed **47,457 KWh/m** which corresponds to a saving of **71,1 %** for this period

From 2019 to date we have saved **6'192.910 KWh/m** which corresponds to a savings of **71,2 %**

164.161 KWh/m

This is the consumption of a building similar to Rochester School without sustainable strategies.

69.182 KWh/m

This is the consumption of a building similar to Rochester School with sustainable strategies.

The energy saved could be compared to a number of trees planted capturing CO2 for 10 years.

Savings in May

1.414 Trees

Savings since 2019

68.441 Trees

OUR ENERGY EFFICIENCY

For the month of May, Rochester School required 58.962 KWh/m for its operation:

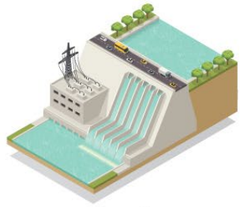
Generated through solar panels

12.415 KWh/m

Consumed from the Public Grid

43.466 KWh/m

16,6% of the energy required in the month of May was produced by our solar panels.



83.4% of the energy required comes mainly from the country's public grid supply, produced mainly through low carbon footprint hydroelectricity.

Our production through solar panels since 2019 has been: **576.073 KWh/m**

CO2 Emissions Reduction

IN MAY

6,17 (Tn CO2 -eq)

SINCE 2019

323,62 (Tn CO2 -eq)

Reductions could be compared to the CO2 captured by a number of trees over 10 years.

If we add up the number of trees per energy consumption and emission reductions it could be compared to a number of trees planted capturing CO2 for 10 years.

In May

10.202 trees

From 2019

508.636 trees

OUR EFFICIENT WASTE MANAGEMENT

Monthly Report: **MAY 2023**

In the month of May Rochester School generated 2791 kg of waste, 79% of which was reused thanks to our recycling and compost strategies to prevent it for reaching a sanitary landfill

The total organic waste generated in the month of May was 2010 kg, and 100% was used to produce organic fertilizer in our compost bin.

781 kg, of inorganic waste was generated during the month of May out of which 25,6% was picked up by our allied recyclers, preventing it form reaching a landfill

meetings. They also had the opportunity of joining the commitment to the SDGs in the activity carried out by the Sustainability Club students.

3. Recognition by the CCCS:

During the XIV version of the Construverde event, the school received the recognition for its performance as a LEED Platinum campus in Operation & Maintenance v4.1. The Sustainability Director, as a representative of the school, received the recognition, highlighting that Rochester School is the only educational institution - school to be a member of the CCCS.

We feel very proud of the way the actions done are giving recognition to the school and how we are providing, with the help of all the staff, a healthy and sustainable environment.

ENERGY DAY: HOW CAN WE SUPPORT COLOMBIA'S ENERGY TRANSITION?

By: Matthew Reis, Environmental Sustainability High School Teacher, and Sustainability Curriculum Coordinator

QR Code 1. Master Engineering Challenge Contestants

QR Code 2. Lion's Honor Master Engineering Final

On January 20th, we celebrated Energy Day at Rochester School. The objective was to raise awareness about Colombia's energy transition through the application of a series of engineering challenges. In the months leading up to Energy Day, students completed various engineering problems to qualify for the grand final: The Master Engineering Challenge.

There were over 100 video submissions from students in 4th-12th grades (QR Code 1). However, only 54 students in total, 18 students from upper primary, middle school, and high school qualified. The Master Engineering Challenge focused on the concepts of renewable energy and transformations. Examples of challenges included building a rubber-band car that could travel 3 meters, a hydraulic wheel that could lift a 50 gram mass using only one liter of water, and building wind blade foils that could generate 3 volts of electricity (QR Code 2). Please scan the QR code below to view a video summarizing the events!

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A LONG WALK TO WATER VIDEO DIARY

By: Jenny Chant, Ana María Campos, Matthew Reis

In the book A Long Walk to Water, Nya is an 11-year-old girl who walks eight hours everyday to fetch water from the pond. She and her family live in South Sudan in 2008. Her family home is far from the nearest pond, where she walks twice a day to support her parents and two siblings. They only have 18L of water to live off of each day.

Students read and discuss this book in English class. Additionally, 10th graders teachers form Chemistry, Arts, Sustainability, Physical Education and Religion taught them the relation of water with each of their disciplines. With all this information, students were able to justify better the importance of this resource for our lives.

Students were asked to experience living off of 4L of water in a day and document this in the form of a video diary. They were asked to document all uses of water in your day such as: brushing their teeth, making coffee or juice, showering, preparing food, drinking water etc.

After they live a day with only 4 liters of water they were asked to answer the following questions:

1. How much water did you use?
2. Was this more or less than you expected?
3. What were the challenges of this activity?
4. How much water do you think you use in your normal day to day life?
5. Has this activity helped to raise your awareness of your use of water? In what ways?
6. Are you efficient in your use of water on a day-to–day basis? Is this important to you? Why? Why not?

With this project students achieved skills related to analyze the components of a system; apply Choice Theory concepts in befriending, counselling, managing, and teaching role-plays and case studies; engage respectfully in a range of collaborative discussions on issues of personal or global significance, expressing or justifying own opinions and understanding with reasons and evidence.

We leave you with some videos made by the students that show their reflections about using only 4 liters of water in one day. Would you challenge yourself to do so?

INTRODUCCIÓN

¿Sabes por qué los páramos son importantes para la sociedad? ¿Sabes por qué este ecosistema está en riesgo? Hoy en dia muchas personas no saben acerca de la importancia de los ecosistemas en nuestra sociedad. Esta falta de conocimiento es preocupante, ya que al no crear conciencia de la importancia de los ecosistemas, no se hace un cambio para protegerlos. Para generar conciencia, los estudiantes de décimo hicieron varias investigaciones, analizaron datos y visitaron el Páramo de Chingaza y el desierto de la Tatacoa para hacer un producto final.

En este caso nosotros decidimos hacer este articulo. A continuación te vamos a explicar la importancia de mantener los páramos, las acciones que ponen en peligro a este ecosistema, y acciones que podemos hacer para proteger a los páramos. También compartiremos los resultados de los datos que analizamos y algunos datos curiosos del páramo de Chingaza.

Características del páramo de Chingaza

Uno de los ecosistemas más reconocidos del país es el páramo de Chingaza. Este es un tesoro natural y cultural que se encuentra en el centro de Colombia, ubicado en la cordillera oriental de los Andes. Este páramo es refugio de fauna y flora de los Andes, donde los ecosistemas predominantes son los bosques altos andinos, sub andinos y páramo. En este lugar tiene una extensión de más de 78 000 hectáreas, su temperatura varia de los 4 °C a 21 °C y se pueden encontrar lugares con más de 4000 m de alto.

En el páramo de Chingaza puedes encontrar la Laguna de Chingaza y la Laguna de Siecha. Para los Muiscas y Chibchas, estas lagunas eran santuarios o sitios sagrados dónde hacian rituales y depositaban ofrendas. Alrededor del páramo de Chingaza hay 383 especies de plantas, entre ellas los frailejones son fáciles de encontrar. Finalmente, la fauna de este páramo consiste en el oso de anteojos, danta de páramo, el puma, el cóndor de los Andes, gallito de roca, jaguar, etc.

El páramo de Chingaza es muy importante porque provee agua a más de 10 millones de personas en Bogotá (alrededor del 80 % de la población de la capital) y otros municipios del país. El páramo también regula el ciclo hidrológico en la macrocuenca del Orinoco.

Fauna , flora y oso de anteojos

El páramo es un ecosistema singular, precioso, extraordinario y así no lo parezca, indispensable para nuestra cotidianidad como la vivimos. El páramo es un ecosistema verdaderamente único, este, solo puede ser encontrado en partes de una cordillera en Latinoamérica, en la cordillera de los Andes. El páramo no se puede encontrar en ninguna otra cadena montañosa, ni en ningún otro continente, es endémico de los Andes. Al ser un ecosistema escaso en el mundo, era de esperarse que el páramo albergue especies endémicas, únicas al páramo, no obstante, la fauna y flora del páramo son peculiares, por mucho más que por ser endémicas, en especial sus plantas. Los frailejones son las estrellas del páramo, este alberga 144 especies de frailejones, y todos cumplen con la misma misión, absorber, filtrar y liberar agua. Cada frailejón puede absorber 40 veces su peso en agua, liberando más de un litro de agua por día, por cada frailejón, de los millones que alberga el páramo. Esta es la razón por la cual el páramo es mayormente reconocido, el páramo es reconocido por ser el filtro de agua más grande del mundo.

El guardián del páramo y el jardinero del bosque

El Oso Andino

El Oso de Anteojos, o también conocido como Oso Andino, es la única especie de oso que se encuentra en la región de los Andes suramericanos. El oso andino es una especie endémica a los Andes, por lo cual es una de las especies más emblemáticas del territorio Colombiano.

Estos simpáticos osos son conocidos por su pelaje negro y por sus “anteojos” o manchas blancas que decoran sus rostros y cuellos. Estas manchas son diferentes y únicas en cada individuo y es a través de estas que se diferencian los osos. El oso andino es considerado un oso relativamente pequeño, con los machos adultos llegando a medir 2 metros de altura cuando erguidos y llegando a pesar entre 140 y 175 kilogramos. Las hembras, por el otro lado, son más pequeñas, midiendo hasta 1.6 metros cuando erguidas.

Habitat

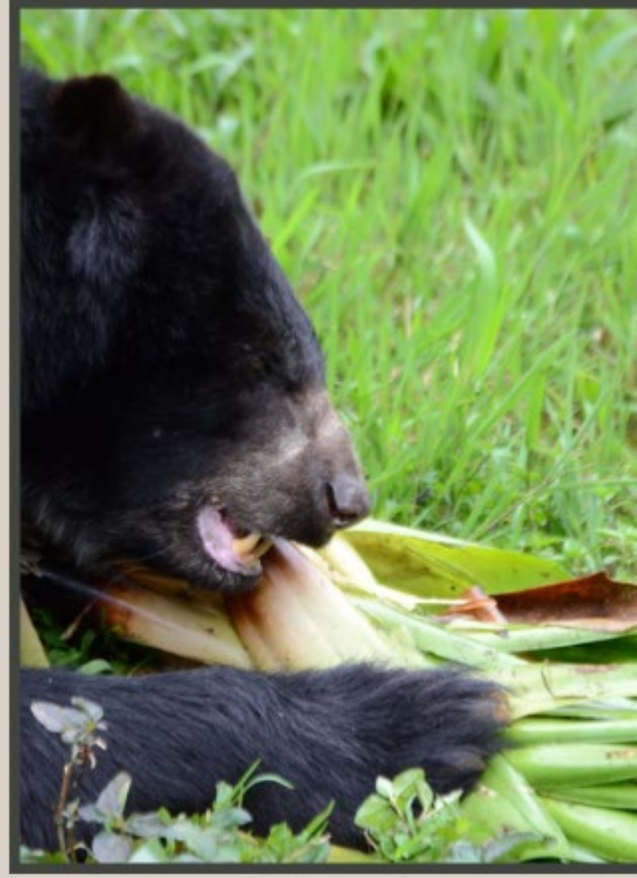
El oso andino habita el ecosistema de bosque alto andino y de páramo en altitudes entre los 800 a 4750 metros. En Colombia, esta especie habita en los 3 ramales de la cordillera de los Andes.

Crías

Los osos andinos son conocidos por ser timidos y solitarios, a excepción a cuando una madre está con sus oseznos. Los oseznos andinos dependen completamente de su madre al nacer, ya que nacen calvos, ciegos y sin dientes. Los ojos de los oseznos se abren por primera vez a la cuarta o sexta semana de edad y a los pocos dias dan sus primeros pasos. Los osos permanecen con su madre por los primeros 2 años de sus vidas y luego parten a buscar un nuevo territorio que habitar.

Dieta

El oso andino es omnívoro, consumiendo como mayor parte de su dieta bromeas, palmas, Plantas de la familia Bromeliáceas, el corazón de las achupallas, puyas (un tipo de frailero), frutos frescos y dulces como las uvas de páramo, y en ocasiones animales pequeños. Ha habido registros del oso andino añadiendo a su dieta animales domésticos, pero, al día, no se han registrado ataques a humanos.



El Oso Andino y los árboles

El oso andino tiene una estrecha relación con los árboles. El oso andino sabe manipular las ramas de los árboles para construir plataformas donde alimentar y descansar. El oso andino es un excelente trepador, y los árboles les proporcionan refugio, y hasta los usan como medio de comunicación. El oso andino frota su cuerpo en los troncos de los árboles y hasta deja marcas de sus garras en ellos para informarle su presencia a otros individuos.

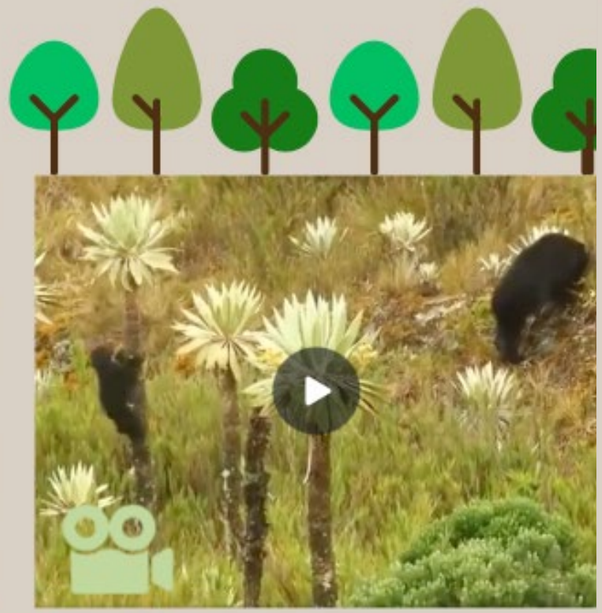
05.

El Oso Andino como especie sombrilla para el páramo

El oso andino es reconocido como una especie sombrilla para los ecosistemas del páramo y del bosque alto andino. Una especie sombrilla es una que, al ser protegida, a su vez protege el o los ecosistemas que habita. Gracias a esto es que el oso andino es reconocido como guardián del páramo y del agua.

La manera en la que esta especie se desplaza y sobre todo en la que manipula los árboles, haciendo camino por ellos, haciendo "construcciones" con sus ramas y hasta derrumbándolos en ocasiones, permite el paso de luz a los suelos húmedos y así promueve la germinación de nuevas plantas, todo un jardinero del bosque. El oso andino, además, se desplaza mucho y transita áreas amplias hasta de 61 kilómetros cuadrados, lo cual explica el cómo puede habitar dos ecosistemas diferentes. Al desplazamiento entre ecosistemas, el oso andino dispersa semillas, así contribuyendo a la dispersión, a la regeneración y conservación de la delicada conexión entre los ecosistemas del bosque andino y del páramo.

Al proteger esta especia tan especial, estamos protegiendo a su vez al bosque alto andino, a los páramos, a las lagunas y a todas las especies que coexisten con el oso andino. La misma presencia del oso andino en los páramos y bosques andino es el mejor indicador de la salud de estos ecosistemas. Llega hasta tal punto que son reconocidos como especie bandera (símbolo de la protección a la naturaleza), especie paisaje (mantiene los recursos ecosistémicos de una región), y especie clave (que es determinante en el funcionamiento de los ecosistemas que habita).



¿Qué factores vulneran al Oso Andino?

El oso andino, con lo fundamental que es, está catalogado como una especia vulnerable a la extinción según los criterios de la unión internacional para la conservación de la naturaleza (UICN). Su principal amenaza es la fragmentación y pérdida de su habita natural, el cual se deteriora por actividades productivas y extractivas del ser humano. El oso andino también es amenazado por su caza, y se vende en el mercado sus garras, su pelaje y su grasa. El oso andino es cazado para usos tradicionales y medicinales o como respuesta a su ocasional consumo de ganado de las comunidades cercanas a su hábitat.

Está de sobra mencionar lo crucial que es esta especie para los ecosistemas que habita y a su vez para la protección del agua proveniente de estos mismos ecosistemas. Se debe garantizar la protección del oso andino si se quiere conservar el páramo y su producción de agua para el humano.

07.

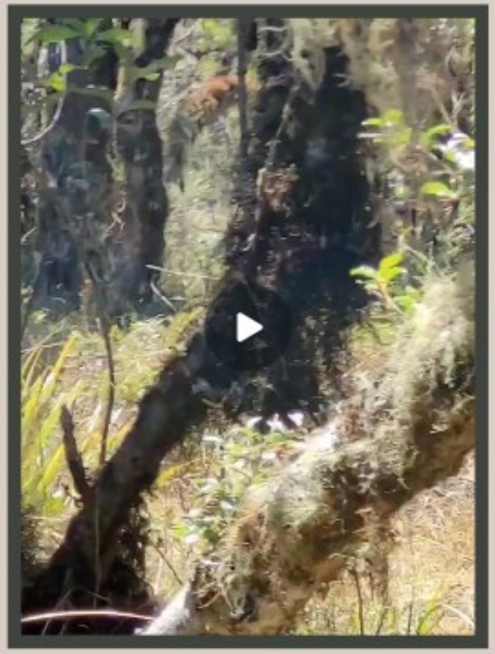
Acciones humanas que ponen en peligro al páramo

Los páramos son como islas geográficas separadas de sus similares por miles de kilómetros de bosque andino, esto se debe a que solo se pueden dar a una cierta altitud y temperatura. Estos factores hacen que el páramo sea un ecosistema frágil, el cual podría deteriorarse con condiciones tan simples como el cambio de la temperatura, o bien, el calentamiento global. Si la temperatura del planeta sigue aumentando, el páramo y sus organismos dejarán de llevar a cabo los procesos que hacen que este ecosistema sea el tesoro que representa. De hecho, los páramos son grandes contribuidores a mitigar el mismo problema que los amenaza.

Los suelos de origen volcánico de los páramos son muy fértiles, este combinado con la concentración de materia orgánica que hay en los suelos le permite al páramo almacenar carbono en mayor proporción que en otros ecosistemas. Esto significa que si el calentamiento global deteriora lo suficiente a los páramos, perderíamos a un gran mitigador de este mismo problema, ayudando a que la condición empeore exponencialmente. El páramo enfrenta diversos problemas como el del cambio climático, que como este, son provocados por el hombre, tales como la minería, la agricultura extensiva, la ganadería, la contaminación y la deforestación y reforestación con especies foráneas.

La agricultura, ganadería, y deforestación y reforestación todas afectan al páramo de la misma manera, estas acciones son problemáticas, ya que requieren que la fauna típica del páramo desaparezca, esto para adquirir terreno útil para promover nuestra industria. La fauna característica del páramo, como los frailejones, aparte de ser endémica, es la responsable de la producción del agua limpia que hace que el páramo sea tan importante. Sin la fauna, el páramo no sería el páramo. De igual forma, la extracción de minerales o la minería es una de las mayores amenazas para el páramo, esto gracias a la cantidad de compañías que solicitan el permiso para grandes proyectos de minería en este ecosistema tan delicado. Aparte de destruir el ambiente, la minería ha contaminado los cuerpos de agua del páramo, dañando de manera irreversible los ecosistemas acuáticos y así contaminando y enfermando a la flora y fauna del páramo y además impidiendo su uso para el ser humano. Aparte de destruir el ecosistema, un ejemplo de lo peligroso que pueden llegar a ser los proyectos de mega minería en el páramo es el proyecto de Santurbán.

Santurbán es un páramo colombiano en el cual se quería llevar a cabo un proyecto de minería a gran escala para la extracción de minerales tales como el oro. La composición orgánica de los suelos de los páramos contiene muchos minerales y nutrientes, por lo cual son deseados para estos proyectos, sin embargo, esta es la misma razón por la cual es peligroso. Hay 65 veces más arsénico que oro en el yacimiento de Santurbán, elemento altamente tóxico y que puede ser disuelto en aguas superficiales y subterráneas, esto se demuestra en que los residuos líquidos de estos proyectos contienen una concentración de arsénico que está bien por fuera de la norma colombiana para consumo humano (500 partes por billón). La minería en los páramos traería como consecuencia la generación de aguas ácidas, otro ejemplo de esto fue el estudio de impacto ambiental de (EIA) del proyecto de minería Greyser. Durante la fase de exploración, cuando aún ni siquiera había empezado la extracción, se encontraron niveles de pH en las aguas subterráneas de 3.16 y 5.39, valores que se encuentran por fuera de los rangos establecidos por el decreto para consumo humano.



08.

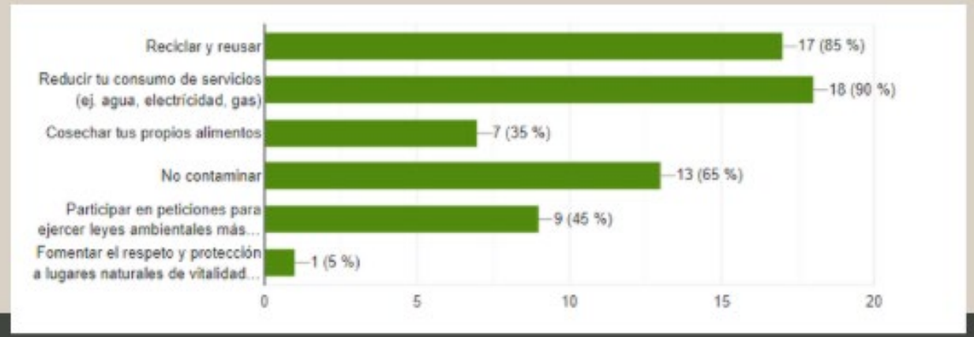
Considerando que el páramo proporciona hasta el 70% del agua potable y de consumo humano de los países que tienen páramos, se es entendida su importancia y lo crucial que es mantenerlos vivos, sanos y además, protegidos. Lamentablemente, este no es el caso, ya que el 88% de los páramos colombiano no se encuentran dentro de las áreas protegidas, sin incluir los parques nacionales. Las personas aún no entienden lo importante que es el páramo no solo para el planeta, sino para nosotros en nuestras vidas diarias, si el flujo de agua del páramo cesará o resultara contaminado, ciudades como Bogotá, Medellín y Cali presentan problemas graves de abastecimiento de aguas. Adicionalmente, la pérdida del páramo afectaría las temperaturas del país, hasta el punto de seriamente acelerar el proceso, se descongelaron de los seis nevados de Colombia, el nevado del Ruiz, santa Isabel, Tolima, Huila, la Sierra Nevada del Cocuy y la Sierra Nevada de Santa Marta.

09.

Análisis de Datos: Hábitos y conciencia

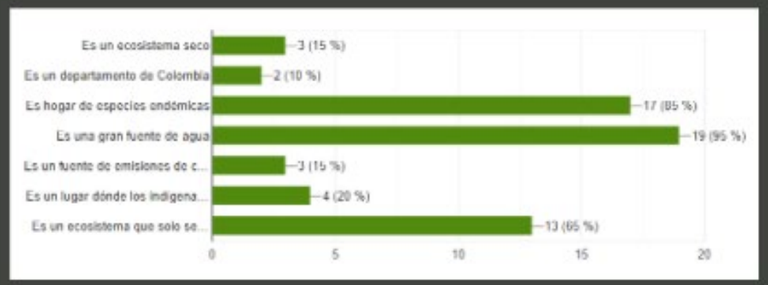
Para saber qué tan educadas están las personas acerca de los peligros del páramo, decidimos hacer una encuesta. Esta incluia preguntas acerca de las caracteristicas de los páramos, las acciones que ponen en peligro a este ecosistema y las posibles soluciones para proteger al ambiente y al ecosistema del páramo.

En total, 20 personas respondieron nuestra encuesta, de la cual la gran mayoria eran estudiantes de escuela alta. Todas las personas respondieron que saben lo que es un páramo. Para proteger los páramos y el ambiente, el 90 % de las personas creen que reducir el consumo de servicios es la mejor solución.

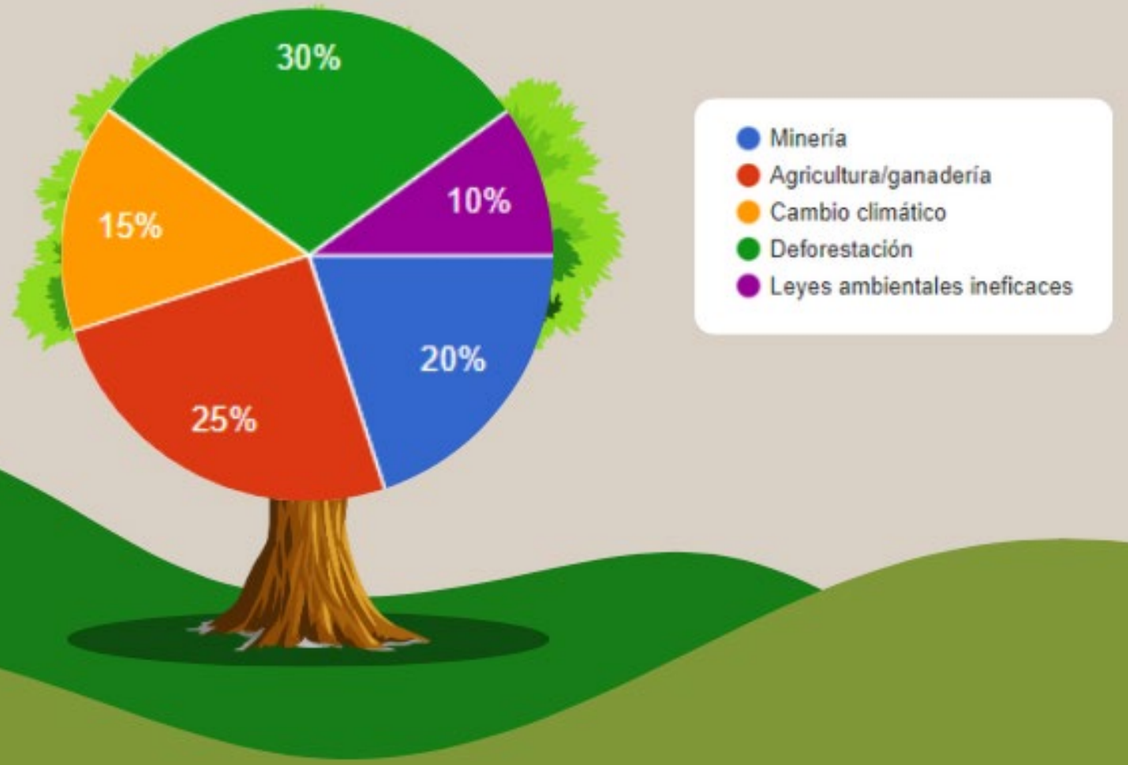


Reciclar, reusar y no contaminar también fueron respuestas frecuentes entre los participantes. Después se les preguntó caracteristicas del páramo a los participantes y se pudo concluir que la mayor parte de los participantes saben que el páramo es una gran fuente de agua y es hogar de especies endémicas.

Todos los participantes dijeron que el ecosistema del páramo es importante porque brinda una gran cantidad de agua a gran parte de la población de Cundinamarca. Además, también se mencionó que era un ecosistema crucial, ya que es el hogar de muchas especies endémicas de los Andes.



Entre las acciones humanas que más perjudican a los páramos, 30 % de los participantes dijeron que es la deforestación, el 25 % dijo que es la agricultura/ganadería y el 20 % dijo que es la minería.

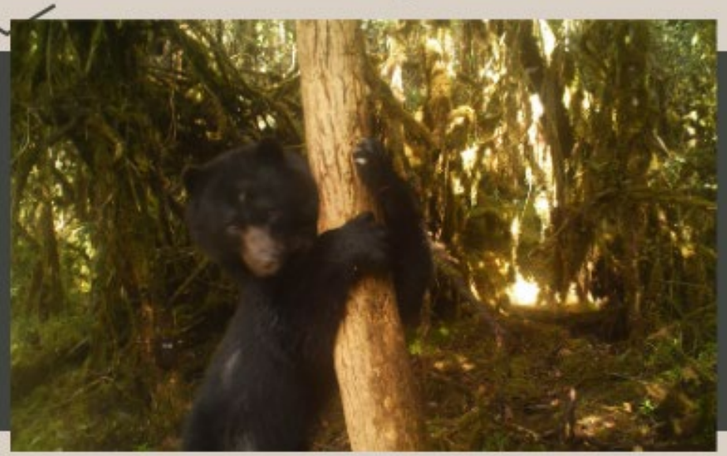


Todos los participantes afirmaron que una de las consecuencias de perder el ecosistema de los páramos es la pérdida de la mayor fuente de agua, asimismo se dijo que habría una gran pérdida de flora y fauna.

Finalmente, mayor parte de los participantes creen que el gobierno debería de imponer leyes más estrictas y eficaces para proteger el ecosistema del páramo. Además de esto, algunos participantes afirmaron que la educación y apoyo a los campesinos con nuevas formas de agricultura/ganadería sostenible son formas en las que el gobierno colombiano puede proteger este ecosistema.

En conclusión, los estudiantes y profesores del Colegio Rochester, demostraron tener un conocimiento avanzado en temas de funciones, formas de dar ayuda y peligros constantes del páramo colombiano. Por lo tanto, esta comunidad se demuestra educada cuando se habla de este ecosistema tan importante.

11. Análisis de Datos: Oso de anteojos

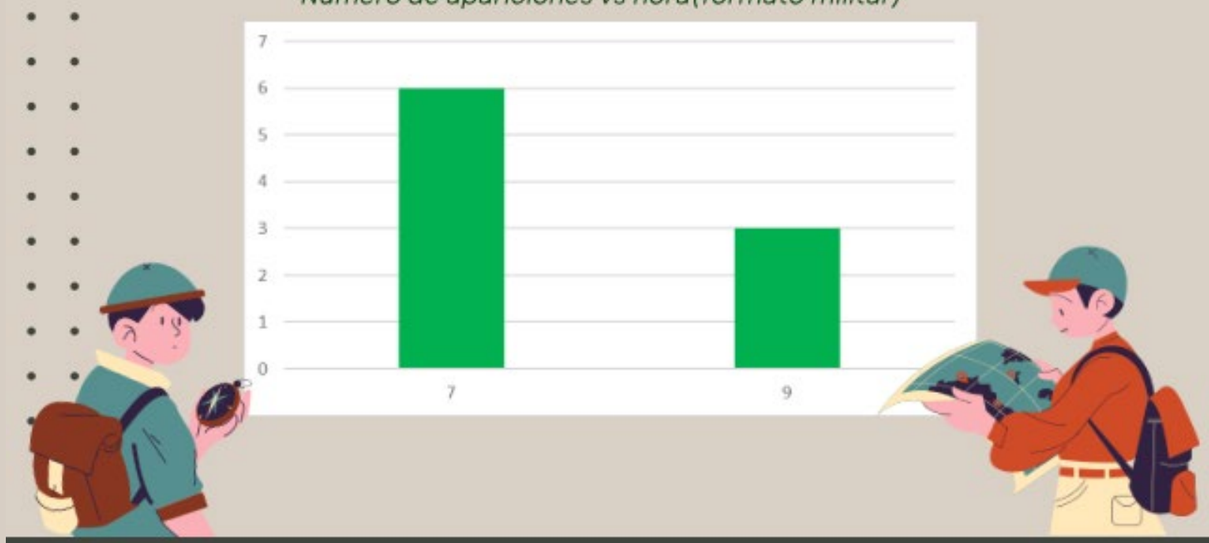


Como parte de nuestra investigación, diferentes cámaras de foto-trampeo tomaron diferentes fotos y videos de los animales que pasaban cerca de estas cámaras. Entre todos los estudiantes de décimo, analizamos una gran cantidad de videos y fotos. Nuestro propósito era analizar el comportamiento de especificamente los osos de anteojos. Nosotros analizamos en conjunto 50 archivos y estos fueron nuestros resultados.

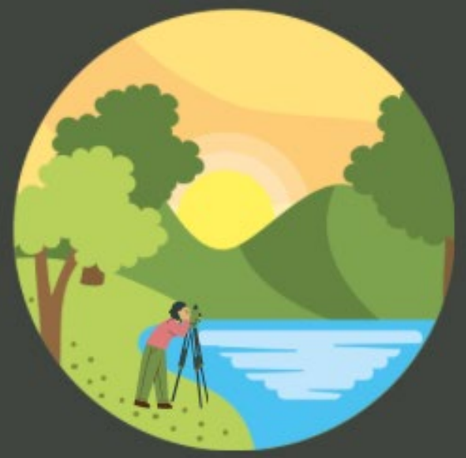
En los 50 archivos analizados, solo 9 de estos contenian alguna imagen o video mostrando un oso de anteojos. Teniendo en cuenta las fechas de los videos e imágenes, se hizo una gráfica de número de pariciones por día. Con resultado, hubo un total de 8 apariciones el 21 de noviembre de 2016, y una sola aparición el 27 de noviembre de ese mismo año.

12.

Teniendo en cuenta las 9 apariciones, estas las clasificamos por horas (en formato militar). A las 7 am hubo seis apariciones de osos y a las 9 am otras tres apariciones. Con estos datos podemos concluir que los osos son activos por la mañana. Sin embargo, se necesitarian más datos de apariciones de osos para confirmar a que hora estos animales son más activos.



Finalmente, al ver cada foto/ vídeo analizamos la actividad principal que hacia cada oso. Así fue como construimos esta gráfica sobre el comportamiento de estos animales. Estos datos nos muestra que las actividades más comunes cuando el oso interactúa con su ambiente es olfatear y estar en reposo.



¡Mira un video captado por una de las cámaras de foto-trampeo aquí!

¿QUÉ PUEDES HACER PARA PROTEGER AL PÁRAMO?

Como bien ya sabemos los problemas del páramo y lo que las personas saben de este lugar. Pero lo más crucial ahora es poder definir cuáles pueden ser nuestras acciones como ciudadanos sistémicos para proteger nuestros páramos. Por ejemplo, una forma simple y muy eficaz de proteger nuestros páramos es comenzar a cultivar nuestros propios alimentos. Al hacer esto reducimos el consumo de fertilizantes y ayudamos a la tierra en la que cultivamos nuestras plantas.

Otra acción muy valiosa que podemos desarrollar es plantar árboles alrededor de los páramos, puesto que así, los árboles recién plantados pueden absorber los gases contaminantes, regulan la temperatura, producen más oxígeno y al mismo tiempo protegemos esta zona.

Por último. Una acción fundamental y muy útil es manejar el uso de la basura. En caso de encontrarse basura en la zona, este debe ser recogido y llevado a algún punto donde se pueda juntar esta basura y ser tratado de manera adecuada, si una persona tiene algún residuo, se puede buscar, reciclarlo o utilizarlo. De esa forma podemos regular los residuos encontrados en la zona y proteger los páramos.

Entrevista con Matthew Reis (Inglés)

Entrevista con Luis Fernando (Español)

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