Frontenac, Lennox & Addington Science Fair

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Prefair Report

1301 **Isabella Caldas**

Div/Cat **Computing and Engineering / Primary**

Title: **Solar Panels in the winter?**

Summary: Humans are abusing our atmosphere with carbon dioxide and other global warming emissions. The purpose of my project is to determine if I can help our planet by using solar energy to power a house in Kingston in the winter. I will test if a miniature solar panel will work on top of a miniature house outside. The weather in Kingston is very cold, therefore I am not sure if this experiment will work and if solar panels are reliable in cold weather. I will also need to determine how many solar panels are needed to power a house in Kingston. The independent variables will be the weather conditions and the dependent variables will be the energy generated by the solar panels.

The experiment will most likely show that a house in Kingston can be powered by a large solar panel, even in the cold winter months. I think this because in the winter even though it is cold it does not matter what the temperature is it just depends on the sun. I predict this because my research has shown that solar panels work really well in cold weather conditions, even though it may not seem obvious. Solar panels work by allowing photons, or particulars of lights, to knock electrons free from atoms, generating a flow of electricity; even in extreme cold weather.

My experiment was completed by building a small house with a panel on top, placing it outside and taking solar panel readings weekly at exactly the same time of day, location and angle. A volt meter box was used to measure the voltage, and the readings were logged in a book with date, time, temperature, weather conditions and volts. Twelve readings were taken and different weather conditions were existent.

The solar panel readings completed in this experiment showed that energy produced by a solar panel is on average 38% more efficient on a bright sunny day compared to a cloudy day. The readings show that as the independent variables (weather condition] changed the dependent variable (voltage) also changed. As long as it was a bright sunny day, the solar panel will produce its highest level of energy, regardless of the temperature outside.

As a conclusion, the results agreed with my hypothesis. A conventional solar panel of 17.6 sqf usually produces about 250 watts of power. On average, Kingston, Ontario has 6.6 hours of bright sun light per day. Knowing this information, I determined that on average in Kingston in a month a solar panel can produce 250 watts x 6.6 hrs x 30 days = 49.5 kwh. On average my house uses 1,000 kwh per month, therefore I would need 20 solar panels on my roof top to help this planet.

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Prefair Report

1302 **Ambalika Kumar**

Div/Cat **Computing and Engineering / Primary**

Title: **Which brand of battery is more powerful?**

Summary: "Most batteries advertise say that the batteries will last a long time, but some of them do and others don't. My experiment will test the claims made by different manufacturers of batteries so that we can buy the one that is the best for us.

The battery is full of chemicals that produce electrons through a chemical reaction. Electrons collect on the negative terminal of the battery. It is marked (-), or negative. The other terminal is marked (+), or positive. When we connect both terminals with a wire, electrons start flowing from the negative terminal to the positive terminal. For a battery to last longer it needs to have good quality chemicals so that they produce enough electrons.

For my project I will test only AAA size batteries of different companies because we use them the most.

I want to find out which brand of battery will last the longest. Will the more expensive battery last for a long time? My hypothesis is that the most expensive will last longer.

The different brand of battery is independent variable. The life of the battery (how long it can hold the nail) is the dependent variable.

My project will try to detect the loss of power in different brands of battery by using an electromagnet. I will make an electromagnet by wrapping wire around a nail and connecting the wire to the battery. The electromagnet will be strong enough to hold the nail. When the battery will become weak, the nail will fall. I will record which brand of battery can hold the nail for a longer period of time.

I will record the start time and the drop time. I will subtract the start time from the drop time to calculate the power of the battery."

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Prefair Report

1303 **Aidan Louie**

Div/Cat **Computing and Engineering / Primary**

Title: **What do people think of Artificial Intelligence?**

Summary: "
Prefair Report
Aidan Louie
Lakeshore School, Grade 6

What do people think about Artificial Intelligence?

Introduction
The rapid progression of Artificial Intelligence (AI) is unquestionable. More and more, humans will be interfacing with computerized robots. I wanted to know what people think about this reality. How do we feel about this, knowing that both good and bad can result from the advancement of AI? Will people fear AI taking their jobs or will they embrace the changes to come? Steven Hawkings predicted Artificial Intelligence would eventually result in the end of humanity. Movies depict characters that are half human, half bot. For my science fair project, I wanted to see what people think about how the world will change with the advancements of AI. I created a study which helped me understand people's perceptions of Artificial Intelligence and allowed me to compare the differences across generations.

Hypothesis
People of younger ages think that Artificial Intelligence is something to be feared, whereas people of an older generation believe that Artificial Intelligence will bring good to the world.

Method
Research topic: I read articles on the advancements of Artificial Intelligence and understood better the predictions of how AI will impact our lives in the future.
A 10 question multiple choice survey was built on Survey Monkey. It was launched on social media in December 2018, for 30 days, and 101 people responded. Adults were asked to have their children, aged 8 and above, respond to the survey as well. People as young as 8 and as old as 70 participated.
I analyzed the results and created charts and tables that demonstrated my results.

Results

I had 101 people complete the survey over 30 days. For the majority, I have more females to complete my survey than males. My hypothesis was correct, the younger generations were more likely to fear the Advancements of Artificial Intelligence, whereas the older generations indicated a more positive outlook and embraced the changing technology. Despite these differences, all ages were able to recognize the benefits that AI will bring to the field of medicine as well as to our daily chores. Younger generations are more concerned with AI replacing their jobs of people.

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Prefair Report

1304 **Benjamin Slack**

Div/Cat **Computing and Engineering / Primary**

Title: **Home made wind tunnel**

Summary: "Question
Which wing is more aerodynamic, a Boeing 787, Airbus or Rocket?

For my science fair project I am going to experiment with the aerodynamics of different airplane wings. I am going to study the Boeing 787, Airbus, and Rocket ship to test to see which wing in the most aerodynamic! I will use a homemade wind tunnel and a video camera to experiment and see which is the most aerodynamic.
Each wing will be carefully carved out of styrofoam with the same dimensions as the actual planes

My hypothesis is the rocket will be the most aerodynamic because the carve is less difficult and more simple to make, so the aerodynamics is easier to exact to the actual plane. I think that the Boeing 787 is going to be the more difficult less likely one to pass because it is designed for higher altitude and is a more specific carve and will more likely fail the test. The airbus is designed for lower altitude but is not to specific in the build so i feel that it will pass.

Procedure
Print copy of your chosen plane wing and thumb tack it to the styrofoam block.
Trace wing on your picture and carve the wing.
Trim wing of plane till exact point. edge will be slick when done.
Repeat this for all 3 wings or rockets.
Turn fan on in the wind tunnel and add flour or any powder you have at hand to the wind tunnel.
Add slo-mo camera to see thoroughly and clearly.
Move wing around till every point of the subject has been touch with flour.
If the flour did not move smoothly through the wind tunnel then it probably won't fly in the air.
If wished to be conducted again the repeat as many times as possible or wished.

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Prefair Report

1305 **Henry Yanovsky-Ball**

Div/Cat **Computing and Engineering / Primary**

Title: **Suspension Bridge Study**

Summary: "My study is about suspension bridges. The reason why I am doing this is to learn about one of the coolest bridges in my opinion. The reason why I chose to build a suspension bridge instead of growing a plant or something is because when you are building a suspension bridge you are doing instead of observing a growing a plant; the plant is doing all of the work.

I'm going to be studying the mechanism of suspension bridges. There are a number of types of suspension bridges. Suspension bridges can be made of rope and wood in its simplest form, a more modern form is the box section roadway and strong cables. Some famous suspension bridges are the Golden Gate bridge, Brooklyn Bridge, Humber Bridge, and the Lion's Gate Bridge. I'm going to create a working model of a tower suspension bridge. This type relies on both anchored cables and pylons. I want to explore the use of compression and tension in providing an efficient way to create a bridge that can span great distances and work in difficult environments such as earthquake prone zones. Part of my project is to not only study the bridge but through its creation have fun discovering how to build; documenting the process as I go.
"

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Prefair Report

1306 **Alisha Khan**

Div/Cat **Computing and Engineering / Primary**

Title: **Using a homopolar motor to make a ballerina spinning toy**

Summary: "In this innovation, I will be making a ballerina dancer toy using a homopolar motor. A homopolar motor is a direct current electric motor with two magnetic poles, the conductors of which always cut unidirectional lines of magnetic flux by rotating a conductor around a fixed axis so that the conductor is at right angles to a static magnetic field. I will be using a copper wire 1/2″ x 1/8″ Neodymium Disc Magnets, AA Battery, 3 in 1 Combination Tool or pliers/wire cutters,Crepe Paper (optional for skirt),and Hot Glue. Step One, Cut a long piece of wire off your spool, I started with about a 10" long piece. Lay it on the template of your choice and bend as shown using 3-in 1 tool or pliers. Step Two, to create the base section of wire that wraps the magnets, I recommend bending the end of the wire around the battery. Remove the battery and gently widen the circular wire form with your fingers. Step Three, place three neodymium magnets on the negative side of your battery. Step Four, place the motor on top of the battery so that it touches the positive pole. The round section at the bottom of the motor must be low enough to encircle the magnets. Step Five, let it go. If properly constructed it should start to spin. If it doesn't see our tips below. Step Six, (optional) to make a skirt for your dancer cut a small circle of crepe then cut a slit in the center of the circle. Slide it up onto the dancer and secure in place with a dab of hot glue.

"

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Prefair Report

1307 **Lachlan McCurdy**

Div/Cat **Computing and Engineering / Primary**

Title: **Hydrogen Fuel Cells: The Future Of Transportation**

Summary: "Hydrogen Fuel Cells: The Future of Transportation

My project is on hydrogen fuel cells and how they work for powering cars and trucks. I chose this project because I like finding new clean ways to power the never-ending needs of the human species.

Through my research I found fuel cells work by using a process called electrolysis, which separates water into its two components, hydrogen and oxygen, by putting an electric current through water. My central question was: "Are fuel cells viable for practical vehicular use?". I thought overall they would.

My experiment uses a Horizon Fuel Cell connected to an Arduino measurement system that I programmed to measure the active current and voltage from the Fuel Cell. There is also a fan and resistor in the circuit. The materials needed to reproduce my experiment in a simpler way are as follows:
Hydrogen Fuel Cell (Proton Exchange Membrane)
Cylinders for H2 and O2
Electric Motor and Fan
DISTILLED water
2 AA batteries
Voltmeter
Measurement resistor

The fuel cell was wired to a 3V battery to generate hydrogen from distilled water. When complete the battery was removed, and the fuel cell connected to an electric motor and a fan blade.

As the fuel cell charged and discharged, the current and voltage were recorded. Initially, the experiment was focussed on the total amount of energy into and out of the Fuel Cell, but as the first results showed some interesting behaviour from the Cell during the process, I decided to examine that in more detail.

The voltage and current from the Fuel Cell running the motor were very interesting. Instead of being a constant current, it varied quite a bit during the experiment. I changed the experiment to read the voltage and current during the experiment and send the data to the laptop once every second. The results showed that the motor resistance changed the response of the fuel cell when running and that the fuel cell was not well suited to provide power on demand.

I completed several data collection trials using my circuit. I set up multiple graphs to show the active current and voltage for each trial. The power and current flow during charging of H2 from a constant voltage power source were constant. Connecting the Cell to the motor showed that the voltage would start high and reduce during running, the motor would stop turning when the power

voltage fell below a certain value. The motor would stop while there is still an amount of H2 in the cylinder.

In conclusion, I found that my circuit had some major differences from the circuits in fuel-cell-powered cars. For practical use, the Fuel Cell should power a battery first, and then the battery is used to power the electric motor of the car. The Fuel Cell reaction needs specific conditions to be efficient, and these conditions are difficult to maintain on a tabletop and are more difficult in a moving car.

I hope to see you at my project."

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Prefair Report

1308 **Matthew Kabin**

Div/Cat **Computing and Engineering / Primary**

Title: **Safe or not: unlocking encryption**

Summary: "
Pre-fair report

Question:
How safe and secure is your digital information?

For my science fair I want to investigate how data is encrypted. Through research, I learned that most data is readable to big companies like apple and microsoft. The information on your hard drive is not as secure as you think it is. To solve this problem i have created an innovation, my innovation is an encryption program that encodes plain text. Where first it is encoded with a simple substitution cipher and then it applied a vignet style cipher. The twist is where the key changes to the last encoded character, thus making the cypher change depending on both the key and the and the text itself. On top of that even if they decode the vignet they will still see gibberish and they will need to try another way to decode it, but fail again! It works by you putting in your input into a "in" file you run the program it encodes it and puts the encoded text in a designated "out" file. I am doing a survey to find out whether or not people know about this phenomena.

Hypotheses:
I think that people under 20 years will not be aware of companies reading their data, I predict that the older part of the population because they have grown up with technology and thus most of the time trust it more.

Method:

Method for survey:
1.create a survey about whether or not people are aware of the fact that their info is completely readable by larger companies.
2.Release the survey through social media
3 Analyse and present results.
"

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Prefair Report

1309 **Ryan Layton-Matthews**

Div/Cat **Computing and Engineering / Primary**

Title: **Right Rotations: Experimental Apparatus to Test Water Turbines**

Summary: This project was to create a testing apparatus to design the best impeller for use in hydroelectric turbines. I created a experimental setup that I designed and built to pass approximately two litres of water past a series of simple impellers with specific design parameters. I designed a series of impellers in TinkerCAD on my computer and printed them on a 3D printer at Queen's University. The parameters that were tested included: 1) Impeller angles that included 0, 15, 30, 60, 75 & 90 degrees; 2) thickness of impeller blades that included 5, 4, 3, 2, & 1 mm; and 3) number of impeller blades that included 2, 4, & 8. Each impeller was recorded in slow motion using an iPhone as the two litres of water past the impellers in one experimental run. The number of rotations was counted from the beginning of the run until all of the water had passed the impellers. The best impeller angle was determined to be ~22.5 degrees. The thickness of the impellers was also found to be 1 mm. It was found that the best impeller has the most blades as long as the blades did not overlap. I used this data to combine all of the best attributes to 3D print an ideal impeller. Testing of this propeller created the most rotations. At the time of submission of his summary more testing is being completed and will be presented at the fair on my poster presentation.

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Prefair Report

1310 **Jake Skilnick**

Div/Cat **Computing and Engineering / Primary**

Title: **The Coding Curiculum**

Summary: Science Fair: Pre-Fair Report.

My name is John Jacob Skilnick. My teacher is Mrs. Bullock and I am in grade 5. My school is Lakeshore elementary school. My exhibit title is "The Coding Curriculum".

Question:
Should coding be implemented more into the school curriculum?
Hypothesis:
I think coding should be implemented more into the school curriculum because only 2.7% of people know how to code, so if someone needs a big project done quickly there will not be enough people to do so, but if people are learning to code early maybe the next generation will be able to increase the percent of people.

Variables:
Age:5-13
Gender: Male or Female
Grades: 1-8
Coding language: Python

Background Research:
History of coding (early languages, inventors)
What the current coding part of the school curriculum is (what programs for what grades, is it mandatory in the curriculum and is it effective)

Procedure:
I tested 50 people and split them into 2 groups, one with help and one with only prior knowledge. Next, they had to make a program that could print the numbers 1 through 10 on separate lines in the coding language python in 10 minutes.

Observations:
I am still in the process of testing all the participants. This is a small sample.
Group with help
1.60% complete
2.0% complete
Group without help
1.0%complete
2.0%complete

I noticed that one of the participants in group 2(without help), who did not know how to code, wrote the code so that it was like the participant was talking to the computer. Basically, the way the participant wrote the code had the right logic for coding.

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Prefair Report

1311 **Mekyle Mandviya**

Div/Cat **Computing and Engineering / Primary**

Title: **Charge from Change - Chemical Reaction**

Summary: Electricity is the presence of an electrical charge which can be either positive or negative. An electric current is generated by moving charges, usually in the form of electron or ions. In batteries these charges are created from chemical reactions, meaning electrical energy is derived from chemical energy. I will be displaying different types of home made batteries to light a small bulb and to compare which source generates maximum energy/current to light bulb/Led for longer time.
I will attempt to generate energy by using simple ingredients, for example salt, vinegar and or lemon, combining it with different types of metals eg copper or zinc alloy and or carbon.
For instance, copper coins, aluminum foil and paper soaked in vinegar and salt, connect it with wire and attach LED to experiment if chemical reaction occurs and if succeed, to what extent generate energy by checking with Volta meter.
I will also show my experiment by combining lemon (as a source of acid) with copper and zinc (nail & wire) to light a bulb.
I will display a third form of battery by using carbon and copper to combine them with vinegar, salt and then attach it to actual battery cell through copper wire to generate energy in liquid by chemical reaction.