Science Demonstration

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Teacher Notes

Paper Airplane

Grade 6 Science - Tying it to the curriculum

Big Idea

- Newtons three laws of motion, describe the relationship between force and motion

1st Law Inertia – An object in motion will stay in motion unless acted upon by another force (air resistance/gravity)

2nd Law Force/Acceleration - The acceleration of an object is directly proportional to the net force applied to it and inversely proportional to its mass (weight of the material you use vs force you throw it)

3rd Law Action/Reaction - For every action, there is an equal and opposite reaction. Forces always occur in pairs, acting on different objects (Gravity vs Lift, air resistance vs thrust)

Throughout the lesson, we will be touching on all of the areas in the curricular competencies - **questioning and predicting** (Demonstrating a sustained curiosity, making observations/predictions), **planning and conducting** (decide on changing variables, use equipment/materials safely – identify potential risks, observe/measure/record data), **Processing and Analyzing** (Construct and use a variety of methods, identify patterns/connections with data, open to new ideas), **Evaluating** (Evaluate if investigations were fair tests, identify sources of possible error, suggest improvements), **Applying and Innovating** (Cooperatively design projects, transfer and apply learning to new situations, generate new ideas when problem solving , contribute to care for self, others, and community), **Communicating** (Express and reflect on experiences, communicate ideas/processes in a variety of ways)

Content:

- Newtons three laws of motion
- Force of gravity

FPPL:

- Intro in Ktunaxa
- Learning is hands on and contextual

- Learning involves recognizing the consequences of one's actions
- Learning involves patience and time
- Learning is reflective
- Sharing circle at the end – talking about what went well and what we could improve on
- Recommended to do activity outside.
- Frederick James Carmichael. He is the founder of the aviation company Western Arctic Air and was also the first Indigenous commercial pilot who flew planes in the 1950's and 60's known for his search and rescue endeavors.

Adaptations/Modifications:

- Group work – Allows all students to have a role and for their ideas to be heard

Safety Considerations:

- Slips/trips/falls
- Safety glasses
- Paper cuts
- Throwing space/area

Materials: Instructions on how to fold a paper airplane, blow dryer, stapler, paper airplane launcher, different sizes of paper, different thicknesses of paper (cardstock, construction, tissue paper), measuring tape, painters tape, sticking notes

Description of the setup:

We need a table with all the materials. Additionally, open space for people to throw their airplane. There should be a line of where the students are going to stand.

Description on what to do: The teacher will introduce the class to paper airplanes and explain how we will be using data collection, making predictions, talking about the different forces (thrust, weight, lift, drag/resistance), and lastly variables. Students will choose a template and build a paper airplane of their choice using one of the provided paper types. The instructor should then introduce the safety rules and have any number of students move to the designated area and throw their airplanes (place a sticky note on the ground where it landed). The students will then record what happened on the student handout sheet. The students will then add a variable to their paper airplane that relate to one of the four forces for example a paper clip for weight, drier for lift flaps for resistance etc… they will then record what happened on the student handout sheet when they threw the paper airplane and why they think it happened (the students will leave their plane on the ground). Now crumple up a ball of paper, and then the students will make a comparison between

the ball and the paper airplane and explain what their results are. The teacher will walk around and help support the students.

Questions to ask during the demo:

- Does anyone know any pilots?
- What are the 4 forces that act on a paper airplane?
- What do you think would happen if we changed any one of these forces?
- What are variables?
- What happened when you flew your plane?
- Why do you think your plane flew the way it did?
- How can we make a paper airplane through trial and error that flies the furthest?
- What one of these forces has the most impact on how the paper airplane flies?
- Based on your observations, how would you make your paper airplane fly further on your next toss?

Explanation / theory underpinning the demonstration:

There are four forces that make paper airplanes fly: lift, drag, weight, thrust.

Lift – upward force generated by the wing angle or foils

Drag – wind resistance and forces acting on the front of the plane

Thrust – the force that drives the plane like the engine or in this case the plane thrower or your arm.

Weight – the mass of the plane as well as the force of gravity acting upon it.

How can we make a paper airplane through trial and error that flies the furthest? What one of these forces has the most impact on how the paper airplane flies?

https://www.sciencebuddies.org/stem-activities/paper-airplanes-aerodynamics