DHULIKHEL HOSPITAL
We Care

Dhulikhel Hospital

FLIGHTFORGE:

WHERE PAPER TAKES FLIGHT

THE ULTIMATE PAPER PLANE THROWDOWN

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WHY US?

Elevate your classroom experience with an electrifying Paper Plane Challenge, championing a noble cause—fundraising for Dhulikhel Hospital. Our toolkit transforms your space into a vibrant hub of innovation where students design, prototype, and test their planes, aiming for maximum flight distance. Engage in a mission to gather pledges from family and friends for every 5 centimeter flown, amplifying the impact beyond the classroom. Through collaborative problem-solving, students refine their designs, making a tangible difference in healthcare. Join us in empowering students to reach new heights for a brighter future!

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FLIGHT FORGE

The ultimate paper plane throwdown

Explore the principles of aerodynamics with our dynamic lesson plan! Students will delve into the science behind flight, designing and testing their own aerodynamic creations. The excitement culminates in a thrilling competition where students showcase their designs, putting their newfound knowledge to the test. Get ready to soar to new heights and unleash your inner engineer!

Lesson Hyperlinks:

Lesson 1

Lesson 2

Lesson 3

Lesson 4

Grades: 6-8

Total Time: 180 min

Topics:

Aerodynamics, Engineering

Standards:

Next Generation Science Standards

Supplies(more specifics will be on before lesson sections)

- Stack of paper
- paper
- tape
- glue
- measuring tape
- something to take notes with

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BEFORE LESSONS

Read over the included slides and teacher notes for your lesson day! Make sure to gather the required materials for each section. We've listed them below :)

Slides will be needed for all four lessons: (Here is the slide)

Lesson 1:

- 1-2 sheets of A4 (or similar) paper per student.
- Print enough companion worksheets for your lesson. ('Four Forces of Flight', linked on this page.)

Lesson 2:

- Students may need 1-2 sheets of paper to test new plane designs, but altering the originals is an alternative. (to save paper).

Lesson 3:

- Print the John Collins worksheet for your students, too! :)
- Make sure to hand out pledge sheets to students so they can start collecting! pledges (The pledge sheet can be found in 'additional resources' at the bottom of this document.)

Lesson 4:

- Its throwdown day! Provide your students 1-2 sheets of paper once again so they can bring their improved airplanes to life.
- print out the Educator Donation Form at the bottom of this doc to manage your students' pledges and donations! :)

FOUR FORCES OF FLIGHT WORKSHEET

JOHN COLLINS WORKSHEET

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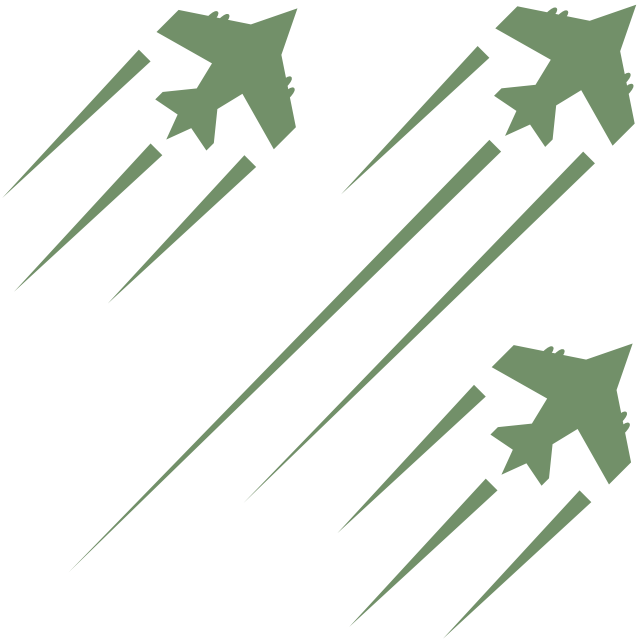
FLIGHT FORGE

Where Paper Takes Flight

The Ulitmate Paper Plane Throwdown



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LESSON 1: SPEAKER NOTES FOR TEACHERS (45 MIN)

WHAT TO SAY? (Here is the slide)

Slide 2- Introduce the Dulikehl hospital

Who?

Dhulikhel Hospital is a place where people go when they are sick. Doctors and nurses work there to help them feel better. Their purpose is to give quality care to people who are ill or injured, and they aim to help them recover and improve their health in any way they can by using as little to no money as possible.

Why?

The hospital was founded as a community clinic that aimed to give good quality care to those outside Kathmandu who can't afford private hospitals. The organization has rapidly expanded its frontiers by setting up satellite clinics, opening labs for medical testing, inviting students to study within its gates, and offering never-before-seen treatment and operation in Nepal. They are determined and committed to giving affordable, quality treatment because they are motivated to ensure that everybody can lead healthy, happy lives.

How?

Students can help Dhulikhel by participating in our toolkit fundraisers, and anyone can help out by donating directly to the hospital's website! The money gained from donations is used to expand the hospital, set up clinics in rural communities, hire more staff, and help pay for the treatment of patients who can't afford it. Aside from Dhulikhel's mission to provide quality healthcare for everyone, they also carry many treatments that most hospitals in the area don't, meaning your donation also helps introduce new medical technology to patients who need it

SPEAKER NOTES FOR TEACHERS

Slide 3-
Show the video provided about Ankita Nagarkoti a patient at Dulikhel Hospital.

Slide 4-
Today we will be learning about aerodynamics and the four forces of flight, with this skill you will later fundraise for dulikhel hospital! So pay attention! Tell them to make a paper airplane.

Slide 5-
Please watch the video on how to make the paper airplane if your class needs to.

Slide 6-
Make them discuss;
Do you have any prior experience with making paper airplanes? If you do, how far have they traveled?
Do you have any tips for making better paper airplanes?

Slide 7 -
Say: Now fly your plane and measure how far it goes. Note it down. We will use it later.

Have students measure the distance that their normal airplanes fly and note it down in their notebooks.

Slide 8- Say:
So, how far did your airplane go? Not that far right. Well, what do you think learning aerodynamics helps you do? (let a student answer) exactly!

Explain:
What is Aerodynamics?

- Aerodynamics is the science that explains how things move through the air. It helps us understand why airplanes can fly and how objects like rockets or kites behave when airborne. Even everyday things like cars are affected by aerodynamics because they interact with the air as they move.

- In aerodynamics, four forces of flight interact with each other. These forces make an object move up and down faster or slower. The amount of each force compared to its opposing force determines how an object moves through the air.

SPEAKER NOTES FOR TEACHERS

Four forces of flight (slide 9)

Say: so what are the four forces of flight? their weight, lift, drag, and thrust.

What is weight?

- Gravity is the force that pulls objects toward the Earth, and weight measures how heavy something is due to gravity. Weight is also the downward force that an aircraft must overcome to fly.
- Example: A kite has less mass and, therefore, less weight to overcome than a jumbo jet, but both still need the same thing to fly - Lift!

What is lift?

- Lift is the push that lets something go. It is the force that is the opposite of weight. Everything that flies must have a lift. For an aircraft to move upward, it must have more lift than weight.

Examples

- A hot air balloon has a lift because the hot air inside is lighter than the air around it. Hot air rises and carries the balloon with it.
- A helicopter's lift comes from the rotor blades. Their motion through the air moves the aircraft upward. Lift for an airplane comes from its wings.

What is drag?

- Drag is a force that pulls back on something, trying to move. Drag provides resistance, making it hard to move.
- For example, walking or running through water is more complex than air. Water causes more drag than air.
- The shape of an object also affects the amount of drag. Round surfaces usually have less drag than flat ones. Narrow surfaces generally have less drag than wide ones. The more air hits a surface, the more drag the air produces.

What is thrust?

- Thrust is the force that is the opposite of drag. It is the push that moves something forward. For an aircraft to keep moving forward, it must have more thrust than drag.
- A small airplane might get its thrust from a propeller. A more giant airplane might get its thrust from jet engines. A glider does not have thrust. It can only fly until the drag causes it to slow down and land.

LESSON 2: SPEAKER NOTES FOR TEACHERS (45MIN)

Slide 10:

Say: So we learned about what aerodynamics is and what the forces of flight are, in the previous lesson. let recap that.

Ask:

- So, can someone tell me what aerodynamics is?
- What are the four forces of flight

Four forces of flight (slide 11):

say:

What is weight?

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What is thrust? (slide 11)

- Thrust is the force that is the opposite of drag. It is the push that moves something forward. For an aircraft to keep moving forward, it must have more thrust than drag.

SPEAKER NOTES FOR TEACHERS

How do airplane wings provide lift? (slide 12)

Say:

- The shape of an airplane's wings makes it possible for the aircraft to fly.
- Airplanes' wings are curved on top and flatter on the bottom. That shape makes airflow over the top faster than under the bottom.
- As a result, less air pressure is on top of the wing.
- This lower pressure makes the wing and the attached airplane move up.
- Curves are a trick used on many aircraft to affect air pressure.
- For example, Helicopter rotor blades use this curved shape. Lift for kites also comes from a curved shape. Even sailboats use this curved shape. A boat's sail is like a wing. That's what makes the sailboat move.

Say: now make another airplane, but now use what you have learned so it flights further. Record it in your notebooks.

Slide 13

Introduce this, ask students about it, and let them discuss it:
How do experimentation and learning from mistakes help us design better paper airplanes?

Engineering Process (slide 14)

Introduce the 5 steps:

Ask: Could you define the problem? What does it need?
Imagine: imagine what your airplane will look like. What parts of the planes will implement the distance it will go?
Plan: Plan how you are going to assemble your paper plane.
Create: Create your airplane and implement parts of the plane you imagined.
Improve: Improve your airplane after experimenting in the trial step.

LESSON 3: SPEAKER NOTES FOR TEACHERS (45MIN)

Engineering Process (slide 16)
Review:
Ask: Could you define the problem? What does it need?
Imagine: imagine what your airplane will look like. What parts of the planes will implement the distance it will go?
Plan: Plan how you are going to assemble your paper plane.
Create: Create your airplane and implement parts of the plane you imagined.
I**mprove**: Improve your airplane after experimenting in the trial step.

Observe and Note down (slide 17)

- Could you instruct the students to observe and note how John Collins's paper airplane has been able to fly so far? What techniques does he use to do this?

- Give them the observation sheet

Depending on the time that is left, allow them to get started on the challenge!

Your Turn (slide 19)

- Assign the students in groups of 3-4 each.
- Introduce the Challange
- Hand out the Student Pledge sheet

What?

- The challenge for you is to make a paper airplane that flies the farthest. In the next class, we will be having a final throwdown event that will help us to raise money for Dulikhel Hospital.

Slide 22

So how are we raising the money? You will be raising money depending on how much your sponsor's pledge amount is for each 5 cm your airplane flies. (show slide

- At the end, we all will be bringing in some amount of money to donate to Dulikhel Hospital.

Give them the student pledge sheet for them to go and get sponsors by the time of the throwdown.

LESSON 4: SPEAKER NOTES FOR TEACHERS (45MIN)

Your Turn (slide 20)
Re-introduce the challenge.
What?

- The challenge for you is to make a paper airplane that flies the farthest. In the next class, we will be having a final throwdown event that will help us to raise money for Dulikhel Hospital.

Slide 22
So how are we raising the money? You will be raising money depending on how much your sponsor's pledge amount is for each 5 cm your airplane flies. (show slide

- At the end, we all will be bringing in some amount of money to donate it to Dulikhel Hospital.

Note for the Teacher:
How the challenge works:
set a timeline for students to design their paper airplanes

- 45 - 60 min (Recommended)
- Arrange them in groups of 3-4

During this time, they can:

- Plan, build, test, and improve their paper airplanes to make them fly as far as possible
- Find donors who will pledge money.

<u>Allow 1 class period for the competition:</u>

- Invite donors (Optional)
- Give groups 10 minutes to finalize their paper airplanes

During Competition:

- Each group will fly their paper plane and measure the distance flown.
- the teacher will record each distance down with the students in the group

RESOURCES FOR TEACHER

Note for the Teacher:

As the final day of the competition comes, make sure to have your measuring tape to see how far the airplanes made by your students go!

This packet also includes pledge sheets, so as you go near the D-Day of the competition, please get comfortable with the pledge sheet and how it works.

Student Pledge sheets work as so:

- fill in a goal fundraising amount
- write the name of the donor or donors
- write the amount that the donor is willing to pay per centimeter of flight.
- write the total donation made by the donor after the competition
- Fill in the total of all donations at the bottom.

Education Donation sheet:

- Write down how much each students raised.
- Write the total amount raised as a whole class.

Videos in the Slide

How to make a paper Airplane

Observe the record holder for farthest paper airplane flight distance :)

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Name:
Date:

OBSERVATION WORKSHEET: JOHN COLLINS PAPER PLANE

Instructions:
Observe the paper airplane made by John Collins and answer the following questions based on your observations. As you watch and reflect, try to identify what it is, exactly, that makes his plane so effective!

1. Design:
Draw the airplane John Collins makes.

Is there anything unique about the way he folds his airplane?

2. Weight:
How heavy do you think the airplane is? Is it better to have a lighter or heavier airplane?

OBSERVATION WORKSHEET: JOHN COLLINS PAPER PLANE

3. Efficiency:
How does he reduce drag? Do you think this helps his plane fly farther?

4. Environmental Factors:
What sort of environment do you think is best for flying paper airplanes? How can things like wind or trees affect your flight?

Draw an accident that could happen as a result of bad environmental factors:

Name: _____
Date: _____

Four Forces of Flight

Fill out these questions as you listen to the presentation!

Weight

1. What effect do weight and gravity have on an object?

2. Draw an example below! Use arrows to show the force of gravity, and clearly label the objects in your diagram.

3. What's the difference between weight and gravity?

4. Why do aircraft need to be careful about their weight?

Companion activity as you present!

Click the link for the full worksheet

MEASURING IMPACT

Measuring progress is essential to understand the advancements made towards achieving the Sustainable Development Goals (SDGs). It provides valuable insights into the effectiveness of our efforts, identifies areas that require further attention, and informs decision-making for future actions. This section of the SDG Progress Report outlines the critical measurement approaches and indicators used to assess SDG progress.

Donation		Equivalent
NRS 25	=	1 OPD card - patients who have this card can go to any department free of charge
NRS 400	=	1 X-Ray of the Chest
NRS 600	=	24 hours of staying in the hospital (including 4 meals)
NRS 5,000	=	CT Scan of the Head
NRS 20,000	=	Cleft Lip surgery for new born babies

STUDENT PLEDGE SHEET

Record the pledges you collect here! Calculate the final amount at the end of the activity.

My Goal for Dhulikhel Hospital NPR ____

The total amount of distance my paper airplane traveled was _____ (cm/inch)

Sponsor's Name:	Pledge Amount per Centimeter/Inch:	Donation Amount:

Make additional copies as needed

Grand Total NPR _____

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EDUCATOR DONATION FORM

Record the donations collected by each student at the end of the activity here and calculate the final donation to Dhulikhel Hospital. :)

Students Name:	Donation amount

Make additional copies as needed

Total Donation NPR _____

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THANK YOU

for helping Dhulikhel Hospital care for patients

https://dhulikhelhospital.org/

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NEXT GENERATION SCIENCE STANDARDS

MS-ETS1-1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.

MS-ETS1-2. Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.

MS-ETS1-3. Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.

MS-ETS1-4. Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.