

LIFELINES Lung Trauma Task: Teacher Notes

Description

Our doctors and paramedics are often faced with the task of treating patients at a scene who have received an injury to their chest. This type of injury has a serious impact on the effectiveness of a patient's lungs.

This project encourages pupils to discuss, design and present a temporary pre-hospital solution to treat this specific injury, whilst learning about the **anatomy** of the chest, **mechanics of breathing** and the **gas exchange system**.

Curriculum Links: Key Stage 3 Biology

- Gas Exchange Systems
- The Skeletal and Muscular Systems
- Cells and Organisation.

Learning Objectives

During this project students will:

- Make a lung pressure model to explain **mechanisms of breathing**.
- Create graphs to explain **exchange of gases**.
- Recognise the cause, symptoms and effect of a chest injury on the human body.
- Work as a team to design a new medical product, and present their ideas to the class.
- Be introduced to STEM careers and real-life application of biology and medical innovation.

Learning Outcomes

Students will be able to:

- Present observations and data using appropriate methods, including tables and graphs.
- Understand the uses and implications of science, today and for the future.
- Develop a line of enquiry based on observations of the real world.
- Understand simple medical terminology.

Running The Project: (60 mins Total)

Introduction Activity (15 mins)

Before you start the project, encourage pupils to find out a bit more about Hampshire and Isle of Wight Air Ambulance by using the following websites: www.hiowaa.org and www.hiowaa.org/lifelines. Ask pupils to research the following questions and discuss as a group or class:

1. What are the key benefits of the Air Ambulance?
2. How much does it cost to run per day and how is it funded?
3. Explain the key roles of each Critical Care Team member – The Pilot, The Paramedic, The Doctor and The Engineer.

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Main Project (40 mins)

NOTES

- Pupils can work in pairs or as a team.
- Pupils can use the downloadable worksheet to work through the project.
- You can download and use the accompanying Power Point presentation to help guide pupils during the project: www.hiowaa.org/lifelines/stem-projects
- There are short videos interviews of our Doctors and Paramedics on our LifeLines website.
- Once pupils have presented their Medical Product, you can show them this video which explains how to treat a open pneumothorax in a pre-hospital emergency situation: <https://www.youtube.com/watch?v=5faPmSLHy14>
- **You can find answers and guidelines for each step of the project below.**

Project Equipment

- Clear plastic drink bottles
- Drinking straws
- Elastic bands
- Balloons
- Modeling Clay
- Scissors
- Sticky Tape
- Drawing Paper
- Drawing pencils / pens

Medic Test (5 mins)

This project includes terminology that your pupils may not have heard before. Test how much they have learnt by asking them to complete the 'Medic Test' at the end of the work sheet. This can be completed as a whole class, in teams or individually.

STEM Careers: Useful Links

There are a variety of video clips on our LifeLines website which will help to give pupils more of an insight into the daily lives of our Team: www.hiowaa.org/lifelines

The Royal Institute of Medicine website offers information about careers in medicine career <https://www.rsm.ac.uk/about-us/public-information/careers-in-medicine.aspx>

STEM Now (Winchester Science Centre) delivers educational STEM projects, teacher and STEM professional CPD: http://www.winchestersciencecentre.org/stem-now/overview/#.Wb_RobpFzIU

Share

We would love to hear from you! Please share your thoughts and photos of your group during the project by emailing : joanna@hiowaa.org

Take the Challenge

Get your pupils involved in The LifeLines Challenge. This is a four step programme which includes a one hour workshop at your school and a visit to our air base at Thruxton. For more information visit: www.hiowaa.org/lifelines/the-challenge

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Worksheet Answers

Task 1: Fake Lung Experiment Part 1

Students create a model lung using the instructions on the worksheet or PowerPoint. You can also have a look at this video to see how it is made: <https://www.youtube.com/watch?v=S1zvNOHIG-c>

Task 2: Inhaled and Exhaled Air

Pupils draw two graphs, one for inhaled air and one for exhaled air. They can use a **bar** or **line graph** to show the data. They need to include scale, labels and a title.

Task 3A: Cause and Symptoms

Here are some examples of the type of injuries that could **CAUSE** an open pneumothorax.

1. Stab wound.
2. Gunshot wounds.
3. Broken ribs.
4. Bite wounds.
5. Something piercing the chest cavity.

Here are some examples of the **SIGNS** and **SYMPTOMS** we might observe in cases of open pneumothorax:

1. An open wound in the chest area.
2. Bloody froth coming from the wound, especially when the patient exhales.
3. A sucking sound coming from the wound, especially when the patient inhales.
4. Rapid, shallow and difficult breathing.
5. Chest pain.

Task 3B: Fake Lung Experiment Part 2

Pupils pierce a small hole in the side of their model lung using scissors or a compass. The size of the hole needs to be larger than the width of the straw.

What happens to the balloon inside the bottle when you pull the bottom balloon up and down?

Answer = (C) Nothing

Task 4: Medical Innovation

The key objective in this Medical Innovation Task is for teams to create a one-way valve to treat the wound. Teams need to create a product which allows air to escape from the chest cavity, but no more air can get into the chest cavity.

In pre-hospital care, medical teams tend to use a one-way valve called a Russel Chest Seal. Have a look at this YouTube video to see how it works: <https://www.youtube.com/watch?v=5faPmSLHy14>

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Task 5: Tension Pneumothorax

1. What effect would a tension pneumothorax have on the chest cavity (thorax)?

A tension pneumothorax happens when a hole in the lung functions as a valve. Air escaping from the lung is trapped between the lung and chest wall. The pressure builds, causing the lung to collapse and eventually the heart is pushed to the side and squeezed until it is unable to pump effectively, and cardiac arrest occurs.

2. How would our team of doctors and paramedics resolve this?

Making a hole in the chest wall (thoracostomy) releases the pressure and the problem resolves rapidly.

Medic Test

Test your medical knowledge and see if you can explain the following terminology.

Wording	What does it mean?
Thorax	The chest cavity.
Capnograph	A monitoring device that measures the concentration of carbon dioxide in exhaled air.
PHEM	Pre-Hospital Emergency Medicine.
ED	Emergency Department.
Open Pneumothorax	An open pneumothorax is caused by a piercing in the chest cavity (thorax).
Tension Pneumothorax	Tension pneumothorax occurs when air accumulates between the chest wall and the lung and increases pressure in the chest
Pleural Cavity	The space between the chest wall and the lung.
Alveoli	Tiny air sacs in the lungs, where gas is exchanged during breathing.
HEMS	Helicopter Emergency Medical Services.
CO2	Carbon Dioxide.