Ontario Council For Technology Education

Respiratory System

Grade Level: 5

Science and Technology Topic:
Human Organ Systems
Forces Acting on Structures and Mechanisms

Introduction/Context:
This is an open-ended project where students design and make a stable structure that will support a working, model respiratory system. The activity begins with an analysis of structures and an investigation of existing design problems (e.g., weak, collapsing legs, poor construction) and a discussion about how the use of models and simulations, help people to learn the systems such as the respiratory system. Students explore the basic needs of the body: air, water,food. After viewing a working model of a lung (see diagram below) the students are asked to make a similar working model. Then they must design a stand, which will support the finished working model.

Prior Knowledge and Skills:
- Measuring and Layout
- Safe handling of hand tools and materials
- Basic fastening techniques: gluing, clamping, drilling for screws, nuts and bolts
- The key parts of a lung
- Structures need to be strong and stable to be useful
- A basic understanding of structural components (eg. struts, ties and gussets)

Tools and Materials:
- Jinx wood
- fastening materials – glue, tape, screws, nails
- 1 litre clear pop bottle
- large round balloon
- straws
- plastic bag
- 2 Balloons
- Saw
- Clamp
- Mitre box or
- Easy-Cutters

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Curriculum Expectations:

Big Ideas:

- Organ structures are linked to their functions.
- Structures and mechanisms throughout our environment have forces that act on and within them.

Overall:

Human Organ Systems

1. investigate the structure and function of the major organs of various human body systems;
2. demonstrate an understanding of the structure and function of human body systems and interactions within and between systems.

Forces Acting on Structures and Mechanisms

1. investigate forces that act on structures and mechanisms;

2. identify forces that act on and within structures and mechanisms, and describe the effects of these forces on structures and mechanisms.

Specific:

Human Organ Systems

2.3 design and build a model to demonstrate how organs or components of body systems in the human body work and interact with other components

Forces Acting on Structures and Mechanisms

2.1 follow established safety procedures for working with tools and materials

2.3 use scientific inquiry/research skills to investigate how structures are built to withstand forces

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2.5 use appropriate science and technology vocabulary, including tension, compression, torque, system, and load, in oral and written communication

2.6 use a variety of forms (e.g., oral, written, graphic, multimedia) to communicate with different audiences and for a variety of purposes

3.1 identify internal forces acting on a structure 3.2 identify external forces acting on a structure

Learning Goals (student-friendly language):

Using a model, supported by a stable, non-tipping frame, I can explain how a lung works.

Activity Description:

Every year thousands of people are treated for lung related diseases. Doctors have discovered that most people have difficulty understanding how the human lung works.

University Hospital is in need of a simple model, which can be used by their patients to learn how a lung works within the human body. This model needs to be able to sit on a table. You will need to design a prototype and prepare a design brief outlining the development and operation of your model.

Prototype (model):

Your prototype needs to include the following:

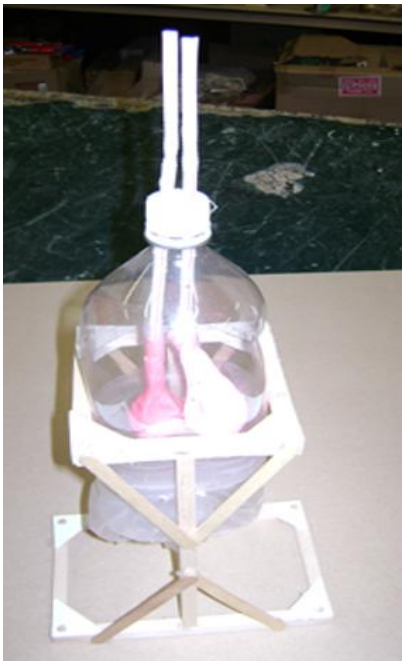
- The lung must be suspended in a visible "chest cavity"
- Air must be able to inflate and deflate the lung
- The model must be able to stand on a flat surface.

Design Brief

Your design brief must contain the following information:

- a clear, concise statement of the problem to be solved
- 3 sketches of possible solutions to the problem
- an explanation and the reasons for your plan choice
- an evaluation of how well your solution solves the problem
- a Technical Drawing (a neat, accurate drawing of the final design which includes labels and dimensions)

Sample Photo:



A Student Project of a Lung Model and Stand

Assessment and Evaluation (including Criteria for Success):

Evidence of Student Learning: design notes and drawings, working prototype, understanding of how electrical systems work, appropriate choice of materials, demonstration of knowledge of design process with a particular emphasis on field testing (e.g., a detailed design brief recording process of technological problem solving), presentation of design and final product with suggestions for improvement.

Criteria: safe, appropriate, and effective use of materials and tools, design specification requirements are met, presentation shows understanding of key learnings, including consideration of economic and environmental factors that determine the suitability of materials for use in manufacturing a product.

Completeness & Accuracy of Planning Sheets	/20 or level 1- 4
Constructive Use of Class Time	/20 or level 1- 4
Safe Use of Tools & Equipment	/20 or level 1- 4
Responsible Use of Materials	/10 or level 1- 4
Performance of the Model	/10 or level 1- 4
Technical Drawing	/20 or level 1- 4
Total	/100 or level 1- 4