

Building Strong Mines

| Northwest Territories | |
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| Grade 5 | |
| Forces Acting on Structures | |
| <u>General Curriculum Outcomes:</u> | <p>Demonstrate an understanding of the effect of forces acting on different structures and mechanisms.</p> <p>Design and make load-bearing structures and different mechanisms, and investigate the forces acting on them.</p> <p>Evaluate the design of systems that include structures and mechanisms, and identify modifications to improve their effectiveness.</p> |
| <u>Specific Curriculum Outcomes:</u> | <p>Identify and measure forces acting on a structure (e.g., mass, air pressure), and describe the effects of their application.</p> <p>Identify the parts of a structure that are under tension and those that are under compression when subjected to a load (e.g., the wires in a suspension bridge are under tension; a ladder bearing a mass is under compression).</p> <p>Formulate questions about and identify needs and problems related to structures and mechanisms in the outdoor environment, and explore possible answers and solutions (e.g., construct a bridge that must support a given load across a given distance; determine which surface of a cantilever bridge or beam is under tension and which is under compression).</p> <p>Design and make a frame structure that can support a load (e.g., a bridge).</p> <p>Make a mechanical system that performs a specific function (e.g., lifting a heavy load; retrieving an object from a position that cannot be reached by hand).</p> <p>Cut, join, and rearrange pliable and rigid materials to make an object (e.g., cut cardboard at a 45 degree angle to make a miter joint; make a paper mache mould for a face mask).</p> <p>Identify modifications intended to improve the performance, aesthetic appeal and impact on the environment of a product they designed.</p> |

Grade 7

Unit D: Structures and Forces

Specific Outcomes:

1. Describe and interpret different types of structures encountered in everyday objects, buildings, plants and animals; and identify materials from which they are made
 - identify points of failure and modes of failure in natural and built structures (e.g., potential failure of a tree under snow load, potential failure of an overloaded bridge)
2. Investigate and analyze forces within structures, and forces applied to them
 - identify tension, compression, shearing and bending forces within a structure; and describe how these forces can cause the structure to fail (e.g., identify tensile forces that cause lengthening and possible snapping of a member; identify bending forces that could lead to breakage)
 - analyze a design, and identify properties of materials that are important to individual parts of the structure (e.g., recognize that cables can be used as a component of structures where only tensile forces are involved; recognize that beams are subject to tension on one side and compression on the other; recognize that flexibility is important in some structures)
 - infer how the stability of a model structure will be affected by changes in the distribution of mass within the structure and by changes in the design of its foundation (e.g., infer how the stability of a structure will be affected by increasing the width of its foundation)
4. Demonstrate and describe processes used in developing, evaluating and improving structures that will meet human needs with a margin of safety
 - demonstrate and describe methods to increase the strength of materials through changes in design (e.g., corrugation of surfaces, lamination of adjacent members, changing the shape of components, changing the method of fastening)
 - identify environmental factors that may affect the stability and safety of a structure, and describe how these factors are taken into account (e.g., recognize that snow load, wind load and soil characteristics need to be taken into account in building designs; describe example design adaptations used in earthquake-prone regions)

General Outcomes

Skills Outcomes:

Work collaboratively on problems; and use appropriate language and formats to communicate ideas, procedures and results

- work cooperatively with team members to develop and carry out a plan, and troubleshoot problems as they arise

Attitude Outcomes:

- Show interest in science-related questions and issues, and pursue personal interests and career possibilities within science-related fields
- Work collaboratively in carrying out investigations and in generating and evaluating ideas
- Show concern for safety in planning, carrying out and reviewing activities