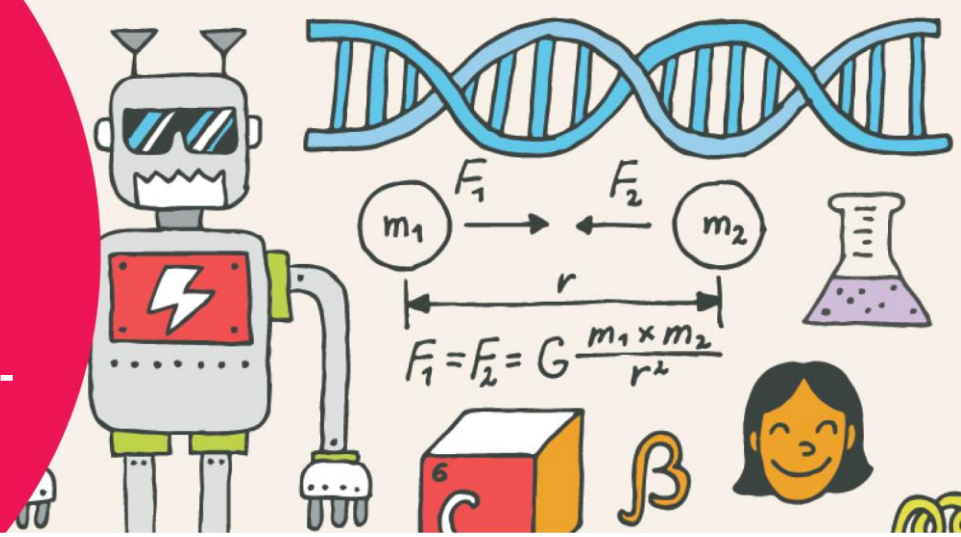
Bridge Builders

Curriculum Connections - Ontario



GRADE 5 – SCIENCE AND TECHNOLOGY

Forces Acting on Structures and Mechanisms

2. Investigate forces that act on structures and mechanisms

2.1 follow established safety procedures for working with tools and materials (e.g., wear protective eyewear when testing structures to the breaking point)

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

2.4 use technological problem-solving skills to design, build, and test a frame structure (e.g., a bridge, a tower) that will withstand the application of an external force

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 (e.g., make an oral presentation explaining the techniques they used to build a model of a bridge that can withstand vibrations from a train)

3. Identify forces that act on and within structures and mechanisms, and describe the effects of these forces on structures and mechanisms

3.1 identify internal forces acting on a structure (e.g., compression [squeezing], tension [stretching]), and describe their effects on the structure

3.2 identify external forces acting on a structure (e.g., the weight of people and furniture in a house, wind blowing on a tent, the movement caused by a passing train), and describe their effects on the structure, using diagrams

3.4 describe forces resulting from natural phenomena that can have severe consequences for structures in the environment (e.g., a house loses its roof in a wind storm), and identify structural features that help overcome some of these forces.

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GRADE 7 – SCIENCE AND TECHNOLOGY

Understanding Structures and Mechanisms, Form and Function

2. design and construct a variety of structures, and investigate the relationship between the design and function of these structures and the forces that act on them;

2.1 follow established safety procedures for using tools and handling materials (e.g., wear safety glasses when cutting or drilling)

2.2 design, construct, and use physical models to investigate the effects of various forces on structures (e.g., the struts of a roof experience compression forces from shingles; the support cables of a suspension bridge are in tension; a twisted ruler has torsion forces; the pin that holds the two parts of a pair of scissors together has shear forces acting on it)

2.3 investigate the factors that determine the ability of a structure to support a load (e.g., the weight of the structure itself; the magnitude of the external loads it will need to support; the strength of the materials used to build it)

2.4 use technological problem-solving skills to determine the most efficient way for a structure (e.g., a chair, a shelf, a bridge) to support a given load Sample problem: Using the least amount of material (by mass), construct a bridge to support a specific load (e.g., minimum of 4 kilograms).

2.6 use appropriate science and technology vocabulary, including truss, beam, ergonomics, shear, and torsion, in oral and written communication

3. demonstrate an understanding of the relationship between structural forms and the forces that act on and within them.

3.3 identify the magnitude, direction, point of application, and plane of application of the forces applied to a structure

3.4 distinguish between external forces (e.g., wind, gravity, earthquakes) and internal forces (tension, compression, shear, and torsion) acting on a structure

3.6 identify and describe factors that can cause a structure to fail (e.g., bad design, faulty construction, foundation failure, extraordinary loads)

3.7 identify the factors (e.g., properties of the material as they relate to the product, availability, costs of shipping, aesthetic appeal, disposal) that determine the suitability of materials for use in manufacturing a product (e.g., a running shoe).