Mighty Mining Machines

Alberta & Nunavut	
Grade 4	
Topic B: Wheels and Levers	
General Learner Expectations:	4–6 Demonstrate a practical understanding of wheels, gears and levers by constructing devices in which energy is transferred to produce motion.
Specific Learner Expectations:	3. Construct devices that use wheels and axles, and demonstrate and describe their use in: model vehicles, pulley systems, gear systems 4. Construct and explain the operation of a drive system that uses one or more of the following: wheel-to-wheel contact, a belt or elastic, a chain, cogs or gears. 6. Demonstrate ways to use a lever that: applies a small force to create a large force, applies a small movement to create a large movement.
Topic C: Building Devices and Vehicles that Move	
General Learner Expectations:	4–7 Construct a mechanical device for a designated purpose, using materials and design suggestions provided. 4–8 Explore and evaluate variations to the design of a mechanical device, demonstrating that control is an important element in the design and construction of that device.
Specific Learner Expectations:	1. Design and construct devices and vehicles that move or have moving parts—linkages, wheels and axles. 2. Use simple forces to power or propel a device; e.g., direct pushes, pulls, cranking mechanisms, moving air, moving water and downhill motion. 3. Design and construct devices and vehicles that employ energy-storing or energy-consuming components that will cause motion; e.g., elastic bands, springs, gravity, wind, moving water 6. Identify steps to be used in constructing a device or vehicle, and work cooperatively with other students to construct the device or vehicle
General Outcomes	
General Learner Expectations:	4–3 Investigate a practical problem, and develop a possible solution. 4–4 Demonstrate positive attitudes for the study of science and for the application of science in responsible ways.

Grade 8	
Mechanical Systems	
Specific Outcomes:	1. Illustrate the development of science and technology by describing, comparing and interpreting mechanical devices that have been improved over time • illustrate how a common need has been met in different ways over time (e.g., development of different kinds of lifting devices) 2. Analyze machines by describing the structures and functions of the overall system, the subsystems and the component parts • analyze a mechanical device, by: describing the overall function of the device, describing the contribution of individual components or subsystems to the overall function of the device, identifying components that operate as simple machines • identify linkages and power transmissions in a mechanical device, and describe their general function (e.g., identify the purpose and general function of belt drives and gear systems within a mechanical device) 4. Analyze the social and environmental contexts of science and technology, as they apply to the development of mechanical devices • evaluate the design and function of a mechanical device in relation to its efficiency and effectiveness, and identify its impacts on humans and the environment • develop and apply a set of criteria for evaluating a given mechanical device, and defend those criteria in terms of relevance to social and environmental needs • illustrate how technological development is influenced by advances in science, and by changes in society and the environment
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