



ORC CURRICULUM MAP

Grade 8 Science

Topics Included: Unit D: Mechanical Systems

Resources Included:

*Science in Context, Britannica School, ScienceFLIX, TrueFLIX,
PowerKnowledge Suite, Crash Course, Crash Course Kids*

Created: March 2017

Updated: January 2019

Erin Hansen, On Behalf of The Alberta Library

ORC@thealbertalibrary.ab.ca

Crash Course Disclaimer

These Curriculum Maps have been updated to include the YouTube educational web series *Crash Course*. This web series is geared towards science. It includes topics related to Earth Science, Physical Science, Biology, Astronomy, and more. These videos can sometimes contain irreverent humour. We encourage educators to preview the videos for appropriateness before showing them in a classroom or library setting.

Background and Access Information

Learn Alberta's Online Reference Centre is a \$1.4 million collection of authoritative curricular aligned resources that are licensed on behalf of all students, staff, parents and public librarians learning/teaching/supporting the Alberta curriculum.

To Access the Online Reference Centre:

1. Go to LearnAlberta.ca
2. Select English or French
3. Click on "Online Reference Centre" in the tab along the top of the screen
4. In school while on a school device, users do not need to enter a username or password. Users are able to enter any database or website instantly.
5. Access from a person device in school or remotely from outside of the school will require the user to enter a username/password once to unlock all of the resources.
6. Please share your district's ORC username/password with your students, parents of your students, student teachers and fellow staff members. Please do not share the username and password information on an open website (a website that does not require the user to login).

How to Use This Guide

Attached please find a listing of databases found on Learn Alberta's Online Reference Centre (ORC) that directly support specific learner outcomes in the grade two science and social studies curricula.

Formatting Overview for PowerKnowledge Databases:

Curricular Topic

Specific Learner Outcome (SLO)

Name of the Database

- Topic
 - Subtopic
 - Article Title with Hyperlink
 - Article Sections

Formatting Overview for TrueFLIX:

Curricular Topic

- Topic
 - eBook Title (alphabetized listing found in the Resources & Tools link in the top right hand corner of the screen)
 - Chapters in eBook if applicable

*Please Note:

- TrueFLIX eBook links will be in the 'Resources Below Grade Level' sections.
- Links from the "Explore More" section of TrueFLIX are at a higher reading level and appear in the "Resources At or Above Grade Level" sections.

Formatting Overview for ScienceFLIX:

Curricular Topic

Specific Learner Outcome (SLO)

- Topic Area or Search Term
 - Article/Resource Title

*Special Note: ScienceFLIX articles are presented in three (3) Lexile levels.

Formatting Overview for Science In Context:

Curricular Topic

Specific Learner Outcome (SLO)

Science In Context

- Browse Topics (link found in the top grey bar next to Home)
 - Topic
 - Introductory Article/Featured Content/Reference
 - Article Name with hyperlink

A note about Science In Context:

Science In Context is a database that is designed for students in grades six to twelve. As such, some of the content of this database may be challenging for students who may struggle with reading.

However, this database does have several features to make it more user friendly for students with varied skill levels. First, each article indicates the reading level using a symbol just below the title of the article beside the name of the source. A green circle indicates a basic reading level, yellow square an intermediate reading level, and red triangle an advanced reading level. In addition, the "Advanced Search" feature allows users to limit the content search to a basic, intermediate or advanced reading level. This guide will include basic articles in the "At or Above Grade Level" sections and

intermediate articles in the "Above Grade Level" sections. Each title includes a hyperlink that takes you directly to the article in the database.

Last, this database does include a customizable listen feature, as well as a text translation and the ability to download a computer generated reading of the article to an MP3 format.

If you have any questions regarding this guide or if you would like a guide for additional grades please contact Bethany Arsenault, ORC Coordinator at barsenault@thealbertalibrary.ab.ca

Science 8 Unit D: Mechanical Systems

Unit D: Mechanical Systems

SLO 1: Illustrate the development of science and technology by describing, comparing and interpreting mechanical devices that have been improved over time

- *Investigate and provide examples of mechanical devices used in the past to meet particular needs (e.g., describe and interpret devices developed to move water or be moved by water, such as the Persian wheel, Archimedes' screw, mill wheel)*
- *Illustrate how a common need has been met in different ways over time (e.g., development of different kinds of lifting devices)*
- *Illustrate how trial and error and scientific knowledge both play a role in technological development (e.g., development of aircraft)*

Resources for Students Reading Below Grade Level

Britannica School: Elementary

- Keyword Search: Mechanical Device
 - Article Title: Gyroscope
 - Article Title: Clock
 - Article Title: Car
 - Article Title: Airplane
 - Article Title: Machine
- Keyword Search: bicycle
 - Article Title: Bicycle
 - Article Title: Motorcycle
- Keyword Search: Archimedes Screw
 - Article Title: Archimedes
 - Early Life and Studies
 - See IMAGES and VIDEO in article
- Keyword Search: Mill
 - Article Title: Technology and Invention
 - Ancient Technology

- Technology in the Middle Ages
- Industrial Revolution
- Modern Technology
- Article Title: Windmill

PowerKnowledge Physical Science

- Force and Motion
 - Simple Machines
 - All About Simple Machines
 - [Simple Machines in History](#)
 - [Simple Machines Today](#)
 - Inclined Planes
 - [Inclined Planes Throughout History](#)
 - [Inclined Planes on the Job](#)
 - Lever
 - [The Earliest Levers](#)
 - [Levers Today](#)
 - Pulley
 - [The First Pulley](#)
 - [Pulleys Today](#)
 - Screws
 - [The First Screw](#)
 - [Screws Through Time](#)
 - [Screws on the Job](#)
 - [Screws All Around](#)
 - [Simple Machines with Graphic Organizers \(whole article\)](#)
 - [Machines and Us](#)
 - Wedges
 - [The First Wedge](#)
 - [Wedges Through Time](#)
 - [Wedges Today](#)
 - Wheels and Axles
 - [The First Wheel and Axle](#)
 - [Wheels and Axles Through Time](#)
 - [Wheels, Axles and You](#)
 - Motion in our world

- [Airplanes](#)

TrueFLIX

- Topic: Physical Science
 - eBook Title: Simple Machines
 - Watch It
 - Read It

Crash Course Kids

- (Playlist of 17 Videos) [Engineering: The Engineering Process](#)

Resources for Students Reading At or Above Grade Level

Britannica School: Middle

- Keyword Search: Mechanical Device
 - Article Title: Ratchet (Mechanical Device)
 - Article Title: Screw (Machine Component)
 - Article Title: Gyroscope
 - Article Title: Clock
 - Article Title: Car
 - Article Title: Aerospace Industry
 - (Images & Video)
- Keyword Search: Airplane
 - Article Title: Airplane
 - Introduction
 - Airplane History
 - (Images & Video)
- Keyword Search: Machine
 - Article Title: Machine
 - Article Title: Simple Machines (from the article Mechanics (physics))
- Keyword Search: Archimedes
 - Article Title: Archimedes
- Keyword Search: Mill Wheel
 - Article Title: Waterpower
 - Water Wheels
 - Article Title: Wheel

- Keyword Search: Lift
 - Article Title: Elevator and Escalator
 - Article Title: Crane and Derrick

ScienceFLIX

- Topic: Simple Machines
 - Watch It
 - Read It
 - Dive Deeper
 - Complex Machines
 - Waterwheel and Windmills
 - Bicycles
 - Explore More
 - Making Connections
 - Clock
 - Conveyer
 - Crank
 - Etc...
- Keyword Search: Efficiency
 - Article Title: Transportation
 - Article Title: The Automobile
 - Article Title: Human-Powered Transportation
 - Article Title: Windpower

TrueFLIX

- Topic: Physical Science
 - eBook Title: Simple Machines
 - Explore More
 - Inclined Plane
 - Lever
 - Pully
 - Screw
 - Wedge
 - Wheel and Axle
 - Profiles
 - Archimedes

- Leonardo Da Vinci
- Galileo
- Sir Isaac Newton
- Primary Sources
 - Inventions in the Century
 - Chesapeake and Ohio Canal: Inclined Plane

Science in Context

- Advanced Search: “mechanical engineering” (Beginning & Intermediate Content Level selected)
 - Topic: [Mechanical Engineering](#) (Gale Encyclopedia of Science, 2014)
- Advanced search: “Archimedes’ screw”
 - Biography
 - [Archimedes of Syracuse](#) (World of Mathematics, 2006)
 - [Archimedes of Syracuse](#) (Notable Mathematicians, 2008)
 - Images
 - [Archimedes Screw, Recycling Plant](#) (Gale Science in Context, 2005)
 - News
 - [Ancient Greek engineering meets JCB innovation to generate 'green' power for new centre of learning](#) (ENP Newswire, Apr 13, 2010)
 - Academic Journals
 - [Served straight up: the Archimedes screw took the flying machine in an entirely new direction](#) (Mechanical Engineering-CIME, Dec 2003)
 - [Uniform Powder Flow](#) (Mechanical Engineering-CIME, Aug. 2001)
- Advanced Search: “mill wheel”
 - Magazines
 - [Keep the mill wheels grinding: a new flour mill uses traditional milling techniques with a state-of-the-art screener](#) (Food Engineering, Feb, 2013)
 - [Rediscovering hydropower: as residents of one Vermont Town can attest, clean renewable energy is flowing right past us. All](#)

- Internal Combustion Engine
- Windmill
- Clock
- Article Title: Catapult
- Article Title: Bicycle

PowerKnowledge Physical Science

- Force and Motion
 - Simple Machines
 - All About Simple Machines
 - [Simple Yet Helpful](#)
 - Pulley
 - [A Pulley's Work](#)
 - [Smooth Riding](#)
 - Simple Machines With Graphic Organizers
 - [Types of Simple Machines](#)
 - Motion in our World
 - [Airplanes](#)
 - [Orville and Wilbur Get it Right](#)
 - [How Planes Fly](#)
 - [Bicycles](#)
 - [Get in Gear](#)

TrueFLIX

- Topic: Physical Science
 - eBook Title: Simple Machines
 - Watch It
 - Read It

Resources for Students Reading At or Above Grade Level

Britannica School: Middle

- Keyword Search: Simple Machines
 - Article Title: Mechanics (physics)
 - Simple Machines
 - Article Title: Machine

- Article Title: Bicycle
- Keyword Search: Linkage
 - Article Title: Machine
 - Machine Elements
 - Article Title: Brake
 - Friction Brake
 - Article Title: Die and Diemaking
 - Article Title: Machine Gun
 - Development
 - Locking and Firing
 - Article Title: Steam Engine
 - Development of the Steam Engine
- Keyword Search: Mechanical Device
 - Article Title: Clock
 - Article Title: Weapon (Military Technology)
 - Article Title: Brake
 - Friction Brake
- Keyword Search: Power Transmission
 - Article Title: Automobile
 - Power Train
- Keyword Search: Belt drive
 - Article Title: Automation
 - Development of Automation
- Keyword Search: Gears
 - Article Title: Automobile
 - Power Train
 - Article Title: Bicycle
 - Article Title: Clock
 - Article Title: Machine
 - Machine Elements
 - Article Title: Mechanics (physics)
 - Simple Machines
 - Article Title: Watch (timekeeping device)

ScienceFLIX

- Topic: Simple Machines

- Watch It
- Read It
- Explore More
 - Simple Machines
 - Inclined Plane
 - Lever
 - Etc...
 - Force and Work
 - Work, Power and Machines
- Dive Deeper
 - Making Connections
 - Linkages
 - Cams and Gears
 - Other Machine Mechanisms

TrueFLIX

- Topic: Experiments
 - eBook Title: Experiments with Motion
 - Explore More
 - Contact Forces
 - Force and Motion
 - Linkages

Science in Context

- Advanced Search: “power sources” (Beginning & Intermediate Content Level selected)
 - Reference
 - [Possible Future Energy Sources](#) (Alternative Energy, 2012)
 - [Non-renewable Energy Resources](#) (World of Physics, updated 2014)
 - [Fossil Fuel](#) (UXL Encyclopedia of Weather and Natural Disasters, 2016)
 - [Alternative Energy Sources](#) (UXL Encyclopedia of Science, 2015)
 - [Electric Motor](#) (UXL Encyclopedia of Science, 2015)
 - [Generator](#) (UXL Encyclopedia of Science, 2015)

- [Industrial Revolution](#) (UXL Encyclopedia of Science, 2015)
- [Mill](#) (UXL Encyclopedia of Science, 2015)
- [Power Plant](#) (UXL Encyclopedia of Science, 2015)
- [Steam Engine](#) (UXL Encyclopedia of Science, 2015)
- [Automobile, electric](#) (ULX Science, 2008)
- [Power Supply](#) (World of Invention, Sep 2011)
- [Waterwheel](#) (World of Invention, 2006)
- Advanced Search: "gears" OR "gear system"
 - Reference
 - [Differential](#) (World of Invention, 2006)
 - [Automobile](#) (UXL Encyclopedia of Science, 2015)
 - Transmission
 - [Electric Motor](#) (UXL Encyclopedia of Science, 2015)
 - [Gear](#) (World of Invention, 2006)

Crash Course Videos

- [Engines: Crash Course Physics #24](#)

SLO 3: *Investigate and describe the transmission of force and energy between parts of a mechanical system*

- *Analyze mechanical devices to determine speed ratios and force ratios build or modify a model mechanical system to provide for different turning ratios between a driving and driven shaft, or to achieve a given force ratio*
- *Compare theoretical and actual values of force ratios, and propose explanations for discrepancies (e.g., identify frictional forces, and estimate their effect on efficiency)*
identify work input and work output in joules for a simple machine or mechanical system (e.g., use a device to lift a measured mass an identified distance, then calculate the work output)
- *Describe fluid pressure qualitatively and quantitatively, by:*
 - *explaining how forces are transferred in all directions*
 - *describing pressure in units of force per unit area*
- *Describe how hydraulic pressure can be used to create a mechanical advantage in a simple hydraulic jack (e.g., describe the relationship*

among force, piston size and distance moved, using different sized syringes linked by tubing)

- *Describe and interpret technologies based on hydraulics and pneumatics (e.g., applications in hydraulic lifts and air-driven tools)*

Resources for Students Reading Below Grade Level

Britannica School: Elementary

- Keyword Search: Force
 - Article title: Friction (force between two objects)
 - Article title: Force (physics)
 - Article title: Machine
 - Simple Machines
 - Compound Machines
- Keyword Search: Energy
 - Article title: Energy (physics)
 - Article title: Energy Transformation
- Keyword Search: Mechanical System
 - Article title: Energy (physics)
 - Mechanical Energy
 - Potential and Kinetic Energy
 - Heat Energy
- Keyword Search: Fluid Pressure
 - Article title: Hydraulics

PowerKnowledge Physical Science

- Force and Motion
 - [All About Force and Motion](#)
 - (whole article)
 - [Force and Motion with Graphic Organizers](#)
 - (whole article)

TrueFLIX

- Topic: Physical Science
 - eBook Title: Simple Machines

- Watch It
- Read It
- eBook Title: Friction
 - Watch It
 - Read It

Resources for Students Reading At or Above Grade Level

Britannica School: Middle

- Keyword Search: Force
 - Article Title: Force (physics)
- Keyword Search: Energy
 - Article Title: Energy (physics)
- Keyword Search: measure speed
 - Article Title: Meter
- Keyword Search: Friction
 - Article Title: Force (physics)
 - Friction
 - Contact Force
 - Air Resistance
 - Article Title: Brake (machine component)
 - Article Title: Automobile
 - Friction Clutch
 - Clutch
 - Lubrication System
 - Article Title: Energy (physics)
 - Changing Forms of Energy
 - Laws of Thermodynamics
 - Article Title: Mechanics (physics)
 - Forces
 - Simple Machines
 - Article Title: Hydraulics
 - Hydrodynamics
 - Hydrostatics
 - Keyword Search: Work Output
 - Article Title: Machine

- Simple Machines and Machine Principles
 - Machine Elements
- Keyword Search: Fluid Pressure
 - Article Title: Pumps and Compressors
 - Article Title: Machine
 - Machine Elements
- Keyword Search: Hydraulics
 - Article Title: Hydraulics
- Keyword Search: Pneumatic
 - Article Title: Pneumatic Device (instrument)
 - Article Title: Air
 - Compressed Air

ScienceFLIX

- Topic: Simple Machines
 - Dive Deeper
 - Force and Work
 - The Science of Work
 - Mechanical Power
 - Making Connections
 - Cams and Gears
 - See Also: (links at end of article)
 - Hydraulic Systems
 - Pneumatic Systems
 - Linkages
 - Other Machine Mechanisms
 - Complex Machines
 - Waterwheel
- Topic: Force and Motion
 - Read It
 - Dive Deeper
 - Types of Forces
 - Friction and Other Contact Forces
 - See Also: (links at end of Article_)
 - Machine
- Keyword Search: Friction

- Article Title: Friction
- Keyword Search: Hydraulic
 - Article Title: Fluid Dynamics

TrueFLIX

- Topic: Physical Science
 - eBook Title: Friction
 - Explore More
 - Bearings
 - Force
 - Motion
 - Simple Machines

Science in Context

- Advanced Search: force AND friction (Beginning & Intermediate Content Level selected)
 - Topic
 - [Friction](#) (World of Physics, updated 2014)
 - Reference
 - [Force](#) (World of Scientific Discovery, 2007)
 - [Friction](#) (UXL Encyclopedia of Science, 2015)
 - [Mill](#) (UXL Encyclopedia of Science, 2015)
- Advanced Search “force ratio” OR “speed ratio”
 - Reference
 - [Acceleration](#) (World of Scientific Discovery, 2007)
- Advanced Search: work
 - Reference
 - [Work](#) (World of Physics, updated 2014)
 - [Work](#) (World of Mathematics, 2007)
 - [Energy and Work](#) (World of Physics, updated 2014)
 - [Energy Transformations](#) (World of Physics, updated 2014)
 - [Levers](#) (World of Physics, updated 2014)
 - [Simple Machines](#) (World of Physics, updated 2014)
- Advanced Search: “fluid pressure”
 - Reference
 - [Fluid Dynamics](#) (UXL Encyclopedia of Science, 2015)

- [Fluid Dynamics](#) (World of Scientific Discovery, 2007)
- [Hydraulic Cylinder](#) (UXL Encyclopedia of Science, updated 2016)
- [Hydraulics](#) (World of Mathematics, 2007)
- Advanced Search: “hydraulic jack”
 - Academic Journals
 - [Case study of a synchronous hydraulic jack-up system for constructing high-rise residential buildings](#) (Canadian Journal of Civil Engineering, June 2010) (advanced level)
 - Magazines
 - [Moving BIG Stuff: IF YOU CAN MOVE A LIGHTHOUSE, YOU CAN MOVE ANYTHING](#) (Smithsonian, Jan 2000)
- Advanced Search: “pneumatic tool”
 - Reference
 - [Piston](#) (World of Invention, 2006)
 - Magazines
 - [Air Power](#) (Popular Science, 1988)
 - [Pneumatic Systems Sharpen Their Accuracy](#) (Machine Design, April 1998)
 - [Pneumatic hose-clamp tool](#) (Machine Design, 2009)

Crash Course Videos

- [Engines: Crash Course Physics #24](#)
- [Fluids at Rest: Crash Course Physics #14](#)
- [Fluids in Motion: Crash Course Physics #15](#)

SLO 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*

Resources for Students Reading Below Grade Level

Britannica School: Elementary

- Keyword Search: Mechanical Device
 - Article Title: Clock
 - Article Title: Rocket
 - Article Title: Telephone
 - Article Title: Car (vehicle)
 - Article Title: Technology and Invention
 - Article Title: Airplane
 - Article Title: Machine
 - Article Title: United States History
 - Developments in Industry and Transportation

Crash Course Kids

- (Playlist of 17 Videos) [Engineering: The Engineering Process](#)

Resources for Students Reading At or Above Grade Level

Britannica School: Middle

- Keyword Search: Technology Invention
 - Article Title: Industry
 - Article Title: Invention (technology)
 - Article Title: Exploration
 - Article Title: Technology
 - Article Title: Science
 - Information Technology
 - Significance of Science in Society
 - Etc.
- Keyword Search: Efficiency
 - Article Title: Energy Conversion
 - Efficiency
 - Article Title: Automobile
 - Fuel Efficiency

- Styling for Efficiency
- Article Title: Automobile Industry
 - Energy Efficiency
 - Model Design
- Article Title: Internal Combustion Engine (mechanics)
 - Characteristics of Piston Engines
 - Two-cycle Engines
 - History

ScienceFLIX

- Keyword Search: Efficiency
 - Article Title: Transportation
 - Article Title: The Automobile
 - Article Title: Human-Powered Transportation
 - Article Title: Windpower

TrueFLIX

- Topic: Physical Science
 - eBook Title: Simple Machines
 - Explore More
 - Primary Sources
 - Inventions in the Century
 - Chesapeake and Ohio Canal: Inclined Plane

Science in Context

- Advanced Search: “fossil fuels” AND “Climate Change” (Beginning & Intermediate Content Level selected)
 - Reference
 - [Global Warming and Climate Change](#) (Opposing Viewpoints Online Collection, 2017)
 - [Acid Rain](#) (UXL Encyclopedia of Weather and Natural Disasters, 2016)
 - [Climate Change](#) (UXL Encyclopedia of Weather and Natural Disasters, 2016)
 - [Fossil Fuel](#) (UXL Encyclopedia of Weather and Natural Disasters, 2016)
 - [Global Warming](#) (UXL Encyclopedia of Weather and Natural Disasters, 2016)

- Disasters, 2016)
 - [Ocean Acidification](#) (UXL Encyclopedia of Weather and Natural Disasters, 2016)
 - [Oceans and Climate Change](#) (UXL Encyclopedia of Weather and Natural Disasters, 2016)
 - Advanced Search: Efficiency AND design
 - Reference
 - [Energy Efficiency](#) (Environmental Encyclopedia, 2011)
 - [Energy Conservation and Efficiency](#) (Alternative Energy, 2012)
 - [Aerodynamics](#) (UXL Encyclopedia of Science, 2015)
 - Academic Journals
 - [Green Cars: plastics make them possible: key factors include better fuel economy, safety & design freedom](#) (Plastics Engineering, 2017)
 - [Auxiliary equipment: innovations generate energy savings, efficiency, higher performance](#) (Plastics Engineering, 2008)
 - Advanced Search: technology AND society
 - Reference
 - [Social Impact](#) (Computer Sciences, 2013)
 - [The Rise of the Appropriate Technology Movement](#) (Science and Its Times, updated 2009)
 - [Technological Disasters: The Modern Challenge to the Enlightenment](#) (Science and Its Times, updated 2010)
 - [The Influence of Watermills on Medieval Society](#) (Science and Its Times, 2001)
-