EDUCATIONAL RESOURCES OVERVIEW

These lessons have been developed by teachers and geoscientists to compliment teacher resource materials provided by the Saskatchewan Ministry of Education. Lesson plans and the M4S Teacher Resource can be downloaded from the SMA website (http://www.saskmining.ca/news-article/Education-Outreach/For+Schools/Education+Resources/1/2011-06-09-posters.html)

Grade 4 Science: Rocks, Minerals and Erosion

Saskatchewan Learning Outcomes and Indicators	*Lesson and Activity Correlation*
RM4.1 Investigate physical properties of rocks and minerals, including those found in their local environment. [CP, SI]	
a) Pose questions about the properties of rocks and minerals (e.g., What is the difference between rocks and minerals? Where do we find rocks and minerals? Do rocks become minerals?).	
b) Document the locations and characteristics of rocks that exist in their local environment.	Potash Solution Mining: Dissolving Potash Potash Solution Mining: Recovering Dissolved Potash Is There Potash Under My Feet?
c) Observe and record physical properties of rocks and minerals such as colour, texture, lustre, hardness, cleavage, transparency, and crystal structure..	Potash Solution Mining: Dissolving Potash Potash Solution Mining: Recovering Dissolved Potash
d) Use appropriate tools (e.g., hand lens, safety glasses, brush, rock pick, knife, and gloves) safely while making observations and collecting information on the physical properties of rocks and minerals.	Potash Solution Mining: Dissolving Potash Potash Solution Mining: Recovering Dissolved Potash
e) Demonstrate respect for all components of their environment when observing and collecting rocks and minerals.(e.g., do not remove rocks and minerals from private property without permission)	
f) Demonstrate processes for testing the hardness of rocks, including reference to guides such as Moh's scale of mineral hardness	Potash Solution Mining: Dissolving Potash
g) Record observations of rocks and minerals using jot notes, labelled diagrams, and charts.	Potash Solution Mining: Dissolving Potash Potash Solution Mining: Recovering Dissolved Potash
h) Compare the physical properties of rocks and minerals from their local environment with those from other geological areas.	
i) Develop their own classification scheme to organize their understanding of rocks and minerals.	
j) Account for any variation between their classification schemes of rocks and minerals and those of classmates, Elders, traditional knowledge keepers, geologists, or from other resources.	
k) Differentiate between rocks and minerals.	Potash Solution Mining: Dissolving Potash

l) Develop simple generalizations about the physical characteristics of rocks and minerals based on observation and research.	
Saskatchewan Learning Outcomes and Indicators	***Lesson and Activity Correlation***
RM4.2 Assess how human uses of rocks and minerals impact self, society, and the environment. [DM]	
a) Discuss ways in which people of different cultures value, respect, and use rocks and minerals, including First Nations and Metis connections to Mother Earth.	History of Mining Early Mining Saskatchewan Reference material (M4S)
b) Identify objects in their local environment that are made from rocks and minerals (e.g., nickel, table salt, pottery, cement, brick, jewellery, bicycle, nutrients, battery, copper wiring, soda can, plumbing pipe, and sidewalk).	Potash, What is it? Rocks and Minerals in Your Life (M4S)
c) Research historical (e.g., flint arrowheads, gold jewellery, paint pigments, and coal heating) and contemporary (e.g., fertilizer, building products, ceramics, glass, salt, silver fillings, and electronics) uses for rocks and minerals in Saskatchewan.	History of Mining Early Mining Saskatchewan Reference material (M4S)
d) Suggest alternative materials that could be used to create everyday objects or propose new uses for rocks and minerals.	Rocks and Minerals in Your Life (M4S)
e) Relate uses for rocks and minerals to characteristics such as functionality, mineral shape, cost, availability, and aesthetics.	
f) Identify locations where minerals, including potash, sodium sulphate, salt, kaolin, uranium, copper, coal, diamond, and gold, are extracted in Saskatchewan.	Potash Solution Mining Is There Potash Under My Feet? Mineral Potential and Mines in Saskatchewan (M4S)
g) Discuss economic benefits associated with mineral extraction and refining, including related careers, in Saskatchewan.	Granola Bar Mining: (Being Developed) Potash, What is it? Finders, Miners? (M4S) Careers in the Minerals Industry (M4S)
h) Analyze issues related to the extraction and use of minerals from the perspectives of various stakeholders (e.g., company owner, employee, scientist, Elder, environmental group, and end user).	Granola Bar Mining: (Being Developed) Finders, Miners?(M4S)
i) Research ways in which products made from rocks or minerals can be recycled and reused.	
j) Suggest methods of reclaiming resource extraction sites (e.g., quarry, strip mine, open pit mine and hard rock mine) to reduce short-term and long-term impacts on communities and the environment.	Granola Bar Mining: (Being Developed) Cookie Mining (M4S)
k) Assess their own and their family's impact on natural resources based on their current lifestyle.	Potash, What is it?

Grade 4 Social Studies: Resources and Wealth

Saskatchewan Learning Outcomes and Indicators	*Lesson and Activity Correlation*
RW4.3 Assess the impact of Saskatchewan resources and technological innovations on the provincial, national, and global communities	
a) Represent on a map the major resources in Saskatchewan (e.g., minerals, potash, oil, uranium, natural gas, lumber, water, crop, and livestock production).	Mineral Potential and Mines in Saskatchewan (M4S)
b) Locate on a map the major industries in Saskatchewan (e.g., agriculture processing, mining, manufacturing, forestry products, energy refinement, tourism, livestock production.	Mineral Potential and Mines in Saskatchewan (M4S)
d) Illustrate the goods made from the major natural resources, the consumers of those goods and the export destinations.	Rocks and Minerals in Your Life (M4S)

Grade 5 Science: Properties and Changes of Materials

Saskatchewan Learning Outcomes and Indicators	*Lesson and Activity Correlation*
MC5.3 Assess societal and environmental impacts that result from the production, use, and disposal of raw materials and manufactured products.	
c) Research a product to determine the raw materials from which it is made, and describer the changes required to the natural materials to manufacture the product.	Rocks and Minerals in Your Life (M4S)

Grade 6 Career Education: Connections to Communities

Saskatchewan Learning Outcomes and Indicators	*Lesson and Activity Correlation*
CC6.1 Investigate various aspects of careers and their requirements.	
b) Examine at least one occupation through an exploration of work information such as occupational description, working conditions, earnings, and education/training requirements.	Careers in the Minerals Industry (M4S) Investigating Careers in the Minerals Industry (M4S)
c) Utilize various sources of information such as parents, relatives, community members, newspapers, and digital resources.	Careers in the Minerals Industry (M4S) Investigating Careers in the Minerals Industry (M4S)
h) Describe various work roles (such as labourer, entrepreneur, manager) and settings (such as outside, office tower, manufacturing plant) of interest to oneself.	Careers in the Minerals Industry (M4S) Investigating Careers in the Minerals Industry (M4S)

Grade 7 Science: Mixtures and Solutions

Saskatchewan Learning Outcomes and Indicators	*Lesson and Activity Correlation*
MS7.1 Distinguish between pure substances and mixtures (mechanical mixtures and solutions) using the particle model of matter. [SI, CP]	
a. Examine a variety of objects and materials, and record qualitative (e.g., colour, texture, and state of matter) and quantitative (e.g., density, melting point, and freezing point) physical properties of those objects in a chart or data table.	Potash Solution Mining: Dissolving Potash Physical Separation of Minerals (M4S) Sizing and Separation of Mixtures (M4S)
b. Describe the characteristics of pure substances, mechanical mixtures, and solutions.	Potash Solution Mining: Dissolving Potash Potash Solution Mining: Recovering Dissolved Potash Potash Solution Mining: How Do We Know Its KCl? Physical Separation of Minerals (M4S)
c. Construct a graphic organizer for the classification of matter that includes mixtures, pure substances, elements, compounds, mechanical mixtures, and solutions.	
d. Classify common substances (e.g., Kool-Aid, vinegar, bubble bath, soft drinks, juice, chocolate chip cookies, salad dressings, hand lotion, shampoos, tea, bread, soil, and concrete) as pure substances, mechanical mixtures, or solutions.	
e. Listen to and consider the ideas of classmates when classifying materials as pure substances or mixtures.	
f. Create mechanical mixtures and solutions using common materials and compare the physical properties of the original materials and the resultant mixture or solution.	Potash Solution Mining: Dissolving Potash Potash Solution Mining: Recovering Dissolved Potash
g. State the four main ideas of the particle model of matter.	
h. Create models and/or physical representations that depict the nature of particles in pure substances, mechanical mixtures, and solutions according to the particle model of matter.	
i. Analyze the usefulness of personally constructed representations of particles and the strengths and limitations of models in science generally.	Potash Solution Mining Model
j. Generate questions related to differences between mixtures and solutions and rephrase in a testable form (e.g., rephrase a question such as “How sweet is iced tea?” to “What is the most iced tea that can be dissolved in 500 mL of water at 23°C?”).	
MS7.2 Investigate methods of separating the components of mechanical mixtures and solutions,	

and analyze the impact of industrial and agricultural applications of those methods. [SI, TPS]	
a. Describe methods used to separate the components of mechanical mixtures and solutions, including mechanical sorting, filtration, evaporation, distillation, magnetism, and chromatography.	Potash Solution Mining: Dissolving Potash Potash Solution Mining: Recovering Dissolved Potash Potash Solution Mining: How Do We Know Its KCl? Potash Solution Mining Model Physical Separation of Minerals (M4S) Sizing and Separation of Mixtures (M4S)
b. Trace the historical development of a technology or process used to separate mixtures (e.g., settling, sifting, filtering, fusion, distillation, and chromatography).	
c. Describe common household examples of technologies that are used to separate components of mechanical mixtures or solutions (e.g., kitchen strainer, oil and air filters).	
d. Design and conduct an experiment to determine the effectiveness and/or efficiency of one or more methods of separating mechanical mixtures and solutions.	Potash Solution Mining Model Physical Separation of Minerals (M4S) Sizing and Separation of Mixtures (M4S)
e. Report the strengths and limitations of a chosen experimental design to determine the effectiveness and/or efficiency of one or more methods of separating mechanical mixtures and solutions.	Physical Separation of Minerals (M4S) Sizing and Separation of Mixtures (M4S)
f. Use tools and apparatus (e.g., safety glasses, glassware, and Bunsen burners) safely when conducting investigations into methods of separating mixtures.	
g. Demonstrate knowledge of WHMIS standards by using proper techniques for handling and disposing of lab materials and following warning label symbols, including common household product symbols, when separating mixtures.	
h. Describe the scientific principles underlying a past or present industrial technology designed to separate mixtures (e.g., petroleum refining, sewage treatment plant, recycling station, combine, and cream separator).	Potash Solution Mining Model
i. Discuss intended and unintended consequences of a particular industrial or agricultural technology or process used for separating materials.	Potash Solution Mining: Recovering Dissolved Potash Physical Separation of Minerals (M4S)
j. Use a technological problem-solving process to design, construct, and evaluate a prototype of a process or device for separating a mechanical mixture or solution (e.g., purifying drinking water, separating household waste).	Potash Solution Mining Model Physical Separation of Minerals (M4S)
k. Identify new questions and problems that arise from what was learned about solutions and mixtures (e.g., “Are there mixtures that cannot be separated?”, “What techniques are used to remove pollutants from air and water?”), including questions that science cannot answer.	

Saskatchewan Learning Outcomes and Indicators	*Lesson and Activity Correlation*
MS7.3 Investigate the properties and applications of solutions, including solubility and concentration. [SI, DM]	
a. Provide examples of solid, liquid, and gaseous solutions and identify which substance is the solute and which is the solvent in each solution.	Potash Solution Mining: Dissolving Potash
b. Describe the characteristics of solutions using the terms solute, solvent, soluble, and insoluble, based on the particle model of matter.	
c. Create and describe the concentration of student-prepared dilute, concentrated, saturated, and supersaturated solutions using those qualitative terms and quantitative measurements (e.g., parts per million [ppm], g/L, and g/100 mL).	Potash Solution Mining: Dissolving Potash Potash Solution Mining: Recovering Dissolved Potash
d. Value accuracy, precision, and honesty when collecting and reporting data related to concentrations of solutions.	
e. Investigate the factors that determine how quickly a solute dissolves in a solvent.	Potash Solution Mining: Dissolving Potash
f. Gather and interpret information from various resources (e.g., nutrition labels on foods, newspaper or magazine articles) related to solutions and concentrations of solutions.	
g. Design and implement an experiment to investigate the effect of temperature on the solubility of a solution.	
h. Predict the solubility of a solute by interpolating or extrapolating from student-generated solubility curves.	
i. Analyze the effects of technological inventions or processes related to solutions (e.g., water softeners, water treatment plants, solution mining, agricultural sprays, insecticides, bleaches, and drain cleaners) on self, community, and the environment.	Potash Solution Mining: Recovering Dissolved Potash
j. Research how various science disciplines and engineering fields study and apply scientific knowledge related to solutions.	Potash Solution Mining: How Do We Know Its KCl? Ext'n Exploring for Minerals in Saskatchewan: Stream Sediment and Soil Sampling (M4S)

Grade 7 Science: Earth's Crust and Resources

Saskatchewan Learning Outcomes and Indicators	*Lesson and Activity Correlation*
EC7.2 Identify locations and processes used to extract Earth's geological resources and examine the impacts of those locations and processes on society and the environment.	
a. Identify questions to investigate arising from practical problems and issues related to the study of Earth's geological resources (e.g., "What types of rocks are best for cement-making or road construction?" and "What are some environmental concerns related to open-pit mining?").	
b. Distinguish between rocks and minerals using physical samples, pictures, and/or video recordings and identify the minerals most often found in rocks in Saskatchewan and around the world (e.g., quartz, calcite, feldspar, mica, hornblende).	Potash Solution Mining: Dissolving Potash
c. Classify rocks and minerals based on physical properties such as colour, hardness, cleavage, lustre, and streak.	Potash Solution Mining: Dissolving Potash
d. Identify locations of Saskatchewan's primary mineral resources (e.g., potash, gold, diamond, salt, uranium, copper, and graphite) and their primary uses.	Is There Potash Under My Feet? Mineral Potential and Mines in Saskatchewan (M4S) Rocks and Minerals in Your Life (M4S)
e. Relate processes used to extract primary mineral resources in Saskatchewan (e.g., open-pit mining, underground mining, and solution mining) to the location, type, and depth of the resource.	Potash Solution Mining: Dissolving Potash Potash Solution Mining: Recovering Dissolved Potash Is There Potash Under My Feet?
f. Provide examples of technologies used to further scientific research related to extracting geological resources (e.g., satellite imaging, magnetometer, and core sample drilling).	Exploring for Minerals in Saskatchewan: Geophysics – Using Magnetics to Find a Mine. (M4S) Exploring for Minerals in Saskatchewan: Stream Sediment and Soil Sampling. (M4S) Finders, Miners? (M4S)
g. Evaluate different approaches taken to answer questions, solve problems, and make decisions when searching for geological resources within Earth (e.g., trial-and-error prospecting versus core sampling).	Exploring for Minerals in Saskatchewan: Geophysics – Using Magnetics to Find a Mine. (M4S) Exploring for Minerals in Saskatchewan: Stream Sediment and Soil Sampling. (M4S) Finders, Miners? (M4S)
h. Provide examples of Canadian contributions to the scientific understanding and technological developments related to surface and sub-surface geology and mining, and identify societal and economic factors that drive such exploration and research.	Rocks and Minerals in Your Life (M4S)
i. Suggest solutions to economic and environmental issues related to the extraction of geological resources in Saskatchewan (e.g., managing mine tailings and pollutants; reclaiming open pit mining sites; ecological impact of pipelines; resource depletion; maintaining water quality; and increasing urbanization).	Potash Solution Mining: Recovering Dissolved Potash Finders, Miners? (M4S)
j. Identify uses for rocks and minerals, such as healing, recuperative powers, and ceremonies,	

which include ideas not explained by science.	
k. Research Saskatchewan careers directly and indirectly related to resource exploration.	Careers in the Minerals Industry (M4S) Investigating Careers in the Minerals Industry (M4S)

Grade 7 Social Studies: Resources and Wealth

Saskatchewan Learning Outcomes and Indicators	*Lesson and Activity Correlation*
RW7.2 Investigte the influence of resources upon economic conditions of peoples in circumpolar and Pacific Rim countries.	
b) Identify the locations of natural resources of circumpolar and Pacific Rim countries using appropriate maps, and analyse the impact of the resources on local communities.	Mineral Potential and Mines in Saskatchewan – Indirectly (M4S)

Grade 7 Career Education: Connections to Communities

Saskatchewan Learning Outcomes and Indicators	*Lesson and Activity Correlation*
CC7.1 Reflect on and express insights about how knowledge and skill learned in school transfer to one's future life and work.	
a) Research to identify the skills, knowledge and abilities needed in specific economic sectors such as manufacturing, agriculture, business or mining.	Careers in the Minerals Industry (M4S) Investigating Careers in the Minerals Industry (M4S)
f. Research and report on some key occupations available in the various economic sectors in Canada as represented by sector councils	Careers in the Minerals Industry (M4S) Investigating Careers in the Minerals Industry (M4S)

Grade 7 Career Education: Life and Work Plan

Saskatchewan Learning Outcomes and Indicators	*Lesson and Activity Correlation*
LW7.1 Investigate and demonstrate the personal qualities and abilities needed to seek, obtain or create work.	
c) Compare advantages and disadvantages of secondary and post-secondary programs for the attainment of career goals including university, college, apprenticeship, and entrepreneurship.	Careers in the Minerals Industry (M4S) Investigating Careers in the Minerals Industry (M4S)

Grade 9 Career Education: Connections to Community

Saskatchewan Learning Outcomes and Indicators	*Lesson and Activity Correlation*
CC9.1 Investigate and demonstrate the personal qualities and abilities needed to seek, obtain or create work.	
b) Demonstrate how education and training interests relate to various options regarding post-secondary programs, workplace training, and/or entry into the workforce	Careers in the Minerals Industry (M4S) Investigating Careers in the Minerals Industry (M4S)
CC9.2 Analyze and express one's own understanding of how societal and economic needs influence the nature of paid and unpaid work.	
a) Utilize career information resources such as occupation classification systems, labour market information, mass media, and Internet-based information delivery systems to analyze the realities and requirements of various work roles	Careers in the Minerals Industry (M4S) Investigating Careers in the Minerals Industry (M4S)

Chemistry 30: Solubility and Solutions

Saskatchewan Learning Outcomes and Indicators	*Lesson and Activity Correlation*
Understand the principles of qualitative analysis of solutions.	Potash Mining: How to Separate the KCl from the Ore
• Use solubility charts to determine the solubility of various substances.	Potash Mining: How to Separate the KCl from the Ore
• Describe how to perform tests on solutions to determine which ions or ion groups are present.	
• Describe how to separate ions in solution by selective precipitation.	Potash Mining: How to Separate the KCl from the Ore
• Describe how the common ion effect influences the solubility of a solute in a solution.	
• Investigate the application of the principles of solubility.	
Use numbers and numerical data to strengthen understanding of the concept of solubility.	Potash Mining: How to Separate the KCl from the Ore
• Read and interpret solubility charts and tables.	Potash Mining: How to Separate the KCl from the Ore
• Discuss with others the process of estimation.	
• Use the concepts of probability and logic to understand how qualitative analysis is done.	
Promote both intuitive, imaginative thought and the ability to evaluate ideas, processes, and experiences in meaningful contexts.	Potash Mining: How to Separate the KCl from the Ore
• Use metaphoric and analogic thinking to build	

understanding and create insights.	
• Generate and evaluate alternative solutions to problems.	Potash Mining: How to Separate the KCl from the Ore
• Analyze data to create hypotheses, predictions and estimates.	Potash Mining: How to Separate the KCl from the Ore
• Generate and explore rules underlying categories.	
• Propose generalizations which explain relationships.	
• Explore the concepts of probability and risk as it applies to levels of pollutants	
• Consider all evidence before drawing conclusions and developing generalizations.	
• Withhold judgement when the evidence and reasons are insufficient.	

PAA Energy and Resources 10, 20, 30

Saskatchewan Learning Outcomes and Indicators	*Lesson and Activity Correlation*
Module 1	Careers in the Minerals Industry (M4S) Investigating Careers in the Minerals Industry (M4S)
Module 3	Careers in the Minerals Industry (M4S) Investigating Careers in the Minerals Industry (M4S)
Module 4	Careers in the Minerals Industry (M4S) Investigating Careers in the Minerals Industry (M4S)
Module 5	Careers in the Minerals Industry (M4S) Investigating Careers in the Minerals Industry (M4S)
Module 11	Careers in the Minerals Industry (M4S) Investigating Careers in the Minerals Industry (M4S)
Module 12	Potash Mining: How to Separate the KCl from the Ore Mineral Potential and Mines in Saskatchewan (M4S)
Module 13	Physical Separation of Minerals (M4S)
Module 14	Careers in the Minerals Industry (M4S) Investigating Careers in the Minerals Industry (M4S)
Module 15	Rocks and Minerals in Your Life (M4S) Investigating Careers in the Minerals Industry (M4S)
Module 16	Potash Mining: How to Separate the KCl from the Ore Mineral Potential and Mines in Saskatchewan (M4S) Careers in the Minerals Industry (M4S) Investigating Careers in the Minerals Industry (M4S)
Module 18	Careers in the Minerals Industry (M4S) Investigating Careers in the Minerals Industry (M4S)
Module 22	Potash Mining: How to Separate the KCl from the Ore Mineral Potential and Mines in Saskatchewan (M4S)
Module 24	Physical Separation of Minerals (M4S)