



Saskatchewan Catholic Schools Curriculum Permeation

**REVEALING
CHRIST
IN ALL WE TEACH

SCIENCE 7**

2010

"Revealing Christ in All We Teach"

“Revealing Christ In All We Teach”

A Curriculum Permeation initiative of the Saskatchewan Catholic School Boards Association

Introduction:

“The Gospel spirit should be evident in a Christian way of thought and life which permeates all facets of the educational climate. Prime responsibility for creating this unique Christian school climate rests with the teachers, as individuals and as a community.” (The Religious Dimension of Education in a Catholic School, 1988 #25 -26.)

Teachers in Saskatchewan are mandated by the Ministry of Education to implement provincial curricula. Teachers in Saskatchewan Catholic Schools are further charged to utilize the “Revealing Christ in All We Teach” resources to permeate the Ministry curriculum with the Catholic world view.

Our Catholic schools seek to create a learning environment that reflects the identity and character of the Catholic Church. In each of our Catholic schools throughout Saskatchewan, we strive to become learning environments in which the uniqueness of our Catholic faith is expressed in all we do.

We believe that teaching in our Catholic schools is a ministry in which all are called to witness their faith. The teaching that occurs within our Catholic schools ought to reflect more than the content and outcomes/indicators of the provincial curricula. In addition to these core fundamentals, we are called to infuse our Catholic beliefs and values in all subject areas.

In an ever-increasing secular world in which religious beliefs are dismissed, we must take up the challenge to see that the teaching of our Catholic values and beliefs are not limited to Religion and Christian Ethics classes alone, but are taught across the entire curricula. Our Catholic faith must permeate all subject areas! This undertaking is critical to the distinctiveness of Catholic education in Saskatchewan.

As Catholic educators, how do we permeate our Catholic teachings across the curricula? How do we, for example, discuss our church’s teachings on respect for the environment in science classes? How do we promote social justice in our studies of the humanities? How do we critique literary works through the eyes of our faith? In biology, how do we promote the sanctity of all human life, indeed, all of creation?

At the direction of the Saskatchewan Catholic School Boards Association, the following resource has been produced to assist teachers in the permeation of our Catholic faith across the curricula. A number of dedicated Catholic teachers in Saskatchewan have contributed to this resource by developing and sharing a variety of activities, lessons, and units for this purpose.

Please note: Teachers are invited to submit feedback and/or suggestions for additional faith permeation ideas to their Religious Education coordinator/consultant.

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Gr. 7 Science - Faith Permeation Essential Connections

Unit Theme: Interactions within Ecosystems

The focus of this unit is **Life Science: Interactions within Ecosystems**. The use of this unit will help students achieve the following **Outcomes of the provincial Gr. 7 Science Curriculum: IE 7.1, IE 7.2, IE 7.3 and IE 7.4**.

NOTE: All highlighted/shaded areas indicate faith permeation.

Catholic Faith Focus for Learning:

God wants human beings to be intimately involved in caring for creation.

Catholic Faith Big Ideas:

Students will understand that ...

- all creation is a gift and a responsibility.
- God calls us to be stewards of creation.

Catholic Faith Essential Skills:

Students will understand that

- God intended interdependent relationships (ecosystems) to exist among all living things.
- God calls us to show responsible action in caring for these ecosystems

Catholic Faith Essential Questions:

What are some actions that I can take as a Catholic Christian to demonstrate my commitment to care for the environment?

Description of Culminating Task - Integrating Catholic Faith

- In written form, the student will state some actions that he/she can take as a Catholic Christian to demonstrate his/her commitment to care for the environment. *Appendix C*
- In visual form, the student will create an ecological web showing interactions/interdependence within a particular ecosystem, and a web showing the connections between the Catholic community and the Holy Trinity. CCC # 249-256 *Appendix D*

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Additional Resources:

- *Believe in Me* Year 7
- Catechism of the Catholic Church (CCC): #372 – St. Francis’ “Canticle of the Creatures”, CCC #296, #307, CCC #373 – Stewards of creation CCC #2415-#2418 –
- Bible (Genesis 2,3)

Unit Instruction Plan/Lesson Sequence

Introduction: Brainstorm possible definitions of ‘ecosystem’. What are interactions that humans have with God?

Faith Permeation

Remind students that Catholic faith encourages a balanced relationship with the environment. Use the story of Adam and Eve (Genesis 2, 3). God’s plan was that people should take care of the environment; nature would provide what people needed. Adam is instructed to till the soil and maintain what God has provided.

Topic 1: IE7.1

Outcome : Relate key aspects of Indigenous knowledge to their understanding of ecosystems.

Indicators

- Gather information about traditional Indigenous practices with respect to the relationships and connections between people and their ecological environment.
- Examine key aspects of Indigenous knowledge and First Nations and Métis people’s practices that contribute to understanding of ecosystems and the interactions of their components.
- Provide specific examples of Indigenous knowledge in understanding the components of their ecosystems.
- Describe the ways that traditional Indigenous knowledge about respect and responsibility for the land, self, and others has been transmitted over many years, including the oral tradition.

Topic 2: IE7.2

Outcome: Observe, illustrate, and analyze living organisms within local ecosystems as part of interconnected food webs, populations, and communities.

Faith Permeation

- Our faith tells us to be stewards of God’s creation – CCC #307 – To human beings God even gives the power of freely sharing in his providence by entrusting them with the responsibility of “subduing” the earth and having dominion over it. God thus enables (us) to be intelligent and free causes in order to complete the work of creation to perfect its harmony for (our) own good and that of (our) neighbours.

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- The story of Adam and Eve from Genesis 2, 3, reminds us to live a balanced relationship with the environment; it was God’s plan that people would take care of the environment, and in return nature would provide the things that people needed to live. Reference: Unit 4, Topic 2 Believe in Me – Year 7
- The food web reminds us of the important interactions we have with God through His creation: CCC #372, Canticle of the Creatures/Prayer of St. Francis.
- CCC #373 – God made man and woman to work together and complement each other; their interactions affect the interactions within nature.
- Genesis 2:20 – “And Adam gave names to all cattle and to the fowl of the air, and to every beast of the field...” This quote from scripture relates well to the importance of how creatures all have a name and purpose in their interactions within the ecosystem that God has created. This invitation to name God’s creatures helps shape creation; just as the producers/consumers/decomposers all have an important role to play in God’s creation.
- Genesis 2, 3 tells the great story of the creation of man and woman: woman was created equal to man in shaping and directing creation. Together, Adam and Eve brought new life to the world; as they built their relationship, they shared their life with God and the on-going creation of the world. Reference: CCC #296, #307

Indicators

- a. Illustrate the ecological organization of life within the biosphere, using specific examples of species, populations, communities, ecosystems, and biomes.
- b. Provide examples of ecosystems of varying sizes and locations, including their biotic and abiotic components.
- c. Conduct a field study to observe, record (using sketches, notes, tables, photographs, and/or video recordings), and identify biotic and abiotic components of a local ecosystem.
- d. Show respect for all forms of life when examining ecosystems.
- e. Examine the biotic and abiotic components of distant ecosystems using photographs, videos, or online resources.
- f. Choose and use appropriate instruments (e.g., magnifying glass, thermometer, light meter, hand-held microscope, and digital camera) safely, effectively, and accurately to observe and illustrate biotic and abiotic components of ecosystems.
- g. Compile and display ecological data to illustrate the various interactions that occur among biotic and abiotic components of ecosystems.
- h. Identify strengths and weaknesses of different methods of collecting and displaying ecological data (e.g., compare field observations of an ecosystem with observations from a video or television program, compare a food chain with a food web).
- i. Classify organisms in a variety of ecosystems as producers, consumers, or decomposers and further classify consumers as herbivores, carnivores, or omnivores.

- j. Interpret interdependence within natural systems by constructing food chains and food webs to illustrate the interactions among producers, consumers, and decomposers in a particular ecosystem.
- k. Construct a classification key, using appropriate scientific terminology, which will enable classmates to differentiate between producers, consumers, and decomposers.
- l. Provide examples of organizations in Canada that support scientific research related to ecosystems (e.g., environmental conservation groups, federal and provincial government departments, agricultural and marine institutes, universities, and colleges).

Topic 3: IE7.3

Outcome: Evaluate biogeochemical cycles (water, carbon, and nitrogen) as representations of energy flow and the cycling of matter through ecosystems.

Faith Permeation

- Plants need nutrients and soil to grow. An analogy for us as Catholic learners would be the use of scripture and prayer as essential nutrients for our growth in faith.
 - An interesting topic that might appeal to some of the students is the idea of people growing a 'Bible' garden; cultivating every flower, shrub, food crop or fruit mentioned in the scriptures. Web sites and books are available to aid the gardener in finding seeds and identifying the plants that are recognized in the Bible. People have the opportunity to visualize the species as it is used in the Scriptures.
- When discussing the food web, integrate some webs of Catholicism, e.g., illustrate the interactions between the human community (those living and the Communion of Saints) and the Holy Trinity; show how the flow of energy all originates with and through God.

TRINITY → creation → angels → human community

Sun → earth → plants → animals → humans

This can be done in a cyclical manner with illustrations and words.

- An ecological pyramid could be used to show the flow of energy from the Trinity, at the top of the pyramid, to humans, animals, and plants.

TRINITY

Humans, humans

Animals, animals, animals

Plants, plants, plants, plants, plants

Soil, soil, soil, soil, soil, soil, soil, soil, soil, soil

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Indicators

- a. Illustrate how energy is supplied to and flows through a food web using the concept of ecological pyramids (e.g., pyramid of energy, pyramid of numbers, and pyramid of biomass).
- b. Model the carbon, nitrogen, and water cycles to illustrate how matter cycles through ecosystems.
- c. Analyze the strengths and limitations of models in science generally, and then apply these criteria to evaluate the efficacy of a student model of a biogeochemical cycle.
- d. Explain the role of decomposers in recycling matter in an ecosystem.
- e. Describe examples of how scientists collect evidence, search for patterns and relationships in data, and propose explanations to further the development of scientific knowledge about energy and matter flow in ecosystems.
- f. Design and conduct an experiment to investigate the conditions essential for the growth of plants (e.g., determine whether nutrients in soil are sufficient to support plant growth, determine the influence of sunlight or other forms of light on plant growth).
- g. Consider observations and ideas from a variety of sources during investigations and before drawing conclusions related to biogeochemical cycles.
- h. Describe how energy passes through ecosystems during the processes of photosynthesis and cellular respiration.
- i. Identify and evaluate potential impacts on energy flow and the cycling of matter by the removal of one or more living organisms from a specific ecosystem.
- j. Provide examples of scientific knowledge that have resulted in the development of technologies designed to assist in managing aspects of ecosystems (e.g., understanding the effect of nitrogen, phosphorus, and potassium on plant growth led to the production of specific formulations of fertilizers, knowledge of how micro-organisms help break down matter led to the development of composting bins).

Topic 4: IE7.4

Outcome: Analyze how ecosystems change in response to natural and human influences, and propose actions to reduce the impact of human behaviour on a specific ecosystem.

Faith Permeation

- In CCC #373, God reminds us our sovereignty is not to be an arbitrary and destructive domination. God calls man and woman, made in the image of the Creator “who loves everything that exists,” to share in his providence toward other creatures; hence, their responsibility for the world God has entrusted to them.
- Humankind is warned that misusing nature to get power for ourselves will bring death to Creation, Proverbs 24: 30-34
- Psalm 8 is a beautiful reminder of the majesty of God’s creation. Use those words as a backdrop to discussions about the impact of our actions on the environment. (see Appendix C for Psalm 8)

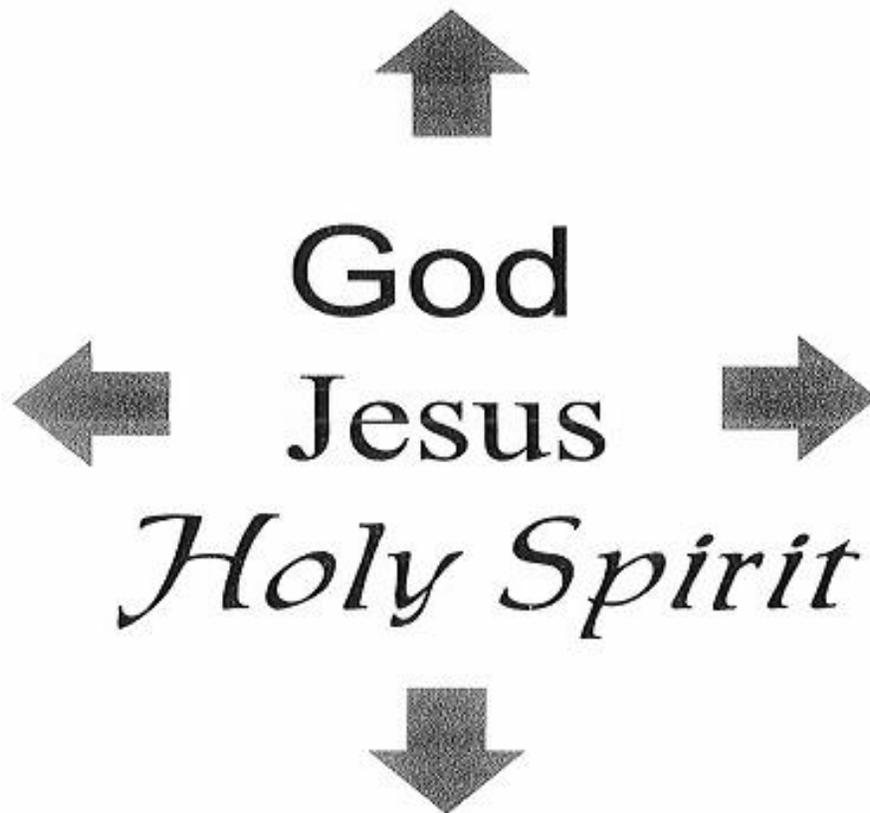
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- Keep the Catholic focus of stewardship in mind when you discuss actions/behaviours that students can take to improve the quality of living for creatures in the environment. Some examples of people who have taken on the responsibility of stewardship in regards to ecological issues are given in Unit 4, Topic 2 Believe in Me text for Grade 7: Sister Geraldine MacNamara, David Suzuki, David Grassby, Father Lou Quinn. (See Appendix D)
- Ask the students to brainstorm individual qualities a person of faith may have to possess to be an active part of solutions to ecological issues. (reference the information used in the 'Earth's Crust' unit, on Nettie Wiebe – advocate for responsible use of soil and the environment).

Indicators

- Identify evidence of ecological succession in ecosystems, using the concepts of pioneer species, climax community, primary succession, and secondary succession, and by identifying changes in plant and animal life in the ecosystem.
- Propose ecological questions to investigate arising from practical problems and issues (e.g., “What is the impact of clearing land for farming?”, “How could a community prolong the life of its landfill site?”, “How could a community reduce the amount of garbage it produces?”, “What is the impact of a sports field being constructed in a particular location?”).
- Predict what a specific ecosystem (e.g., clear-cut forest, abandoned sports field, abandoned farm yard, abandoned rail line, ditch, driveway, or sidewalk) will look like in the future (e.g., 5, 10, and 25 years) based on characteristics of the area and long-term changes observed in similar ecosystems.
- Identify and refine questions and problems related to the effects of natural or human influences on a particular ecosystem.
- Select and synthesize information from various sources to develop a response to specific questions related to natural or human influences on a particular ecosystem.
- Propose a course of action or defend a given position on a local ecological issue or problem related to natural or human influences on a particular ecosystem, taking into account scientific, societal, technological, and environmental factors.
- Be sensitive and responsible in maintaining a balance between human needs and a sustainable environment by considering both immediate and long-term effects of their course of action or stated position.
- Provide specific examples to illustrate that scientific and technological activities related to ecosystems take place in a variety of individual or group settings, locally and globally, and by men and women from a variety of cultural backgrounds (e.g., individual and community gardening, impact studies done by environmental engineers, and research done by teams of international scientists).

Appendix B



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Appendix C

Psalm 8

O LORD, our Sovereign,
how majestic is your name in all the earth!

You have set your glory above the heavens.
Out of the mouths of babes and infants
you have founded a bulwark because of your foes,
to silence the enemy and the avenger.

When I look at your heavens, the work of your fingers,
the moon and the stars that you have established;
what are human beings that you are mindful of them,
mortals that you care for them?

Yet you have made them a little lower than God,
and crowned them with glory and honour.
You have given them dominion over the works of your hands;
you have put all things under their feet,
all sheep and oxen,
and also the beasts of the field,
the birds of the air, and the fish of the sea,
whatever passes along the paths of the seas.

O LORD, our Sovereign,
how majestic is your name in all the earth!

Appendix D

The Action Cycle Reference: Global Environmental Outlook United Nations Environment Program

<u>Major environmental trends</u>		<u>Key action</u>		<u>Impact</u>
Unsustainable use of renewable resources	⇒		⇒	Improved human and ecosystem health and well-being.
Increasing greenhouse emission	⇒		⇒	
Increasing use of chemicals	⇒		⇒	
Escalating use of energy	⇒		⇒	
Unplanned urbanization	⇒		⇒	
Increasing waste generation	⇒		⇒	

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Teacher Catholic Faith Integrations Reflections <i>What have I learned about teaching this unit?</i>	
Subject: Gr. 7 Science	Unit: Ecosystems
<p>What permeation ideas worked well in this unit?</p> <p>How well did the permeation prompts engage the students?</p> <p>Describe how the faith permeation prompts helped your students to grow in understanding the Catholic faith.</p> <p>As a teacher, describe how the faith permeation prompts helped you to grow in understanding the Catholic faith.</p> <p>It would have been good to have...</p> <p>If I adapted / modified this unit I would...</p> <p>General Comment:</p>	

UNIT 1: Interactions within Ecosystems 1

Saskatchewan Science 7 (Pearson)	Suggested integration of faith permeation ideas
Invitation to Explore p.2	† Brainstorm possible definitions of ‘ecosystem’. What are interactions that humans have with God?
1.0 Ecosystems are made up of living and non-living things. p.6 1.1 A Virtual Field Trip p.8 1.2 What Do You Have in Common with Other Living Things? p.II 1.3 Check Your Progress p.15	† Remind students that Catholic faith encourages a balanced relationship with the environment. Use the story of Adam and Eve (Genesis 2, 3). God’s plan was that people should take care of the environment; nature would provide what people needed. Adam is instructed to till the soil and maintain what God has provided.
2.0 Ecosystems are interactions of biotic and abiotic components. p.16 2.1 Defining an Ecosystem p.16 2.2 Check Your Progress p.22 Careers and Profiles: Herman Michell: All Things Are Connected p.23	† (See Topic 2 above) Our faith tells us to be stewards of God’s creation – CCC #307 – To human beings God even gives the power of freely sharing in his providence by entrusting them with the responsibility of “subduing” the earth and having dominion over it. God thus enables (us) to be intelligent and free causes in order to complete the work of creation to perfect its harmony for (our) own good and that of (our) neighbours.
3.0 Ecosystems are made up of producers, consumers, and decomposers that interact to form food webs. p.4 3.1 The Components of Ecosystems 24 3.2 Producers p.26 3.3 Food Chains 31 3.4 Scavengers and Decomposers→A Special Group of Consumers p.34 Experiment on Your Own: Observing Decomposition p.37 3.5 Check Your Progress p.38	† (See Topic 2 above) Genesis 2:20 – “And Adam gave names to all cattle and to the fowl of the air, and to every beast of the field...” This quote from scripture relates well to the importance of how creatures all have a name and purpose in their interactions within the ecosystem that God has created. This invitation to name God’s creatures helps shape creation; just as the producers/consumers/decomposers all have an important role to play in God’s creation. † (See Culminating Task above) In visual form, the student will create an ecological web showing interactions/interdependence within a particular ecosystem, and a web showing the connections between the Catholic community and the Holy Trinity. CCC # 249-256 Appendix D
4.0 Matter and energy are necessary in all ecosystems. p.40 4.1 What Happens to Matter in Ecosystems? p.40 Careers and Profiles: Sheri	† (See Topic 2 above) The food web reminds us of the important interactions we have with God through His creation: CCC #372, Canticle of the Creatures/Prayer of St. Francis. † (See Topic 2 above) CCC #373 – God made man and

<p>Florizone: Stop Wasting Resources! p.47</p> <p>4.2 What Happens to Energy in Ecosystems? p.48</p> <p>4.3 Food Webs p.50</p> <p>4.4 Check Your Progress p.53</p> <p>Careers and Profiles: Deanna Trowsdale- Mutofov: Watching Out for Climate Change p.55</p>	<p>woman to work together and complement each other; their interactions affect the interactions within nature. Genesis 2, 3 tells the great story of the creation of man and woman: woman was created equal to man in shaping and directing creation. Together, Adam and Eve brought new life to the world; as they built their relationship, they shared their life with God and the on-going creation of the world. Reference: CCC #296, #307</p> <p>† (See Topic 3 above) When discussing the food web, integrate some webs of Catholicism, e.g., illustrate the interactions between the human community (those living and the Communion of Saints) and the Holy Trinity; show how the flow of energy all originates with and through God.</p> <p>† (See Topic 3 above) An ecological pyramid could be used to show the flow of energy from the Trinity, at the top of the pyramid, to humans, animals, and plants.</p>
<p>5.0 Natural changes can cause changes in ecosystems. p.56</p> <p>5.1 Natural Changes in Ecosystems p.57</p> <p>5.2 The Fight for Survival: Competition p.60</p> <p>Experiment on Your Own: Competition Between Three or More Species p.63</p> <p>5.3 Succession: How Ecosystems Change Over Time p.64</p> <p>5.4 Biomes: The Products of Succession p.67</p> <p>5.5 Check Your Progress p. 68</p>	<p>† (See Topic 3 above) Plants need nutrients and soil to grow. An analogy for us as Catholic learners would be the use of scripture and prayer as essential nutrients for our growth in faith.</p> <p>† An interesting topic that might appeal to some of the students is the idea of people growing a ‘Bible’ garden; cultivating every flower, shrub, food crop or fruit mentioned in the scriptures. Web sites and books are available to aid the gardener in finding seeds and identifying the plants that are recognized in the Bible. People have the opportunity to visualize the species as it is used in the Scriptures.</p>
<p>6.0 Human activities can change ecosystems. p.69</p> <p>6.1 The Impact of Technology p.70</p> <p>6.2 The Impact of Human Activities p.73</p> <p>6.3 Check Your Progress p.75</p> <p>Ask an Elder: Ivan Morin: Seasons of Change p.76</p>	<p>† (See topic 2 above) The story of Adam and Eve from Genesis 2, 3, reminds us to live a balanced relationship with the environment; it was God’s plan that people would take care of the environment, and in return nature would provide the things that people needed to live. Reference: Unit 4, Topic 2 Believe in Me – Year 7</p>

<p>7.0 Technologies have been developed to manage wastes that humans generate. p.77</p> <p>7.1 Human Generated Waste: Dealing with Our Garbage p.78</p> <p>7.2 Have We Learned from the Past? p.83</p> <p>7.3 Check Your Progress p.86 Science World: The Clear Cutting Debate p.87</p>	<p>† (See Topic 4 above) In CCC #373, God reminds us our sovereignty is not to be an arbitrary and destructive domination. God calls man and woman, made in the image of the Creator “who loves everything that exists,” to share in his providence toward other creatures; hence, their responsibility for the world God has entrusted to them.</p> <p>† Humankind is warned that misusing nature to get power for ourselves will bring death to Creation, Proverbs 24: 30-34</p> <p>† Psalm 8 is a beautiful reminder of the majesty of God’s creation. Use those words as a backdrop to discussions about the impact of our actions on the environment.</p> <p>† (see Appendix C for Psalm 8)</p> <p>† Keep the Catholic focus of stewardship in mind when you discuss actions/behaviours that students can take to improve the quality of living for creatures in the environment. Some examples of people who have taken on the responsibility of stewardship in regards to ecological issues are given in Unit 4, Topic 2 Believe in Me text for Grade 7: Sister Geraldine MacNamara, David Suzuki, David Grassby, Father Lou Quinn.</p> <p>† (See Appendix D)</p> <p>† Ask the students to brainstorm individual qualities a person of faith may have to possess to be an active part of solutions to ecological issues. (reference the information used in the ‘Earth’s Crust’ unit, on Nettie Wiebe – advocate for responsible use of soil and the environment).</p> <p>† (See Culminating Task above) In written form, the student will state some actions that he/she can take as a Catholic Christian to demonstrate his/her commitment to care for the environment. Appendix C</p>
<p>Project: Design a Land-Use Plan p.88</p> <p>Unit Summary p.91</p> <p>Unit Review p.93</p>	



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Gr. 7 Science - Faith Permeation Essential Connections

Unit Theme: Mixtures and Solutions

The focus of this unit is **Physical Science: Mixtures and Solutions**. The use of this unit will help students achieve the following Outcomes of the provincial Gr. 7 Science Curriculum: MS 7.1, MS 7.2 and MS 7.3.

NOTE: All highlighted/shaded areas indicate faith permeation.

Catholic Faith Focus for Learning:

We sometimes choose the good and we sometimes choose the bad. We are a mixture of sin and grace, good and evil.

Catholic Faith Big Ideas:

Students will understand that ...

- To lead a moral and ethical life, we cannot separate ourselves from God, Catholic Church teachings and the sacred words of Scripture.

Catholic Faith Essential Skills:

Students will explore ways they can strengthen (concentrate) their faith or weaken (dilute) their faith.

Catholic Faith Essential Questions:

- My personality is made up of a mixture of qualities. What qualities of a strong person of faith do I need to develop in myself?
- How do Catholic faith teachings, relationship with God, and scripture help me to be a strong person of faith?

Description of Culminating Task - Integrating Catholic Faith

The skills of observation, judgment and action are used in conducting an experiment, and are also the steps to follow in making a major decision in a Catholic faith-based life. The students will use the chart in *Appendix A* to outline a specific experiment covered in the unit and compare the process to a specific decision they've had to make in their life.

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Unit Instruction Plan/Lesson Sequence

Topic 1: MS7.1

Outcome: Distinguish between pure substances and mixtures (mechanical mixtures and solutions) using the particle model of matter.

Indicators

- 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.
- b. Describe the characteristics of pure substances, mechanical mixtures, and solutions.
- 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.
- 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.
- 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?”).

Topic 2: MS7.2

Outcome: Investigate methods of separating the components of mechanical mixtures and solutions, and analyze the impact of industrial and agricultural applications of those methods.

Faith Permeation

A piece of information from the scriptures that students may be interested in: a mixture that was used in early Biblical times was myrrh and aloes (used with strips of linen to wrap Jesus' body for his burial). "Your shoots are an orchard of pomegranates With choice fruits, henna with nard

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plants, Nard and saffron, calamus and cinnamon, With all the trees of frankincense, Myrrh and aloes, along with all the finest spices” (Canticles, 4:13-14).

Indicators

- a. Describe methods used to separate the components of mechanical mixtures and solutions, including mechanical sorting, filtration, evaporation, distillation, magnetism, and chromatography.
- 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.
- 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.
- 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).
- i. Discuss intended and unintended consequences of a particular industrial or agricultural technology or process used for separating materials.
- 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).
- 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.

Topic 3: MS7.3

Outcome: Investigate the properties and applications of solutions, including solubility and concentration.

Faith Permeation

- An analogy to the qualitative terms of diluted and concentrated could be an activity where you ask the students to draw a cup on a piece of paper. The cup symbolizes their faith (ensure that you have given a guideline – prayer, going to church, service to others, stewardship of our earth, following the commandments...). Ask the students to draw a line at the point where they think their faith is right now. (This could be more teacher-led and teacher-prepared using Smart Board technology. Prepare examples of choices in students' lives that may 'dilute' their faith, and choices that may 'concentrate' their faith.)

Indicators

- a. Provide examples of solid, liquid, and gaseous solutions and identify which substance is the solute and which is the solvent in each solution.
- 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).
- 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.
- 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.
- j. Research how various science disciplines and engineering fields study and apply scientific knowledge related to solutions.

Appendix A

Comparison writing:

Experiment with mixtures and solutions

Title –

Observation - (being attentive to the process and activities during the experiment)

Judgment - (conclusion)

Action - (how I will use this knowledge)

Decision making

Description of the decision –

Observation - (what specific information am I getting that is influencing my thinking?)

Judgment - (am I satisfied with the decision that I made? Does it conform to my value and belief system?)

Action - (how does this decision affect my relationships with my friends, parents and God?)

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Teacher Catholic Faith Integrations Reflections <i>What have I learned about teaching this unit?</i>	
Subject: Gr. 7 Science	Unit: Mixtures and solutions
<p>What permeation ideas worked well in this unit?</p> <p>How well did the permeation prompts engage the students?</p> <p>Describe how the faith permeation prompts helped your students to grow in understanding the Catholic faith.</p> <p>As a teacher, describe how the faith permeation prompts helped you to grow in understanding the Catholic faith.</p> <p>It would have been good to have...</p> <p>If I adapted / modified this unit I would...</p> <p>General Comment:</p> <p>If you are recommending changes to this resource, please provide a copy to your Religious Education Coordinator/Consultant.</p>	

UNIT 2: Mixtures and Solutions

Saskatchewan Science 7 (Pearson)	Suggested integration of faith permeation ideas
Invitation to Explore p.98 1.0 The amount of matter is measured in two ways: volume and mass. p.101 1.1 The Characteristics of Substances and Mixtures When Added to Liquids p.101 1.2 Measuring Volume p.105 1.3 Measuring Mass p.107 1.4 Check Your Progress p.109	
2.0 Mixtures can be classified into two types: mechanical mixtures and solutions. p.110 2.1 What is Matter? p.110 Ask an Elder: Yvonne Chamakese: Tanning Hides p.115 2.2 Getting the Right Mix p.116 2.3 Solutions p.118 2.4 Check Your Progress p.120 Try This at Home: Making Rock Candy p.121 Careers and Profiles: Doug and Cheryl Spicer: "Natural Living Products" p.122	† (See Topic 2 above) A piece of information from the scriptures that students may be interested in: a mixture that was used in early Biblical times was myrrh and aloes (used with strips of linen to wrap Jesus' body for his burial).
3.0 Components of mechanical mixtures and solutions can be separated. p.123 3.1 Separating Mechanical Mixtures p.123 3.2 Separating Solutions p.126 3.3 Check Your Progress p.129	† (See Culminating Task above) We cannot separate our relationship with God from our relationships with one another. Describe how this is similar to a solution in the scientific world, where you cannot separate the ingredients.
4.1 What's in Matter? p.130 4.2 The Particle Theory of Matter p.131 4.3 Using the Particle Theory of Matter p.133 4.4 Dissolving 135 Experiment on Your Own: The Disappearing Sugar Cube Race p.137	† (See Culminating Task above) Comparison chart: the skills of observation, judgment and action are used in conducting an experiment, and are also the steps to follow in making a major decision in a Catholic faith-based life. Possible activity: construct a chart outlining a specific experiment covered in the unit compared to a specific decision you've had to make in your life. (see Appendix A)

<p>4.5 Check Your Progress p.139</p> <p>4.0 Scientists understand that all matter is made up of tiny particles. p.130</p> <p>5.0 Solutions vary and can be described . in a variety of ways. p.140</p> <p>5.1 Types of Solutions p.140 Try This at Home: Concentrate! p.142</p> <p>5.2 Unsaturated and Saturated Solutions p.142</p> <p>5.3 Solubility p.144</p> <p>5.4 Solubility and Water Hardness p.149</p> <p>5.5 Check Your Progress Careers and Profiles: Nancy Case: A Mechanical Engineer with a Solution p.153</p>	<p>† (See Topic 3 above) An analogy to the qualitative terms of diluted and concentrated could be an activity where you ask the students to draw a cup on a piece of paper. The cup symbolizes their faith (ensure that you have given a guideline – prayer, going to church, service to others, stewardship of our earth, following the commandments....). Ask the students to draw a line at the point where they think their faith is right now. (This could be more teacher-led and teacher-prepared using Smart Board technology. Prepare examples of choices in students' lives that may 'dilute' their faith, and choices that may 'concentrate' their faith.)</p> <p>- use this as a prompt, rather than an in-depth activity</p>
<p>6.0 Mixtures of raw materials can be processed to make useful things. p.154</p> <p>6.1 Products Manufactured from Mixtures p.154</p> <p>6.2 Cleaning Our World p.157</p> <p>6.3 Waste and the Environment p.161</p> <p>6.4 Check Your Progress p.165 Science World: Sewage Treatment: A Mix of Solutions p.166</p>	<p>† (See Topic 2 above) Discuss the significance of proper stewardship of certain mixtures and solutions (pesticides, toxic cleaning solutions, sprays). What effect does using and disposing of those products have on the environment and the intricate interactions within the life system that God has created?</p>
<p>Project: What's Really in There? P.168</p> <p>Unit Summary p.171</p> <p>Unit Review p.173</p>	



Saskatchewan Catholic Schools Curriculum Permeation

Gr. 7 Science - Faith Permeation Essential Connections

Unit Theme: Heat and Temperature

The focus of this unit is **Physical Science: Heat and Temperature**. The use of this unit will help students achieve the following **Outcomes of the provincial Gr. 7 Science Curriculum: HT 7.1, HT 7.2 and HT 7.3**.

NOTE: All highlighted/shaded areas indicate faith permeation.

Catholic Faith Focus for Learning:

The power of God works in both dramatic and hidden ways

Catholic Faith Big Ideas:

Students will understand that ...

- it is the fruits of our actions that is the greatest sign of the effects of God in our life.

Catholic Faith Essential Skills:

Believing in things that we cannot see is a very important premise of our Catholic faith. We understand the Holy Trinity through scripture and faith; even though we cannot see the Father, Son and Holy Spirit, we often see the effects in our lives and in the creation.

Catholic Faith Essential Questions:

- Can I see the effects of God's presence in my life?
- Even though I cannot see do I believe that God is working in my life?

Description of Culminating Task - Integrating Catholic Faith

Students will write a poem or story about how they have experienced God's spirit in their life- e.g. nature, relationships, forgiveness, death ...

Or students will describe how they have affected others by bringing the warmth of God's spirit to them.

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Unit Instruction Plan/Lesson Sequence

Introduction: Brainstorm sources of heat available to humans.

Topic 1: HT7.1

Outcome: Assess the impact of past and current heating and cooling technologies related to food, clothing, and shelter on self, society, and the environment.

Faith Permeation

- As stewards of the earth (CCC #307), remind the students that sometimes technology has a detrimental effect on the environment: the use of air-conditioning in vehicles and the coolant used in refrigerators, can lead to the depletion of the ozone layer in our atmosphere.
- Heat can be generated by the burning of wood. As stewards of the earth (CCC #307), do we respect the amount of wood we use for recreational purposes?

Indicators

- a. Illustrate the historical development and the underlying scientific principles of technologies designed to address practical problems regarding human heating and cooling needs for food, shelter, and clothing (e.g., oven mitts, survival suits, air conditioning, central heating, thermos, refrigerators, stoves, heaters, home insulation, fleece jackets, and toques).
- b. Communicate questions, ideas, intentions, plans, and results of inquiries related to heat transmission using lists, notes in point form, sentences, data tables, graphs, drawings, oral language, and other means.
- c. Analyze the impact of the design and function of a heating- or cooling-related technology on self and society.
- d. Compare, in qualitative terms, the heat capacities of some common materials, including water, and explain how heat capacity influences choices of materials used in the development of technologies related to clothing, food, and shelter.
- e. Evaluate the efficiency of different types of home insulation (e.g., sod, straw bales, fibreglass, cellulose, mineral wool, polystyrene, and polyurethane foam) with respect to criteria such as R-value, cost, and resistance to water and air infiltration.
- f. Use a technological problem-solving process to design, construct, and evaluate a prototype of a device that will provide a solution to a practical problem related to heating or cooling (e.g., cooking food, keeping food warm or cool for an extended period, keeping a shelter warm or cool, keeping a person warm or cool).
- g. Assess the design of a personally constructed heating or cooling prototype using collaboratively developed criteria.

- h. Provide examples of problems related to heating and cooling that arise at home, in an industrial setting, or in the environment, that cannot be solved using scientific and technological knowledge.
- i. Create a photo journal of science- and technology-based careers in the community related to heating and cooling, such as heating systems and equipment contractors, and boiler engineers.

(A point of interest: Modern methods of agriculture control the atmosphere to preserve grain that is stored. At one time, grain was stored in underground pits; promoting low oxygen levels which killed pests. This practice was thought to have been put into place during the seven years of famine that followed the seven years of plentiful harvest in Egypt. This ancient management system of heat and atmosphere control has been the basis of some current agricultural management systems.)

Topic 2: HT7.2

Outcome: Explain how understanding differences between states of matter and the effect of heat on changes in state provide evidence for the particle theory.

Faith Permeation

- Believing in things that we cannot see is a very important premise of our Catholic faith. Remind students that this is a parallel to many scientific beliefs: heat causes changes in matter, and even though we often cannot see the process happen (evaporation, condensation, sublimation), we see the effects.
- We understand the Holy Trinity through scripture and faith; even though we cannot see the Father, Son and Holy Spirit, we often see the effects in our lives and in the creation that surrounds us

Indicators

- a. Provide examples from daily life that illustrate the effects of heating and cooling on solids, liquids, and gases.
- b. Conduct experiments to determine the effects of changes in temperature on solids, liquids, and gases.
- c. Construct and label a heating curve for water, using student-collected data, indicating states of matter and changes of state.
- d. Create a visual or dramatic representation to explain changes of state of matter (e.g., melting, freezing, evaporation, condensation, and sublimation) according to the particle model of matter.
- e. Choose appropriate instruments (e.g. alcohol thermometer, temperature probe, and thermocouple) and use them safely, effectively, and accurately for collecting temperature data when investigating states of matter and changes of state.
- f. Trace the historical development of different scales (e.g., Kelvin, Celsius, Fahrenheit, and Rankine) and instruments used to measure temperature (e.g., liquid-in-glass

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thermometers, bi-metallic strips, digital thermometers, liquid crystal thermometers, thermocouples, and computer sensors) and discuss the need for standardized measurements of temperature.

- g. Distinguish between heat and temperature using the concept of kinetic energy and the particle model of matter.
- h. Explain how evidence gathered while investigating states of matter and changes in states of matter supports or refutes the particle theory of matter.

Topic 3: HT7.3

Outcome: Investigate principles and applications of heat transfer via the processes of conduction, convection, and radiation.

Faith Permeation

- Radiant heat is caused by the sun's rays and is light energy for the earth. We often refer to Jesus as the Light of the World. In what ways does Jesus' compassion and forgiveness warm our hearts? How are we called to bring the heart of Christ to others?

Indicators

- a. Demonstrate and explain how heat is transferred by the processes of conduction, convection, and radiation in solids, liquids, and gases.
- b. Construct a visual or dramatic representation of heat transfer via conduction in a solid.
- c. Model convection currents in fluids (liquid or gas) and discuss the effectiveness of the model.
- d. Assess the impacts on self, society, and the environment, of conduction, convection, and radiation in the natural and constructed world (e.g., heating over cities, temperature layers in lakes, thunderstorms, radiant heaters, refrigerators, and convection currents in air or water).
- e. Evaluate applications of technologies designed to enhance or restrict the transfer of heat energy via conduction, convection, or radiation (e.g., metal frying pans, radiant heaters, home insulation, ovens, convection ovens, thermoses, winter parkas, and heat exchangers) using student-developed criteria.
- f. Design and carry out an experiment to determine differences in the ability of various surfaces to absorb and reflect radiant heat.
- g. Select appropriate methods and tools for collecting and displaying data and information related to radiant heat.
- h. Demonstrate safe and responsible work practices, including keeping the work area uncluttered with only appropriate materials present when investigating heat transfer via conduction, convection, and radiation.

Teacher Catholic Faith Integrations Reflections <i>What have I learned about teaching this unit?</i>	
Subject: Gr. 7 Science	Unit: Heat and Temperature
<p>What permeation ideas worked well in this unit?</p> <p>How well did the permeation prompts engage the students?</p> <p>Describe how the faith permeation prompts helped your students to grow in understanding the Catholic faith.</p> <p>As a teacher, describe how the faith permeation prompts helped you to grow in understanding the Catholic faith.</p> <p>It would have been good to have...</p> <p>If I adapted / modified this unit I would...</p> <p>General Comment:</p> <p>If you are recommending changes to this resource, please provide a copy to your Religious Education Coordinator/Consultant.</p>	

Unit 3: Heat and Temperature

Saskatchewan Science 7 (Pearson)	Suggested integration of faith permeation ideas
Invitation to Explore p.176 1.0 Heat can cause matter to change. p.180 1.1 States of Matter p.180 1.2 Heat Can Affect the Volume of Liquids and Gases p.183 1.3 Heat Can Affect the Volume of Solids p.186 1.4 Check Your Progress p.190	† (See Topic 2 above) Believing in things that we cannot see is a very important premise of our Catholic faith. Remind students that this is a parallel to many scientific beliefs: heat causes changes in matter, and even though we often cannot see the process happen (evaporation, condensation, sublimation), we see the effects. † We understand the Holy Trinity through scripture and faith; even though we cannot see the Father, Son and Holy Spirit, we often see the effects in our lives and in the creation that surrounds us † Discuss with the students: Why is fire an appropriate symbol for the Holy Spirit? (Acts 2:1-3)
2.0 The Particle Theory can be used to explain volume and state changes in matter. p.191 2.1 Main Ideas of the Particle Theory of Matter p.191 2.2 The Particle Theory Explains Volume and State Changes p.194 2.3 Check Your Progress p.196 Experiment on Your Own: That Cup of Hot Chocolate! p.197	
3.0 The amount of heat energy in on object depends on its temperature, mass, and composition. p.198 3.1 Studying Heat and Temperature p.198 3.2 Investigating Heat Energy and Different Masses p.201 3.3 Holding on to Heat Energy p.203 3.4 Check Your Progress p.205 Careers and Profiles: Dave Fetsch: Making Homes More Energy Efficient p.206	† (See Topic 3 above) Our faith teaches us that God is the architect of our world. We should be able to articulate how we have taken the gift of radiant heat and used modern technology to accommodate our needs and wants.
4.0 Heat energy is transferred in different ways. p.207 4.1 Heat Energy Can Move by Conduction p.208	† Remind students that radiant heat comes from the sun, which is a creation of God. The flow of energy from the sun results in the creation of heat, which is necessary for human sustainability, as well as the

<p>Experiment on Your Own: Design Challenge: Insulate It! p.211</p> <p>4.2 Heat Energy Can Move by Convection p.212</p> <p>4.3 Heat Energy Can Move by Radiation p.215</p> <p>4.4 Heat Transfer and Earth p.218</p> <p>4.5 Check Your Progress p.222 Careers and Profiles: Wayne Emerson: Helping to Produce Power p.223</p>	<p>growing of crops and plants.</p> <p>† (See Topic 3 above) Radiant heat is caused by the sun's rays and is light energy for the earth. We often refer to Jesus as the Light of the World. In what ways does Jesus' compassion and forgiveness warm our hearts? How are we called to bring the heart of Christ to others?</p>
<p>5.0 Traditional knowledge and practices have been used to produce clothing and shelter. p.224</p> <p>5.1 Protection from the Weather p.224</p> <p>5.2 Check Your Progress p.230 Ask an Elder: Alma Kytwayhat: The Buffalo Our Food, Our Ceremony, and Our Shelter p.231</p>	<p>† (A point of interest: Modern methods of agriculture control the atmosphere to preserve grain that is stored. At one time, grain was stored in underground pits; promoting low oxygen levels which killed pests. This practice was thought to have been put into place during the seven years of famine that followed the seven years of plentiful harvest in Egypt. This ancient management system of heat and atmosphere control has been the basis of some current agricultural management systems.)</p>
<p>6.0 Technologies that use heat energy have benefits and costs to society and the environment. p.232</p> <p>6.1 Heating-System Technologies p.232 Careers and Profiles: Michelle Zimmer: A Passion for Food p.237</p> <p>6.2 The Costs of Relying on Heat Energy p.238</p> <p>6.3 Check Your Progress p.241 Science World: The Great Heat Treasure Hunt p.242</p>	<p>† (See Topic 1 above) As stewards of the earth (CCC #307), remind the students that sometimes technology has a detrimental effect on the environment: the use of air-conditioning in vehicles and the coolant used in refrigerators, can lead to the depletion of the ozone layer in our atmosphere.</p> <p>† Heat can be generated by the burning of wood. As stewards of the earth (CCC #307), do we respect the amount of wood we use for recreational purposes?</p>
<p>Project: Design an Energy-Efficient Building p.245</p> <p>Unit Summary p.248</p> <p>Unit Review p.250</p>	<p>† (See Culminating Task above) Write a poem or short story about how you experienced God through nature, a loving relationship, forgiveness, death etc.</p>



Saskatchewan Catholic Schools Curriculum Permeation

Gr. 7 Science - Faith Permeation Essential Connections

Unit Theme: Earth's Crust

The focus of this unit is Earth and Space Science: Earth's Crust and Resources. The use of this unit will help students achieve the following Outcomes of the provincial Gr. 7 Science Curriculum: EC 7.1, EC 7.2 and EC 7.3.

NOTE: All highlighted/shaded areas indicate faith permeation.

Catholic Faith Focus for Learning:

We Believe in God...the creator of heaven and earth (Apostles' Creed)

Catholic Faith Big Ideas:

Students will understand that ...

- God creates from nothing.
- God creates for people and with people.
- All creation is good.

Catholic Faith Essential Skills:

Students will understand that

- God is the source of all creation.
- God continues to create through us.

Catholic Faith Essential Questions:

- Do I believe that I am God's creation?
- Am I a faithful steward of God's creation i.e. myself, others, all living things, and Earth?

Description of Culminating Task - Integrating Catholic Faith

Individually, the student will:

- Create a visual representation of the creation story, using a variety of media.

If discussion arises in regards to the theory of evolution and the Catholic teaching on creation, see appendix A for clarification.

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Additional Resources:

- Believe in Me Year 7
- Bible (Genesis 1,6,7)
- Catechism of the Catholic Church (CCC) #159, #293, #294, #296, #307

Unit Instruction Plan/Lesson Sequence

Introduction: Brainstorm their knowledge base (KWL) about plate tectonics and the Genesis story of creation.

Faith Permeation**Topic Background for Teachers:**

- Faith and science: CCC#159 – “Though faith is above reason, there can never be any real discrepancy between faith and reason. Since the same God who reveals mysteries and infuses faith has bestowed the light of reason on the human mind, God cannot deny himself, nor can truth ever contradict truth.” Consequently, methodical research in all branches of knowledge, provided it is carried out in a truly scientific manner and does not override moral laws, can never conflict with the faith because the things of the world and the things of faith derive from the same God. (Unit 4, Topic 2 Believe in Me – Gr. 7)
- Such is the nature of scientific progress. Scientific models come and go, “but the word of the Lord endures forever.” 1 Peter 1:25.
- See Appendix A

Goal for Students

Students will understand that the Catholic Church’s understanding is a balance of both faith and science. The Catholic Church does not uphold only the story of Creation at the exclusion of the theory of evolution. Rather, the Church does accept the role of evolution as long as it respects the place of God as the ultimate creator.

Topic 1: EC7.1

Outcome: Analyze societal and environmental impacts of historical and current catastrophic geological events, and scientific understanding of movements and forces within Earth’s crust.

Faith Permeation

Explain to the students that both Scripture and science contribute their respective truths to help us form a complete, integrated picture. Everything originates from God. God is the ultimate cause of creation and is always present in the creative process because creation is a continuous process.

Some references from the Catechism of the Catholic Church include:

- CCC #293, 294: Why was the world created? It was created for the glory of God who wished to show forth and communicate his goodness, truth and beauty.

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- CCC #295- #301 How did God create the universe? God created the universe freely with wisdom and love...God created “out of nothing” a world which is ordered and good.

Earthquakes, volcanic eruptions and mountain building remind us of the constant changes that continue to occur within the realm of God’s creation. Life and land are never stagnant.

Indicators

- Trace the development of plate tectonics theory as an explanation for movement of Earth’s lithosphere in light of new geological evidence, including knowledge of tectonic plates and movement at plate boundaries.
- Provide examples of past theories and ideas, including cultural mythology, that explain geological phenomena such as volcanic activity, earthquakes, and mountain building.
- Construct a visual representation of the composition of Earth, including the crust, upper and lower mantle, core, and inner core.
- Create models or simulations of the processes of mountain formation and the folding and faulting of Earth’s surface, including movements at diverging, converging, and transform plate boundaries.
- Describe societal and environmental impacts of some catastrophic geological events, including earthquakes, tsunamis, and volcanic eruptions, which have occurred on or near Earth’s surface and predict the impacts of future events.
- Work cooperatively with group members to research catastrophic geological events and integrate individual findings into a chronological model or time scale of major events in Earth’s geological history.
- Organize data on the geographical and chronological distribution of earthquakes, tsunamis, and volcanic eruptions to determine patterns and trends in data and relationships among variables.
- Explain the operation of tools scientists use to measure and describe the effects of catastrophic geological events, including earthquakes and volcanoes (e.g., seismograph, Mercalli intensity scale, and Richter magnitude scale).
- Provide examples of how science and technology affect self and community through understanding, predicting, and minimizing the effects of catastrophic geological events (e.g., earthquake resistant construction, earthquake and tsunami preparedness, and minimizing climatic effects of volcanic eruptions).

Topic 2: EC7.2

Outcome: 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.

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Faith Permeation

The Bible mentions the importance of rocks and minerals in many different places. Students should be reminded of their Catholic belief in stewardship of God's creation; responsible use of God's gifts, including those from the Earth.

- Deuteronomy 8: "The Lord led you out of the desert...for the Lord your God is bringing you into a good land-a land with streams and pools of water...a land where the rocks are iron and you can dig copper out of the hills."
- Job 28: "There is a mine for silver and a place where gold is refined, iron is taken from the earth, and copper is smelted from ore...the earth, from which food comes, is transformed below as by fire; sapphires come from its rocks, and its dust contains nuggets of gold...He tunnels through the rock; His eyes see all its treasures."

Our search for wisdom in the words of scripture is similar to humankind's search for valuable resources from the land. God reminds us to use the earth's gifts prudently because the ecological impact of erosion and mining are long-lasting.

Discuss people who are strong examples of stewardship; list qualities they possess that make them feel love and responsibility for careful consumption of God's gifts (e.g., Father Lou Quinn of the Scarborough Foreign Mission Society, is a missionary in the Dominican Republic. He helps replant trees/forests to end soil erosion. Unit 4, Topic 1 Believe In Me – Year 7).
See Appendix B

An excellent resource for suggesting a Catholic perspective to ecological complications from science and technology is the Development and Peace website: www.devp.org/devpme/main-eng.html This site illustrates how humans can work to correct some of the problems that they create; the importance of being a steward of creation.

Indicators

- 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).
- c) Classify rocks and minerals based on physical properties such as colour, hardness, cleavage, lustre, and streak.
- d) Identify locations of Saskatchewan's primary mineral resources (e.g., potash, gold, diamond, salt, uranium, copper, and graphite) and their primary uses.
- 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.

- f) Provide examples of technologies used to further scientific research related to extracting geological resources (e.g., satellite imaging, magnetometer, and core sample drilling).
- 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).
- 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. **See Faith Permeation goal in Topic 2 above, reference to Development and Peace.**
- 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).
- 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.

Topic 3: EC7.3

Outcome: Investigate the characteristics and formation of the surface geology of Saskatchewan, including soil, and identify correlations between surface geology and past, present, and possible future land uses.

Faith Permeation

Our Catholic faith teaches us to be stewards of God's creation. Purposeful neglect of the needs of the soil (which supplies so many resources for humankind) is irresponsible.

- Job 14: 18-19 "But as a mountain erodes and crumbles and as a rock is moved from its place, as water wears away stones and torrents wash away the soil, so you destroy man's hope" This analogy ties in very well with the concept of weathering and erosion mentioned in this lesson. It reminds us that we, as Catholics, need to protect our faith from the erosion and weathering of temptation and sin through prayer and God's Word.

Several words from scripture refer to the depth and quality of soil in analogy with following God's Word:

- Matthew 13:23 – "What was sown on the good ground, this is he who hears the word, and understands it, who most certainly bears fruit, and brings forth, some one hundred times as much, some sixty, some thirty."
- Luke 6:49 – "But he who has heard and not practiced is like a man, who has built a house upon the soft soil without a foundation, against which the torrent bursts, and immediately it collapses, and terrible is the wreck and ruin of that house."

It is very important that students have strong role-models who demonstrate this stewardship of God's creation. A role-model in Saskatchewan is Nettie Wiebe, leader and activist in social

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justice and agriculture. She teaches about strong commitment to the environment and soil conservation, and lives the ideals that she teaches. For more information on Mrs. Wiebe, please see her official website: <http://nettiewiebe.ca/>

Indicators

- a. Model the processes of formation of the three major types of rocks: sedimentary, igneous, and metamorphic.
- b. Explain how geologists use the fossil record to provide evidence of geological history.
- c. Construct a visual representation of the rock cycle (e.g., formation, weathering, sedimentation, and reformation) and relate this representation to the surface geology of Saskatchewan and Canada.
- d. Develop and use a classification key for rocks based on physical characteristics and method of formation.
- e. Describe examples of mechanical and chemical weathering of rocks.
- f. Differentiate between weathering and erosion, and explain the role of water in each process.
- g. Document the natural surface geological features of the local environment and provide explanations for the origin of those features.
- h. Relate mechanical (e.g., wind and water), chemical (e.g., acid rain and rusting), and biological (e.g., lichens, mosses, and tree roots) weathering processes to the formation of soils.
- i. Collect, with permission, and examine samples of local soils to determine their physical properties (e.g., colour, odour, texture, presence of organic matter, pore size, and air and water holding capacity).
- j. Classify soil samples according to their characteristics (e.g., sand, loam, and clay composition) and research ways to enrich soils for specific uses (e.g., vegetable garden, road building, dam construction, waste management, and sports field).
- k. Identify predominant soil types (e.g., black, dark brown, brown, and grey) and corresponding land uses in Saskatchewan.
- l. Assess environmental and economic impacts of past and current land use practices in Saskatchewan (e.g., agriculture, urban development, recreation, and road construction), and describe intended and unintended consequences of those practices on self, society, and the environment, including soil degradation

Appendix A Adam, Eve and Evolution

The controversy surrounding evolution touches on our most central beliefs about ourselves and the world. Evolutionary theories have been used to answer questions about the origins of the universe, life, and man. These may be referred to as cosmological evolution, biological evolution, and human evolution. One's opinion concerning one of these areas does not dictate what one believes concerning others.

People usually take three basic positions on the origins of the cosmos, life, and man: (1) *special or instantaneous creation*, (2) *developmental creation or theistic evolution*, (3) and *atheistic evolution*. The first holds that a given thing did not develop, but was instantaneously and directly created by God. The second position holds that a given thing did develop from a previous state or form, but that this process was under God's guidance. The third position claims that a thing developed due to random forces *alone*.

Related to the question of *how* the universe, life, and man arose is the question of *when* they arose. Those who attribute the origin of all three to special creation often hold that they arose at about the same time, perhaps six thousand to ten thousand years ago. Those who attribute all three to atheistic evolution have a much longer time scale. They generally hold the universe to be ten billion to twenty billion years old, life on earth to be about four billion years old, and modern man (the subspecies *homo sapiens*) to be about thirty thousand years old. Those who believe in varieties of developmental creation hold dates used by either or both of the other two positions.

The Catholic Position

What is the Catholic position concerning belief or unbelief in evolution? The question may never be finally settled, but there are definite parameters to what is acceptable Catholic belief.

Concerning cosmological evolution, the Church has infallibly defined that the universe was specially created out of nothing. Vatican I solemnly defined that everyone must "confess the world and all things which are contained in it, both spiritual and material, as regards their whole substance, have been produced by God from nothing" (*Canons on God the Creator of All Things*, canon 5).

The Church does not have an official position on whether the stars, nebulae, and planets we see today were created at that time or whether they developed over time (for example, in the aftermath of the Big Bang that modern cosmologists discuss). However, the Church would maintain that, if the stars and planets did develop over time, this still ultimately must be attributed to God and his plan, for Scripture records: "By the word of the Lord the heavens were made, and all their host [stars, nebulae, planets] by the breath of his mouth" (Ps. 33:6).

Concerning biological evolution, the Church does not have an official position on whether various life forms developed over the course of time. However, it says that, if they did develop, then they did so under the impetus and guidance of God and their ultimate creation must be ascribed to him.

Concerning human evolution, the Church has a more definite teaching. It allows for the possibility that man's *body* developed from previous biological forms, under God's guidance, but it insists on the *special creation* of his *soul*. Pope Pius XII declared that "the teaching authority of the Church does not forbid that, in conformity with the present state of human sciences and sacred theology, research and discussions . . . take place with regard to the doctrine of evolution, in as far as it inquires into the origin of the human body as coming from pre-existent and living matter—[but] the Catholic faith obliges us to hold that souls are immediately created by God" (Pius XII, *Humani Generis* 36). So whether the human body was specially created or developed, we are required to hold as a matter of Catholic faith that the human soul is specially created; it did not evolve, and it is not inherited from our parents, as our bodies are.

While the Church permits belief in either special creation or developmental creation on certain questions, it in no circumstances permits belief in atheistic evolution.

The Time Question

Much less has been defined as to *when* the universe, life, and man appeared. The Church has infallibly determined that the universe is of finite age—that it has not existed from all eternity—but it has not infallibly defined whether the world was created only a few thousand years ago or whether it was created several billion years ago.

Catholics should weigh the evidence for the universe's age by examining biblical and scientific evidence. "Though faith is above reason, there can never be any real discrepancy between faith and reason. Since the same God who reveals mysteries and infuses faith has bestowed the light of reason on the human mind, God cannot deny himself, nor can truth ever contradict truth" (*Catechism of the Catholic Church* 159).

The contribution made by the physical sciences to examining these questions is stressed by the *Catechism*, which states, "The question about the origins of the world and of man has been the object of many scientific studies which have splendidly enriched our knowledge of the age and dimensions of the cosmos, the development of life-forms and the appearance of man. These discoveries invite us to even greater admiration for the greatness of the Creator, prompting us to give him thanks for all his works and for the understanding and wisdom he gives to scholars and researchers" (CCC 283).

It is outside the scope of this tract to look at the scientific evidence, but a few words need to be said about the interpretation of Genesis and its six days of creation. While there are many interpretations of these six days, they can be grouped into two basic methods of reading the account—a *chronological reading* and a *topical reading*.

Chronological Reading

According to the chronological reading, the six days of creation should be understood to have followed each other in strict chronological order. This view is often coupled with the claim that the six days were standard 24-hour days.

Some have denied that they were standard days on the basis that the Hebrew word used in this passage for day (*yom*) can sometimes mean a longer-than-24-hour period (as it does in Genesis 2:4). However, it seems clear that Genesis 1 presents the days to us as standard days. At the end of each one is a formula like, "And there was evening and there was morning, one day" (Gen. 1:5). Evening and morning are, of course, the transition points between day and night (this is the meaning of the Hebrew terms here), but periods of time longer than 24 hours are not composed of a day and a night. Genesis is presenting these days to us as 24-hour, solar days. If we are not meant to understand them as 24-hour days, it would most likely be because Genesis 1 is not meant to be understood as a literal chronological account.

That is a possibility. Pope Pius XII warned us, "What is the literal sense of a passage is not always as obvious in the speeches and writings of the ancient authors of the East, as it is in the works of our own time. For what they wished to express is not to be determined by the rules of grammar and philology alone, nor solely by the context; the interpreter must, as it were, go back wholly in spirit to those remote centuries of the East and with the aid of history, archaeology, ethnology, and other sciences, accurately determine what modes of writing, so to speak, the authors of that ancient period would be likely to use, and in fact did use. For the ancient peoples of the East, in order to express their ideas, did not always employ those forms or kinds of speech which we use today; but rather those used by the men of their times and countries. What those exactly were the commentator cannot determine as it were in advance, but only after a careful examination of the ancient literature of the East" (*Divino Afflante Spiritu* 35–36).

The Topical Reading

This leads us to the possibility that Genesis 1 is to be given a non-chronological, topical reading. Advocates of this view point out that, in ancient literature, it was common to sequence historical material by topic, rather than in strict chronological order.

The argument for a topical ordering notes that at the time the world was created, it had two problems—it was "formless and empty" (1:2). In the first three days of creation, God solves the formlessness problem by structuring different aspects of the environment.

On day one he separates day from night; on day two he separates the waters below (oceans) from the waters above (clouds), with the sky in between; and on day three he separates the waters below from each other, creating dry land. Thus the world has been given form.

But it is still empty, so on the second three days God solves the world's emptiness problem by giving occupants to each of the three realms he ordered on the previous three days. Thus, having solved the problems of formlessness and emptiness, the task he set for himself, God's work is complete and he rests on the seventh day.

Real History

The argument is that all of this is *real* history, it is simply ordered topically rather than chronologically, and the ancient audience of Genesis, it is argued, would have understood it as such. Even if Genesis 1 records God's work in a topical fashion, it still records God's work—things God really did.

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The *Catechism* explains that "Scripture presents the work of the Creator symbolically as a succession of six days of divine 'work,' concluded by the 'rest' of the seventh day" (CCC 337), but "nothing exists that does not owe its existence to God the Creator. The world began when God's word drew it out of nothingness; all existent beings, all of nature, and all human history is rooted in this primordial event, the very genesis by which the world was constituted and time begun" (CCC 338).

It is impossible to dismiss the events of Genesis 1 as a mere legend. They are accounts of *real* history, even if they are told in a style of historical writing that Westerners do not typically use.

Adam and Eve: Real People

It is equally impermissible to dismiss the story of Adam and Eve and the fall (Gen. 2–3) as a fiction. A question often raised in this context is whether the human race descended from an original pair of two human beings (a teaching known as monogenism) or a pool of early human couples (a teaching known as polygenism).

In this regard, Pope Pius XII stated: "When, however, there is question of another conjectural opinion, namely polygenism, the children of the Church by no means enjoy such liberty. For the faithful cannot embrace that opinion which maintains either that after Adam there existed on this earth true men who did not take their origin through natural generation from him as from the first parents of all, or that Adam represents a certain number of first parents. Now, it is in no way apparent how such an opinion can be reconciled that which the sources of revealed truth and the documents of the teaching authority of the Church proposed with regard to original sin which proceeds from a sin actually committed by an individual Adam in which through generation is passed onto all and is in everyone as his own" (*Humani Generis* 37).

The story of the creation and fall of man is a true one, even if not written entirely according to modern literary techniques. The *Catechism* states, "The account of the fall in Genesis 3 uses figurative language, but affirms a primeval event, a deed that took place at the beginning of the history of man. Revelation gives us the certainty of faith that the whole of human history is marked by the original fault freely committed by our first parents" (CCC 390).

Science and Religion

The Catholic Church has always taught that "no real disagreement can exist between the theologian and the scientist provided each keeps within his own limits. . . . If nevertheless there is a disagreement . . . it should be remembered that the sacred writers, or more truly 'the Spirit of God who spoke through them, did not wish to teach men such truths (as the inner structure of visible objects) which do not help anyone to salvation'; and that, for this reason, rather than trying to provide a scientific exposition of nature, they sometimes describe and treat these matters either in a somewhat figurative language or as the common manner of speech those times required, and indeed still requires nowadays in everyday life, even amongst most learned people" (Leo XIII, *Providentissimus Deus* 18).

As the *Catechism* puts it, "Methodical research in all branches of knowledge, provided it is carried out in a truly scientific manner and does not override moral laws, can never conflict with

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the faith, because the things of the world and the things the of the faith derive from the same God. The humble and persevering investigator of the secrets of nature is being led, as it were, by the hand of God in spite of himself, for it is God, the conservator of all things, who made them what they are" (CCC 159). The Catholic Church has no fear of science or scientific discovery.

NIHIL OBSTAT: I have concluded that the materials presented in this work are free of doctrinal or moral errors.
Bernadeane Carr, STL, Censor Librorum, August 10, 2004

IMPRIMATUR: In accord with 1983 CIC 827 permission to publish this work is hereby granted.
+Robert H. Brom, Bishop of San Diego, August 10, 2004

Catholic Answers, "Adam, Eve and Evolution" (San Diego: Catholic Answers, 2004)

http://www.catholic.com/library/Adam_Eve_and_Evolution.asp

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Appendix B



"Revealing Christ in All We Teach"

Teacher Catholic Faith Integrations Reflections <i>What have I learned about teaching this unit?</i>	
Subject: Gr. 7Science	Unit: Earth's Crust
<p>What permeation ideas worked well in this unit?</p> <p>How well did the permeation prompts engage the students?</p> <p>Describe how the faith permeation prompts helped your students to grow in understanding the Catholic faith.</p> <p>As a teacher, describe how the faith permeation prompts helped you to grow in understanding the Catholic faith.</p> <p>It would have been good to have...</p> <p>If I adapted / modified this unit I would...</p> <p>General Comment:</p>	

UNIT 4: Earth's Crust and Resources

Saskatchewan Science 7 (Pearson)	Suggested integration of faith permeation ideas
Invitation to Explore p.254	† Brainstorm their knowledge base (KWL) about plate tectonics and the Genesis story of creation.
1.0 Processes within Earth's crust cause natural events. p.259 1.1 Inside Earth p.259 1.2 Discovering Clues to Earth's Structure p.263 1.3 What Happens When Plates Meet? p.268 Ask an Elder: Isador Pelletier: Stories in the Stones p.271 1.4 Earthquakes p.272 1.5 Building Mountains p.279 1.6 Check Your Progress p.284 Careers and Profiles: Dale Worme: A Geologist with a Purpose p.285	† (See Topic 1 above.) Explain to the students that both Scripture and science contribute their respective truths to help us form a complete, integrated picture. Everything originates from God. God is the ultimate cause of creation and is always present in the creative process because creation is a continuous process.
2.0 Minerals can be classified by their composition; rocks by how they are formed. p.286 2.1 What Are Rocks and Minerals? p.286 Try This at Home: Testing for Hardness p.289 2.2 How Rocks Form p.290 2.3 Check Your Progress p.298 Careers and Profiles: Earl Woods: Working Inside Earth p.299	† (See Topic 2 above) The Bible mentions the importance of rocks and minerals in many different places. Students should be reminded of their Catholic belief in stewardship of God's creation; responsible use of God's gifts, including those from the Earth.
3.0 Many valuable minerals are mined in Saskatchewan. p.300 3.1 The Process of Mining p.301 3.2 The Technology of Mining p.304 3.3 Check Your Progress p.307	† (See Topic 2 above) Our search for wisdom in the words of scripture is similar to humankind's search for valuable resources from the land. God reminds us to use the earth's gifts prudently because the ecological impact of erosion and mining are long-lasting.
4.0 The rock cycle describes how rocks form and change over time. p.308 4.1 What Changes Rocks on Earth's Surface? p.308 4.2 Tracing Evidence of Geological Change p.315 4.3 Connecting the Rocks p.319	† (See Topic 1 above.) Earthquakes, volcanic eruptions and mountain building remind us of the constant changes that continue to occur within the realm of God's creation. Life and land are never stagnant.

<p>4.4 Check Your Progress p.321 Careers and Profiles: Nancy Chaw: Geologist-Digging Down Deeply p.322</p>	
<p>5.0 Knowing the characteristics of soil can help you understand how it can be used and conserved. p.323 5.1 What is Soil? p.323 5.2 Soil Characteristics p.328 Try This at Home: Rocky Fields p.329 5.3 Saskatchewan Soil p.333 5.4 Soil Conservation p.336 5.5 Check Your Progress p.339 Experiment on Your Own: Guilty or Innocent? p.340 Careers and Profiles: Emily Clauson: Environmental Planner p.341</p>	<p>† (See topic 3 above) Our Catholic faith teaches us to be stewards of God's creation. Purposeful neglect of the needs of the soil (which supplies so many resources for humankind) is irresponsible.</p> <p>† It is very important that students have strong role-models who demonstrate this stewardship of God's creation. A role-model in Saskatchewan is Nettie Wiebe, leader and activist in social justice and agriculture. She teaches about strong commitment to the environment and soil conservation, and lives the ideals that she teaches. For more information on Mrs. Wiebe, please see her official website: http://nettiewiebe.ca/</p>
<p>6.0 We can make informed decisions about how our actions might affect the landscape. p.342 6.1 How We Affect the World Around Us p.342 6.2 Using Earth's Resources 346 6.3 Check Your Progress p.350 Science World: Living with the Power of Nature p.351</p>	<p>† (See Topic 2 above) Discuss people who are strong examples of stewardship; list qualities they possess that make them feel love and responsibility for careful consumption of God's gifts (e.g., Father Lou Quinn of the Scarborough Foreign Mission Society, is a missionary in the Dominican Republic. He helps replant trees/forests to end soil erosion. Unit 4, Topic 1 Believe In Me – Year 7).</p> <p>† See Appendix B An excellent resource for suggesting a Catholic perspective to ecological complications from science and technology is the Development and Peace website: www.devp.org/devpme/main-eng.html This site illustrates how humans can work to correct some of the problems that they create; the importance of being a steward of creation</p>
<p>Project: Earth Models and Simulations p.352 Unit Summary p.355 Unit Review p.357</p>	