

*Integrating Science and Technology  
and  
Catholic Curriculum Maps*

**Introduction**

**Understanding Life Systems Strand  
Grades 1 to 8**



**Catholic Curriculum Corporation  
Central and Western Region**

**November, 2008**

## *Integrating Science and Technology and Catholic Curriculum Maps*

### **Understanding Life Systems Strand Grades 1 to 8**

#### **Our Purpose**

The Catholic Curriculum Corporation is a consortium of seventeen Catholic school boards across central and western Ontario. As an important partner in Catholic education, we recognize that Catholic education exists to provide a holistic formation of people as living witnesses of faith. We demonstrate our mission when we engage with, and support, our member boards in sustained, substantive school improvement and student growth that is reflective of a Catholic professional learning community.

#### **Our Mission**

Our mission is to build and sustain the Catholic capacity of educators through the development and provision of high quality Catholic curriculum, resources, support and professional development.

#### **Our Vision**

***Faith through Learning – A Distinctive Catholic Curriculum***

#### **Message from the Executive Director**

On behalf of the Catholic Curriculum Corporation, I would like to invite educators to review and use this rich Science and Technology resource. The writers have made every effort to ensure it aligns with the revised Ministry document, while examining it with the lens of the Catholic learner.

**Integrating Science and Technology and Catholic Curriculum Maps – Understanding Life Systems Strand Grades 1-8** is a well developed resource which provides teachers with practical examples in using the Catholic Curriculum Maps to support and implement one strand of the Ontario Science and Technology Curriculum. The Catholic world view is explicitly addressed in each Understanding Life Systems lesson.

The Catholic Curriculum Corporation would like to thank Andrea Bishop and the Halton Catholic District School Board writers, as well as the reviewers from Waterloo Catholic District School Board. Their exemplary work has brought to reality the development of this faith-filled Science and Technology resource.

**G.A. Blake,  
Executive Director**

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## **Understanding Life Systems Strand Grades 1 to 8**

### **Purpose of the Resource**

This resource provides practical examples for teachers in using the Catholic Curriculum Corporation's Catholic Curriculum Maps, to support the implementation of The Ontario Curriculum, Grades 1 – 8: Science and Technology strand, *Understanding Life Systems*.

The examples do not attempt to cover all science and technology expectations, nor do they attempt to suggest all possible links that could support the Catholic world view for this strand.

The writers identified the essential understandings for each grade using The Ontario Curriculum, Grades 1 to 8, Science and Technology 2007, the Catholic Curriculum Maps, and the Ontario Catholic School Graduate Expectations, to demonstrate how the topics for the strand, *Understanding Life Systems* can be planned and implemented from a uniquely Catholic perspective.

Note: There are two Scientific Inquiry Skills addressed throughout the grades in the Science and Technology curriculum, *Research* and *Experimentation*. *Research* provides the better opportunity to promote Catholic thought and action in *Understanding Life Systems* and is the skill most often referenced in the overview and incorporated into the lessons.

### **Background**

In Catholic schools there must be a balance between the acquisition of knowledge, and the development of those habits of mind which will enable our students to grow as free, responsible, and transformational agents within the Catholic community.

*Science and technology can play a key role in shaping students' views about life and learning. Science and technology exist in a broader social and economic context. Both are affected by the values and choices of individuals, businesses, and governments, and in turn have a significant impact on society and the environment. Teachers must provide opportunities for students to develop habits of mind appropriate for science and technology, which include a commitment to precision and integrity in observation, experimentation, and reporting; respect for evidence; adherence to safety procedures; and respect for living things and the environment.*

*It is important for students to see science and technology in this wider context – as endeavours with important consequences for people and other living things – and that they learn to connect their knowledge of science and technology to the world beyond the school.*

*The Ontario Curriculum Grades 1 – 8: Science and Technology, 2007 p8, p5*

This resource provides considerations for reflecting on how the values and attitudes that underpin the content of the science and technology curriculum are consistent with the Catholic world view that calls each of us to see:

*The Presence of God – Spiritual Feature*

*The Dignity of the Human Person – Humanizing Feature*

*A Call to Life in Community – Ecclesial Feature*

*A Reverence and Stewardship of the Planet – Transformative Feature*

*A Call to a Specific History – Apostolic Feature*

*Educating the Soul, Larry Trafford (In consultation with ICE & CCC), 1998, p 13-15*

## **Catholic Curriculum Maps**

Teachers in Ontario are guided by the mandate of the Ministry of Education to implement a common curriculum. Catholic teachers are further charged to translate the Ministry curriculum to more explicitly reflect the Catholic world view.

Catholic Curriculum Maps are a response to the call for strategies that help make the Catholic world view explicitly visible when addressing any curriculum area in Kindergarten to Grade 8. Catholic Curriculum Maps are intended to actively promoting Catholic thought and action in all subject areas.

Catholic Curriculum Maps use Catholic themes and essential questions to organize the content and skills that students are expected to know from the catechetical programs, *Catechism of the Catholic Church*, *Born of the Spirit*, *We Are Strong Together*, and *Fully Alive*.

Catholic Curriculum Maps allow teachers to see how these overarching Catholic themes and essential questions hold the curriculum together for the grade, and guide our instruction to help students look at the world through a Catholic lens.

Catholic boards of education not using these catechetical programs may find the framework of the Catholic Curriculum Maps useful in making connections to their catechetical programs. Information about the Catholic Curriculum Maps can be found on the Catholic Curriculum Corporation website ([www.catholiccurriculumcorp.org](http://www.catholiccurriculumcorp.org)) and an overview of the maps has been provided in Appendix A.

## **Ontario Catholic School Graduate Expectations**

The Ontario Catholic Graduate Expectations create a common purpose and focus for the realization of this vision all curriculum planning and implementation. The expectations of Catholic graduates are described not only in terms of knowledge and skills, but in terms of values, attitudes and actions. The Catholic Graduate is expected to be:

1. **A discerning believer** formed in the Catholic Faith community who celebrates the signs and sacred mystery of God's presence through word, sacrament, prayer, forgiveness, reflection and moral living.
2. **An effective communicator** who speaks, writes, and listens honestly and sensitively, responding critically in light of Gospel values.
3. **A reflective, creative, and holistic thinker** who solves problems and makes responsible decisions with an informed moral conscience for the common good.
4. **A self-directed, responsible, lifelong learner** who develops and demonstrates their God-given potential
5. **A collaborative contributor** who finds meaning, dignity and vocation in work which respects the rights of all and contributes to the common good.
6. **A caring family member** who attends to family, school, parish and the wider community.
7. **A responsible citizen** who gives witness to Catholic social teaching by promoting peace, justice and the sacredness of human life.

## The Ontario Curriculum, Grades 1-8: Science and Technology 2007

The Science and Technology Curriculum outlines the skills and knowledge that students will develop, as well as the attitudes that they need to develop in order to use their knowledge and skills responsibly. The science and technology document includes the following:

*Fundamental Concepts:* key ideas that provide a framework for the acquisition of all scientific and technological knowledge; they also help students to integrate scientific and technological knowledge in other subject areas (p.5)

*Big Ideas:* the broad, important understandings that students should retain long after they have forgotten many of the details of something they have studied; these big ideas describe aspects of the fundamental concepts that are addressed at each grade level (p.6)

*Sample Guiding Questions:* sample prompts designed to stimulate student thinking and to help clarify the requirements specified in the expectations; designed to model appropriate practice for the grade and are meant to serve as illustrations for teachers (p.10)

*Skill Continua:* present an ordered series of descriptive statements that mark out students' development e.g. research, experiments (p.12)

### Instruction

The context for addressing the strand, *Understanding Life Systems*, is **inquiry**, based on guiding questions that link the fundamental concepts and big ideas for the grade level topic to Catholic thought and action.

To support student inquiry, teachers will use instructional strategies that vary according to student needs and provide opportunities for them to learn and demonstrate their learning in a variety of ways, individually, small group, large group and teacher directed. Teachers will need to adjust the suggestions to address the learning needs of their students.

Differentiating instruction is a Catholic teacher's response to each student's learning needs, recognizing that all students are unique gifts from God.

### Assessment and Evaluation

*Assessment and evaluation in a Catholic school must respect the dignity of all students by recognizing the uniqueness of their learning styles and rates of development... When assessing student learning, Catholic educators base their practice on assessment principles which reflect gospel values and respect the uniqueness of each individual within the learning community.*

*Learning From Assessment, Catholic Curriculum Corporation, 2007 p 10*

Assessment and evaluation for the strand, *Understanding Life Systems*, is driven by a Unit Guiding Questions, Subtasks, and a Culminating Task. Tools and strategies that support assessment *for* learning and assessment *of* learning are suggested in each lesson. Teachers will need to adjust the suggestions to address the learning needs of their students.

The unit assessment strategies also provide teachers with opportunities to assess student demonstration of learning related to the fundamental concept, Sustainability and Stewardship.

## **Sustainability and Stewardship**

It is important for the Catholic educator to consider the common fundamental concept that can be traced throughout the grades in the strand, *Understanding Life Systems*, because it provides a continuous lens for students to view their impact on living things.

The common fundamental concept identified for the *Understanding Life Systems* strand for all grades, except Grade 5, is Sustainability and Stewardship. The Catholic social teaching for Grade 5, Community and the Common Good, is a concept that can be extended to reflect sustainability and stewardship.

Sustainability and stewardship are defined as:

*Sustainability is the concept of meeting the needs of the present without compromising the ability of future generations to meet their needs.*

*Stewardship involves understanding that we need to use and care for the natural environment in a responsible way and making the effort to pass on to future generations no less than what we have access to ourselves. Values that are central to responsible stewardship are: using non-renewable resources with care; reusing and recycling what we can; switching to renewable resources where possible.*

*Ontario Curriculum Grades 1 – 8 Science and Technology, 2007, p 5*

## **Considerations for Addressing the Catholic World View**

Stewardship calls us to care for the sacred gifts God has entrusted to us. This includes our bodies, talents, spiritual gifts, and the entire created order. Stewardship means acting as managers for God, according to God's plan and wishes, and respecting God's laws that we find embedded in reality. Stewardship is thus not just a social agenda, but rather, has an inherently moral character. Therefore, we must use wisely what God has entrusted to us, with reverence for our own human dignity and destiny, and for the spiritual and material well-being of all. Stewardship for the gifts of creation requires the responsible use of resources through all available means. No one owns anything absolutely; everything we possess we hold in trust for everyone, including future generations. Problems of global scarcity and environmental pollution present an urgent call to stewardship. These pressing issues challenge us to a stewardship which condemns the use of technology and human talent for global trade and profit through environmentally unsustainable development. More than ever, stewardship demands renewed efforts at preserving the *dignity of the human person*, the *common good* and the gift of creation through solidarity, conservation and sustainable economic progress.

## Scriptural Story and the Catholic Social Teachings on Stewardship

### ***Six Days of Creation and the Sabbath***

*God blessed them, and God said to them, "Be fruitful and multiply, and fill the earth and subdue it; and have dominion over the fish of the sea and over the birds of the air and over every living thing that moves upon the earth. God said, "See I have given you every plant yielding seed that is upon the face of all the earth, and every tree with seed in its fruit; you shall have them for food. And to every beast of the earth, and to every bird of the air, and to everything that creeps on the earth, everything that has the breath of life, I have given every green plant for food. And it was so. God saw everything that he had made, and indeed, it was very good. And there was evening and there was morning, the sixth day. Thus the heavens and the earth were finished, and all their multitude. And on the seventh day God finished the work that he had done, and he rested on the seventh day from all the work that he had done. So God blessed the seventh day and hallowed it, because on it God rested from all the work that he had done in creation.*

*Genesis 1: 28 - 2: 3*

### ***The Sabbatical Year***

*The Lord spoke to Moses on Mount Sinai, saying: Speak to the people of Israel and say to them: When you enter the land that I am giving you, the land shall observe a Sabbath for the Lord. Six years you shall sow your field, and six years you shall prune your vineyard, and gather in their yield; but in the seventh year there shall be a sabbath of complete rest for the land, a sabbath for the Lord: you shall not sow your field or prune your vineyard. You shall not reap the aftergrowth of your harvest or gather the grapes of your unpruned vine: it shall be a year of complete rest for the land. You may eat what the land yields during its sabbath - you, your male and female slaves, your hired and your bound labourers who live with you; for your livestock also, and for the wild animals in your land all its yield shall be for food.*

*Leviticus 25: 1-7*

*God's creation is a sacred gift entrusted to our care. This value has deep biblical roots in both the Hebrew and Christian scriptures. Those "who practice stewardship recognize God as the origin of life, the given of freedom and the source of all they have and are and will be. They know themselves to be recipients and caretakers of God's many gifts. They are grateful for what they have received and eager to cultivate their gifts out of love for God and one another."* *Stewardship: A Disciple's Response, United States Conference of Catholic Bishops, December 1992*

*Clearly, stewardship has come to mean more a way of life than a single, particular action. Stewardship is a Christian lifestyle: "The life of stewardship is an ongoing process of integration whereby we relate our whole person to the whole action of God...By acknowledging our dependence upon God for all life, we are called to regard both material things and human capacities not as private possessions or as the property of limited groups, but as God's (Deitterich, p.10). *The New Dictionary of Catholic Social Thought, Judith Dwyer, 1994**

*The concept of an ordered universe and a common heritage both point to the necessity of developing in the heart of every individual and in the activities of every society a true sense of stewardship and of solidarity. It is the obligation of a responsible steward to be one who cares for the goods entrusted to him and not one who plunders, to be one who conserves and enhances and not one who destroys and dissipates...Responsible stewardship demands a consideration for the common good.*

*Responsible Stewardship: Ecology as a Moral Task, Archbishop Renato Martino. Judith Dwyer, ed. 3*

*God's glory is revealed in the natural world, yet we humans are presently destroying creation. In this light, the ecological crisis is also a profoundly religious crisis. In destroying creation we are limiting our ability to know and love God. "The ecological crisis is a moral issue" and "the responsibility of everyone," says Pope John Paul II. "Care for the environment is not an option. In the Christian perspective, it forms an integral part of our personal life and of life in society. Not to care for the environment is to ignore the Creator's plan for all of creation and results in an alienation of the human person." A Pastoral Letter on the Christian Ecological Imperative from the Social Affairs Commission, Canadian Conference of Catholic Bishops, October 4, 2003*

*Curriculum Support for Catholic Schools: Enhancing the Religious Dimension of Catholic Education, Eastern Ontario Catholic Curriculum Cooperative, 2005*

# Organization of the Unit

## Planning the Units

The organization and structure of the unit for the strand Understanding Life Systems, is based on the backward design model (Wiggins & McTighe, 2005), and the Ministry's 2008 implementation sessions for The Ontario Curriculum Grades 1 to 8: Science and Technology 2007.

The unit was planned and developed using three reflective prompts:

### 1. *What do I want students to learn?*

Identify the Essential Understandings for the unit (Big Ideas, Fundamental Concept(s), Overall and Specific Expectations from the Science and Technology Curriculum, and the Essential Question(s) and skills for the grade from the Catholic Curriculum Maps

Develop guiding questions related to the Essential Understandings

### 2. *How will I have students demonstrate their learning?*

Design assessment *of* learning task(s) to evaluate student achievement of the overall expectations

Determine acceptable criteria to measure performance of the task(s)

Identify assessment *for* learning tools and strategies to monitor learning and progress, to provide feedback and opportunities for peer and self-assessment

### 3. *How will I design instruction so that all will learn?*

Design lessons using instructional strategies that scaffold learning according to students' needs addressing time to teach, time to practice and time to share

Use assessment *for* learning data to adjust instruction as needed

## Unit At-A-Glance

The Unit At- A - Glance chart for the strand, *Understanding Life Systems* lists the **Catholic World View, Science and Technology Strand Topic, Unit Guiding Question, Unit Culminating Task** and **Unit Overview** for each grade. Teachers will need to adjust the Units Guiding Questions, Unit Culminating Task and Essential Understandings to address the learning needs of their students.

<b>Catholic World View</b>	<i>Catholic Social Teaching</i> - the unifying Catholic social teaching for the grade based on the Religious Education and Family Life Education programs (from the Catholic Curriculum Map for the grade, 2007)
	<i>Essential Question</i> - guiding questions based on the Religious Education and Family Life Education programs that provide inquiry considerations for curriculum (from the Catholic Curriculum Map for the grade, 2007)
	<i>Ontario Catholic School Graduate Expectation(s)</i> – distinctive expectations for graduates of Catholic schools that are determined and shaped by the vision and destiny of the human person emerging from our faith tradition (from the Institute for Catholic Education, 1998)
<b>Topic</b>	Grade level topic and description for the unit, Understanding Life Systems (from The Ontario Curriculum Grades 1-8 Science and Technology 2007)
<b>Unit Guiding Question</b>	Grade specific question designed to focus planning for instruction and assessment and evaluation for the unit topic from the Catholic world view (designed by the unit writers)
<b>Unit Culminating Task</b>	Final grade specific task designed to provide opportunities for students to demonstrate their learning of the Essential Understandings for the unit topic (designed by the unit writers)
<b>Essential Understandings</b>	The skills and knowledge and attitudes that students are expected to develop by the end of the unit find their source from, Catholic Curriculum Maps – Appendix A Science and Technology Fundamental Concepts Science and Technology Big Ideas and Overall Expectations Science and Technology Scientific Inquiry Skill Science and Technology Expectation Tags, Guiding Questions and Specific Expectations Other Curriculum Expectations as appropriate
<b>Unit Overview</b>	The breakdown of the number of Subtasks, Lessons, Time Allocation, Essential Understandings Addressed, Assessment Tools and Strategies and Resources, for the unit topic for the grade

### Subtasks and Lessons

**Subtask:** a description of the assessment *for* learning or assessment *of* learning task designed to assess or evaluate student learning of the essential understandings identified for the accompanying lessons

**Lesson:** a description of the purpose, essential understandings, assessment opportunities, teacher notes and instruction that support a subtask.

**Note:** The subtasks and lessons in this resource do not attempt to cover all the science and technology expectations for the unit topic, nor does it attempt to address all possible links that support the Catholic world view for the topic. Teachers will make planning and instructional decisions about extending the Catholic world view to meet the needs of their students.

## Overview Chart - Unifying Catholic Themes and Essential Questions

Grade	Catholic Theme	Essential Question	Points for Consideration
K	Stewardship of Creation	Where is God?	<ul style="list-style-type: none"> <li>• Our Catholic tradition teaches that we are charged with caring for all of God’s creation</li> <li>• We come to know God through our experience and understanding of our selves, others, and the rest of the created world</li> <li>• Students explore and experience elements of creation as a trace of God</li> </ul>
1	Dignity of the Human Person	Who is God?	<ul style="list-style-type: none"> <li>• The Catholic Church professes that all human life is sacred</li> <li>• The inherent dignity of the human person is foundational to all other Catholic social teaching</li> <li>• We develop a deeper awareness of our human dignity when we come to more fully understand God, our Creator</li> <li>• Students use Scripture stories to develop an understanding of the attributes of God</li> </ul>
2	Promotion of Peace	How are we members of God’s family?	<ul style="list-style-type: none"> <li>• Peace is the work of justice and the result of love (EOCCC)</li> <li>• Peace is not just the absence of war. It involves the mutual respect and confidence between peoples and nations. (Pope John Paul II)</li> <li>• As members of God’s family, we are called to seek justice and peace for all of the members</li> <li>• Students develop an understanding Eucharist as a sacrament of belonging</li> </ul>
3	Community and the Common Good	Who is the Holy Spirit?	<ul style="list-style-type: none"> <li>• The Catholic tradition teaches that all humans are called to live with, and for, others in community</li> <li>• The Holy Spirit is God’s loving and guiding presence in the community</li> <li>• Students recognize that the Holy Spirit gathers us to be a people of God and inspires us to share in the mission of Jesus</li> </ul>
4	Preferential Option for the Poor and Vulnerable	What does Jesus ask of us?	<ul style="list-style-type: none"> <li>• A distinctly Catholic perspective on the world maintains that we can measure the quality of any society by the way its most poor and vulnerable are treated (EOCCC)</li> <li>• Jesus is the ultimate model of how we are called to care for those that society overlooks</li> <li>• Students use Scripture to develop a deeper understanding Jesus, and what Jesus expects of his followers</li> </ul>

5	Community and the Common Good	How do we live in community?	<ul style="list-style-type: none"> <li>• The Catholic tradition proclaims that humans are not only sacred, but are also social</li> <li>• We must be mindful of the human dignity and rights of all as we come together in community</li> <li>• We are called to critique prevailing social structures to ensure that all are fairly represented</li> <li>• Students investigate covenant stories in Scripture as well as stories of the early formation of the Church</li> </ul>
6	Human Rights and Responsibilities	How do we live in accordance with God's will?	<ul style="list-style-type: none"> <li>• By virtue of our human dignity, our Catholic tradition teaches that all humans have the right to life, food, shelter, health care, education, and employment</li> <li>• We, in turn, have the duty and responsibility to care for one another, our families, and those in society</li> <li>• We come to a greater understanding of how we are to ensure the rights of all, and what our obligations are, by understanding God's will for humanity</li> <li>• Students examine the Decalogue and the Beatitudes as guides for right action</li> </ul>
7	Dignity of the Human Person	What is our story?	<ul style="list-style-type: none"> <li>• This foundational social teaching is revisited, allowing students to come to a deeper understanding of its implications appropriate to the developmental stage of an adolescent</li> <li>• A greater appreciation of the sacred and social nature of the human emerges, this time, through an investigation of the Christian story</li> <li>• Students develop an understanding of the Bible as our story to more fully understand what it means to be called into relationship with God through Jesus</li> </ul>
8	Solidarity	How are we Church in the world?	<ul style="list-style-type: none"> <li>• The Catholic tradition proclaims that we are to love our neighbour regardless of national, racial, ethnic, economic, or ideological differences</li> <li>• Solidarity means that "loving our neighbour" has global dimensions in an interdependent world (<a href="http://www.osjspm.org">www.osjspm.org</a>)</li> <li>• Students are challenged, appropriate to their now more advanced developmental level, to extend their prior understanding of the Common Good to the broader global community</li> <li>• Students identify how the Ten Commandments and Jesus' rule of love are related, and develop an understanding of the Catholic view of social justice and its need in the world</li> </ul>