

APPENDIX 1: UNIT DEVELOPMENT IN SENIOR 3 CURRENT TOPICS IN THE SCIENCES

Unit Development

Senior 3 Current Topics in the Sciences is driven by learning outcomes and process. This design empowers teachers to plan appropriate learning experiences based on the nature of their students, school, and community. Teachers are encouraged to seek their own comfort level with the new curriculum, to share approaches and experiences with colleagues, and to use an integrated interdisciplinary focus to develop and extend student experiences and understandings in new ways. The thematic approach to integrated instruction will allow teachers to work closely together as they develop units that extend across disciplines (Willis).

Working with bigger ideas will allow a more in-depth inquiry. Organizing units around a problem or theme will generally present information in the context of real-world applications (Willis). Students will be presented with opportunities to uncover concepts from each of the sciences during the year in a substantial way and to make coherent connections between them.

Science deals with major themes in which people are already interested or can readily be interested: life and living things, matter, the Universe, information, the “made-world.” A primary reason, therefore, for teaching science to young people is to pass on to them some of this knowledge about the material world, simply because it is both interesting and important—and to convey the sense of excitement that scientific knowledge brings (Millar and Osborne 7).

Choosing a Current Topic

The flexibility of Senior 3 Current Topics in the Sciences allows teachers to design meaningful and engaging interdisciplinary units based on current scientific issues and developments. It is suggested that teachers develop three or four units for this course. The first step in the development of a unit is choosing a topic.

Choosing an effective topic is critical to the success of Senior 3 Current Topics in the Sciences. An engaging topic should have one or more of the following characteristics:

- is age appropriate and accessible to a diversity of learning styles, interests, and abilities
- is meaningful and engaging to students
- is of current societal and scientific significance
- incorporates a significant number of the student learning outcomes identified for this course
- connects a range of science disciplines
- is framed within the context of a question or problem
- provides opportunities for in-depth student-driven inquiry

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- provides opportunities for both knowledge acquisition and skill development to arise naturally in context
- will result in a performance-based activity as a culminating experience

Teachers may decide to choose a topic from the suggestions listed below, develop a topic based on one of their own strengths or interests, or involve students in brainstorming a current scientific topic of interest that includes a significant treatment of scientific ideas, perspectives, content, and processes.

Possible Current Themes or Topics

- Are We Alone in the Universe?
- Biotechnology: The Good, the Bad, and the Unknown
- What in the World Is Climate Change?
- Cloning: What Can We Do and What Should We Do?
- Forensic Sciences: Crime Scene Investigation
- Where Will the Next Earthquake Occur?
- Energy Today and Tomorrow: Can We Avoid Large-Scale Blackouts?
- Environmental Interactions
- The Evolution of the Human Species: Where Did We Come From? Where Are We Going?
- Global Warming: Fact or Fiction?
- The Human Endeavour in Space
- Medical Technologies: What's New?
- Great Geological Controversies: Expanded Earth or Plate Tectonics?
- The "Snowball Earth": Has the Entire Planet Frozen over in the Past?
- Is the World Doing Enough to Reduce Pollution?
- Recycling: Is It Working?
- Science of Music: Why Do We Like It So Much?
- Sports Science: How Do Science and Technology Aid the Athlete?
- Stem-Cell Research: Ideas and Issues
- Technologies of the Future: What Was Predicted in 1950 and Where Are We Now?
- Transportation in the Future: Getting From A to B
- Water: Will We Ever Run Out?
- Causes and Consequences of Wildfires
- Human Population Cycles: Is There Room for Us All?

Senior 3 Current Topics in the Sciences welcomes and encourages the input of students in the choice of topics and in topic development. Teachers may choose to involve students in the development of a thematic unit. A brainstorming session with the class could allow students to generate topics of interest, from which a unit may be planned, or develop the essential understandings within the chosen unit.

The Forensic Sciences topic has been developed as a sample unit for teachers to consider for use in implementing this curriculum.

Planning a Unit

A unit plan evolves from a particular topic. A number of essential understandings within the area of interest could be generated, either by the teacher or with the help of students.

Essential understandings are concepts, skills, or bodies of knowledge that are crucial for students to comprehend to develop an in-depth understanding of the topic. The essential understandings will likely determine the SLOs for GLO D (Essential Concepts).

The number of essential understandings generated will depend upon the topic, the amount of time allotted to the unit, and the interest of students. There may be essential understandings of particular interest to students that develop during the presentation of the unit, and teachers are encouraged to pursue these. While the size of a unit may vary (for example, from eight to 30 hours), teachers are encouraged to pursue a depth of treatment to essential understandings.

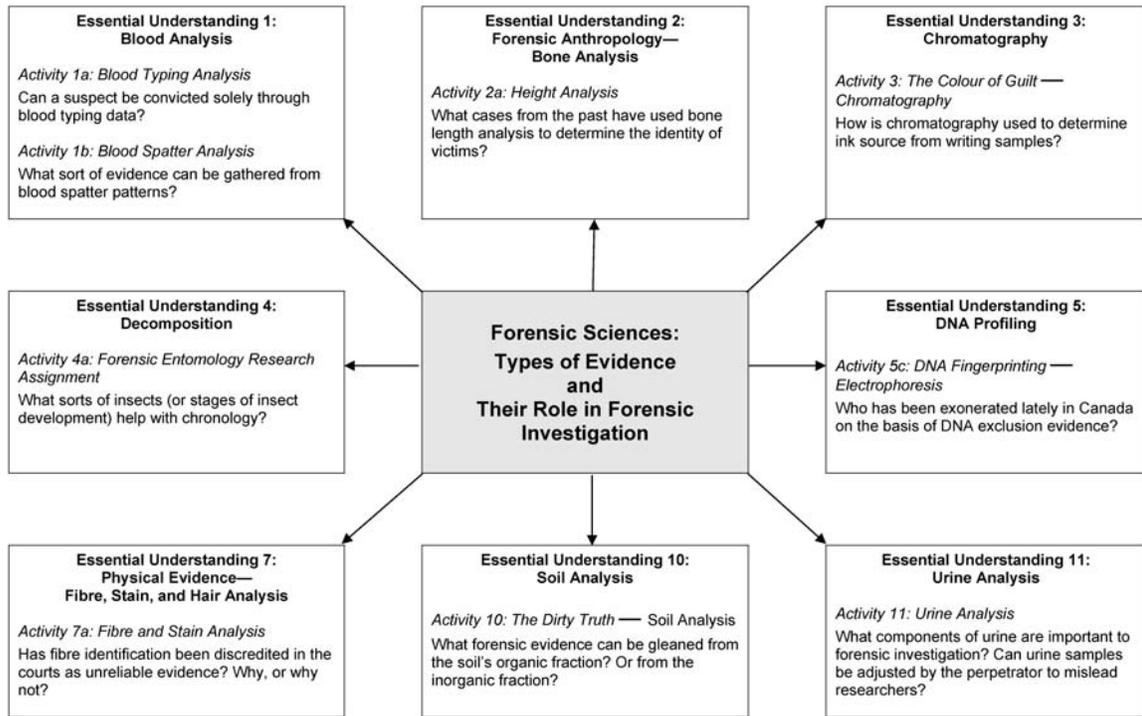
Teachers may choose to use development tools such as the Unit Development Using Essential Understandings Approach or the Unit Development Concept Map shown in the samples that follow. (Templates of these planning tools follow the samples.)

Unit Development Using Essential Understandings Approach Forensic Sciences: A Crime Scene Investigation Unit (Sample 1)			
Current Topic:		Forensic Sciences: Crime Scene Investigation	
Essential Understanding:		1. Blood Analysis	
		SLO Tracking	
Knowledge:	<ul style="list-style-type: none"> There is a relationship between the distance a drop of blood falls and the diameter of its spatter. There is a relationship between the angle and direction a drop of blood falls and its spatter pattern. 	SLO D3: Understand the processes and conditions in which change, constancy, and equilibrium occur.	
Skills:	<ul style="list-style-type: none"> Measurement Collaboration Data Analysis 	SLO C1: Demonstrate appropriate scientific inquiry skills, attitudes, and practices when seeking answers to questions.	
Activities:	<ul style="list-style-type: none"> Blood Spatter Analysis Lab 	SLO A2: Recognize both the power and limitations of science as a way of answering questions about the world and explaining natural phenomena.	
Assessment:	Formative	<ul style="list-style-type: none"> Blood Spatter Analysis Lab 	SLO C1 SLO C4 SLO C5
	Summative	<ul style="list-style-type: none"> Blood Spatter Analysis Lab Report 	SLO A2 SLO C4 SLO D3

Unit Development Using Essential Understandings Approach		
Current Topic:		
Essential Understanding:		
		SLO Tracking
Knowledge:	•	
Skills:	•	
Activities:	•	
Assessment:	Formative	•
	Summative	•

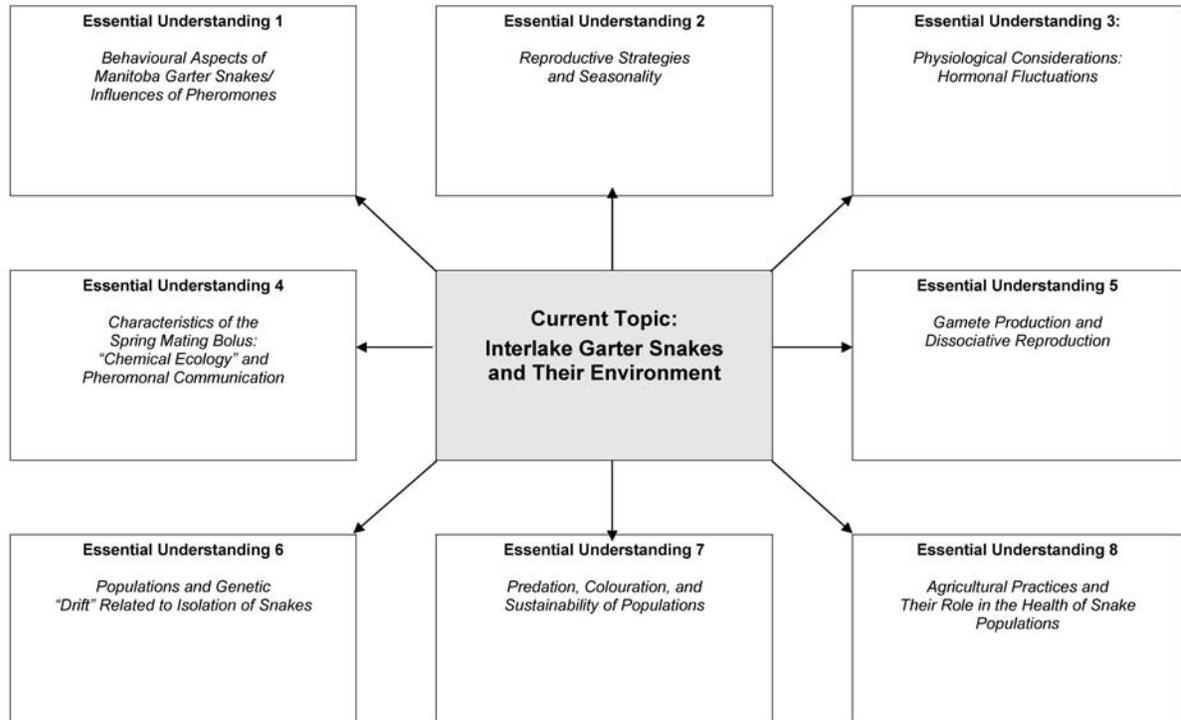
Unit Development Concept Map

Forensic Sciences: Types of Evidence and Their Role in Forensic Investigation (Sample 1)



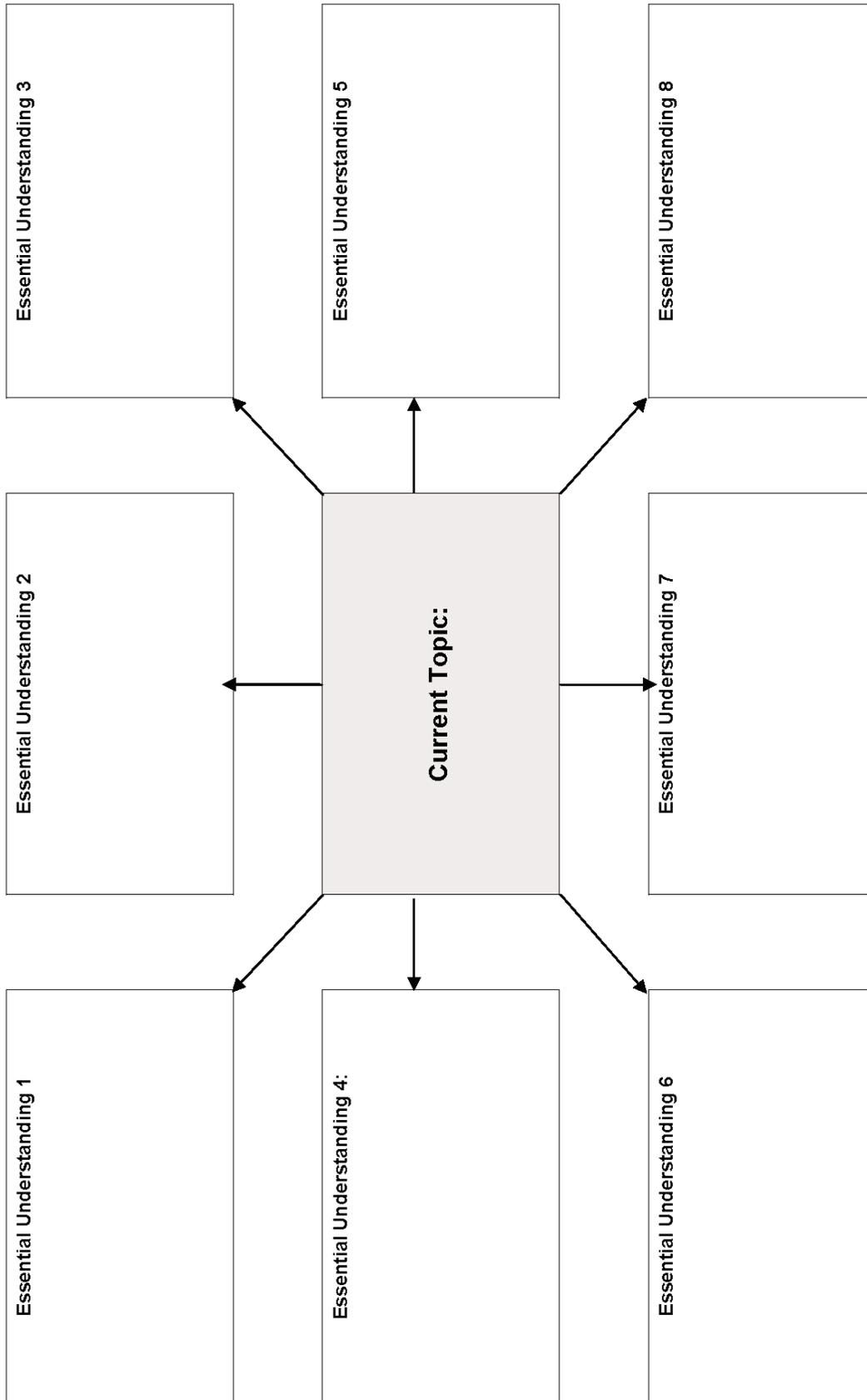
Unit Development Concept Map

Interlake Garter Snakes and Their Environment (Sample 2)



Note: There may be more or fewer than eight essential understandings. The arrows may serve to connect essential understandings to the topic.

Unit Development Concept Map



Note: There may be more or fewer than eight essential understandings. The arrows may serve to connect essential understandings to the topic.

Linking to Specific Learning Outcomes (SLOs)

After developing the initial unit plan, teachers can use an SLO Tracking Chart to link instructional strategies and student learning activities to specific learning outcomes (SLOs).

A single unit will not necessarily address all SLOs. The SLOs are cumulative in nature, and it is expected that a student will achieve all outcomes by the end of Senior 3 Current Topics in the Sciences.

An SLO Tracking Chart will assist teachers in determining whether each SLO has been addressed at least once during curriculum implementation. Many SLOs will be addressed more than once by virtue of the design of interdisciplinary units.

A sample SLO Tracking Chart for a set of learning activities for a Forensic Science unit is provided on the following pages. (A template of this chart follows the sample.)

Finding Learning Resources

After having developed a unit plan and tracking or auditing for SLOs, teachers may decide where and how to obtain information and ideas for learning activities. Teachers may gather information, or they may have students research and share.

Possible Sources of Information			
• Textbooks	• Journals	• Interviews	• Teachers
• Internet	• Videos	• Community	• Students

Instructional Strategies

A variety of instructional approaches may be used, depending on the nature of the unit. For suggestions, see a discussion of Varied Instructional Approaches and Instructional Strategies in Section 2, as well as Appendices 2 to 6.

Assessment Strategies

Assessment strategies will vary, depending on the nature of the unit, the instructional strategies used, and the characteristics of the learners. For suggested assessment ideas, see Section 3 and Appendices 7 to 9.

SLO Tracking Chart									
Forensic Sciences: A Crime Scene Investigation Unit (Sample 1)									
Learning Outcomes	Forensic Sciences Activities								
	Blood Typing Analysis	Blood Spatter Analysis	Height Analysis	The Colour of Guilt— Chromatography	Forensic Entomology Research Assignment	DNA Fingerprinting— Electrophoresis	Fibre and Stain Analysis	The Dirty Truth— Soil Analysis	Urine Analysis
	1a.	1b.	2a.	3.	4a.	5c.	7a.	10.	11.
NATURE OF SCIENCE AND TECHNOLOGY									
GLO A: Differentiate between science and technology, recognizing their strengths and limitations in furthering our understanding of the world, and appreciate the relationship between culture and technology.									
SLO A1: Distinguish critically between science and technology in terms of their respective contexts, goals, methods, products, and values.	•					•			
SLO A2: Recognize both the power and limitations of science as a way of answering questions about the world and explaining natural phenomena.		•					•		
SLO A3: Identify and appreciate the manner in which history and culture shape a society's philosophy of science and its creation or use of technology.									
SLO A4: Recognize that science and technology interact and evolve, often advancing one another.	•					•			
SLO A5: Describe and explain disciplinary and interdisciplinary processes used to enable us to investigate and understand natural phenomena and develop technological solutions.				•		•		•	
SCIENCE, TECHNOLOGY, SOCIETY, AND THE ENVIRONMENT									
GLO B: Explore problems and issues that demonstrate interdependence among science, technology, society, and the environment.									
SLO B1: Describe scientific and technological developments, past and present, and appreciate their impact on individuals, societies, and the environment, both locally and globally.						•			
SLO B2: Recognize that scientific and technological endeavours have been, and continue to be, influenced by human needs and by societal and historical contexts.							•		
SLO B3: Identify the factors that affect health and explain the relationships of personal habits, lifestyle choices, and human health, both individual and social.	•								•
SLO B4: Demonstrate a knowledge of, and personal consideration for, a range of possible science- and technology-related interests, hobbies, and careers.				•	•				
SLO B5: Identify and demonstrate actions that promote a sustainable environment, society, and economy, both locally and globally.								•	

(continued)

SLO Tracking Chart									
Forensic Sciences: A Crime Scene Investigation Unit (Sample 1)									
(Continued)									
Learning Outcomes	Forensic Sciences Activities								
	Blood Typing Analysis	Blood Spatter Analysis	Height Analysis	The Colour of Guilt— Chromatography	Forensic Entomology Research Assignment	DNA Fingerprinting— Electrophoresis	Fibre and Stain Analysis	The Dirty Truth— Soil Analysis	Urine Analysis
	1a.	1b.	2a.	3.	4a.	5c.	7a.	10.	11.
SCIENTIFIC AND TECHNOLOGICAL SKILLS AND ATTITUDES									
GLO C: Demonstrate appropriate inquiry, problem-solving, and decision-making skills and attitudes for exploring scientific and/or technological issues and problems.									
SLO C1: Demonstrate appropriate scientific inquiry skills, attitudes, and practices when seeking answers to questions.	•		•				•		
SLO C2: Demonstrate appropriate technological problem-solving skills and attitudes when seeking solutions to challenges and problems related to human needs.									
SLO C3: Demonstrate appropriate critical thinking and decision-making skills and attitudes when choosing a course of action based on scientific and technological information.						•			
SLO C4: Employ effective communication skills and use a variety of resources to gather and share scientific and technological ideas and data.					•				•
SLO C5: Work cooperatively with others and value their ideas and contributions.		•	•			•			
ESSENTIAL CONCEPTS									
GLO D: Explore, understand, and use scientific knowledge in a variety of contexts.									
SLO D1: Use the concepts of similarity and diversity for organizing our experiences with the world.	•		•			•	•	•	
SLO D2: Recognize that the universe comprises systems and that complex interactions occur within and among these systems at many scales and intervals of time.					•				•
SLO D3: Understand the processes and conditions in which change, constancy, and equilibrium occur.		•		•		•			
SLO D4: Understand how energy is the driving force in the interaction of materials, processes of life, and the functioning of systems.					•				

Note: This chart is intended to highlight how student learning activities connect to the identified learning outcomes. It is not a comprehensive treatment of all activities in the sample Forensic Sciences unit.

SLO Tracking Chart									
Learning Outcomes	Activities								
	1.	2.	3.	4.	5.	6.	7.	8.	
NATURE OF SCIENCE AND TECHNOLOGY									
GLO A: Differentiate between science and technology, recognizing their strengths and limitations in furthering our understanding of the world, and appreciate the relationship between culture and technology.									
SLO A1: Distinguish critically between science and technology in terms of their respective contexts, goals, methods, products, and values.									
SLO A2: Recognize both the power and limitations of science as a way of answering questions about the world and explaining natural phenomena.									
SLO A3: Identify and appreciate the manner in which history and culture shape a society's philosophy of science and its creation or use of technology.									
SLO A4: Recognize that science and technology interact and evolve, often advancing one another.									
SLO A5: Describe and explain disciplinary and interdisciplinary processes used to enable us to investigate and understand natural phenomena and develop technological solutions.									
SCIENCE, TECHNOLOGY, SOCIETY, AND THE ENVIRONMENT									
GLO B: Explore problems and issues that demonstrate interdependence among science, technology, society, and the environment.									
SLO B1: Describe scientific and technological developments, past and present, and appreciate their impact on individuals, societies, and the environment, both locally and globally.									
SLO B2: Recognize that scientific and technological endeavours have been, and continue to be, influenced by human needs and by societal and historical contexts.									
SLO B3: Identify the factors that affect health and explain the relationships of personal habits, lifestyle choices, and human health, both individual and social.									
SLO B4: Demonstrate a knowledge of, and personal consideration for, a range of possible science- and technology-related interests, hobbies, and careers.									
SLO B5: Identify and demonstrate actions that promote a sustainable environment, society, and economy, both locally and globally.									

(continued)

SLO Tracking Chart (<i>continued</i>)									
Learning Outcomes	Activities								
	1.	2.	3.	4.	5.	6.	7.	8.	
SCIENTIFIC AND TECHNOLOGICAL SKILLS AND ATTITUDES									
GLO C: Demonstrate appropriate inquiry, problem-solving, and decision-making skills and attitudes for exploring scientific and/or technological issues and problems.									
SLO C1: Demonstrate appropriate scientific inquiry skills, attitudes, and practices when seeking answers to questions.									
SLO C2: Demonstrate appropriate technological problem-solving skills and attitudes when seeking solutions to challenges and problems related to human needs.									
SLO C3: Demonstrate appropriate critical thinking and decision-making skills and attitudes when choosing a course of action based on scientific and technological information.									
SLO C4: Employ effective communication skills and use a variety of resources to gather and share scientific and technological ideas and data.									
SLO C5: Work cooperatively with others and value their ideas and contributions.									
ESSENTIAL CONCEPTS									
GLO D: Explore, understand, and use scientific knowledge in a variety of contexts.									
SLO D1: Use the concepts of similarity and diversity for organizing our experiences with the world.									
SLO D2: Recognize that the universe comprises systems and that complex interactions occur within and among these systems at many scales and intervals of time.									
SLO D3: Understand the processes and conditions in which change, constancy, and equilibrium occur.									
SLO D4: Understand how energy is the driving force in the interaction of materials, processes of life, and the functioning of systems.									

Note: This chart is intended to highlight how student learning activities connect to the identified learning outcomes.

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