APPENDIX 4: RESEARCH ▬▬▬▬▬

Learning through student-directed or student-initiated projects is known to be a highly effective pathway to promote individualized instruction or to make the best use of the diversity within the classroom. The inquiry approach advocated in Senior 3 Current Topics in the Sciences presupposes that students will have ample opportunity to develop and refine their research skills through gathering, filtering, processing, and evaluating scientific information.

The following learning strategies can be used in the science classroom to help students develop research skills and strategies.

Action Plan (See *Senior 3 ELA* 4-216 for Whole-Class Inquiry)

Students may submit action plans for group inquiries that include the following components.

Group Inquiry Action Plan					
Objectives	**Strategies**	**Responsibilities**	**Timelines**	**Results**	**Resources**

Concept Maps (See *SYSTH* 9.6, 11.7, 11.8, 11.11)

A Concept Map is intended to help students identify key vocabulary for a topic or identify the relationships between terms in a topic. The teacher may model this procedure by arranging pieces of paper with key terms to show the relationships or logical connections between them. Concept Maps may follow a category, a chain, or a hierarchy as an organizational strategy.

Email

The teacher can arrange links with schools, universities, or other research facilities in other parts of Canada or the world to have students carry out parallel research and to share and discuss data through email.

Interviews (See *Senior 3 ELA* 4-240, 4-226)

Students may analyze models of interviews and practise with peers before conducting interviews in the community. It may be useful to have a preliminary interview in which students introduce themselves, describe the topic and purpose, ask the interviewee what information or experience he or she is able to relate on the topic, explain how the interview will be conducted and how the information will be used, and discuss the time, length, and place of the interview.

Literature-Based Research Projects (See *SYSTH* 4.7)

A literature-based research approach can be applied to many STSE topics. A series of questions can direct students during their topic research. Students with competent literature research skills will be able to

- locate and analyze the validity of scientific information

- reduce unnecessary duplication of laboratory investigations

- recognize multiple perspectives from various interest groups

- determine how decisions are made at the local, provincial, and federal levels of government

- examine scientific, environmental, technological, societal, and economic sides of an issue

Teachers should model the five stages of effective research: planning, information retrieval or gathering, information processing, information sharing, and evaluation.

Plagiarism (Avoidance of) (See *Senior 3 ELA* 4-260)

Teachers use direct instruction to teach students the conventions for summarizing, paraphrasing, and quoting from research materials. To avoid plagiarism, students need opportunities for supervised practice in using secondary sources appropriately in their research.

Three Ways to Use Secondary Sources (Student Handout)

- **Summaries:** Summarize general information as you proceed with your research. General information consists of facts and concepts that are generally known and that appear in several sources. If you cannot judge whether information is generally known or is the property of one writer, you need to read several more sources. When you write your own text, synthesize the facts and concepts from these summaries in your own words. This information does not need to be referenced.

- **Paraphrases:** Paraphrase ideas and statements that belong to one writer, but that you do not wish to quote. To paraphrase, restate the ideas in a passage in your own words. You may need to use common words that appeared in the original, but do not repeat striking words or unique phrases that can be recognized as the style of the original writer. Reference the source of this material. It is considered good style to name the original writer in your paraphrase (e.g., Eldon Craig argues that the hog-nosed snake is a newcomer to Manitoba prairies.).

- **Quotations:** Quote striking or powerful lines that would lose their impact if they were paraphrased. Take care to quote lines accurately, and ensure that you do not lose or change their meaning by taking them out of their original context. Make arguments in your own words, and support them with a quotation rather than using quotations to make key arguments. Name the speaker or writer you are quoting, enclose the quoted material in quotation marks, and reference the source of the quotation.

Plagiarism (Avoidance of): Adapted from Manitoba Education and Training, *Senior 3 English Language Arts: A Foundation for Implementation* (Winnipeg, MB: Manitoba Education and Training, 1999) 4-260.

A form such as the following can help students distinguish between material cited directly and their own paraphrases, summaries, and comments.

Form for Recording Information	
Author's name: (last) _____ (first) _____ Title of source: _____ Place of publication: _____ Publisher: _____ Year of publication: _____	
Summaries: Briefly note the main ideas of the whole text.	**Paraphrases:** Write important and supporting information in your own words. Record the page number(s).
Comments: Record your own responses to questions about what you read.	**Direct Quotations:** Record only passages that you are very likely to quote in your final article. Record the page number(s).

Proposals (See *Senior 3 ELA* 4-221)

Students may submit proposals for major group projects. Depending on the project, the proposal may include the following categories:

- Purpose
- Audience
- Outline
- Resources
- Team Members and Their Responsibilities
- Steps in Research
- Risk Factors and Plans for Addressing Them
- Form for Reporting
- Timelines
- Progress Reports
- Criteria for Success

Reading Scientific Information (See *SYSTH*, Chapter 12)

Chapter 12 of *SYSTH* presents strategies to help students acquire the skills they need to comprehend science texts and scientific information accessed from multimedia sources. Students use interactive and collaborative strategies to understand and learn the content.

Good readers begin by skimming and analyzing a text and providing themselves with a structural and conceptual framework into which new information might fit. They then read for detail, with three levels of comprehension: literal understanding, interpretation, and application.

Students will be able to become better readers if teachers divide reading exercises into three sections:

- **Prereading:** Prereading strategies are intended to establish a purpose or focus, to activate prior knowledge, to emphasize new terms and vocabulary, or to provide familiarity with text features.
- **During-reading:** During-reading strategies are meant to promote collaboration, to help students recognize text structure, or to promote questioning and paraphrasing.
- **Post-reading:** Post-reading strategies are designed to teach students how to apply content by increasing comprehension and recall, connecting details to the big picture, making new connections, applying ideas, and transferring knowledge.

Various strategies are developed in *SYSTH*.

Surveys and Questionnaires (See *Senior 3 ELA* 4-226, Appendix C)

Students may submit a proposal for a survey or questionnaire in which they describe

- type of information they wish to gather
- type of survey they intend to implement
- target group and plan for random sampling
- how and when they will pilot the survey
- how and when they will administer the survey
- how they will analyze, interpret, and report data

Surveys are a useful tool for collecting information, particularly on timely, community-based inquiry topics. The following should be considered when designing and conducting a survey:

- Purpose
- Appropriateness
- Practicality
- Clarity
- Reliability
- Target Group
- Sample
- Random Selection

Types of surveys include fixed response questions (multiple choice, agree-disagree, checklists), rating scales (numerical, categorical), open-ended, and phenomenological (extended interview). Students may choose to pilot their survey before administering it.

WebQuest

A WebQuest is an inquiry-oriented activity in which most or all of the information used by learners is drawn from the Web. WebQuests are designed to make efficient use of time, to focus on using information rather than looking for it, and to support learners' thinking at the levels of analysis, synthesis, and evaluation.

A basic WebQuest design includes an introduction, a task, a set of information sources needed to complete the task (not all sources need to be web-based), a description of the process in clear steps, guidance (such as guiding questions, timelines, Concept Maps), and a conclusion. WebQuest design information, templates, and samples may be obtained at *The WebQuest Page:* <http://webquest.sdsu.edu/>

The following flow chart shows possible stages involved in the development of a WebQuest.

The WebQuest Design Process

0. Do you really need to create a WebQuest from scratch?
Read **http://webquest.sdsu.edu/adapting/index.html**
to learn about adapting existing WebQuests.

Select a Topic Appropriate for WebQuests

1. Read:
http://webquest.sdsu.edu/project-selection.html
Pick a topic that requires understanding, uses the web well, fits curriculum standards, and has been difficult to teach well.

Select a Design

2. Study:
http://webquest.sdsu.edu/designpatterns/all.htm
Select a design that will fit your topic. Download the student and teacher templates for the design you chose. Open them up in your favorite web editor (Dreamweaver, Composer, FrontPage, etc.).

3. Write up the **Task** in the student template and the **Standards** and **Learners** in the teacher template.

Describe How Learners Will Be Evaluated

4. Read:
http://webquest.sdsu.edu/rubrics/weblessons.htm
and
http://webquest.sdsu.edu/rubrics/rubrics.html

Complete the **Evaluation** section in the student template. Duplicate it in the teacher template and add any extra information needed by teachers.

Design the Process

5. Read:
http://webquest.sdsu.edu/searching/fournets.htm
and
http://webquest.sdsu.edu/searching/specialized.html

Flesh out the **Process** section by finding a focused set of resources to provide the information needed by learners.

If you have any doubts about the legitimacy of a site, check it out with Fagan's URLInfo tool.
http://www.faganfinder.com/urlinfo/

Polish & Prettify

Scaffold where needed with Process Guides.
http://webquest.sdsu.edu/processguides/

Check yourself:
http://webquest.sdsu.edu/processchecker.html

6. Complete the **Introduction, Conclusion** and **Credits** section and all other parts of the teacher template. Add graphics where appropriate.

Read:
http://webquest.sdsu.edu/finepoints/

Have someone else evaluate your draft:
http://webquest.sdsu.edu/webquestrubric.html

The process isn't always as linear as this, of course. As you work your way through the steps, you may need to go back and modify the work done in previous steps. By the time you get to the bottom, you're done! The most difficult part is choosing a design and task. The most time-consuming part is designing the process.