Appendix 9: Assessment

For the purpose of this curriculum, assessment is the systematic process of gathering information about what a student knows, is able to do, and is currently *learning to do*. Science education today, therefore, demands a broad range and variety of assessment tools to gauge student learning. An inclusive classroom will encourage, whenever possible, assessment opportunities that provide *all students* with the chance to demonstrate what they know *most of the time*.

This appendix provides an overview of various assessment perspectives intended to promote fair assessment and evaluation and increase students' role and responsibility in their own ongoing assessment. Some actual assessment instruments that are proving to be effective in today's classrooms are also included.

Teachers are encouraged to review the *Senior Years Science Teachers' Handbook* (see *SYSTH*, Chapter 15: Assessing and Evaluating Science Learning). Further information is also provided in *Senior 3 English Language Arts: A Foundation for Implementation* (Manitoba Education and Training), abbreviated as *Senior 3 ELA* on the following pages.

Concept Relationship Frame (See *SYSTH* 11.20, 11.25, 11.35)

This differentiated instruction technique is designed to help students examine particular, detailed associations between two concepts (i.e., cause/effect, problem/solution, either/or, compare/contrast). The aim is to avoid superficial analysis by probing for deeper associations. Chapter 11: Developing Science Concepts Using Graphic Displays in *SYSTH* demonstrates how the Concept Relationship Frame can be used effectively.

Developing Assessment Rubrics in Science (See Appendix 10)

Appendix 10 outlines various ways in which students can be engaged with their teachers in the development of assessment rubrics. It addresses questions such as the following:

- What are assessment rubrics?
- Why do teachers use assessment rubrics?
- How can assessment rubrics enhance instruction?
- What are some sources of rubrics? Sources include classroom-developed, teacher-developed, and externally developed rubrics.

Journal Writing and Assessment (See *SYSTH* 13.21)

Journal writing is a *writing to learn* strategy that engenders mixed feelings among students. Part of the "uncertainty" comes from the inability to be passive about one's learning if one is asked to comment upon it, write carefully about it, or be reflective about it. Journals should have an *informal*, familiar tone but should not be quaint or dismissive. Journal entries can be simple and short, vary in frequency, and be structured to a particular format or free-form. It is valuable to consider how best to use journal writing in the science classroom, but experience shows that overuse defeats the purposes of the journal. For instance, if journal writing has little or no assessment/evaluation potential toward a student's grade, or does not provide a means of obtaining teacher feedback, it is difficult to sustain a successful experience.

Establishing a dialogue with students is an important element of formative assessment. Teachers may respond to students' journal entries, extending student thinking through comments and questions. In assessing journal entries, teachers may look for different interpretations and consideration of different perspectives, analyses, and growth.

Laboratory Report Assessment (See Appendix 11)

The Lab Report Assessment rubric is designed for both self-assessment and teacher assessment, and includes criteria such as the following:

- Formulates Testable Questions
- Formulates a Prediction and/or Hypothesis
- Creates a Plan
- Conducts a Fair Test and Records Observations
- Interprets and Evaluates Results
- Draws a Conclusion
- Makes Connections

Observation Checklist: Scientific Inquiry—Conducting a Fair Test (See Appendix 11)

This rubric is designed with five performance criteria, and can be used for an entire class list. The emphasis is on gathering information over time through observation. The criteria include the following:

- Demonstrating Safe Work Habits
- Ensuring Accuracy and Reliability
- Observing and Recording
- Following a Plan
- Showing Evidence of Perseverance and/or Confidence

Peer Assessment (See *Senior 3 ELA* 4-307)

Peer conferences could be organized to allow peers to act as problem solvers who offer concrete suggestions. The teacher may choose to provide students with questions and prompts. For instance, if students are editing a research paper, the peer assessment may include the following questions:

- Does the text contain enough information?
  - Pose questions that are not answered.
  - Mark passages that require more information.
- Is the text well organized?
  - Use arrows to show suggested reordering of paragraphs.
  - Mark places where a transition is required.
- Is the text clear?
  - Mark passages that are clear.
  - Mark words or phrases that need to be explained or defined.
  - Mark passages that need charts, graphs, diagrams, or examples.
- Is the information communicated in an interesting way?
  - Mark the least and most interesting sections.
- Are the sources referenced?
  - Mark un-referenced information.
  - Suggest other sources that may be used.

Performance Assessment

Performance assessment may take the form of

- demonstrating a lab technique (e.g., lighting a Bunsen burner, using a balance, focusing a microscope)
- demonstrating a safety procedure
- interpreting Workplace Hazardous Materials Information System (WHMIS) labels
- identifying an unknown

Portfolios (See *Senior 3 ELA* 4-180)

Portfolio items that allow students to demonstrate attainment of specific learning outcomes include

- inquiry logs
- project proposals
- webs and maps
- samples of notes
- reports on primary research
- reflective pieces

Reading Scientific Information (Concept Map Evaluation) (See *SYSTH* 12.15 to 12.19)

Chapter 12: Reading Scientific Information of *SYSTH* suggests techniques for comprehending science texts. It includes examples of how students could take notes from text in the manner of a detailed Concept Map organizer (see 12.16) and how this strategy can connect to *reading for meaning*. Once teachers have effectively modelled the techniques and students have had ample time to practise with scientific reading skills and note-taking, some criteria can be established that can be used in evaluation (see 12.19).

References

Students hand in a preliminary list of references as part of their proposal for a research paper.

Rubric for Assessment of Class Presentation (See Appendix 11)

This rubric is designed with four performance levels, and includes assessment criteria such as the following:

- Content
- Interest and Enthusiasm
- Clarity and Organization of Materials
- Use of Visual Aids

Rubric for Assessment of Research Project (See Appendix 11)

This rubric is designed with four performance levels, and includes criteria such as the following:

- Source of Information
- Information Collected
- Organization of Material
- Presentation of Material

Rubric for Assessment of Scientific Inquiry (See Appendix 11)

This rubric is designed for guidance of student assessment in relation to the performance of *scientific inquiry tasks.* The rubric is not intended to be comprehensive, but seeks to provide some project-management parameters for teachers who are observing their students' initial attempts at sophisticated investigation work.

The rubric is designed around four levels of competency, as continua, and includes criteria in the following areas:

- Development of a Position Statement (Proto-Abstract)
- Objective/Purpose/Testable Question
- Procedure (design of the investigation)
- Data Collection
- Analysis and Interpretation of Results
- Application/Discussion of Scientific Results and Concepts
- Independence Factors (measuring degree of reliance upon outside assistance)

Self-Assessment

Self-assessment by students is integral to the overall assessment of learning. To assess their own work, however, students require some detailed advance knowledge (e.g., criteria) of what the expectations are. More advanced learners in this self-reflection process can then participate in setting criteria with their teacher(s). Teachers are encouraged to model self-assessment before expecting students to assess themselves.

Word Cycle (See *SYSTH* 10.6 to 10.8, 10.21)

A Word Cycle is considered a Level 1 strategy in building a scientific vocabulary (see *SYSTH*, Chapter 10: Building a Scientific Vocabulary). The value in using a Word Cycle comes from taking a broad concept such as an ecosystem, providing a list of terms that could be related to that concept, and then asking students to link these words coherently. Students then learn how terminologies are related, broaden the meaning of terms, and promote collaboration. Teachers are encouraged to use Word Cycle activities with their students in a cooperative manner (e.g., pairings).

NOTES