PLANNING FOR INSTRUCTION

An Integrated Approach

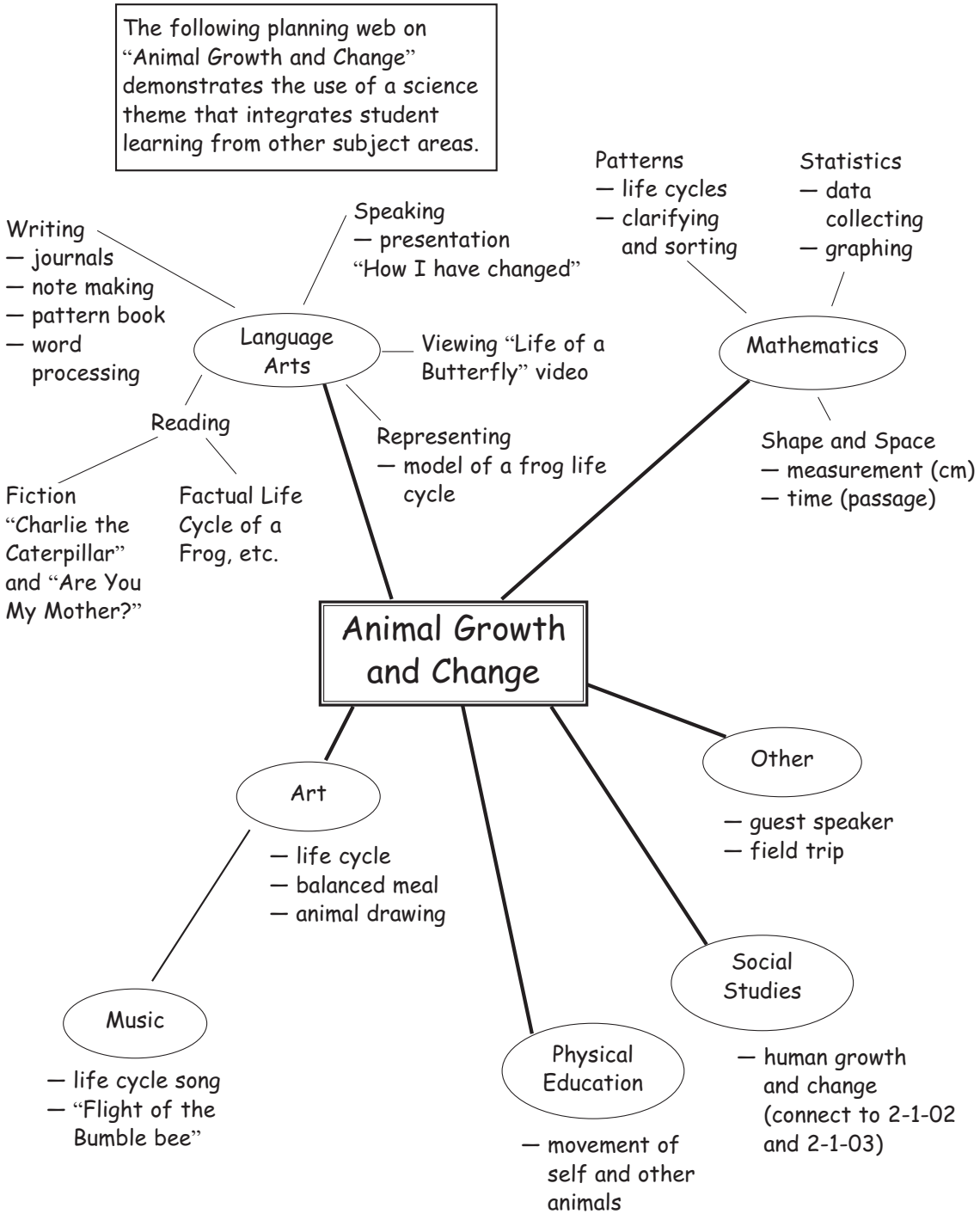
Effective science learning does not happen in isolation. Early Years students learn best by making connections within and among the different subject areas. Students need to understand the inter-relationships among the science outcomes within a grade, among grades, and with the every-day world. Throughout a unit of instruction, teachers should help students make these connections. Using an integrated approach allows teachers to make connections between the acquisition of skills and real world applications across the curriculum. Integration also helps teachers make the most efficient use of valuable teaching and learning time.

A thematic approach can be used to integrate the various subject areas. Using a science topic as a central focus can help students see their world through the eyes of a scientist. It can provide a meaningful context in which to apply and strengthen skills already acquired and to learn new skills in the different subject areas.

Science utilizes skills developed in other subject areas. Students need to be able to read and view science-related materials. They need to be able to listen in order to acquire information and benefit from the ideas of others. Speaking, writing, and representing are important so students can communicate their questions and understandings related to science. Students also need to be able to see patterns in the real world as well as in collected data. Measurement and number skills are important in making observations and in collecting and interpreting data. Students need skills in statistics in order to represent their data. Student learning is enhanced by the use of information technology in the science classroom both in acquiring information and communicating results.

To assist with integration, references to *Kindergarten to Grade 4 Mathematics: A Foundation for Implementation, Kindergarten to Grade 4 English Language Arts: A Foundation for Implementation,* and *Technology as a Foundation Skill Area: A Journey Toward Information Technology Literacy* have been made. Ideas for links to other areas such as art, music, Native studies, and social studies have been included. For general information on curricular integration, refer to *Curricular Connections: Elements of Integration in the Classroom* (1997). The following page contains a sample planning web for an integrated unit of instruction.

Web for a Science-Focussed Theme: An Integrated Approach



Planning Instructional Units

Kindergarten to Grade 4 Science: Manitoba Curriculum Framework of Outcomes (1999) prescribes general and specific student learning outcomes for Early Years students in Manitoba. The specific student learning outcomes identify what all students are expected to know and be able to do by the end of each grade.

As noted in *Senior 2 English Language Arts: A Foundation For Implementation (1998)* (hereafter referred to as *S2 ELA*), teachers play an enormous role in facilitating student growth. They determine the organization, pace, and focus of instruction. Effective teachers keep instruction centred on student learning outcomes and maintain high expectations for instruction and assessment. They differentiate instruction and provide developmentally appropriate learning experiences and opportunities for all students to achieve the learning outcomes.

Creating balanced, integrated science programming is an individual and creative process. Many elements shape Early Years science programming including:

- the teaching style, resources, and strengths of each teacher
- the interests, ideas, and gifts students brings to the classroom
- the learning requirements of individual students
- the community, public events, and resources that provide science learning opportunities

Teachers need to recognize that there are many factors that have an influence on the direction and character of student learning and achievement. The following discussion adapted from *S2 ELA* suggests a number of points for consideration for teachers as they plan their units. These considerations are also relevant to Early Years science teachers.

> Learning outcomes are generally not taught separately or in isolation from each other. Almost all classroom learning experiences involve several learning outcomes. Focussing on the learning outcomes that they plan to assess, rather than all the learning outcomes involved in a learning experience, may help teachers to plan.
>
> Learning is recursive, and many of the learning outcomes need to be addressed repeatedly in different ways throughout the school year. As well as developing new scientific and technological skills, students need to practise and refine those learned previously.
>
> General and specific learning outcomes are end-of-the year outcomes for students. Teachers need to consider and plan for the series of instructional steps that will assist students in achieving all the prescribed learning outcomes by the end of the school year.
>
> Planning is ongoing throughout the year, informed by student interests and learning requirements that become evident through classroom assessment. (p. 3)

Planning Tools

To assist in planning for the implementation of the Kindergarten to Grade 4 science learning outcomes, several tools have been included in *Kindergarten to Grade 4 Science: A Foundation for Implementation*. Planning supports for Kindergarten to Grade 4 science include:

- ledger-size, **Grade-at-a Glance Charts** (Clusters 1—3 or 1—4), one for each grade, each of which lists student learning outcomes
- a three-page, **Overall Skills and Attitudes Chart** (Cluster 0), that provides an overview of student learning outcomes for all grades
- **Guidelines for Planning** that show a suggested sequence of steps for planning an instructional unit
- a **Planning Think-Aloud** that demonstrates the steps taken by a group of teachers as they create a sample science unit on plants
- an online, searchable database available on the Manitoba Education and Training website located at
  < http://www.edu.gov.mb.ca/metks4/curricul/k-s4curr/science/index/html >

Teachers should utilize the methods and supports that best suit their planning styles. Manitoba Education and Training's online workspace enables teachers to individualize their planning by electronically arranging student learning outcomes, and adding their own comments as they create their teaching units. The Grade-at-a Glance and the Overall Skills and Attitudes Charts will enable teachers to view the broad scope of student learning outcomes for each grade. These pull-out charts provide an excellent starting point for the planning of instructional units. The Guidelines for Planning and Planning Think-Aloud that follow are intended as suggestions only.

Guidelines for Planning

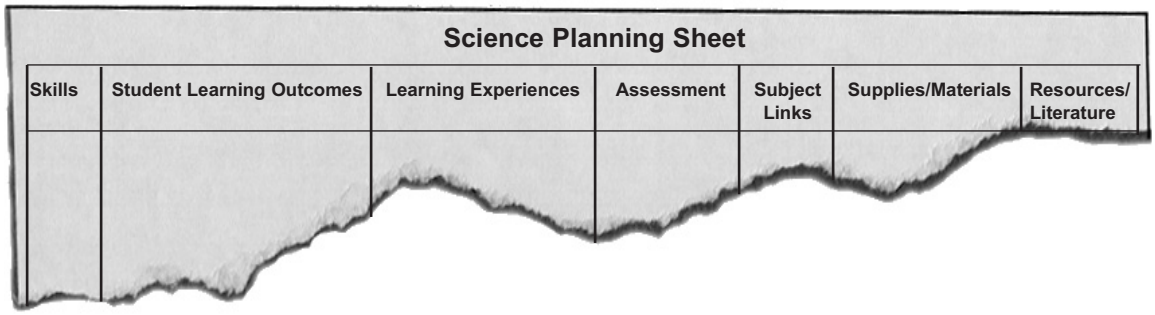
Review the Grade-at-a-Glance and Overall Skills and Attitudes charts to become familiar with the student learning outcomes and related skills and attitudes for a particular grade or grade grouping

Identify learning outcomes that logically fit together and could be used as a focus for study to meet students' learning requirements for that grade

Develop a mind-map to show the relationship among the outcomes by identifying concepts and sub-concepts and an overall order in which they can be addressed

Complete a science planning sheet, such as the one below

- list the student learning outcomes in the order that they will be addressed
- identify assessment strategies and tools to match the student learning outcomes (begin by considering those included in the Suggestions for Assessment column)
- list the associated learning experiences provided in the Suggestions for Instruction (add or delete as needed)
- identify skills and attitudes (Cluster 0) to be addressed
- build in links to other subject areas
- identify supplies, materials, and learning resources, (including literature) to support the learning experiences



Science Planning Sheet

Skills	Student Learning Outcomes	Learning Experiences	Assessment	Subject Links	Supplies/Materials	Resources/ Literature

Address and accommodate the variety of student needs and learning styles by considering

- differentiated instruction and developmental appropriateness
- multi-modal learning experiences that allow all students to use their strengths
- cooperative or collaborative strategies, grouping patterns, and social skills
- critical and creative thinking and metacognitive strategies
- multiple intelligences
- cultural inclusiveness

Plan with the Student Learning Outcomes in Mind!

Planning Think-Aloud

Grade 3: Plants

The following sample is intended to illustrate how the Guidelines for Planning may be used.

Review

As a team, we reviewed the Grade-at-a-Glance and Overall Skills and Attitudes charts to become familiar with the science knowledge, skills, and attitudes that students are expected to acquire and demonstrate by the end of Grade 3.

Identify

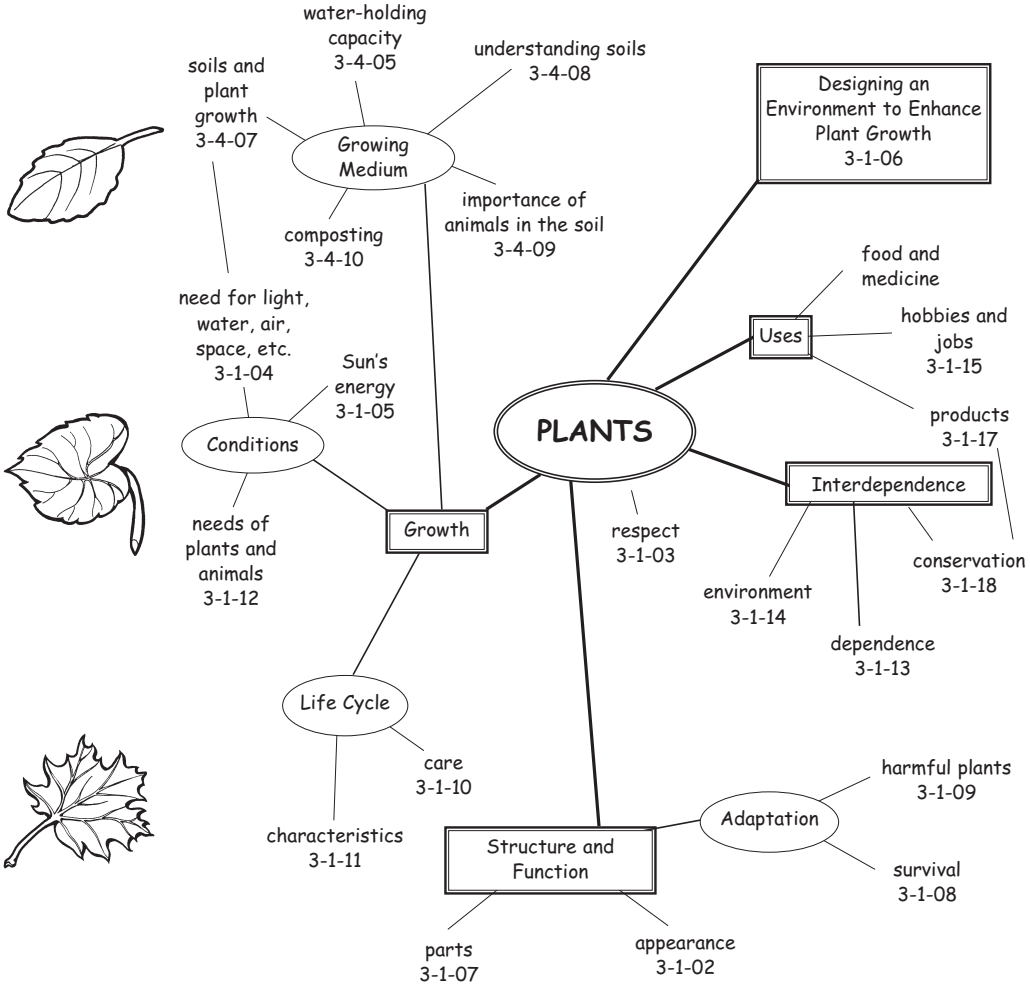
We decided to begin the year with a focus on plants. This decision was based on several factors: in September live plants are easily observable, composting can take place, and students are likely to bring to the class prior knowledge of plant growth and changes. We also determined that an understanding of the relationship between soil types and growth of plants was important. For these reasons we decided that our first instructional unit would address all of the outcomes from Cluster 1: Growth and Changes in Plants, as well as several from Cluster 4: Soils in the Environment.

Develop

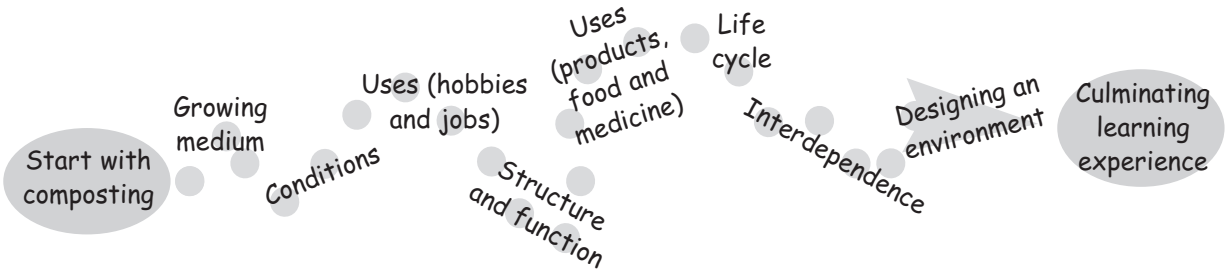
Once we had determined the learning outcomes we wished to address, we developed a mind-map to identify the concepts and sub-concepts that we would address through the learning outcomes. We made sure that all of the learning outcomes we wanted to cover were included on the mind-map.

Once the mind map was completed, we determined an overall order for how we wanted to approach the unit. This is identified in the Sequence of Topics. The first things we decided were how to begin and end the unit. We knew that the beginning of a new unit should be interesting to the students, motivating them to want to learn more about the topic. We identified composting as a good place to start, realizing that the soil produced could be used as a growing medium later in the unit. We chose the design process project as the culminating learning experience. This project provides students the opportunity to apply the things they learned throughout the unit in a practical, hands-on manner.

Sample Mind-Map for Plants



Sequence of Topics



Complete

Our next step was to complete a science planning sheet. We listed all of the specific learning outcomes in the order we wished to address them in the unit on plants. We retained the headings from our mind-map to help remind us of the major concepts. We consulted *Kindergarten to Grade 4 Science: A Foundation for Implementation* for ideas on how to assess student attainment of the learning outcomes, and suggested learning experiences that would help students achieve the outcomes. We also selected outcomes from Cluster 0: Overall Skills and Attitudes that could be addressed by these learning experiences. We left out learning experiences and strategies that did not fit with our approach to the unit and our students' needs and added in others. We verified that Cluster 0 learning outcomes were reflected in the experiences chosen. Finally, we made note of links to other subject areas and identified supplies/materials, and learning resources.

Address

After these initial planning steps, we reviewed our unit on plants to ensure that it would enable all of our students to achieve the prescribed learning outcomes. We considered:

- differentiated instruction and developmental appropriateness
- multi-modal learning experiences
- critical and creative thinking and metacognitive strategies
- multiple intelligences
- cultural inclusiveness

For example, we noted that we had included a variety of instructional approaches and activities, e.g., hands-on experiences, research, and real-life tasks. Students would therefore be able to represent what they learned in a variety of ways. What was missing from this section was the opportunity to identify prior knowledge. Students bring a great deal of knowledge as well as some misconceptions to the class. We knew it would be important to identify entry-level knowledge in order to plan for instruction. Students learn best when they can relate new knowledge to what they already know. We did not want our students to build on misconceptions. Additionally, our school also has many students from other countries and cultures, providing an opportunity to include non-local varieties of plants, where appropriate, within the instructional unit.

Science Planning Sheet — Grade 3: Plants

Skills	Student Learning Outcomes	Learning Experiences	Assessment	Subject Links	Supplies/ Materials	Learning Resources
	Structure and Function					
3-0-6c (classifying)	3-1-02 Observe, compare, and contrast the structure and appearance of several types of plants.	Page 3.2 Compare and Contrast Venn Comparison	Observation Checklist for Self-Assessment (p. 3.3)	Math PR-I.1.3 Art (p. 3.2)	Plant samples for centre, plant press for art cards, heavy paper	
3-0-2a (access information) 3-0-2b (review information)	3-1-07 Identify the basic parts of plants and describe their functions. Include: roots, stems, leaves, flowers, pistil, stamen, ovule, pollen, seeds, fruit.	Page 3.8 Plant Observations Plant Discovery: Stems Carry Nutrients, Leaves Give Off Oxygen Flower Power	Paper-and-Pencil Task: Plant Observations (p. 3.9)	ELA 1.1.2, 3.2.2 Math SP-I-1.2.3 TFS 2.1.1.	plant samples with all parts, plastic cups, food colouring, celery, flashlight	Plant parts CD-ROM, software package, "The Reason for a Flower" storybook
3-0-4a (carry out a plan) 3-0-5e (record observations)	3-1-08 Explain how different adaptations of plants help them survive in particular environments. 3-1-09 Identify plant adaptations that can be harmful to humans, and describe their effects.	Page 3.8 Weed Pull Plant Adaptation Research		Math SP-V.2.3, SP-II.2.1, SP-II.2.1 ELA 3.2.1, 3.3.2, 4.1.3;	Identify area to have students weed.	*Discover Agriculture Science Curriculum Activities* on plant adaptations.