



YSISTE

ASSESSMENT OF SCIENCE AND TECHNOLOGY ACHIEVEMENT PROJECT (ASAP)

Science and Technology Exemplars

Grade 3: Life Systems – Growth and Changes in Plants

Exemplar Task (3LSPT01/Feb 2002)

Up the Beanstalk!



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Preface

This task is one of a series developed by the Assessment of Science and Technology Achievement Project (ASAP) which is being used for the ASAP Science and Technology Exemplars Project.

This task is organised in three parts:

- A. Task Overview
- B. Student task sheet – designed to be photocopied for the students
- C. Teacher Information – providing essential information relating specifically to this task

For further information, contact the ASAP office at 416-736-5006 or email: asap@edu.yorku.ca

Task Overview

Description of the Task:



This is a culminating activity designed to assess a cluster of expectations for this grade and strand. Students should have been taught the concepts and skills required to perform this task prior to attempting it.

Students will be required to plan and carry out an inquiry related to the growth of a bean plant. Their conclusions should state how different conditions affect plant growth.



Materials and Equipment Recommended:

bean seeds (2 per student)
potting soil
sand
peat moss
soil from school yard
soil from students' yard
containers to hold soil : e.g., yogurt cups, plastic cups, polystyrene cups
plastic bags that can be sealed
paper towels
water
student journal or log book



Suggested Timeline:

planning – 2 X 30 minutes
recording observations – 10 minutes per day
reporting – 2 X 45 minutes



Suggested Grouping:

Individual

Safety Considerations:



- Plants and Soil in the Classroom

It is important that students inform appropriate school staff of any allergies they may have, and take those allergies into consideration when handling plants and soil. (In the case of younger students, parents and guardians should ensure that appropriate school staff are informed of any allergies.)

- Never allow students to put plants or soils in their **mouths**.
- **Wash hands** after touching plants (teachers and students)
- Use the proper protective equipment, including gloves, goggles, and aprons, if **cutting, digging, or raking** tools are to be used.
- Encourage **substituting plastic for glassware** containers to avoid breakage.
- Do not handle **micro-organisms/compost**.
- Do not **eat** any parts of plants
- Do not rub **sap or plant juices** on the eyes, mucous membranes, skin, or an open wound;
- **Washing hands** before and after handling plants, animals and soils.

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Student Task Sheets

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Up the Beanstalk!

Jack found some bean seeds. He wanted to find out the best way to grow them into strong bean plants. He wanted to have beans to eat and more seeds to grow.

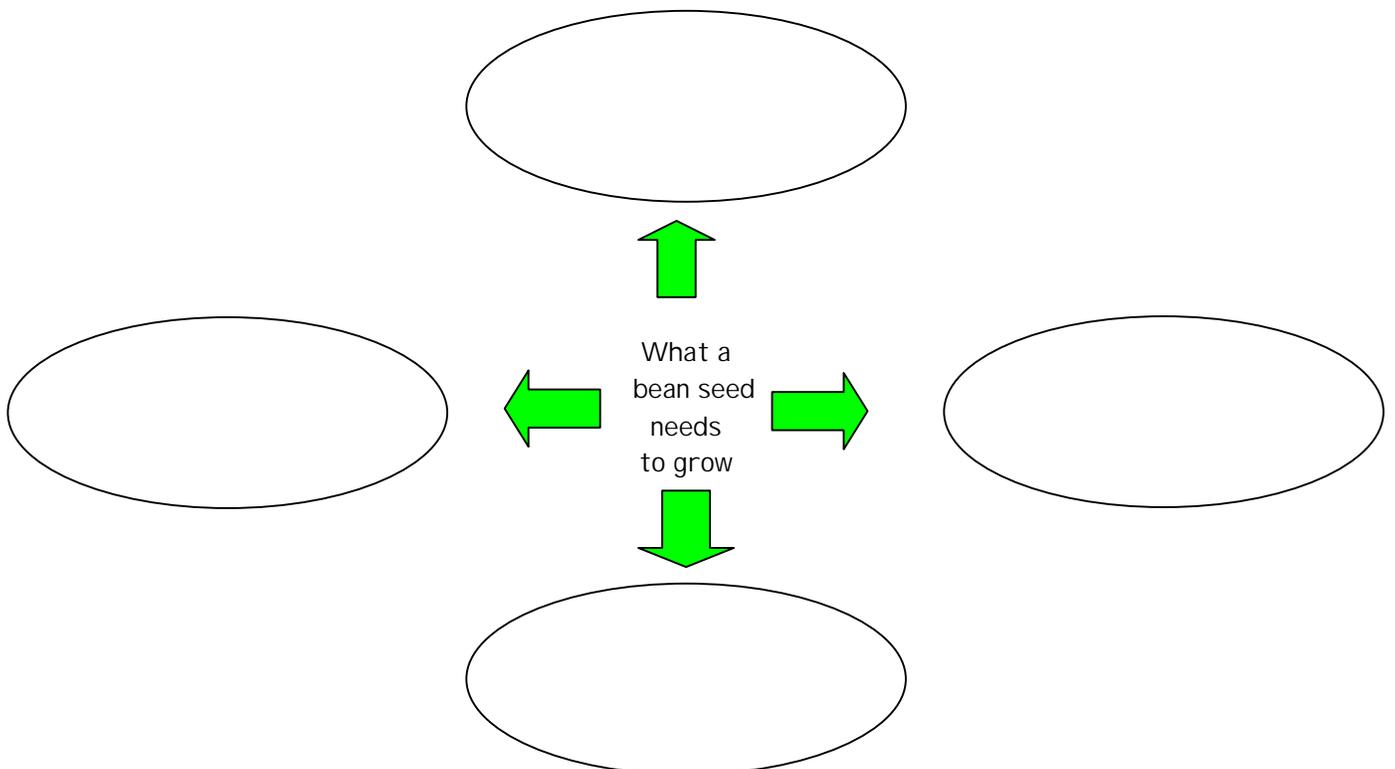
Help Jack grow strong bean plants by conducting a fair test to find out what things help a plant to grow.

Part A: Conducting a Fair Test

1. In your own words, what have you been asked to find out?

My prediction:

2. What things do you think the bean seeds will need to grow?



3. Which of these things will you choose as a variable in your fair test?

4. Which of these things will you keep constant in the testing?

Explain why it is important to keep these constant in a fair test.

My plan:

5. Tell how you will conduct your fair test.

Results:

6. Draw the seeds as they grow and tell what you see happening to them.

1. DAY _____

2. DAY _____

3. DAY _____

4. DAY _____

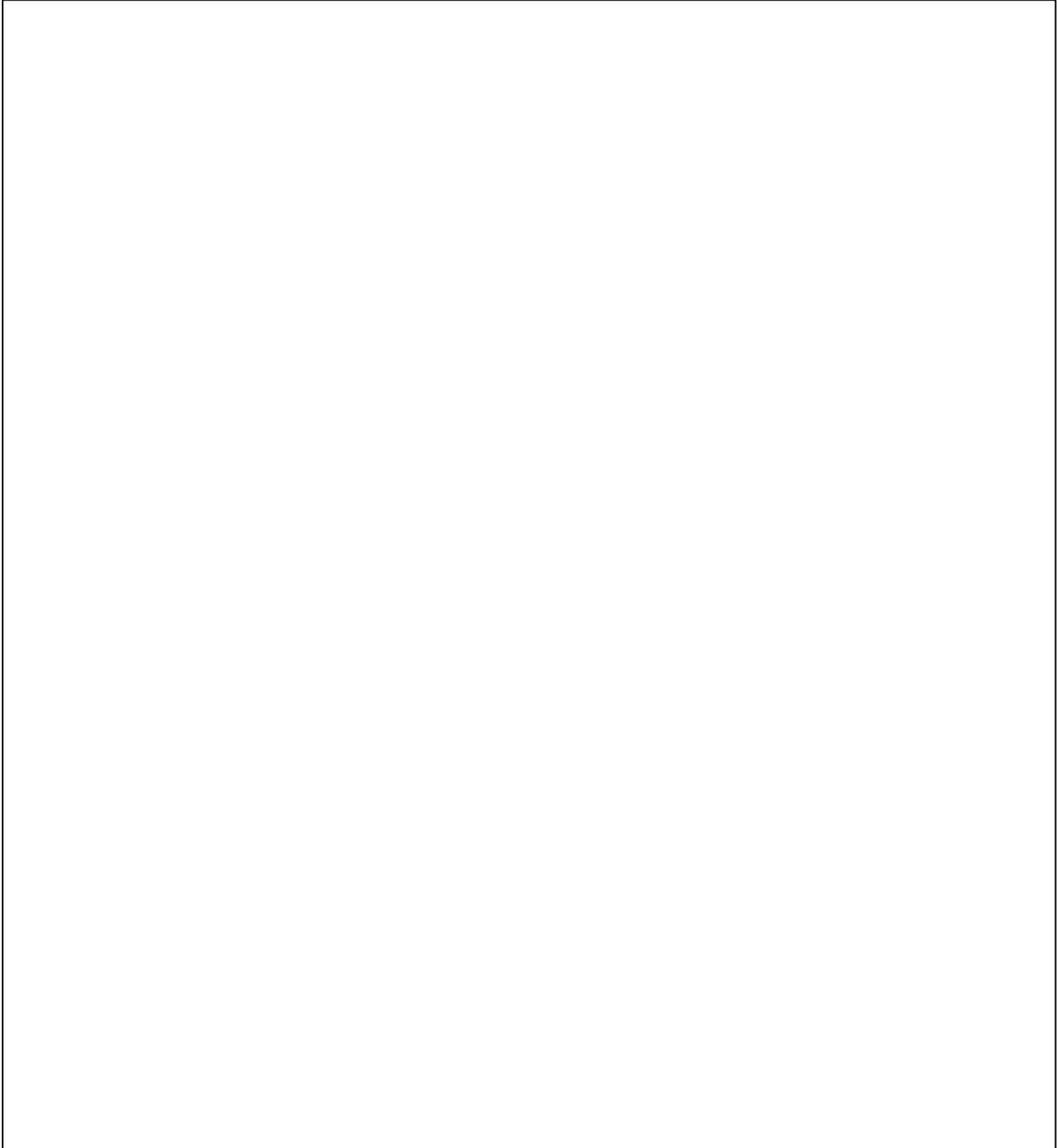
5. DAY _____

6. DAY _____

7. DAY _____

8. DAY _____

7. Carefully remove your growing bean seeds from their containers and surrounding soil. Make a labeled drawing of the complete plant that grew the most in the space below.

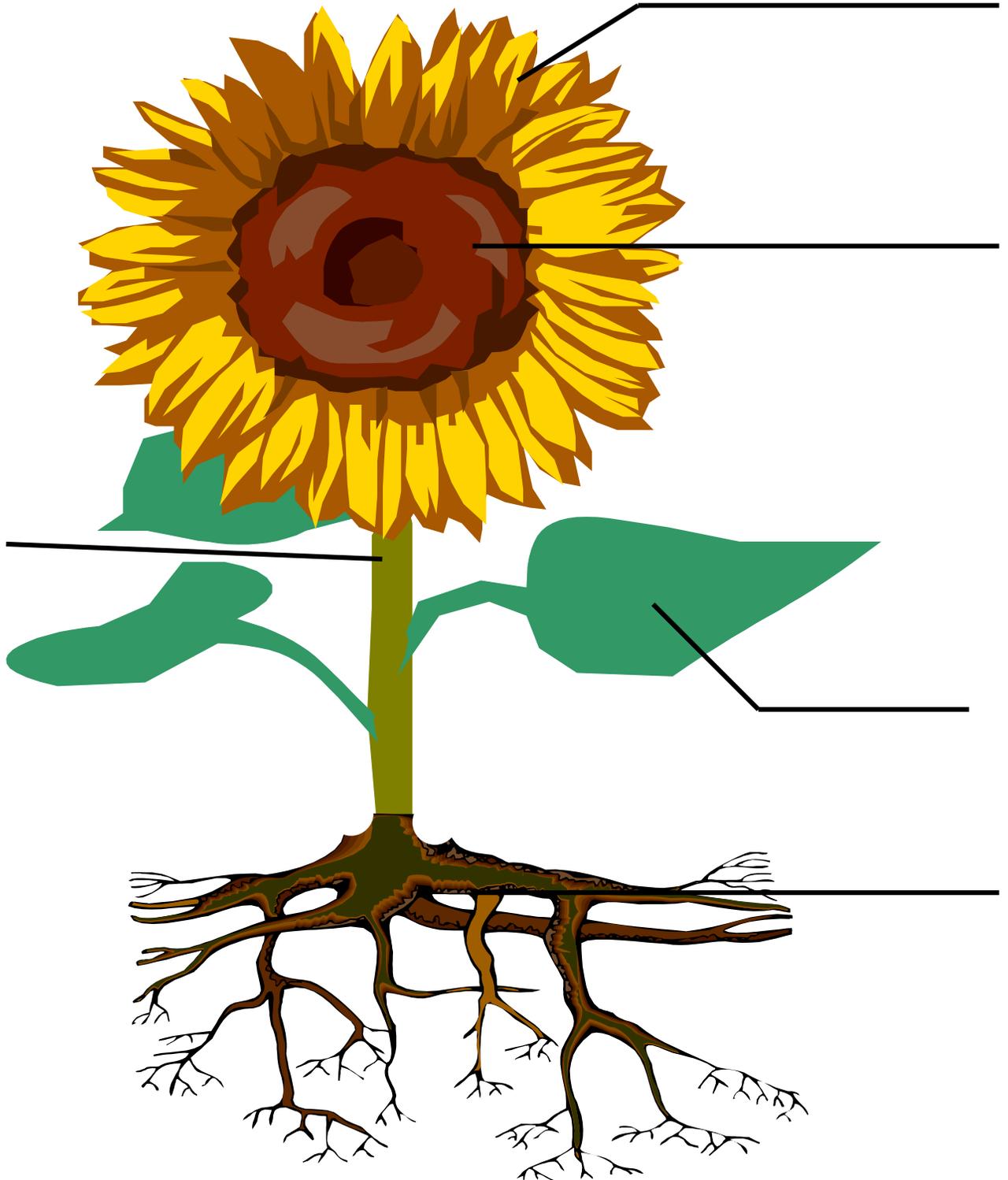
A large, empty rectangular box with a thin black border, intended for a student to draw a bean plant. The box is centered on the page and occupies most of the lower half of the page.

Findings:

8. Explain what helps seeds to grow using your results in the fair test.

Part B: Sharing Your Understanding

9. Look at this plant. Label the main parts of the plant.



10. Draw a line from each part of the plant to its function.

Root

Carries water to the parts of the plant

Stem

Helps the plant make food from sunlight

Flower

Gets nutrients and water from the soil

Leaf

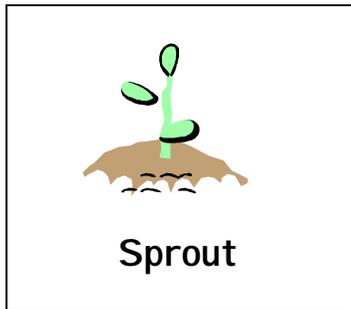
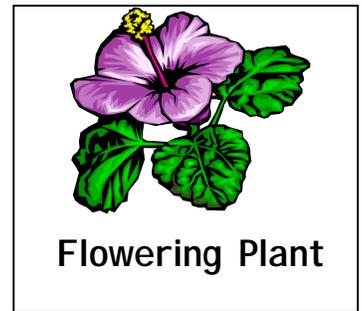
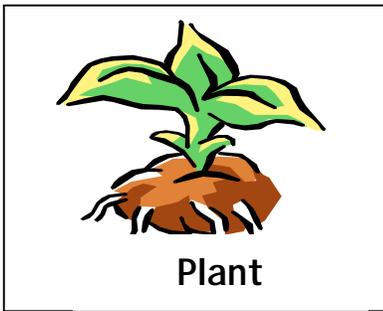
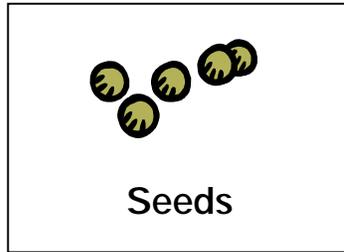
Protects the plant from rain

Produces seeds

11. In the chart below, suggest two human uses for different parts of plants.

	Root	Stem	Leaf	Flower
Human Uses	1.	1.	1.	1.
	2.	2.	2.	2.

12. Draw arrows below to connect the boxes showing the life cycle of a plant.



13. Explain how the life cycle of a plant that grows from a bulb would be different from this plant

14. Tell how you can care for plants to make them grow well.

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A Fair Test

The second goal of Science and Technology Education encourages students to develop the skills, strategies, and habits of mind for scientific inquiry and technological design. As students investigate solutions to problems through an inquiry approach, it is important that they accommodate the conditions of a fair test as follows:

- One variable at a time is selected for testing
- Only the chosen variable is altered
- As many variables as possible are kept constant in the testing
- All tests are measured in the same way
- Tests are repeated to determine the validity of the test results

Note: A variable is something which can be changed and which may affect results.

This task addresses the following cluster of expectations. Expectations assessed by the rubric are highlighted in bold.



Understanding Basic Concepts

- **identify the major parts of plants (e.g., seeds, stem, pistil) and describe their basic functions**
- **describe, using their observations, the changes that plants undergo in a complete life cycle (e.g., from the germination of seed to the production of flowers or fruit)**
- **compare the life cycles of different kinds of plants (e.g., plants that grow from bulbs or from seeds)**



Developing Skills of Inquiry, Design and Communication

- **design and conduct a hands-on inquiry into seed germination or plant growth**
- **ask questions about and identify some needs of plants, and explore possible answers to these questions and ways of meeting these needs (e.g., predict how long a particular plant could go without water before its leaves started to droop)**
- **plan investigations to answer some of these questions or find ways of meeting the needs, and explain the steps involved**
- **use appropriate vocabulary in describing their investigations, explorations, and observations (e.g., *stem, pistil, stamen, flower*)**
- **record relevant observations, findings, and measurement, using written language, drawings, charts, and graphs (e.g., produce a series of drawings to show a plant at different stages of development)**
- **communicate the procedures and results of investigations for specific purposes and to specific audiences, using drawings, demonstrations, simple media works and oral and written descriptions (e.g., make a graph that shows the number and kinds of trees found in different yards; design and construct a terrarium or garden that reproduces the conditions that they found to be requirements of specific plants)**



Relating Science and Technology to the World Outside the School

- **identify the parts that are used to produce specific products for humans (e.g., sugar, dyes, paper, cloth, lumber), and describe the steps in production.**

Prior Knowledge Required:



Before attempting this task students should have been taught the following:

- the major parts of plants and their function
- the life cycles of plants with seeds and bulbs
- the uses by humans of the various parts of a plant
- how changes in the environment (e.g., moisture, soil, sunlight) affect the growth of plants
- how to care for plants properly



Students should be familiar with the following science and technology terminology:

Seed, stem, flower, leaf, root



Prior Skills Required:

Before attempting this task students should have experience of the following:

- planning investigations as a fair test
- carrying out investigations
- recording observations clearly using words and drawings
- drawing conclusions based on findings



Suggested Introductory Activities:

The following activities are suggested to introduce this task to the students:

- review prior knowledge
- read task and clarify answers
- do predictions together – brainstorm ideas on chart paper
- as a class, discuss ways to test their predictions
- show materials



Cross-strand Links:

Every strand in the Science and Technology document has common set of expectations clustered under the title ***Developing Skills of Inquiry, Design and Communication***. This task is therefore appropriate to assess and evaluate these skills for every Grade 3 strand. This task can also be linked to Earth and Space Systems: Soils in the Environment. The specific expectations that can be addressed with this task are:

- describe using their observations, the various components within a sample of soil
- compare different ways in which plant roots grow through the soil
- identify living things found in the soil
- describe how the use of different soils affects the growth of indoor plants

Cross-curricular Links:



Links can be made to *The Ontario Curriculum Grades 1-8 Language Writing: Grade 3*. The expectations that can be addressed are:

- use visual material to reinforce a message
- select and correctly use the format suited to their purpose for writing
- print legibly and begin to use cursive writing

Links can also be made to *The Ontario Curriculum Grades 1-6 Social Studies Pioneer Life: Grade 3*. The expectations that could be addressed are as follows:

- explain how the pioneers used natural resources
- describe the influence of Aboriginal peoples and pioneers in the area of farming methods
- compare and contrast life in a pioneer settlement with that of their own community

Links can also be made to *Urban and Rural Communities: Grade 3*. The expectations that could be addressed are:

- demonstrate an understanding of the characteristics of rural communities
- describe the interaction between people and the environment
- describe ways in which they and their families use the natural environment



Reading and Writing Skills:

This task has been constructed to take into account the possible limited reading and writing skills of some students at this grade level. At the end of Grade Three students are expected to be able to write a sentence (see MET Writing Exemplars 1999). Depending on the achievement level of the children in the class and the time in the school year that this task is administered, teachers will need to take into account the diverse abilities in their classes. The task could be presented orally and evaluated through teacher/student conferences. Teachers could use the questions on the student task sheet to guide their conferences. Students could make oral presentations about their observations to the class. Their presentation could be based upon the questions outlined in the student task sheet. Grade 5/6 students could act as reading/writing buddies to read out questions and transcribe answers.



Considerations for Combined Grade Classes:

Appropriate strategies are as follows:

- Teach one grade while the other grade completes the task which does not require active teacher guidance
- Create separate learning centers for student investigation specific to each grade topic and strand. The methods of science and technology (inquiry and communication) would provide the whole class focus
- Introduce self-directed student activities connected to specific expectations
- Reorganize students into grade groupings for the purposes of teaching a given topic
- Teach specific grade expectations when part of the class is working with another teacher
- Make thematic connections by clustering the overall expectations around a unifying organizer such as “Form and Function”.

RUBRIC FOR GRADE 3: Up the Beanstalk

Knowledge/Skills	Level 1 The student:	Level 2 The student:	Level 3 The student:	Level 4 The student:
Understanding of basic concepts <ul style="list-style-type: none"> identify the major parts and functions of plants describe changes in a plant's life cycle 	<ul style="list-style-type: none"> gives simple explanation that shows limited understanding 	<ul style="list-style-type: none"> gives partial explanation that shows some understanding 	<ul style="list-style-type: none"> gives nearly complete explanation that shows good understanding 	<ul style="list-style-type: none"> gives complete explanation that shows detailed understanding
Inquiry skills <ul style="list-style-type: none"> investigates the necessary conditions for the growth of plants 	<ul style="list-style-type: none"> applies few of the required skills and strategies (e.g., asks questions, plans investigations, records observations, reports conclusions) 	<ul style="list-style-type: none"> applies some of the required skills and strategies (e.g., asks questions, plans investigations, records observations, reports conclusions) 	<ul style="list-style-type: none"> applies most of the required skills and strategies (e.g., asks questions, plans investigations, records observations, reports conclusions) 	<ul style="list-style-type: none"> applies all of the required skills and strategies (e.g., asks questions, plans investigations, records observations, reports conclusions)
Communication of required knowledge <ul style="list-style-type: none"> communicates results use of science and technology terminology 	<ul style="list-style-type: none"> communicates with limited clarity and precision rarely uses science and technology terms correctly 	<ul style="list-style-type: none"> communicates with some clarity and precision sometimes uses science and technology terms correctly 	<ul style="list-style-type: none"> communicates clearly and precisely through most of the task often uses science and technology terms correctly 	<ul style="list-style-type: none"> communicates clearly and precisely through all of the task always uses science and technology terms correctly
Relating science and technology to each other and the world outside the school <ul style="list-style-type: none"> describes human uses of plant parts 	<ul style="list-style-type: none"> describes human uses for plant parts with great difficulty and/or errors 	<ul style="list-style-type: none"> describes human uses for plant parts with some difficulty and/or errors 	<ul style="list-style-type: none"> describes human uses for plant parts with little difficulty and/or errors 	<ul style="list-style-type: none"> describes human uses for plant parts with no difficulty and/or errors