

2 Pest-Resistant Crops

The Ontario Curriculum, Grades 1–8: Science and Technology, 2007 (Revised)

Code	Specific Expectations
Relating Science and Technology to Society and the Environment	
1.2	assess the potential that our understanding of cells and cell processes has for both beneficial and harmful effects on human health and the environment, taking different perspectives into account

The Ontario Curriculum, Grades 1–8: Language, 2006 (Revised) — Media Literacy

Code	Specific Expectations	Teacher Prompts
1.3	Evaluate the effectiveness of the presentation and treatment of ideas, information, themes, opinions, issues, and/or experiences in media texts. <i>(e.g., students could compare this media text with others on the same topic – newspaper articles, television news stories, websites for GM crops, organic agricultural organizations, manufacturers of pesticides)</i>	Have you been convinced by the arguments presented in this media text? Have both points of view been presented fairly and accurately? What other points of view might be possible?
1.5	Demonstrate understanding that different media texts reflect different points of view and that some texts reflect multiple points of view. <i>(e.g., genetically engineered crops vs. organic crops)</i>	What different points of view are represented in the text? What are the arguments for each group?
2.2	Identify the conventions and techniques used in a variety of media forms and explain how they help convey meaning and influence or engage the audience. <i>(this video uses still shots, graphics, and animation)</i>	How does the animation of the DNA being replaced help your understanding of the process? What other techniques are used in this video to help explain difficult concepts?

Opening Scenario

Farming today faces heavy damage to corn crops caused by microscopic fungi and a variety of insect pests. Until recently, farmers often used chemical pesticides to control crop disease. But today, farmers and scientists are turning to eco-friendly ways to reduce the damage by developing pest-resistant crops through genetic engineering. This process involves altering the corn plant’s genetic makeup that controls its appearance and how it functions. Genetically engineered pest-resistant corn has an advantage over conventional corn plants, resulting in higher crop yields. But there are some concerns that these crops may reproduce with conventional plants and damage the balance of plants in the field.

Big Idea

- Cells are the basis of life.
- Healthy cells contribute to healthy organisms.
- Systems are interdependent.

In this Unit, the Big Ideas have been further developed to include the following:

- DNA technologies have revolutionized the study of genetics.
- Genetically modified crops have both beneficial and harmful effects on our environment.
- Our choice of products will have an impact on how farmers operate.

Viewing the Video

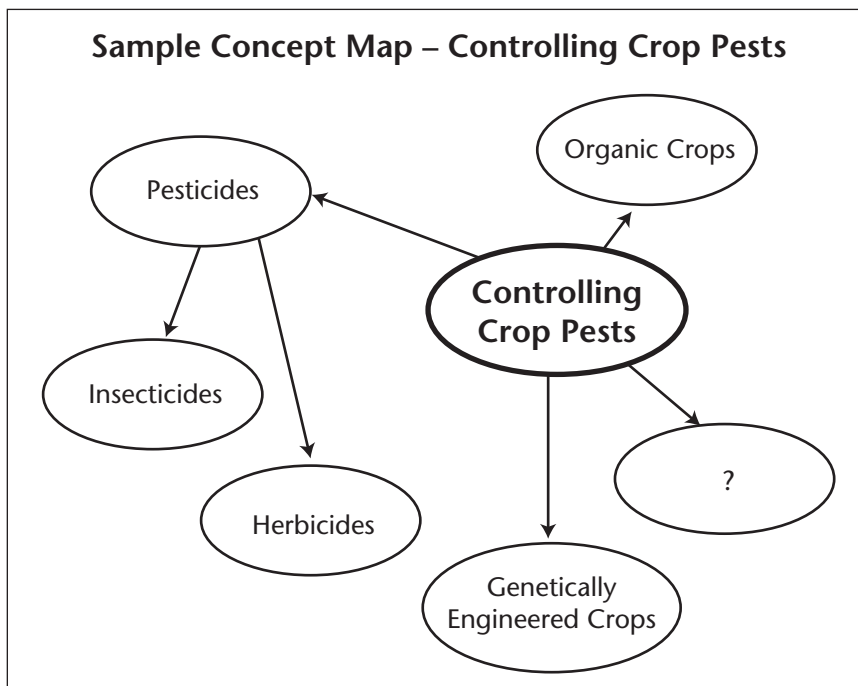
1. Before viewing the video, discuss the following with the students to help determine their prior knowledge about the subject content of the media text
 - Discuss with a partner the issues or concerns that face farmers as they grow their crops.
 - We are poisoning our soil, water and air with the chemical pesticides used to grow food crops. Why should this be a concern for us, if it results in higher food yields?
 - What is DNA and why is it important?
2. Help students focus on the video as they view it with the following questions:
 - Watch for the screen shot of the damage done to the ear of corn. What has happened to the corn? Imagine a farmer's frustration at seeing field after field of corn with that type of damage.
 - As you watch the scene of the airplane spreading pesticide, what are the repercussions of this type of spraying?
 - Listen for the simile to explain a DNA molecule (*like a string of letters*).
 - What is the metaphor used to describe genes? (*a sentence*)
 - Listen for one of the main differences between organic farming and genetically engineered crops (*organic farming does not use genetically engineered crops*).
3. Show the video **Pest-resistant Crops** to the students.
4. Hand out a copy of the video scripts provided in the appendices to students who may require ESL/ELD help.

Thinking and Investigation

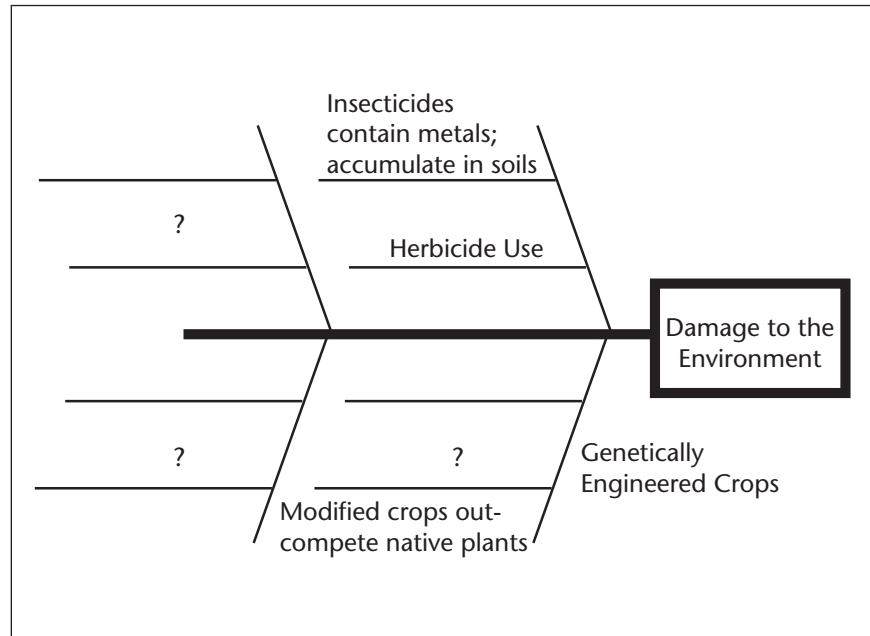
In this Investigation, students explore the science behind genetic engineering to make reasonable choices on its impact on society and the environment. The issue includes a discussion of pesticides (herbicides, insecticides and fungicides) that are widely used in agriculture. However, many of the chemicals used in pesticides pose threats to human health and the environment. There is evidence that pesticides play a role in human cancers. For example, exposure to insecticides in the home has been linked to the development of brain cancer and leukemia in children. Organic farming avoids the use of chemical pesticides to control plant disease and promotes the use of natural methods to encourage healthy crop production. Students finish the investigation and present their points of view by way of Role Playing.

Students should:

1. Identify what is the issue being discussed in the media introduction?
2. In Groups, brainstorm the different methods available to farmers to control agricultural pests.
3. Review a variety of library and Internet resources to complete a concept map.



- Complete a fishbone organizer to investigate the impacts that each method of pest control may have on society and the environment.



- Reach consensus in their group about the most appropriate method of pest control in crops according to a stakeholder perspective (e.g., farmer, pesticide manufacturer) and construct a chart to share the reasons and rationale for their decision.
- In their group, defend their point of view by way of Role Playing. (See Appendix 2)

Assessment and Evaluation

- During the Investigation, students will learn one or more of the following:
 - Fungicides are used to kill microscopic fungi that infect growing crops, fruit and stored seed.
 - Most fungicides are based on compounds containing metals such as copper and sometimes mercury.
 - Traces of fungicide chemicals are frequently found on fruit and vegetables and these can build up within the body with possible consequences to human health.
 - Herbicides kill plants and are often plant-specific.
 - Insecticides kill aphids, weevils, and other insect pests and are used on growing crops and stored grain. As well as killing pests, they often kill the insect predators which feed on them.
 - Genetically engineered crops have been developed to resist insect pests and plant disease.

- Planting organic crops is thought to be both eco-friendly and positive as a way to support human health and wellbeing.
2. Choose applicable Rubrics from Appendices 5-8 with the above to assess students' knowledge and skills.
 3. Use Appendix 10 for the Role Playing assessment.

Tell Me More – Going Organics

Literacy Strategy: Anticipation Guide

Background information

An Anticipation Guide helps students prepare for reading unfamiliar material, by allowing them to make connections to what they already know about a topic.

(See Sample Anticipation Guide on Appendix 12)

Before Reading

1. Introduce the topic by asking students what they think is meant by 'chemically produced', "genetically modified" and "organically grown" crops.
2. Tell students that they will be reading an article on farming techniques. To start, they will complete an "Anticipation Guide", in which they will read some statements about the topic and then decide whether they agree or disagree. Students will complete the chart individually and then share their thoughts in small groups. (It might be intimidating for some students to share their responses with the whole class for fear of 'being wrong').
3. Use the Numbered Heads strategy to have each group share their response, by completing this sentence: "Most of our group thought" (By using this statement, no one is singled out).
 - a) Numbered Heads: Number students in each group from 1-4, if there are only 3 in a group, #3 answers for both 3 and 4. The expectation is that all members of the group will be able to answer the question. Randomly call on #x from each group to respond for his/her group. Call on other numbers for further questions or discussion points.
4. Tally the responses for each question. If there is time, students who agree with particular statements could pair up with students who disagreed, to discuss their reasons for deciding as they did.

During Reading

1. Students will read 'Going Organic' individually. While reading, they will jot down sentences that relate to the issue beside each agree/disagree statement in the anticipation guide. They may need to read the text more than once.

**Literacy Strategy:
Anticipation Guide**
*(adapted from Think
Literacy: Cross-Curricular
Approaches Grades 7-12
(2003) (p. 20-23)*

After Reading

1. Students return to the statements and re-evaluate their opinions based on what they have discovered.
2. Students share in their groups which opinions were changed and why? Opinions must be backed with information from the text.
3. Students may also wish to explain how the anticipation guide helped them comprehend the article.

Differentiated learning Strategies – Anticipation Guide

ESL/ELD/Remedial

- Students can work in pairs to complete the anticipation guide if they have difficulty making connections with the topic.
- Have struggling students work in small groups, tallying and charting their responses before participating in a whole-class discussion.
- Read the statements from the BLM Anticipation Guide (Appendix 12) aloud.

Enrichment

- Encourage students to check out additional resources on the topic of Organic Farming. (see Appendix 16)
- Conduct a survey to see the variety of organic produce available in local food stores. Make your own price comparisons. How do your findings compare with the chart in the TMM?
- If possible, interview a local organic farmer. What are the challenges, successes of being an organic farmer?
- Interview some shoppers in a local food store who are buying organic produce. Why do they prefer organic? Interview shoppers who are not purchasing organic produce.
- Conduct research on non-perishable food products that are labelled 'organic'. How far have they travelled to the store shelf? Which is better – 'long-distance' organic or local but not organic? Why?