Project Guide

PROJECT Agriculture
Project-Based Learning and
Teaching Series

Everyday Chemistry

Why is it important to know what we eat?

ALBERTA milk

www.albertamilk.com/teacher-resources/

PROJECT Agriculture

The Canadian dairy industry is diverse, ranging from family farms to partnerships, and includes regular and organic dairy farms. Dairy cattle are an important feature of many Canadian and Alberta landscapes, and provide a range of products that many people use daily. The dairy industry also provides a range of jobs and occupations. Dairy farmers take their responsibilities seriously, including those for the animals in their care, as well as the impact their industry has on the environment. Milk and dairy products play an important role in a healthy and balanced diet.

The **PROJECT Agriculture** project-based learning resources encourage students to build understandings of the importance of agriculture to their daily lives, whether they live in rural or urban communities. These resources connect students to farmers across Alberta, through Alberta Milk's **Ask a Dairy Farmer** program.

Acknowledgements

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Everyday Chemistry

Why is it important to know what we eat?

Contents

Everyday Chemistry can be accessed on the Alberta Milk website in the **Programs and Resources for Teachers** section at **https://albertamilk.com/teacher-resources/**. Project components include:

- This Project Guide
- Student **Learning Sources**
- **Developing Competencies** with Students
- Assessment Support
- Teacher Fast Facts and Student Vocabulary Support
- Project Tools

Project activities are provided in four sections:

- Spark Inquiry and Curiosity
- Search and Investigate
- Design and Create
- Publish and Share

Each section provides a suggested sequence of activities. These activities should be selected and modified to best meet the needs of your students.

Everyday Chemistry

Why is it important to know what we eat?

Project Summary

Milk and dairy products are one of the most regulated and tested foods that are made and provided for sale in stores. The dairy industry is part of Canada's agricultural resources and the products that come from milk are manufactured into a wide range of products that many people use daily. Dairy processors add "value" to the agricultural products that Canadian farms produce by making them into different types of foods. Milk is a good example of a product that is produced and consumed locally.

Everyday Chemistry encourages students to explore the chemistry that is involved in making everyday foods and drinks. Students use milk and dairy products to perform experiments to investigate the properties of foods and drinks and what happens when they are mixed with other substances, heated and cooled.

Everyday Chemistry supports learning in **Grades 5 Science**, **Language Arts** and **Math** with connections to **Health and Life Skills** curricular areas and support for competencies, literacy and numeracy.

Highlights

In this project, students create a demonstration that shares the chemistry involved in making everyday foods or drinks.

1. Students identify favourite foods as well as the foods they think are most popular with Canadians. They identify the solids, liquids and mixtures involved in making them.
2. Students research the chemistry involved in recipes for favourite foods, including those that use heating, cooling and mixing. They consider the range of different food product choices provided by agriculture, and why it is important to know what is involved in the foods we eat.

   Competency-focused student resources focus on managing information, critical thinking, problem solving and communication

as well as literacy and numeracy strategies.

3. Students create a demonstration, showing the chemistry involved when one or more agricultural products are combined into a favourite food recipe. Note that students are not expected to create a cooking demonstration. They should focus on demonstrating the chemistry that is involved in a favourite recipe.

4. Students explore conclusions and perspectives through questions. Why is chemistry important to the production of different food products? How do we depend on chemical reactions on a daily basis? How do chemical reactions – mixing, heating, cooling – result in foods and drinks that are different than the original ingredients?

Project Stages and Timing

Everyday Chemistry provides a series of activities for the development of a project-based inquiry. Timeline options are suggestions only, as choices about activities will influence the time required for the project.

Project Stage	Activity Focus	Timing Options
Spark Inquiry and Curiosity	Activities in this stage ask students to explore the core question, what it means to them and how they want to focus their project. They select an inquiry question around which to develop their project.	4 to 5 class periods
Search and Investigate	Activities in this stage provide opportunities to search for and critically assess sources, organize information, consider perspectives and consult with experts to build understandings. They use **Learning Sources** handouts as trusted sources and **Developing Competencies** activity handouts to develop skills and understandings related to their projects.	7 to 10 class periods
Design and Create	Activities in this stage ask students to apply ideas and information to the creation of a project that shares their insights and learning.	5 to 7 class periods
Publish and Share	Activities in this stage suggest options to display and share completed projects.	3 to 5 class periods

Technology Integration

Digital creation tools can support learning in a project-based inquiry, including exploration, research, project creation and sharing. The following apps and online programs are referenced as options throughout the **PROJECT Agriculture** project-based series of learning and teaching resources.

Note that some online programs may require sign-in information, but do offer free versions. Some of these programs may also require varying degrees of support when used with students, while others may be more suitable for teacher use. Check for privacy settings in these apps and online programs if you do not want to make students' work public.

Google Classroom is a set of productivity tools that includes email, documents, and storage. Classroom was designed to save time, keep classes organized and improve communication. Classroom can be used to manage and share project work and sources.

Google Keep is a note-taking app that integrates with **Google Docs**. Notes, links, images, screenshots and videos can be shared. Plan and manage project tasks and keep research notes, vocabulary lists and trusted sources.

Google Drive provides online storage and creation of **Google Docs**, **Slides**, **Sheets** and **Forms**. It can be used to hold and share project work.

HyperDoc, found at **http://hyperdocs.co/**, uses interactive Google Docs or Slides that can be created as an instructional activity or lesson. Links to videos, trusted sources, class Padlet boards, Google Maps or other programs and apps can be embedded in a HyperDoc.

Padlet, found at **www.padlet.com**, is a virtual wall that allows sharing of any content (images, videos, documents, text) on a common topic.

Canva, found at **www.canva.com**, is a web-based graphic design tool and app that can be used to design posters, infographics, presentations, social media and photo collages. Students can sign up with a Google account or through an email address and password.

Pinterest, found at **www.pinterest.com**, is a social network that allows you to visually share, and discover, images or videos to your own or others' boards. **Padlet** and **Pinterest** boards can be set up to share project ideas and products with other teachers and classrooms.

Glogster, at **http://edu.glogster.com/**, is an online platform that allows you or your students to create interactive online posters, with text, images, graphics, audio and videos, and share them with others electronically. Glogster can be used to create profiles and timelines. Templates are provided on the website.

Apps such as **Evernote** and **OneNote** can be used to collect, organize and share sources of information and research, while online software such as **Skype** can enable conversations, face-to-face interviews and collaboration with other classrooms and community members.

Prezi, found at **www.prezi.com**, is a presentation tool that can be used as an alternative to traditional slide making programs such as **PowerPoint**. Instead of slides, Prezi makes use of one large canvas with pan and zoom capabilities. Students can use this tool to create and share projects and learning products.

MyHistro, found at **www.myhistro.com**, is an app that allows you to combine maps and timelines into one presentation, convert any public timeline into a personal pdf file or export into **Google Earth** format for offline storage.

Tiki-Toki, found at **www.tiki-toki.com**, is web-based software for creating interactive timelines that can be shared on the internet. The free account can be used to create a fully-functional timeline that can be shared. Tiki-Toki also provides desktop timeline software for Windows, Mac and Chromebooks that can be used to create timelines on local computers.

Read Write Think provides a simple timeline, found at **www.readwritethink.org/files/resources/interactives/timeline_2/**, that allows students to organize and create a timeline by date, time or event. Timelines can be saved as a file.

Wordle, accessed at **www.wordle.net**, and **Tagxedo**, accessed at **www.tagxedo.com**, provide online platforms that students can use to create word clouds.

Kahoot, at **www.getkahoot.com**, is a platform that allows students to create learning games from a series of multiple choice questions, with videos, images and diagrams. Students can create kahoots based on what they are learning about Canadian and Alberta history, geography, agriculture, natural resources and ways of life.

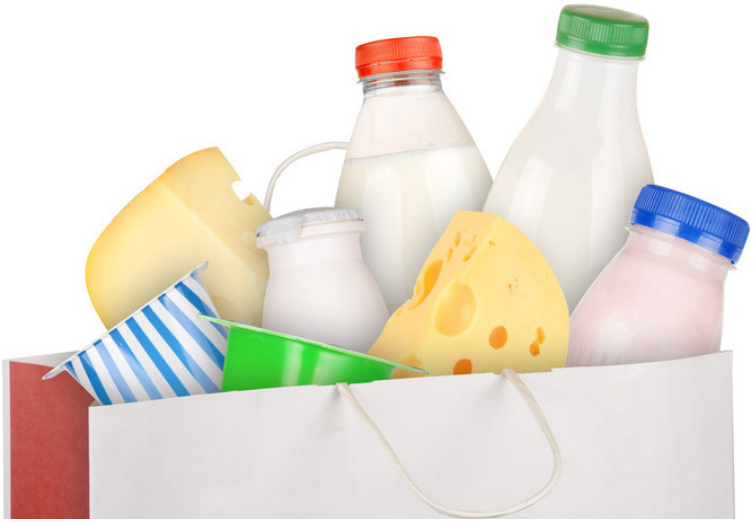
Snapchat, at **www.snapchat.com** offers a feature called **My Story**, created from video clips and pictures taken over time and made into a movie. Stories can be downloaded to students' camera rolls and shared via email with a class.

Sway, accessed at **www.sway.com**, is a digital storytelling app for the creation of interactive presentations, newsletters and personal stories. Sways can be shared with others through email and privacy settings can be customized.

Learning and Competencies

Everyday Chemistry provides opportunities for student to investigate, analyze and manage information to solve problems and explore the chemistry involved in everyday foods.

Students work collaboratively to develop ideas, explore sources, consult with community members and experts and communicate their findings and insights. Technology-based skills are also developed as students use digital tools to research, create and publicly share their projects.



The chart that follows focuses on competencies that integrate and apply across curricular areas.

Specific learning outcomes from the Alberta programs of study promote these competencies and the learning experiences in the **Everyday Chemistry** project.

Assessment tools can be used to reinforce competency development and assess student growth around Alberta curriculum-specific learning outcomes. These assessment tools include a:

- **Learning Checklist** that support assessment of specific learning outcomes and development of competencies
- **Project Check-In** chart that provides criteria statements that students can use to self-assess or monitor their learning
- **Rubric** that can be customized for student use as they develop their projects

Consult **Assessment Support for Everyday Chemistry** to find strategies and templates for assessment of learning and growth in student competencies.

The assessment checklists and templates include fillable text fields and checkboxes. These PDF documents can be saved and completed electronically.

Competency Focus	Curriculum Focus These project activities integrate across Alberta Social Studies, Language Arts and Math programs of study. **Click** the **@grade level subject area** on which you want to focus to go to a specific learning outcomes checklist.	Literacy and/or Numeracy Focus
Creativity and Innovation Students explore materials and processes to apply scientific knowledge to everyday human activities.	Outcomes in the following curricular areas are supported by project activities that ask students to explore new ideas, generate creative solutions and create original products to investigate the properties of everyday foods. **@Grade 5 Science** **@Grade 5 Language Arts**	Students focus on the ways that diverse modes and media can be used to represent and share new ideas and innovative approaches to challenges and issues. They use diverse modes and media to share and present. Students create and interpret different representations of quantitative information.
Critical Thinking Students use reasoning and develop or apply criteria to assess, conceptualize and synthesize ideas and information.	Outcomes in the following curricular areas are supported by project activities that ask students to interact with sources to generate questions, draw comparisons, identify similarities and differences, make inferences and assess chemical processes involved in making everyday foods. **@Grade 5 Science** **@Grade 5 Language Arts**	Students evaluate information from several sources to determine relevant and irrelevant information and consider the intent of a message or point of view. Students interpret, compare and use quantities commonly used in real-life situations. They interpret data from a graph or chart to make inferences and draw conclusions.
Manage Information Students use multiple literacies to access, share and create knowledge and build understandings.	Outcomes in the following curricular areas are supported by project activities that ask students to organize and synthesize information gathered from a variety of sources, including data sources. **@Grade 5 Science** **@Grade 5 Language Arts** **@Grade 5 Math**	Students determine a purpose and develop questions to focus an information search. They select, sort and analyze information from a variety of sources and identify gaps. They organize texts according to their purpose or intent. Students organize objects, ideas or information using a classification system.
Problem Solving Students select strategies and resources to apply the research process to a problem or question and develop original ideas, solutions and products.	Outcomes in the following curricular areas are supported by project activities that ask students to apply a research process and activate background knowledge, information or resources to build and apply understandings. **@Grade 5 Science** **@Grade 5 Language Arts**	Students make connections to background knowledge.

Competency Focus	Curriculum Focus These project activities integrate across Alberta Social Studies, Language Arts and Math programs of study. **Click** the **@grade level subject area** on which you want to focus to go to a specific learning outcomes checklist.	Literacy and/or Numeracy Focus
Communication Students share ideas through oral, written and non-verbal media. They participate in formal and informal exchanges with others, while considering their and others' context and experiences.	Outcomes in the following curricular areas are supported by project activities that ask students to use a variety of oral, written or visual modes of expression when exchanging ideas, considering perspectives and points of view and working with others to construct understandings. **@Grade 5 Science** **@Grade 5 Language Arts**	Students acquire subject and task-specific vocabulary related to their learning. Students present ideas or information in a logical and clear manner and begin to use effects to enhance communication.
Collaboration Students participate, exchange ideas and share responsibilities to complete their learning tasks.	Outcomes in the following curricular areas are supported by project activities that ask students to use language and text to build upon ideas or expand understandings with others, listen to and consider different perspectives and share roles and responsibilities to accomplish group tasks. **@Grade 5 Science** **@Grade 5 Language Arts**	Students apply oral and written language, tone and formality, as appropriate, when communicating with peers and adults.
Global and Cultural Citizenship Students acknowledge other perspectives and consider information to build understandings of food sources and supplies.	Outcomes in the following curricular areas are supported by project activities that ask students to consider a range of needs, perspectives or approaches and demonstrate respect for the agricultural activities that provide food. **@Grade 5 Language Arts**	Students are encouraged to apply literacy-related skills as part of participation as a citizen in communities.
Personal Growth and Well-being Students draw on their strengths and interests to identify a research focus. They reflect on their own learning.	Outcomes in the following curricular areas are supported by project activities that ask students to expand their interests and develop their own thinking and learning processes as they speak, listen, read, write, view and represent. **@Grade 5 Science** **@Grade 5 Language Arts**	Students reflect on their own learning and are encouraged to develop a sense of their strengths and challenges.

Project Activities

Everyday Chemistry provides opportunities for students to focus on the future needs and possibilities involved in agricultural jobs. **Why is it important to know what we eat?**

Spark Curiosity and Inquiry

Favourite Foods

Initiate the **Everyday Chemistry** project by asking students to share some of their favourite foods. Create a class list, identifying food combinations that are part of these favourites.

Connect to Prior Learning

Ask students to categorize food combinations as different types of mixtures, including two or more solids, a solid and a liquid or two or more liquids.

Connect to Experiences

Share stories about where and when students have opportunities to eat their favourite foods, including family meals, food with friends, restaurants or social events or activities.

Scaffold

Support students in this activity by providing your own examples of favourite foods and food combinations.

Challenge students to identify what they think Canadian's favourite foods include. Use sources and information such as those that follow to initiate a discussion with students about favourite foods.

Although there are no studies that identify specific favourite foods, the *Canadian Community Health Survey* (CCHS) found that Canadian's diet quality is poor.

- Thirty per cent of total calories are consumed from food and beverages not recommended in the *Eating Well with Canada's Food Guide* (EWCFG).
- Snacking makes up to 25 percent of the daily energy intake for children and 23 percent for adolescents. For these two groups, snacking contributed more calories than breakfast.

Customize this project by creating your own **Hyperdocs**, using the links from this guide and selecting those activities you think are most appropriate for your students.

Students can be asked to complete a **KWHL** Chart to explore their prior knowledge of solids, liquids and mixtures as well as what their favourite foods are made of. Find this graphic organizer in the **Everyday Chemistry Project Tools**.

This information and more is found in a **Nestle Canada** study called *New study examines eating habits of Canadians* (2016). **www.corporate.nestle.ca/en/media/pressreleases/new-study-examines-eating-habits-of-canadians**

Is there such a thing as "Canadian" foods? **Maclean's** identified the following foods as "iconic" Canadian foods:

- Butter tarts
- Beaver tails (pastry topped with sweet confections)
- Nanaimo bars
- Fish and brewis (A traditional Newfoundland dish, made of salt cod with hard tack – hard bread soaked overnight in water – and scrunchions – fried bits of salted pork fat)
- Figgy duff (Another Newfoundland dish, boiled pudding made of flour, butter, sugar, molasses and raisins)
- Canadian bacon
- Tourtière
- Saskatoon berry pie
- McCain's French fries
- Maple syrup
- Split pea soup

12 foods Canada has given the world (besides poutine) **(2012). Maclean's** online. **www.macleans.ca/society/life/12-foods-canada-has-given-the-world-besides-poutine/**

Students may require support with some of the statistics found in these background sources. Reinforce numeracy skills by providing time in the classroom to compare percentages to fractions and discuss when percentages represent increases or decreases.

- Most calories were consumed at home (88 per cent, 81 per cent and 83 percent for children, adolescents and adults respectively), however, for individuals who ate at locations other than home, on average 40 percent of daily calories (about 1000 Kcal/day) were consumed at these locations.

"A cross-Canada survey of about 3,000 adults by Leger Marketing was commissioned by Quebec-based celebrity chef Ricardo Larrivée learn how Canadians – from the west coast, Prairies, Ontario, Quebec and the Atlantic provinces – eat. One result showed that potatoes top the list for vegetables everywhere in Canada, followed by broccoli in Ontario.

The reality is potatoes are our roots. It means this is where we live. We're not an olive country. We're a milk and butter country. When we talk about PEI and the potatoes we grow there, it means something. When people ask me what would I bring if I had to go away somewhere, I say "butter and potatoes." With the butter you can flavour everything and with potatoes you can do hundreds of recipes, from dessert to savoury, from fancy to very country food. It's very versatile. Broccoli is funny. People love to say we don't like broccoli but actually we love it."

How Canadian families eat (2016). **The Star** online. **www.thestar.com/life/food_wine/2016/03/17/how-canadian-families-eat.html**

Favourite Food Graphs

Ask students to look for patterns in the favourite foods they identify. Create a graph that collates foods that are identified as favourites. Students can create their own "Class Favourite" bar graphs, using the **Grid Graph** found in the **Everyday Chemistry Project Tools**.

Recipes

Have students explain what they think a recipe is. A **recipe** is a set of directions with a list of ingredients for making or preparing food. A recipe can also refer to a formula or process to get to a desired result.

- Have you ever used a recipe? What have you made?
- What types of steps are involved in recipes? Encourage students to share ideas about how mixtures are involved in recipes.
- How do you think recipes involve chemistry? Why do you think it helps to know what happens when substances are combined when you are making a food or drink recipe?
- How do mixtures change foods in recipes that you know about? A **chemical change** happens when two or more substances are mixed together to form something new.

Scaffold

Support students in this activity by sharing examples of different, and favourite, recipes that you use. Some of your recipes could be shared on a **Padlet** board and then displayed with an interactive whiteboard. Students can be encouraged to add recipes to the **Padlet** board and identify the mixtures used in each.

Project Context and Wonder Questions

Challenge students to build a deeper understanding of the chemistry that is part of everyday life. Tell students that they will focus on how and why chemistry is part of the foods and drinks we choose to consume daily.

Students create a demonstration of the chemistry involved in a recipe. They can be provided with the choice to work with a family member. They can also create their demonstration through a slide show, brochure or photo board. Their demonstration should illustrate the everyday chemistry in a recipe. Note that students are not expected to create a cooking demonstration. They should focus on demonstrating the chemistry that is involved in the process of making the recipe.

The recipe demonstration that students create should be focused on a project "wonder" question that they select or create. Remind students that the core question for their project-based inquiry is: **Why is it important to know what we eat?**

Encourage students to start by posing and recording questions they wonder about when they are asked to consider what is involved in making everyday popular foods and drinks. Students can record their questions on a digital bulletin board or poster paper.

Provide support by suggesting and exploring potential "wonder" questions that help students respond to the core question. **Draw ideas from the following sample questions and the background sources that may support initial exploration of each question. Note that some background sources are suitable for students, while others are suggested as sources of professional knowledge.**

- **Sample Wonder Question:** How is cooking like chemistry?

Consult Teacher or Student Background Sources

A brief introduction to how chemistry is used in cooking is provided on the **200 Questions About Chemistry** website at **http://questions.sci-toys.com/node/181**. Some of the information in this blog post can help provide context for this wonder question.

Students should be encouraged to develop and/or select their own project "wonder" question as well as the final product they create.

This project-based inquiry focuses on recipes and experiments involving dairy products. It can be expanded by having students explore other types of foods and mixtures.

This inquiry can also reinforce learning outcomes related to nutrition and food choices in the Health and Life Skills program of studies.

Visit the Agriculture and Agri-food Canada's webpage, **Discover Agriculture**, to explore different types of agricultural products in Canada, including discussions of how changes in technology and research has affected the way they are produced. Find this webpage at **www.agr.gc.ca/eng/about-us/publications/discover-agriculture/?id=1411999466585**. This source can be explored with students, asking them to identify examples of the application of science to the foods we cook with and eat.

Reinforce Language Arts and literacy skills by having students identify the causes and effects of chemical changes they observe, using the **Cause and Effect** Chart. This graphic organizer is provided in the **Everyday Chemistry Project Tools**.

- **Sample Wonder Question:** How are mixtures part of everyday foods and drinks?

  The Great Picnic Mix Up: Crash Course Kids #19.1 video, found on **YouTube** at **www.youtube.com/watch?v=jA0PzblYPUM**, or by searching for "picnic" on the **Crash Course Kids** channel, provides an interesting overview of solutions and mixtures.

- **Sample Wonder Question:** When can you eat a chemical change?

  ### Consult Teacher or Student Background Sources

  The *Chemical Changes: Crash Course Kids #19.2* video, found on **YouTube** at **www.youtube.com/watch?v=37pir0ej_SE**, or by searching for "chemical changes" on the **Crash Course Kids** channel, provides an interesting introduction to the concept of chemical changes in cooking.

- **Sample Wonder Question:** When are chemical changes in foods reversible and irreversible?

  ### Consult Teacher or Student Background Sources

  The **BBC Bitesize** website provides an overview of reversible and irreversible changes, including some food examples, at **www.bbc.co.uk/bitesize/ks2/science/materials/reversible_irreversible_changes/read/1/**.

  An additional online demonstration of reversible and irreversible changes can be found on the **K8 School Lessons** website at **http://k8schoollessons.com/irreversible-changes/**.

Provide students with the option to identify and investigate the "wonder" question that interests or intrigues them most.

Scaffold

Organize students to work collaboratively in small groups to investigate a project question that they select together. Alternatively, provide students with the choice to work individually or with a partner. Provide additional support to groups or individual students as they define their project questions. Provide more or less structure for the project questions that students select.

Organize student projects and their questions in the classroom or in a digital environment. For example, student-selected questions can be posted on poster paper around the classroom. As students find sources and information, "sticky-note" descriptions can be added to the posters.

Alternatively, a **Padlet**, **Google Drive** or **OneNote** board can be established for clusters of student-selected questions. Students can add their websites, articles, images and information to each board. Start and support students by selecting and adding initial resources and trusted sources to the posters or digital boards.

Share the **Rubric** with students before they begin their project so students keep the criteria in mind and set their own project goals. Discuss and adjust the criteria as appropriate with their students. Find the **Rubric** in **Assessment Support for Everyday Chemistry**.

Need to Know

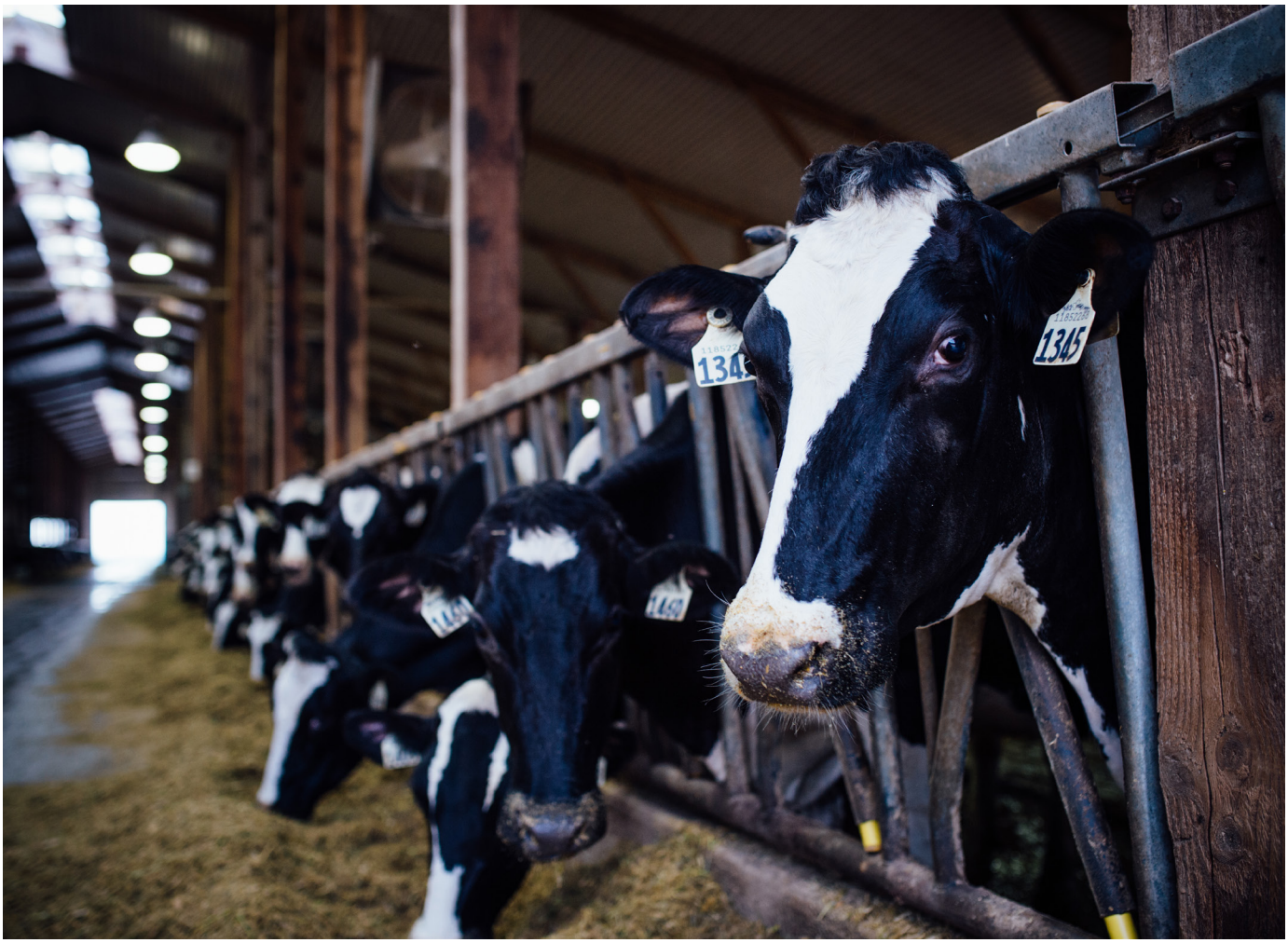
Once students select their project questions, have them create a **Need to Know** paper, poster or digital list that identifies what they think they need to know. Their lists may include bulleted and brainstormed points, questions with more specificity, and/or community places or people that they want to find out more about.

A **Need to Know** list makes learning visible to students. It includes both knowledge- and process-based questions, such as:

- What skills and knowledge do we need to start the project?
- What is food chemistry?
- How are heating and cooling examples of chemical change?
- What does reversible mean? What does irreversible mean?
- What do we need to know to be able to understand a chemical change?

A **Need to Know** list can be used as an exit ticket or a support for what will be learned next. For example, "How did what you learned today help you answer a Need to Know question?" or " My goal today is to answer the Need to Know question...."

This list can be part of a **Know, Need to Know, Next Steps** Triple T-chart that students create to plan their project. Find these graphic organizers in the **Everyday Chemistry Project Tools**.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Search and Investigate

Trusted Sources

Students can be provided with a number of options to identify, select, investigate and explore information that will support predictions they make or answers they develop to respond to their project "wonder" questions.

Discuss the use of sources from the classroom, library or approved websites. Encourage students to consider the credibility and reliability of the sources they use.

A digital bulletin board, such as **Padlet**, **Google Drive**, **Google Classroom** or **HyperDoc,** or a classroom poster can be used to establish a "trusted sources" repository. Select websites, print or online books or other information sources that best support the learning needs of your students. List website urls, book or information source titles on the digital bulletin board, shared document or classroom poster.

Use the student **Learning Sources** provided with this project as trusted sources that students can start with. These student resources can be used to spark student discussion and inquiry and support initial research, depending on the project question that students have selected. **Developing Competencies** student resources provide opportunities for students to focus on skills and develop or strengthen competencies. They are meant to be used with the **Learning Sources**. **Select and use those Learning Sources and Developing Competencies resources that are most relevant to you and your students' interests and project focus. Both provide fillable text fields and can be downloaded and completed electronically.**

As students start their research, structure opportunities to develop skills and make decisions to ensure they maintain the focus of their project.

Manage Collaboration

Review and revisit group work protocols to ensure that all students contribute to and participate in their projects. Timeline apps or software, such as the simple timeline provided on **Read Write Think**, is an ideal tool for creating a project timeline.

Connect to Prior Learning

Have students revisit sources they may have used in other projects or learning experiences. Use the **Learning Sources** and **Developing Competencies** student resources as starting points for brainstorming connections and making inferences that support students' project questions.

Consider maintaining posters in the classroom as a means of recording, displaying and sharing information. As students conduct their research and complete learning tasks with the **Learning Sources**, **Developing Competencies** handouts and other sources, have them add information to these posters. For example, posters can list and illustrate different trends, including organic farming, locally grown foods, the use of technology and sustainable farming practices. Posters can support ELL learners and those students who have difficulty recalling, spelling and identifying vocabulary.

Students can be asked to use the **Thinking about Sources (Reading and Analyzing Non-Fiction: RAN)** graphic organizer to select and analyze sources and determine their information needs. Students identify what they think they know, what was confirmed, new information and wonderings.

Emphasize the skill of making inferences with the **Making Inferences** graphic organizer. Students identify facts they find in their research, what they think and why. Find these graphic organizers in **Everyday Chemistry Project Tools**.

Students can also be asked to use **Read & Write for Google** to highlight words in the PDF **Learning Sources**. The highlighted words are sorted into students' **Google Drives** and can be shared.

As students use these and other sources, remind them to consider:

- What is my project question?
- How will I locate information?
- What sources will I use?
- How will I know my source is reliable? How will I know it can be trusted?

As students select their sources, remind them to consider:

- How do the sources I use influence my project plans?
- How do I choose which information I use?
- What connections do I see between my research sources and what I already know and can do?
- How will I organize my information?
- How will I keep track of the sources I have used?

Scaffold

Organize and select the **Learning Sources** and **Developing Competencies** student resources that are most relevant to the project questions that students have selected.

Encourage students to keep track of "insightful observations" as they research, by recording key words and phrases as well as sketches, doodles or drawings.

Use a reading support app, such as **Read&Write for Google Chrome**, with **Learning Sources** for those students who require additional support with vocabulary and reading skills.

Integrate

Integrate with **Language Arts** curriculum by creating a classroom word bank. Collect vocabulary words, creating a word bank for students to use during later writing activities. Vocabulary from the **Learning Sources** and **Developing Competencies** student resources is provided in **Teacher Fast Facts and Vocabulary Support**.

Ask students to further categorize key words in their word banks into categories such as descriptive words, items, places and people. Use the word banks and categories to construct descriptive paragraphs about topics such as trends, technology, farming, sustainability, responsibility and stewardship. Encourage students to add imagery to their paragraphs by using descriptive language.

Create digital word banks by using **Google Slides** for each category. Have students add words to each slide from their investigations, research and discussions.

The **Learning Sources** and **Developing Competencies** handouts included with this project are listed on the following pages. **Developing Competencies** handouts have been designed to support one or more of the **Learning Sources**.

- Select those handouts that best fit the project questions that students select.
- Some students may benefit from selecting handouts independently to support their project questions.
- Select handouts to introduce or reinforce research information that is most relevant to students' project choices.
- Use **Developing Competencies** handouts to focus on competencies and develop skills that students are expected to apply to their project work.

Scaffold

Provide options for student research and inquiry that accommodate different levels of complexity.

- Realign or simplify the core project question to focus on one factor that will influence agriculture jobs in the future, such as technology or the protection of family farms. Encourage students to explore the core question with a series of examples that they identify from their research.
- Provide students who need additional support with opportunities to use information provided in the **Learning Sources** as the basis of their research. Work with students who require support to identify examples of skills that agriculture jobs require, or conditions that influence those jobs.
- Use a think-aloud strategy to model a thinking process as you work though **Learning Sources** with students who need support. Focus on identification of examples that illustrate what is involved in an agricultural job.
- Pre-teach the vocabulary that students will encounter in the **Learning Sources**.
- Use the questions in **Developing Competencies** for class discussions.
- Provide students with a list of specific sources that can help them narrow and focus their research. For example, students can be guided to focus on one specific type of agricultural job, such as farming.

The **Learning Sources** and **Developing Competencies** handouts include fillable text fields. Students can download and save the PDF files to electronically complete the activities.

Note that some students may require additional accommodations and support to complete the **Developing Competencies** activities.

Use these descriptions of student **Learning Sources** and **Developing Competencies** handouts to help you make decisions about how students can use them to support their project work.

Learning Source: Dairy Products

This **Learning Source** explores some different products made from milk, discussing mixtures, liquids and solids.

The following additional website source can be added to classroom trusted sources boards.

The **American Chemical Society** provides *The Secret Science of Ice Cream*, including "Cool Chemistry" questions at **www.acs.org/content/acs/en/education/whatischemistry/adventures-in-chemistry/secret-science-stuff/ice-cream.html**.

Developing Competencies: Experiment with Milk Mixtures focuses on problem solving and asks students to apply numeracy skills and experiment by mixing milk with other substances. It is designed to be used with **Dairy Products**.

Learning Source: *What Happens to Milk at a Dairy*

Ask students to make predictions, using the title of the **What Happens to Milk at a Dairy Learning Sources** before they read it. Students can use Thinking About Sources to make and check their predictions. This graphic organizer is found in the **Everyday Chemistry Project Tools**.

This **Learning Source** explores processes involved in food production, using milk production as an example and introducing pasteurization and homogenization.

The following additional website sources can be added to classroom trusted sources boards.

The **American Chemical Society** provides a complementary experiment to the one provided in the **Developing Competencies** resource for this source.

Colours on the Moooooove can be accessed at **www.acs.org/content/acs/en/education/whatischemistry/adventures-in-chemistry/experiments/colors-move.html**.

Developing Competencies: Explore the Chemistry of Milk asks students to consider the chemical reactions involved with milk processing and experiment with reactions in different types of milk, including testing it for acidity. It is designed to be used with **What Happens to Milk at a Dairy**. The supplies required for the experiments are listed in the handout.

A simple explanation of the pH and acidity of milk is provided in Is Milk an Acid or a Base? on the ThoughtCo. website at **www.thoughtco.com/milk-an-acid-or-a-base-607361**.

When students complete the experiment, they should find that food colouring reacts differently when added to different types of milk. Students are asked to use all four food colours, as the colours will mix and swirl to make secondary colours. The food colouring in the skim milk should spread quickly and become faint in colour. The colouring in the whole milk spreads faster and does not lose as much colour. The colouring in the cream or half-and-half will not spread as quickly as the skim or whole milk. This happens because food colouring is water-based. It diffuses, or spreads, faster through milk that has a higher water content and lower fat content. When soap is added to the mixture, the soap reacts with the fat, which is spread throughout the milk as a result of homogenization. The soap breaks up the fat globules, causing movement in the milk.

Learning Source: *Milk Mixtures*

This **Learning Source** provides more information about the chemical reactions involved with milk processing, including the process of homogenization and how raw milk and milk fat are mixed to make different milk products. Students are also asked to revisit the concepts of reversible and irreversible changes.

The following additional website source can be added to classroom trusted sources boards.

A simple overview of reversible and irreversible changes can be found on the **K8 School Lessons** website at **http://k8schoollessons.com/irreversible-changes/**.

The Science of Cooking, on the **Accidental Scientist** website at **www.exploratorium.edu/cooking/eggs/index.html**, provides information about the science of different foods, including eggs, meat, bread, pickles, seasoning and candy. Recipes and activities are included for each food. Students may require some support and guidance with the use of these resources.

The *Apprentice Chef Educational Activity Kit* from the **Canada Museum of Agriculture**, at **https://ingeniumcanada.org/agriculture/education/education-apprentice-chef-eak.php**, provide experiments that show the connection between science and what's on our plates for each of the four food groups. The Milk and Alternatives activity sheet, accessed at **https://ingeniumcanada.org/agriculture/doc/education-programs/cafm/Apprentice-Chef-Milk-and-alternatives-eak.pdf**, discusses fermentation and provides a yogurt making experiment to illustrate lactic fermentation.

Developing Competencies: Investigate Food Changes asks students to focus on ways that ingredients are changed to make everyday foods. Students consider recipes with milk mixtures and make their own butter. It is designed to be used with **Milk Mixtures**. The supplies required for the experiments are listed in the handout.

Learning Source: *Dairy Patterns*

This **Learning Source** provides information on the consumption of different types of milk products – liquids and solids.

The following additional website sources can be added to classroom trusted sources boards.

Agriculture More than Ever provides a number of *Fact Photos* that students can access and download to illustrate their bar graphs. These photos highlight various types of farms and agricultural activities. They can be accessed at **www.agriculturemorethanever.ca/resources/fact-photos/**.

Developing Competencies: Analyze Numbers and Patterns asks students to create a bar graph from statistics. It is designed to be used with **Dairy Patterns**.

Students focus on numeracy skills by graphing consumption patterns. They are asked to use the **Grid Graph** graphic organizer to create their own bar graphs. Find this graphic organizer in **Everyday Chemistry Project Tools**.

Expert Options

If appropriate, plan to invite any relevant and available experts from the community that you or students may be able to identify and contact.

Work with students and provide information about how to gather information, artifacts, images or additional sources from these experts. If you have contacts and resources, organize and provide trusted interview sources that students can access.

Consider ideas such as the following:

- What adults in our school and broader community are available for interviews?
- How can I provide opportunities for students to take or collect photographs and/or artifacts?
- How can parents or grandparents support students' project-based inquiries as interview subjects?
- How can community Elders or Knowledge Keepers provide support for students' project-based inquiries?
- How can I manage student groups to ensure that individual students have opportunities to participate in groups?
- What interview skills should be taught and reinforced with students?

Students can also submit questions to **Alberta Milk's Ask a Dairy Farmer** website feature, at **https://albertamilk.com/ask-dairy-farmer/**. Prepare the questions so that they are meaningful and relevant. Have students search this webpage in advance to find existing questions and answers that are relevant to their project-based inquiries.

Alberta Milk also provides a number of recipes on their website at **https://albertamilk.com/recipes/**.

Information Management

Plan class time to debrief students on the research they have collected. What have they found to be the most surprising, interesting, impressive or important? How do they think their research increases their understandings of the processes that are used to make food products as well as the foods that people consume daily?

- Work with students to develop an organizational structure that supports them as they select a recipe and create a demonstration of the chemistry involved in making it. Challenge students to "fill" a bulletin board as they complete their research and post examples that illustrate liquids, solids, mixtures and chemical reactions. Note that students are not expected to create a cooking demonstration. They should focus on demonstrating the chemistry that is involved in a favourite recipe.

Scaffold

Have students start their search for recipes on the Alberta Milk website at **https://albertamilk.com/recipes/**. Encourage students to select recipes that interest them.

Students can also be asked to colour code recipes according to whether they include liquids or solids or both.

Integrate

Ask students to consider how nutritional information is indicated on food products and some recipes. How does this nutritional information affect the choices they make about daily food and drinks?

- Suggest that students use index cards, handmade cards or digital cards to identify the chemistry and/or chemical reactions that are involved in recipes. Collect images, facts and stories that represent processes that change food ingredients, such as heating, cooling or mixing.
- Organize and select cards around categories such as the following:
  - Recipes that contain mixtures of two or more solids/ two or more liquids
  - Recipes that contain mixtures of solids and liquids
  - Recipes that have reversible changes when foods are combined
  - Recipes that have irreversible changes when foods are combined
  - Recipes that use heating/ cooling

Remind students to use the data they collected in response to their research question as well as the core project question: **Why is it important to know what we eat?**

Reinforce self- and group-assessment skills with the **Making Connections** graphic organizer. Students identify facts they connected with, puzzles and feelings. Find this graphic organizer in the **Everyday Chemistry Project Tools**.

Assess

Consult with individual students to review how they assessed themselves in the **Target Learning** features that are provided in some of the **Developing Competencies** student resources.

Have students use the **Project Check-In** chart to self-assess competency development – combinations of knowledge, skills and attitudes that students apply through curricular learning outcomes.

Find the **Project Check-In** in **Assessment Support for Everyday Chemistry**.

Observe students' research skills as they work together in groups. Ask students to individually reflect on the types of sources they used in their research, source credibility and the information they gained from each.

Have students maintain and use a reflective journal to keep notes as they progress through their projects. Pose questions such as the following as students start their inquiries, complete their research and start to design their projects:

- What is going well?
- What are we having trouble with?
- What questions do we have?
- What do we need to do next?

Suggest that students also use these reflective questions to complete a check-in on their group work and collaborative skills.

Design and Create

Project Creation

Challenge students to consider how they can communicate why it is important to understand how our food is produced and consumed, keeping their project focus in mind. Provide time for students to discuss their ideas, either in small groups or as a class. Encourage students to revisit examples of recipes and food combinations they may have found and used in their research.

Share some examples of recipe demonstrations, if possible, with students. Alternatively, "walk through" some recipe examples with students, modeling how you would use the recipe and identifying the chemistry that is involved in it. Provide some time for students to review the features and functions of any digital options they may choose to use.

The demonstrations should encourage students' creativity and ideas, but should illustrate some aspect of ways that food mixtures, heat and cooling result in chemical reactions that change food ingredients before we consume them.

Suggest that students consider the following steps as they create their demonstrations:

- Identify the recipe. Describe whether it involves mixing, heating and cooling.
- Identify the chemical reactions that occur when the food ingredients are mixed, heated and/or cooled. Write descriptive sentences that can be used as part of a script for the demonstration.
- Make decisions about the visual elements of the recipe demonstration. Is word art going to be used to emphasize important ideas? **Canva** provides a simple tutorial on its features and provides free photos, illustrations, backgrounds, icons, shapes, lines, grids and frames.
- Create the demonstration as a video, slide show, poster, timeline or photo board. Post the demonstrations on a class **Padlet** or bulletin board.

Graphic organizers, including different types of chart templates, are provided in **Everyday Chemistry Project Tools**.

Scaffold

Provide options that provide support and accommodate different strengths, interests and abilities in the creation of the recipe demonstrations, such as:

- Model the process of using a **Learning Source** to illustrate how to identify examples of chemical reactions. Guide students who need additional support in finding examples they can use to identify reactions in a recipe.

- Provide various group structures within which students who require support can work. For example, ask each student in a project group to focus on one **Learning Source** to identify examples of information that relates to a recipe.
- Provide a sequenced criteria list that students must meet at a minimum with their projects. Negotiate where students should be on the criteria list. Customize the project **Rubric** to address the criteria negotiated with students.
- Focus on information provided in the **Learning Sources** and work with students who require support to identify examples of the chemistry involved in a recipe. Identify information that illustrates specific concepts.
- Provide opportunities for students to give each other feedback and suggestions. Use **modeling**, **think-pair-share**, **think-aloud** and **stand and share** sessions with students so they can benefit from the ideas and progress of their classmates.

  In a stand and share session, students all stand. When they volunteer an idea, response or information, they sit down. If a student volunteers an idea that another student was thinking of, that student can also sit down. This strategy can create a sharing context with minimal pressure and promote a collaborative environment.
- Use a **Think Sheet** graphic organizer to have students self-check their progress as they create their projects with the following questions:
  - What would be helpful to know more about?
  - What does this have to do with the core project question?
  - Where are we stuck?
  - Where do we need more information?
  - How would we summarize where we are right now?

Find the **Rubric** in **Assessment Support for Everyday Chemistry**. Find the **Think Sheet** graphic organizer in the **Everyday Chemistry Project Tools**.

Assess

Help students understand that their timelines will be assessed according to the criteria on the **Rubric**. Share the rubric with students and make connections between the criteria on the **Project Check-In** chart and the **Rubric**. Discuss how their completed timelines involve the competencies they have developed through their work on their projects.

The **Project Check-In** chart can be found in **Assessment Support for Everyday Chemistry**.

Publish and Share

Peer Share

Sharing with peers in the classroom can create and reinforce a sense of community. Use a carousel strategy to have students share their research and learning with other students or groups in the class. Ask each group to organize a display of their research results on a table. Place a comment sheet on each group table. Have groups rotate through the displays at timed intervals. One group member can remain with his or her display to present group research. Encourage visiting groups to record their feedback, in the form of questions or comments. Alternatively, groups can stay together and be asked to record feedback on the comment sheet on each table.

Students can be asked to make a **Sway** to share their learning with classmates as well as with parents and other family members at Demonstration of Learning opportunities. **Google Classroom** and **Google+ Community** can also be used to share ongoing project work and completed projects.

Public Share

If appropriate, provide students with an opportunity to share and communicate their findings and conclusions with parents, family members and community members.

Publicly sharing student projects can range from posting Everyday Chemistry recipe demonstrations to school or community **Padlet** boards to sharing them with other schools or classrooms in your jurisdiction. Poster, timeline or photo board demonstrations can be photographed to share online.

Students can also create a multimedia presentation, using an app such as **Sway**, to produce and share their demonstrations.

Be aware of FOIP issues and jurisdiction policies when structuring and implementing sharing opportunities.

Reflection

Provide students with options to reflect on their projects and learning, using questions such as the following:

- Why is chemistry important to the production of different food products?
- How do we depend on chemical reactions on a daily basis?
- How do chemical reactions result in foods and drinks that are different than the original ingredients?

Challenge students to pose their own reflection questions as well.

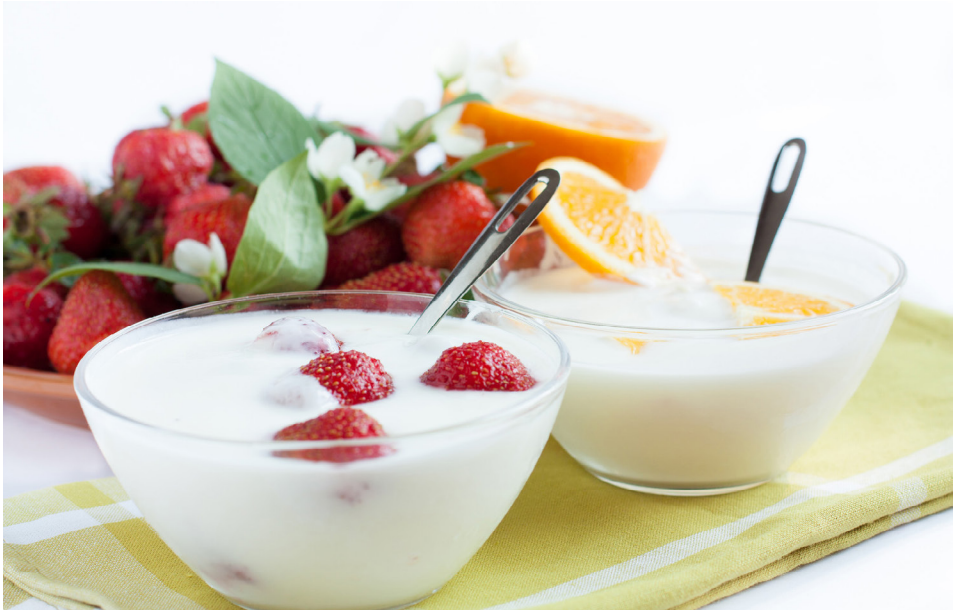
Students can be asked to reflect on these questions by selecting from activities such as:

- Adding reflection cards (index or digital note cards) to their project timelines
- Creating a written response (blog, paragraph, media article)
- Making a mind map or bubble map
- Creating a poster

Questions such as these can also be used on exit slips.

Curriculum Support

Everyday Chemistry supports specific learning outcomes **Grades 5 Science**, **Language Arts** and **Math**. The learning outcomes in the charts that follow are developed and/or reinforced with the activities of this project. Use the check boxes to keep track of the learning outcomes that are appropriate for your grade and subject area context.



The activities in this project may also be used to support learning outcomes in the **Health and Life Skills** program of studies related to food choices, group roles and processes, respectful communication and learning processes.

Project activities also support learning outcomes in the **Information and Communication Technology (ICT)** program of studies. ICT outcomes are also addressed in the Language Arts program of studies.

Science Grade 5	
	Classroom Chemistry **5–7 Describe the properties and interactions of various household liquids and solids, and interpret their interactions** ☐ 1. Recognize and identify examples of the following kinds of mixtures: • two or more solids; e.g., sand and sugar • a solid and a liquid; e.g., sugar and water • two or more liquids; e.g., milk and tea ☐ 2. Apply and evaluate a variety of techniques for separating different materials. ☐ 5. Recognize that the surface of water has distinctive properties, and describe the interaction of water with other liquids and solids. ☐ 7. Distinguish reversible from irreversible changes of materials, and give examples of each. ☐ 8. Recognize and describe evidence of a chemical reaction. Explain how the products of a reaction differ from the original substances. ☐ 9. Use an indicator to identify a solution as being acidic or basic. **Science Inquiry** **5–1 Design and carry out an investigation, using procedures that provide a fair test of the question being investigated** **Focus** ☐ 1. ask questions that lead to exploration and investigation. **Explore and Investigate** ☐ 5. identify sources of information and ideas and access information and ideas from those sources. Sources may include library, classroom, community and computer-based resources **Reflect and Interpret** ☐ 1. communicate with group members to share and evaluate ideas, and assess progress ☐ 2. record observations and measurements accurately, using a chart format where appropriate. Computer resources may be used for record keeping and for display and interpretation of data ☐ 3. state an inference, based on results. The inference will identify a cause and effect relationship that is supported by observations ☐ 4. identify possible applications of what was learned **Attitudes** **4–4 Demonstrate positive attitudes for the study of science and for the application of science in responsible ways** ☐ 4. perseverance in the search for understandings and for solutions to problems ☐ 5. flexibility in considering new ideas ☐ 6. critical-mindedness in examining evidence and determining what the evidence means ☐ 7. a willingness to use evidence as the basis for their conclusions and actions ☐ 8. a willingness to work with others in shared activities and in sharing of experiences ☐ 11. respect for living things and environments, and commitment for their care

Language Arts Grade 5		
	1.1 Discover and Explore **Express ideas and develop understanding** ☐ use appropriate prior knowledge and experiences to make sense of new ideas and information ☐ read, write, represent and talk to explore personal understandings of new ideas and information ☐ use own experiences as a basis for exploring and expressing opinions and understanding **1.2 Clarify and Extend** **Consider the ideas of others** ☐ seek the viewpoints of others to build on personal responses and understanding **Combine ideas** ☐ use talk, notes, personal writing and representing to explore relationships among own ideas and experiences, those of others and those encountered in oral, print and other media text **Extend understanding** ☐ search for further ideas and information from others and from oral, print and other media texts to extend understanding **2.1 Use Strategies and Cues** **Use prior knowledge** ☐ describe ways that personal experiences and prior knowledge contribute to understanding new ideas and information **2.2 Respond to Texts** **Experience various texts** ☐ experience oral, print and other media texts from a variety of cultural traditions and genres ☐ write or represent the meaning of texts in different forms **Construct meaning from texts** ☐ support own interpretations of oral, print and other media texts, using evidence from personal experiences and the text **2.4 Create Original Text** **Generate ideas** ☐ use texts from listening, reading and viewing experiences as models for producing own oral, print and other media texts **Structure text** ☐ use structures encountered in texts to organize and present ideas in own oral, print and other media texts	**3.1 Plan and Focus** **Determine information needs** ☐ identify categories of information related to particular topics, and ask questions related to each category **Plan to gather information** ☐ develop and follow own plan for gathering and recording ideas and information **3.2 Select and Process** **Use a variety of sources** ☐ locate information to answer research questions, using a variety of sources, such as newspapers, encyclopedias, CDROMs, a series by the same writer, scripts, diaries, autobiographies, interviews and oral traditions **3.3 Organize, Record and Evaluate** **Organize information** ☐ use clear organizational structures, such as chronological order, and cause and effect, to link ideas and information and to assist audience understanding ☐ organize ideas and information to emphasize key points for the audience **Record information** ☐ combine ideas and information from several sources **3.4 Share and Review** **Share ideas and information** ☐ communicate ideas and information in a variety of oral, print and other media texts, such as illustrated reports, charts, graphic displays and travelogues **4.3 Present and Share** **Present information** ☐ organize ideas and information in presentations to maintain a clear focus and engage the audience **5.2 Work within a Group** **Cooperate with others** ☐ accept and take responsibility for fulfilling own role as a group member **Work in groups** ☐ formulate questions to guide research or investigations, with attention to specific audiences and purposes ☐ contribute ideas to help solve problems, and listen and respond constructively

Math Grade 5	**Number** **Develop number sense.** ☐ 1. Represent and describe whole numbers to 1 000 000. ☐ 2. Use estimation strategies in problem-solving contexts. ☐ 7 . Demonstrate an understanding of fractions by using concrete, pictorial and symbolic representations to create sets of equivalent fractions. ☐ 8 . Describe and represent decimals (tenths, hundredths, thousandths), concretely, pictorially and symbolically ☐ 9. Relate decimals to fractions and fractions to decimals (to thousandths) **Patterns and Relations (Patterns)** **Use patterns to describe the world and to solve problems.** ☐ 1. Determine the pattern rule to make predictions about subsequent elements. **Statistics and Probability (Data Analysis)** **Collect, display and analyze data to solve problems.** ☐ 1. Differentiate between first-hand and second-hand data.