Lesson Plan

Matter and Changing States

Grade: 5 | Subject: Science & Technology | Duration: 40 Minutes



Dairycraft Overview

Learning Objectives

This Minecraft world supports the following main achievement objectives:

- Teach students about the versatility of milk, as well as concepts such as states of matter and chemical/physical changes.
- Teach students about the nutritional benefits of milk.
- Teach students about life on a working farm, career options associated with dairy farming, and the layout and machinery used in modern farms.
- Teach students about waste management and renewable energy production on dairy farms.
- Teach students about how technology is transforming dairy farming.
- Teach students about the relationship between crop farming and milk production.

How to Use Dairycraft

Dairycraft is a fully automated Minecraft educational world, so there is no need for teacher input once students are in-game. Additional teacher input or guidance may be beneficial for students below the set lesson grades.

- Dairycraft has been designed as a single-player educational game. When completing most lessons, extensions, and sub-activities, each student should be in their own Minecraft world.
- Dairycraft can function on any device compatible with Minecraft: Education Edition.
- For collaborative play, students can be grouped into teams to complete the major extension task: building their own farm based on the knowledge they have learned.
- If you are new to Minecraft: Education Edition, the '[Support Center]' on the Education Edition website provides all the information you will need to get started.

Activities for Students

Dairycraft contains six main activities for students, each of which can be played independently of the others. It will benefit students to have completed Lesson 2 before proceeding with other lessons, in order to have a basic understanding of the farm's layout. Each lesson has an extension task, and after all six lessons are completed there is one major

extension activity in which students are encouraged to build their own farm using the information they have learned from the lessons.

At points in the game, students may be given external links to videos that explain certain processes or concepts in more detail. Everything else they need to learn and interact with is contained within the game.

Dairycraft Map Layout



CrackedCubes

Lesson 3: Overview

This Minecraft-based lesson immerses students in the fascinating journey of milk processing, from raw milk to a variety of finished dairy products. Through this interactive experience involving activities and interacting with NPCs (non-playable characters), students will delve into the science of changing states of matter, participate in hands-on dairy product production tasks, and apply their understanding in a knowledge test.

This lesson combines interactive gameplay with real-world insights, fostering curiosity and critical thinking about the dairy production process.

Learning Objectives

Through this lesson, students will:

- Understand the process of how milk is turned into different dairy products and how it changes states of matter.
- Identify and differentiate between physical and chemical changes in dairy production.
- Explore the production of various dairy products through interactive simulations.
- Apply knowledge of dairy processes in a problem-solving activity.

Curriculum Alignment

Designed for Grade 5 in the Ontario curriculum:

- Explain that matter is anything with mass and volume, and describe the properties of solids, liquids, and gases.
- Identify physical and chemical changes, including changes of state caused by heat.
- Give examples of how the properties of matter make it useful in different situations.
- Grade 5: Science and Technology C2.1 through C2.7

Overall Expectations

Students will learn how to:

- Identify the properties of solids, liquids, and gases, and state examples of each.
- Describe physical changes in matter as changes that are reversible and chemical changes in matter as changes that are irreversible.
- Explain how changes of state involve the release of heat or the absorption of heat.

- Demonstrate and apply an understanding of the differences between chemical and physical change.

Specific Expectations

Students will learn how to:

- Identify the different states of matter, and how they relate to dairy product production.
- Differentiate between reversible physical changes and irreversible chemical changes.
- Explain the role of pasteurization and bacterial cultures in dairy product production.

Student Expectations

Demonstrate an understanding of the properties of matter, changes of state, physical and chemical change, and how they are applied to the production of dairy products.

Activity and Extension Task Overview

During this lesson, students will:

- Watch an introductory video about what happens inside a milk product processing facility (optional).
- Interact with six non-player characters (NPCs) to learn about the states of matter and the manufacturing process of dairy products like cheese, butter, ice cream, and yogurt.
- Participate in dairy product production activities to produce cheese, butter, ice cream, and yogurt.
- Take notes as they learn, and complete a randomized knowledge test at the end of the lesson.
- Complete an extension task involving collecting cheese, butter, ice cream, and yogurt from industrial kitchens and delivering them to the local farmer's market.

Activity: Learning, Knowledge Test, and Production

Student spawns outside the main lobby of the milk processing facility.

STEP 1 | Introduction

- NPC 'Dawn' welcomes students and directs them to the lobby.

- NPC ‘Jay’ explains what the facility does and offers an optional video to watch.
- Student chooses whether or not to watch the video, then proceeds to the next stage of the lesson.

STEP 2 | Laboratory

- Student encounters NPC ‘Supreet’ inside the laboratory, who begins to explain states of matter.
- Student heads to the lecture hall to read a book (which they can carry with them in their inventory) that explains in full the states of matter.

STEP 3 | Knowledge Test

- After reading the book on the states of matter, student takes a knowledge test based on the information they have just learned.
- Student needs to answer two randomized questions successfully in order to proceed. Incorrect answers prompt a review and retest.

STEP 4 | Exploration

- Student follows a prescribed path through the facility until they enter the corridor with the kitchens on each side.
- Each kitchen has its own activity, and student can choose to enter them in any order.

STEP 5 | Yogurt Kitchen

- Students encounters NPC ‘Jack’, who explains how yogurt is made from unpasteurized milk.
- Student undertakes a task: to make yogurt from unpasteurized milk (heating milk, adding bacteria, and fermenting). They can choose to eat the finished product as a reward.

STEP 6 | Cheese Kitchen

- Student encounters NPC ‘Hayley’, who explains how cheese is made from unpasteurized milk.
- Student undertakes a task: to make cheese from unpasteurized milk (heating milk, adding rennet, separating curds from whey, and draining). They can choose to eat the finished product as a reward.

STEP 7 | Butter Kitchen

- Student encounters NPC ‘Khinday’, who explains how butter is made from unpasteurized milk.
- Student undertakes a task: to make butter from unpasteurized milk (heating milk, and using a centrifuge to separate cream and churn butter). They can choose to eat the finished product as a reward.
- Student chooses whether or not to watch an optional video, then proceeds to the next activity.

STEP 8 | Ice Cream Kitchen

- Student encounters NPC ‘Janet’, who explains how ice cream is made from unpasteurized milk.
- Student undertakes a task: to make ice cream from unpasteurized milk (heating milk, mixing ingredients, and freezing). They can choose to eat the finished product as a reward.
- Student chooses whether or not to watch an optional video, then proceeds to the next activity.

STEP 9 | Reward and Feedback

- Upon successful completion of tasks (in any order), student is rewarded with a pail of speed-boost milk and the choice to continue on to the extension task or return to the spawn room to choose the next lesson.
- If student decides not to continue with the extension, the exclamation point above the Lesson 3 NPC in the spawn room turns amber, indicating student has yet to complete the lesson’s extension task.

Extension Task: Collecting and Delivering Dairy Produce

Student spawns inside the processing facility in the corridor with the kitchens.

STEP 1 | Introduction

- Student is introduced to the activity challenge by NPC ‘Amerjeet’: to collect dairy products from each kitchen and deliver them to the farmer’s market.

STEP 2 | Yogurt Collection

- Student enters the yogurt kitchen and takes a knowledge test based on the information they have just learned.
- Student needs to answer one randomized question successfully in order to proceed. Incorrect answers prompt a review and retest.
- Student receives 12 tubs of yogurt for delivery to the farmer's market.

STEP 3 | Cheese Collection

- Student enters the cheese kitchen and takes a knowledge test based on the information they have just learned.
- Student needs to answer one randomized question successfully in order to proceed. Incorrect answers prompt a review and retest.
- Student receives 12 blocks of cheese for delivery to the farmer's market.

STEP 4 | Butter Collection

- Student enters the butter kitchen and takes a knowledge test based on the information they have just learned.
- Student needs to answer one randomized question successfully in order to proceed. Incorrect answers prompt a review and retest.
- Student receives 12 blocks of butter for delivery to the farmer's market.

STEP 5 | Ice Cream Collection

- Student enters the ice cream kitchen and takes a knowledge test based on the information they have just learned.
- Student needs to answer one randomized question successfully in order to proceed. Incorrect answers prompt a review and retest.
- Student receives 12 cones of ice cream for delivery to the farmer's market.

STEP 6 | Delivery

- After visiting all the kitchens, in any order, student chooses a vehicle from the car park and navigates to the farmer's market.
- Student gives all the items from the facility to NPC 'Carole' outside the entrance to the farmer's market.

STEP 7 | Completion and Reward

- NPC ‘Carole’ congratulates student for completing the task and extension task, and gives them the lesson-specific trophy.
- Student places their trophy in the spawn room trophy display cabinet for teacher verification. (The trophy and display cabinet demonstrate that student has completed the lesson in full.)

Miscellaneous

If you are experiencing technical problems or bugs with this lesson, please report them directly through our website’s bug report form: crackedcubes.co.uk/report-a-bug.

For general information about Minecraft: Education Edition, including additional information on how to play and set up lessons, please head to the dedicated Minecraft Education support center: edusupport.minecraft.net/hc/en-us.