Primary: Glass as Packaging

Lesson: Glass as Packaging	
Age Group (Grade): 3-6	Lesson duration: 1 hour *(N.B. Activity 2 requires preparation and 3 days to develop)*

Aim: Glass is utilised as packaging in many applications in both science and food technologies. Students will explore and gain an understanding of the use of glass as a packaging material by looking at how other materials compare when used in similar applications.

Safety considerations: Glass vessels are used in this activity for Years 3-6. It is recommended that teachers undertake a Curriculum Activity Risk Assessment (CARA) process.
It is recommended that teachers also review the CARA guideline for Biological activities and for Food experimentation.
It is recommended that students are briefed as to the risks of cuts and the use of gloves when handling materials should be considered. It is recommended to conduct the activity in smaller groups where appropriate.

Links with Curriculum (KLAs):
Y3/4: Investigate the suitability of materials, systems, components, tools and equipment for a range of purposes (ACTDEK013)
Y4: Living things depend on each other and the environment to survive (ACSSU073)
Y4: Natural and processed materials have a range of physical properties that can influence their use (ACSSU074)
Y6: The growth and survival of living things are affected by physical conditions of their environment (ACSSU094)
Y6: Scientific knowledge is used to solve problems and inform personal and community decisions (ACSHE100)

Key Vocabulary:
Microorganisms
Bacteria
Food acceptable packaging
Preservation
Expiration

Content	Resources
Focus Questions: • How is glass produced? • What are popular options for food packaging? • What is expiration? • What is preservation? • What is the history of food preservation? • When does glass come in? • What is important in food preservation – how does food expire? • What are germs? • How do germs spread? • Does glass prevent bacteria growth? • How are materials deemed as food-acceptable packaging?	Activity 1: • An array of paper materials (e.g. newspaper, cardboard, magazine, tissue paper, etc.), cling wrap, aluminum foil. • Glass container • Pin needle • Water Activity 2: • Petri dish x 4 • Agar (1 teaspoon) • Water • Microwave / stovetop • Cotton swabs • N.B. this activity requires time for the petri dish to sit and develop over a few days • Optional: microscope, access to research materials

Activity

Introduction

Ask students

- What containers do we package our foods in?
- What problems might do we have with these containers?
- Do you think any of this packaging might be a problem for the natural environment?

Introduce the topic

This lesson will address issues we have with packaging food and how glass may overcome these issues. Topics to cover include how glass is made, what we use to package our foods, the history of food preservation, and why food packaging is important.

Activity Prep:

At the beginning of the lesson, allow students to fill containers with water. Leave containers outside in the weather throughout the lesson. Bacteria swabs will be collected from inside the containers.

Main Lesson

What is glass? Glass is a solid material that we use for lots of different purposes in everyday life. Glass is made by melting a mixture of sand, limestone, and soda ash at very high temperatures. When melted, glass acts like a liquid, meaning it can be poured, blown, pressed, and molded into plenty of shapes.

What are popular options for food packaging? Different foods require different packaging. Popular packaging includes plastics, steels, aluminium, paper/card, and glass. Glass is mostly used to contain liquids, plastics are used across all food types and are the main packaging for meats, metals are often used for preserving long-lasting foods, and paper/card is mainly used for dry ingredients.

Explain to students that preservation is when an item like food needs to be kept or saved for a period of time. Explain that expiration is when something has come to an end, so food that has expired means that food is no longer good to eat.

What is the history of food preservation? Before people learnt how to preserve food, they had to be constantly moving around to find food sources. Fridges were invented until the 1800s. Before that, communities used natural ways to preserve their food – freezing foods in the winter, fermenting foods, drying foods, pickling, curing, and eventually canning in the late 1800s.

Why is glass a good option? In pickling, glass or stoneware is used to prevent the corrosion of metals by vinegar. Glass containers can survive in the freezer, unlike plastic, as well as high temperatures. The jars can be sealed to become air-tight and they don't impact the taste of your food.

What is important in food preservation – how does food expire? Microorganisms are living things that are too small to be seen with the naked eye and can get onto our food. They can include mould, yeast, and bacteria which can cause foods to expire and become unsafe to eat.

What do microorganisms do to our food? Microorganisms break down our food by eating it and producing waste. This alters the colour, smell, and taste of our foods.

How does bacteria spread? Microorganisms are spread by being transferred from one surface to another. When transferred, bacteria multiply in ideal conditions.

Does glass prevent bacteria growth? When preserving foods in a glass jar, a vacuum seal can be created by heating and cooling the glass jar. The heating of the jar also kills microorganisms. With an air tight seal, microorganisms are unable to get into the glass.

How are materials chosen as food-acceptable packaging? Food-acceptable packaging must be able to be cleaned effectively, and not allow any particles to enter the packaging and infect the food.

Main Lesson

Activity One: Testing Containers
This first activity will see students using recycled or reused materials (newspapers, magazine, cardboard, cling wrap, aluminum foil, etc.) to attempt to contain a liquid through a series of tests. Students will compete to create the sturdiest packaging.

1. Divide students into groups of around 3-5 students.
2. Present each group with a range of paper materials (newspaper, tissues, cardboard, magazine, etc), cling wrap, and aluminum foil.
3. Students are to design and build a container that can hold liquid using the materials provided.
4. Using masking tape and glue, students are given 10 minutes to create their container.
5. One group at a time, conducts a series of tests to both a glass jar and the designed container.
   Tests may include; holding 500mL of water, being lifted, being poked with a pin, etc.
6. See if any of the designs can outlast the glass jar.

Follow-up questions:
- Could an aluminium or steel can do better than glass?
- What would happen if we used fire to test the container?
- How would the different containers last over time?

Activity Two: Testing Packaging
This second activity will investigate how well glass compares to other products over time containing liquids. Using metal, plastic and glass, students will use food acceptable packaging to contain water and conduct taste test and then using a Petri dish to see which containers have better antibacterial properties.

At the beginning of the lesson, allow students to fill containers with water. Leave containers outside in the weather throughout the lesson. Collect the bacteria swabs from inside the containers.

Bacteria swabs

Preparing the agar solution

1. Combine 1 teaspoon agar with ½ cup (120ml) of hot water.
2. Stir to combine.
3. Bring the agar mixture to a boil for three (3) minutes to completely dissolve the agar.
4. Allow mixture to cool for 3 – 5 minutes.
5. Pour the agar mixture into the petri dishes to fill halfway with the warm mixture.
6. Place the lids on the dishes and allow to cool for at least an hour.

Collecting bacteria swabs

7. After allowing the agar solution to set and cool, tip off any excess solution that hasn't set.
8. Collect a bacteria swab from the inside of each container using a clean cotton swab. Containers should include glass, metal, paper, and plastic.
9. Lightly trace lines in the agar solution using the bacteria swab.
10. Place the lid on the petri dish.
11. Label each of the petri dishes as the corresponding material type.

12. Turn the closed petri dishes upside down to avoid condensation effecting the bacteria swab.
13. Place the dishes in a warm, dark place to grow. Ideally, a temperature around 37 degrees will cause the best results.
14. Allow the bacteria to grow **over a few days**.

Observing the bacteria colonies

15. Remove petri dishes from their dark, warm location and allow students to observe the bacteria growth.
16. Allow students to write down, draw or photograph what they see.

Follow-up questions

- Did the results surprise students?
- What were they expecting to happen?
- Were any dishes free of bacteria?
- How might a swab from your water bottles look?

Evaluation

- Can students briefly explain how foods were preserved in the past?
- Can students explain why preserving food is important?
- Can students identify the benefits of using glass in preservation?
- Can students explain how microorganisms impact food?

Additional suggested activities and support

- Students could utilise time in between conducting the stages of the petri dish experiment to identify and explain the most common types of microorganisms found in foods.
- Students could subsequently attempt to identify the types of microorganisms found on the petri dishes. Further analysis could be conducted through a microscope.