Evolution of the Esky: Object Analysis

YEAR 3 AND 5
CHEMICAL SCIENCES
PHYSICAL SCIENCES
DESIGN AND TECHNOLOGIES

QGC | FUTUREMAKERS | QUEENSLAND MUSEUM NETWORK | Queensland Government

Future Makers

Future Makers is an innovative partnership between Queensland Museum Network and Shell's QGC business aiming to increase awareness and understanding of the value of science, technology, engineering and maths (STEM) education and skills in Queensland.

This partnership aims to engage and inspire people with the wonder of science, and increase the participation and performance of students in STEM-related subjects and careers – creating a highly capable workforce for the future.

Cover Image: Esky from Queensland Museum Network collection. © Queensland Museum

QUEENSLAND MUSEUM NETWORK

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EXPLORE – EXPLAIN – ELABORATE

Evolution of the Esky: Object Analysis

Teacher Resource

Object-based learning is "a mode of education which involves the active integration of authentic or replica material objects into the learning environment"[1]. It can be used to prompt student investigation into a topic or concept and promote student inquiry. Queensland Museum Network (QMN) collections can be used to facilitate object-based learning within the classroom. Objects can be viewed online or in-person at exhibitions on display across QMN.

In *Evolution of the Esky*, students engage in an object analysis task. They use objects from QMN's Cultures and Histories collection and other contemporary objects which have been used to preserve food products to explore how understandings of science concepts (i.e. heat transfer and states of matter) have been applied to create designed solutions that solve a community problem.

During the object analysis, students will:

- Identify and describe the features and characteristics of each object.
- Examine the materials used to construct each object.
- Use their observations to suggest when each object was made and used.
- Use their observations to suggest what each object was used for.
- Consider how the objects were/are designed for their purpose.
- Compare collection items to explore how objects designed for similar purposes have changed over time.

The objects selected for this activity will vary in terms of recognition by students. For differentiation, you may like to provide some students with more recognisable objects (i.e. the modern Esky or cooler bag) and other students with less recognisable objects (i.e. the Coolgardie safe or ice chest).

Evolution of the Esky can be used as a stand-alone activity or incorporated into the *Cool Inventions Maker Space Challenge* (page 39).

1 Jamieson, A. (2017). Object-based learning: A new way of teaching in Arts West. Retrieved from https://rest.neptune-prod.its.unimelb.edu.au/server/api/core/bitstreams/c254c3a2-c6ce-5bb7-a41a-e441d4759c52/content.

Detailed step-by-step instructions can be seen below. It is recommended that you use these instructions to guide your students through the activity.

1. Divide students into groups of two or three. Distribute one object image to each group. Students use the See-Scan-Analyse strategy to observe and analyse the objects.

   See: Describe what you see.

   What materials is the object made from?

   What colour is the object?

   Scan: Look closely at the object.

   What extra details do you notice now that you didn't before?

   Analyse: When do you think the object was made and used? Why?

   What do you think the object was used for? Why?

   Ask groups to consider and respond to the above questions, and to then share their objects and responses with the class.

2. Following the class discussion, inform students that all objects have something in common. Provide students with time to discuss what this might be and to share their ideas with the class. If not already suggested, inform students that all objects were designed to preserve food products by keeping them cold.

3. Ask students to return to their groups and to focus on their original object. Ask students: ***Now that we know the object was designed to keep food cold, how do you think it worked? What might make it effective at keeping food cold?***

   Prompt students to think about their prior learning to help develop their responses. Facilitate a class discussion during which students share and justify their ideas.

4. After students have shared their responses, use the *Object Profile Cards* (page 31) to explore and explain how each of the objects worked.

   Alternatively, you may wish to provide students with a research task and ask them to locate and record this information themselves. An *Object Analysis Template* is provided to guide students' response to the task (page 38).

Possible Extension Activities

- Which objects do students think would be most effective at preserving foods and keeping them cold? Ask students to discuss this question, then arrange the objects in order from least effective to most effective. Ask students to explain and justify the sort.
- Students predict which objects would be the most effective at keeping food cold and/or stopping food from melting. Students could then design and complete a scientific investigation as a class to test their predictions.
- Students construct their own Coolgardie safes. They could either do this by following a set of instructions or by 'reverse engineering' a Coolgardie safe based on an image or a physical object. Students could then test how well the Coolgardie safe works in different conditions.

Curriculum Links

Science

YEAR 3

Science Understanding

A change of state between solid and liquid can be caused by adding or removing heat (ACSSU046)

Heat can be produced in many ways and can move from one object to another (ACSSU049)

Science Inquiry Skills

With guidance, identify questions in familiar contexts that can be investigated scientifically and make predictions based on prior knowledge (ACSIS053)

Represent and communicate observations, ideas and findings using formal and informal representations (ACSIS060)

YEAR 5

Science Understanding

Solids, liquids and gases have different observable properties and behave in different ways (ACSSU077)

Science as a Human Endeavour

Scientific knowledge is used to solve problems and inform personal and community decisions (ACSHE083)

Science Inquiry Skills

Communicate ideas, explanations and processes using scientific representations in a variety of ways, including multi-modal texts (ACSIS093)

Design and Technologies

YEARS 3 AND 4

Design and Technologies: Knowledge and Understanding

Recognise the role of people in design and technologies occupations and explore factors, including sustainability that impact on the design of products, services and environments to meet community needs (ACTDEK010)

Investigate the suitability of materials, systems, components, tools and equipment for a range of purposes (ACTDEK013)

YEARS 5 AND 6

Design and Technologies: Knowledge and Understanding

Investigate characteristics and properties of a range of materials, systems, components, tools and equipment and evaluate the impact of their use (ACTDEK023)

General Capabilities

Literacy

Composing texts through speaking, writing and creating

Critical and Creative Thinking

Inquiring: Identifying, exploring and organising information and ideas

Generating ideas, possibilities and actions

Reflecting on thinking and processes

Analysing, synthesising and evaluating reasoning and procedures

Personal and Social Capability

Social management

Evolution of the Esky: Object Analysis

Teacher Resource

Object Images

Object A

QM, Peter Waddington

Object B

QM, Peter Waddington

Object C

QM, Peter Waddington

Object D

QM, Peter Waddington

Object E

Object F

Object G

Object A: Esky Portable Ice Box

Object Analysis	Examples	Object
DESCRIPTION – what does it look like?	Colour, shape, size, parts, appearance,	Rectangular, green box, lid attached. Size: L: 41.5cm, W: 19.5cm, H: 35cm
MATERIALS – what is it made of?	E.g. metal, wood, cardboard, plastic, clay	Metal exterior, enamel coating, rubber seal, cork insulation (not visible)
CONDITION – what condition is it in?	Complete object or part of object, parts replaced, broken	Complete object, some rust and paint damage
DATE – when was it made and used?	Period of time (estimate)	1960
LOCATION – where was it used / found?	Country and/or region	Australia

History and Design	
How did the object work?	A layer of cork (placed between the metal casing) provided insulation. Cork is an effective insulator because it contains very small air bubbles; the air bubbles transfer heat very slowly. This slows the transfer of heat from the outside environment into the Esky. The rubber seal on the lid stops air from getting into the Esky and heating the food inside.
Is the object still used today? How has it changed over time, or what has replaced it?	Eskies are still used today. However their designs and the materials used to construct them have changed. Modern Eskies are made from a thick plastic casing instead of metal. Foam has also replaced cork as the main insulating material. These modifications mean that modern Eskies are lighter, more durable and more effective at keeping foods cold than older versions.

Object B: Esky Portable Cooler

Object Analysis	Examples	Object
DESCRIPTION – what does it look like?	Colour, shape, size, parts, appearance,	Rectangular, blue box, removable white lid, rounded edges, handles, screw-in plug for drainage Size: L: 40cm, W: 23cm, H: 40cm
MATERIALS – what is it made of?	E.g. metal, wood, cardboard, plastic, clay	Metal exterior and handles, enamel coating, rubber seal, cork insulation (not visible)
CONDITION – what condition is it in?	Complete object or part of object, parts replaced, broken	Complete object, some rust and paint damage
DATE – when was it made and used?	Period of time (estimate)	1965 - 1970 (estimate)
LOCATION – where was it used / found?	Country and/or region	Australia

History and Design	
How did the object work?	A layer of cork (placed between the metal casing) provided insulation. Cork is an effective insulator because it contains very small air bubbles; the air bubbles transfer heat very slowly. This slows the transfer of heat from the outside environment into the Esky. The rubber seal on the lid stops air from getting into the Esky and heating the inside.
Is the object still used today? How has it changed over time, or what has replaced it?	Eskies are still used today. However, their designs and the materials used to construct them have changed. This Esky has new parts and features that were not included in past designs, including: a removable lid to improve accessibility, additional handles to improve portability and a screw-in plug to allow the Esky to be drained after use. Modern Eskies are made from a thick plastic casing instead of metal. Foam has also replaced cork as the main insulating material. These modifications mean that modern Eskies are lighter, more durable and more effective at keeping foods cold than older versions of the object.

Object C: Coolgardie Safe

Object Analysis	Examples	Object
DESCRIPTION – what does it look like?	Colour, shape, size, parts, appearance,	Metal cabinet mounted on four feet, water tray on top, water trough around bottom, green, shelf, hanging wire hook at top, gauze ventilation around sides, front door Size: L: 52cm, W: 47cm, H: 56cm
MATERIALS – what is it made of?	E.g. metal, wood, cardboard, plastic, clay	Metal (tin), wire gauze
CONDITION – what condition is it in?	Complete object or part of object, parts replaced, broken	Complete object, rust and paint damage
DATE – when was it made and used?	Period of time (estimate)	Unknown (estimate: 1890 - 1930)
LOCATION – where was it used / found?	Country and/or region	Australia (particularly rural areas)

History and Design	
How did the object work and how well do you think it worked?	The Coolgardie safe used evaporation to keep food stored inside cool. A tray on top of the safe was filled with water. A wet hessian bag was placed over the safe and pressed into the tray. The hessian absorbed water from the tray, which kept the material damp. The safe was generally kept in an area with good airflow. As the breeze evaporated the water absorbed by the fabric, it also absorbed the heat from the surrounding air and kept the contents of the Coolgardie safe cool. The safe could be placed on the ground or it could be hung from a hook to further promote airflow and better protect the food inside from insects.
Is the object still used today? How has it changed over time, or what replaced it?	Coolgardie safes were replaced by ice chests from the early 1900's in cities and towns where ice was readily available. The Coolgardie safe continued to be used, particularly in rural areas, until the mid-20th century.

Object D: Ice Chest

Object Analysis	Examples	Object
DESCRIPTION – what does it look like?	Colour, shape, size, parts, appearance, similar objects	Wood exterior, interior walls lined with metal, ornate handles Size: L: 1.2m, W: 60cm, H: 46cm
MATERIALS – what is it made of?	E.g. metal, wood, cardboard, plastic, clay	Wood, metal, insulation material – likely cork or charcoal (not visible)
CONDITION – what condition is it in?	Complete object or part of object, parts replaced, broken	Complete object, some wear to metal, wood in good condition
DATE – when was it made and used?	Period of time (estimate)	1820 (however not commonly used in Australia until 1900 - 1950)
LOCATION – where was it used / found?	Country and/or region	Australia

History and Design	
How did the object work and how well do you think it worked?	A large block of ice was placed in the compartment in the top of the box. Cold air circulated down and around the storage compartments in the lower section. A drip pan at the bottom of the chest caught the water from the melted ice. The drip tray had to be emptied regularly. Up until the mid-20th century, an ice man would deliver blocks of ice to houses for use in ice chests.
Is the object still used today? How has it changed over time, or what replaced it?	Ice chests were replaced by kerosene and later electric refrigerators. Ice chests were produced and used in Australia up until the 1950's.

Object E: Styrofoam Cooler

Object Analysis	Examples	Object
DESCRIPTION – what does it look like?	Colour, shape, size, parts, appearance, similar objects	White foam box, rope handle
MATERIALS – what is it made of?	E.g. metal, wood, cardboard, plastic, clay	Styrofoam
CONDITION – what condition is it in?	Complete object or part of object, parts replaced, broken	Complete object, good condition
DATE – when was it made and used?	Period of time (estimate)	1940 - current
LOCATION – where was it used / found?	Country and/or region	N/A

History and Design	
How did the object work and how well do you think it worked?	Styrofoam is effective at keeping food cold because it is a good insulator. A closed Styrofoam container limits the amount of heat transferred into the cooler through its surfaces or the air. Styrofoam has good insulating properties because it has millions of tiny air bubbles that slow the rate of heat transfer through the material.
Is the object still used today? How has it changed over time, or what replaced it?	While Styrofoam coolers are still used today, their use is becoming less common. They are being replaced by coolers made from hard plastics (e.g. Eskies) which are more effective and durable.

Object F: Modern Esky

Object Analysis	Examples	Object
DESCRIPTION – what does it look like?	Colour, shape, size, parts, appearance, similar objects	Hard plastic, blue container, white handle, removable lid
MATERIALS – what is it made of?	E.g. metal, wood, cardboard, plastic, clay	Hard plastic (polypropylene), insulation materials – polyurethane/foam (not visible)
CONDITION – what condition is it in?	Complete object or part of object, parts replaced, broken	Complete object, good condition
DATE – when was it made and used?	Period of time (estimate)	1970's - current
LOCATION – where was it used / found?	Country and/or region	N/A

History and Design	
How did the object work and how well do you think it worked?	Modern Eskies are made from insulators (plastics and foam). These materials slow the spread of heat and help keep the food stored inside the Esky cooler for longer. An Esky has thick walls made from plastic, and inside the plastic walls is a layer of foam. The thick walls further slows the movement of heat from the outside environment into the Esky. Air bubbles inside the foam also slow the transfer of heat. Eskies which have a tightly sealed lid also prevent air from outside getting into the Esky and heating the food inside.
Is the object still used today? How has it changed over time, or what replaced it?	Eskies made from plastics are still used today. Designs and construction processes continue to change to improve their effectiveness and usability.

Object G: Insulated Cooler Bags

Object Analysis	Examples	Object
DESCRIPTION – what does it look like?	Colour, shape, size, parts, appearance, similar objects	Rectangular, zip, blue, fabric handles, foil interior, fabric exterior, lunchbox
MATERIALS – what is it made of?	E.g. metal, wood, cardboard, plastic, clay	Polyester exterior, foil interior, dense thin foam (not visible)
CONDITION – what condition is it in?	Complete object or part of object, parts replaced, broken	Complete object, good condition
DATE – when was it made and used?	Period of time (estimate)	1980's - current
LOCATION – where was it used / found?	Country and/or region	N/A

History and Design	
How did the object work and how well do you think it worked?	Insulated cooler bags work similarly to modern Eskies. A dense, thin layer of foam (placed in between layers of other materials) provides insulation and limits heat transfer, which keeps the food inside cold.
Is the object still used today? How has it changed over time, or what replaced it?	Insulated cooler bags continue to be used today. The bags are lightweight, easily transported, durable and waterproof.

Evolution of the Esky: Object Analysis

Student Activity

Object Analysis Sheet

Object Analysis	Examples	Object
DESCRIPTION – what does it look like?	Colour, shape, size, parts, appearance, similar objects	
MATERIALS – what is it made of?	E.g. metal, wood, cardboard, plastic, clay	
CONDITION – what condition is it in?	Complete object or part of object, parts replaced, broken	
DATE – when was it made and used?	Period of time (estimate)	
LOCATION – where was it used / found?	Country and/or region	

History and Design	
How did the object work and how well do you think it worked?	
Is the object still used today? How has it changed over time, or what replaced it?	
What other interesting features do you notice about this object?	

Research	
What further questions would you like to answer?	