ST LAWRENCE C.E. PRIMARY SCHOOL LEARNING JOURNEY

SUBJECT: Science UNIT: A savage encounter TERM: Spring 1 YEAR GROUP: 5

THE BIG QUESTION	
How do the properties of materials affect how well they insulate heat and cold?	
END OF UNIT OUTCOME	Children plan, carry out, record and evaluate their own fair scientific investigation into insulation, using evidence to justify conclusions and challenge misconceptions.
OBJECTIVES	Compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal) and response to magnets. Working scientifically − Use and develop keys and other information records to identify, classify and describe living things and materials (non-statutory).
Working Scientifically	- Compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal) and response to magnets. Working scientifically – use and develop keys and other information records to identify, classify and describe living things and materials (non-statutory).
Safety in Science	**General laboratory safety:** Children should follow clear instructions, work sensibly in groups, and wash hands after practical work. Adult supervision is required throughout investigations. **Magnets (Lesson 1):** Use only small classroom magnets. Warn pupils not to place magnets near electronic devices or in mouths. Avoid snapping fingers between strong magnets. **Hardness testing:** Use gentle scratching only; do not use sharp tools. Materials should be checked for sharp edges before use. **Electrical circuits (Lesson 2):** Use **low-voltage battery-powered circuits only** (no mains electricity). Check wires and components for damage. Ensure circuits are disconnected when changing components. **Hot water and thermometers (Lessons 3–4):** Hot (not boiling) water should be poured by an adult. Use heat-resistant containers. Pupils should not carry hot water around the room. Care needed when handling thermometers (preferably alcohol/digital rather than mercury). **Cold/ice investigations (Lesson 6):** Normal hygiene precautions when handling ice and water. Mop up spills promptly to prevent slipping.
CONCEPT: Conflict	Children confront misconceptions (e.g. “metal keeps things warm”, “thick means best insulator”) and use evidence to challenge their thinking.
LESSON 1 QUESTION	How can materials be grouped based on their physical properties?
KEY KNOWLEDGE	- Materials can be transparent, translucent or opaque - A harder material will scratch a softer material - Most metals are non-magnetic. Only a few metals are magnetic, such as iron and steel.

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<table>
<tr><td>RICH TASK</td><td colspan="3">Introduce The Big Question – what do they already know?
Explore KO – copy in book after title page and paper copy home.

Work through slides to teach children required knowledge to answer the key questions:

1. What does it mean if a material is magnetic?

2. Is this object made from a magnetic material? How do you know? Object tested: _____

3. Are all metals magnetic, or only some of them?

4. What do these words mean?
○ Transparent: _____
○ Translucent: _____
○ Opaque: _____
5. How could you test two materials to find out which one is the hardest?

6. Before testing, which material do you predict will be the hardest? Why?

Practical:
In groups children test a range of materials and group them based on transparency, magnetism and hardness. In these groups can children order from least to most.</td></tr>
<tr><td>SUPPORT AND CHALLENGE</td><td colspan="3">Support:

○ Pre-labelled sorting hoops
○ Word banks with symbols

Challenge:

○ Justify groupings using scientific vocabulary
○ Create their own classification key</td></tr>
<tr><td>KEY VOCABULARY</td><td>transparent – an object or material that allows all light to pass through it
• translucent – an object or material that allows some light to pass through it
• opaque – an object or material that does not allow any light to pass through it
• magnetism – a non-contact force created by a magnet
• hardness – a measure of how resistant a solid is to a change of</td><td>RESOURCES</td><td>Magnets

Coins

Materials such as wood, brick and rock.

Magnetism - BBC Bitesize</td></tr>
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	shape or indentation when a force is applied		
LESSON 2 QUESTION	Which materials conduct electricity and why?		
KEY KNOWLEDGE	An electrical conductor is a material that allows electricity to flow through it. An electrical insulator is a material that does not allow electricity to flow through it. Metals are good electrical conductors. Plastic, wood and paper are not electrical conductors.		
RICH TASK	Retrieval practice activity – children to describe the properties of materials on their tables using the vocabulary from the previous lesson. **True or False – Fix It** • "Plastic conducts electricity." • "All metals are magnetic." Children correct false statements. Revise KO Work through slides to teach children required knowledge to answer the key questions. Children write Q in book and answer. **Practical:** Provide children with a range of materials. Children complete a series circuit using the material to test if it conducts electricity. Children to predict for each material whether it will be an insulator or conductor.		
SUPPORT AND CHALLENGE	**Support:** Prediction sentence starters **Challenge:** Identify real-life uses of conductors and insulators		
KEY VOCABULARY	Conductor, insulator, electrical circuit, component & prediction	**RESOURCES**	materials which are metal, paper, plastic and wood What are conductors and insulators? - BBC Bitesize
LESSON 3 QUESTION	**Which material is the best insulator of heat?**		
KEY KNOWLEDGE	Heat can transfer from hot objects to cooler surroundings **Insulators slow down heat transfer** A **fair test** changes only one variable A **control** is used for comparison		

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	Temperature can be measured using a thermometer		
RICH TASK	Retrieval practice activity: one side of the room to be labelled insulator and one side to be labelled conductor, hold up materials – children to move to one side of the room if they think the material is an insulator or conductor. Revise KO Plan test and write prediction sentences in books: "I predict ___ will be the best insulator because ___ property will reduce heat transfer." Children plan a comparative test to see which material is the best thermal insulator. Children choose 3 materials to wrap around beakers such as bubble wrap, felt and foil. Children should have an additional beaker with no insulation to act as a control. Each beak should be filled with hot water. Children record the temperature of water over a period of time to investigate what happens.		
SUPPORT AND CHALLENGE	**Support:** • Shared planning model • Provided materials list • Sentence stems for predictions **Challenge:** • Identify variables independently • Suggest improvements to reliability		
KEY VOCABULARY	Thermal insulator, temperature, fair test, variable, control & prediction	**RESOURCES**	KS2 Science: Which material is the most effective insulator? - BBC Teach
LESSON 4 QUESTION	**Which material is the best insulator of heat?**		
KEY KNOWLEDGE	Results should be recorded accurately in tables Patterns in results help answer scientific questions Conclusions must be based on evidence Different materials insulate heat at different rates		
RICH TASK	Retrieval practice activity – show different materials and children to suggest which they predict will be the best insulator of heat and justify why. Revise KO Children to carry out their experiment as planned in the previous lesson and record results. Allow time to share results and to discuss findings as a class.		

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<tr><td>SUPPORT AND CHALLENGE</td><td colspan="3">Support:

• Shared results table
• Adult-led discussion

Challenge:

• Explain anomalies
• Link results to material properties</td></tr>
<tr><td>KEY VOCABULARY</td><td>Results, conclusion, data, thermometer & evidence</td><td>RESOURCES</td><td>- Four same-sized beakers
- Four thermometers
- Aluminon foil
- Bubble wrap
- Hot water
- Stopwatch/ timer
- Cloth</td></tr>
<tr><td colspan="4"></td></tr>
<tr><td>LESSON 5 QUESTION</td><td colspan="3">How reliable and fair was our insulation investigation?</td></tr>
<tr><td>KEY KNOWLEDGE</td><td colspan="3">Scientific investigations can be evaluated for fairness, accuracy and reliability

Repeating results improves reliability

Identifying limitations helps improve future investigations</td></tr>
<tr><td>RICH TASK</td><td colspan="3">Retrieval practice activity

Which Would Improve the Test?

• Repeating readings
• Using different-sized beakers
• Measuring temperature at equal time intervals

Children choose and justify.

Revise KO

Children evaluate using stem sentences:

• “One strength of our investigation was…”
• “One limitation was…”
• “If we repeated this test, we would improve it by…”</td></tr>
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<tr><td>SUPPORT AND CHALLENGE</td><td colspan="3">Support

• Evaluation checklist
• Modelled example conclusion

Challenge

• Link evaluation to reliability and validity
• Suggest improvements linked to variables</td></tr>
<tr><td>KEY VOCABULARY</td><td>Evaluate, reliability, accuracy, limitation & improvement</td><td>RESOURCES</td><td>Results table

Evaluation scaffold

Example conclusion</td></tr>
<tr><td colspan="4"></td></tr>
<tr><td>LESSON 6 QUESTION</td><td colspan="3">How can we apply what we know to design our own investigation?</td></tr>
<tr><td>KEY KNOWLEDGE</td><td colspan="3">Insulation works for both heat and cold

Scientific investigations require planning, testing and evaluating

Evidence is used to challenge ideas and misconceptions</td></tr>
<tr><td>END OF UNIT OUTCOME</td><td colspan="3">Revision of key knowledge & KO quiz

Revisit Big Question:
“How has your answer changed since Lesson 1?”

Concept reflection:
“Which idea were you most surprised was wrong?”

Children are to develop their previous investigation on seeing which material kept the water the hottest for the longest by planning an investigation to see which material would keep the water the coldest. Children to use Ice cubes rather than hot water and decide which materials they wish to use to keep the ice coldest for the longest. Children plan and carry out the practical making sure it is a fair test.</td></tr>
<tr><td>SUPPORT AND CHALLENGE</td><td colspan="3">Support:

• Planning scaffold
• Suggested materials list

Challenge:</td></tr>
</table>

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	• Improve reliability • Justify choices using evidence		
KEY VOCABULARY	Insulation, fair test, variable, control & evaluate	**RESOURCES**	KO quiz Ice cubes Materials Water Beakers