STEM in a Box Lesson Plan

FROM SLUDGE TO SALT

This lesson plan will guide you through the STEM-in-a-Box session.

LESSON LENGTH	Approx. 3 hours – morning lesson (including break) or 3 lessons
SCIENTIFIC PROCESSES	Magnet, sieving, dissolving, filtering & evaporating
LEARNING OBJECTIVES	I can explain the processes needed to separate a material (salt) from a mixture of materials (Sludge)
LEARNING OUTCOMES	• Know that a mixture of materials (Sludge) can be broken down into its individual components (rocks, metal, sand & salt) • Use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating • Know that some materials will dissolve in liquid to form a solution • Be able to describe the recovery process of a substance from a solution • Know that some scientific processes are better than others for recovering specific materials from a mixture of materials
RESOURCES	**STEM-in-a-Box contains all the resources needed** All equipment and resources required for the lesson are provided in the Year 5 plastic storage box and the cardboard '*Lab Station boxes (see packing and storing instruction* *NB Matches are used for the evaporation process. Teachers can decide whether this process should be conducted by the teacher/TA or by the teams of children at their* 'Lab Station'.

PREPARING FOR THE LESSON

Watch the 'How to' video on the Members Area to learn the STEM-in-a-Box scientific processes. Decide whether you wish to use certain sections or all of the the video (see below) to guide the children through the lesson or if you wish to teach it yourself. Teaching it yourself will build your science confidence and will allow more opportunity for the children to make independent decisions about the order in which to carry out the processes.

Set tables up into 6 'Lab Stations' for teams of 5 scientists.

NB If you have more than or fewer than 30 pupils then teams can be larger or smaller.

Put one closed STEM-in-a-Box, one workbook and the team badges on each 'Lab Station'.

'HOW TO' VIDEO SECTIONS

Use the clickable time codes in the description to navigate directly to a particular section of the video listed below.

- Introduction to lesson
- Safety briefing
- Process explanation (example of mixing a cake)
- Get ready! (lay out the equipment)
- Observing the 'Sludge'
- Planning your processes
- Process: Magnet
- Process: Sieving
- Process: Dissolve
- Process: Filter
- Process: Evaporate

(NB specific measurements of water and salt solution are required for the processes Dissolve (fill 100ml large beaker with water, pour 25ml into small beaker) and Filter (pour salt solution from measuring cylinder into small beaker. Measure 5ml back into the cylinder).

UNDERSTANDING THE CHALLENGE		
TIMING	**TEACHER TASKS**	**CHILDREN TASKS**
4 MINS	**Find out about Greenergy** Explain that the project is provided by Greenergy, Europe's biggest producer of waste-based renewable biofuel, and Delight, an Arts Education charity. Show the children the Greenergy video so that they understand the connection between Greenergy's scientific process – extracting biofuel from used cooking oil – and the process they will be doing – extracting a material (salt) from a mixture of materials (Sludge). **RESOURCE:** Greenergy video (See Members Area)	Children understand the application of a scientific process in the real world.
10 MINS	**Observation: Magnified Images** *NB Ask the children not to open their STEM-in-a-Box – we don't want them getting distracted by the equipment just yet.* **RESOURCE:** Observation Power Point (See Members Area) Show the magnified images on the smartboard. Ask the children: • What might they be of? • What makes them think that? **RESOURCE:** Observation Answers Sheet (See Members Area) Reveal what the magnified images are to see if the children have identified them correctly.	Children offer ideas on what the magnified images might be of. Children discuss that an object can look very different when observed closely (magnified).
12 MINS	**STEM-in-a-Box – Processes** **RESOURCE:** 'How To' video (optional) Reiterate that experimentation and failure is key in science; it is part of a process to keep moving forward to success.	Children understand how to use the science equipment to complete each process.
4 MINS	**Safety** **RESOURCE:** Workbook (Page 4) ('How to' video optional) Ask the children to open the workbook to page 4. Recap on safety points.	Children understand the importance of safety when using hazardous equipment and materials.
5 MINS	**STEM Team** **RESOURCE:** Team badges and Workbook (Page 5) • Magnet Manager • Sieve Manager • Dissolve Manager • Filter Manager • Evaporation Manager Instruct the children to discuss which role each will take and to put on the badge. Explain that each child will get a turn at leading a process. Children can ask for help from another team member but they are in charge of their process.	Working together, children take time to decide who is going to take which role.
10 MINS	**Scientific Equipment** **RESOURCE:** Workbook (Pages 6 & 7) and Teacher Cheat Workbook for answers (See Members Area) Ask the children to lay out all of the STEM-in-a-Box equipment on their 'Lab Stations', then work together to identify what each piece of equipment is called and label it in their workbook.	Children work together to identify and label scientific equipment.

Continued overleaf…

UNDERSTANDING THE CHALLENGE		
TIMING	**TEACHER TASKS**	**CHILDREN TASKS**
5 MINS	**Observe** **RESOURCES:** Workbook (Page 8) Ask the children to look at the equipment and choose which item will help them look closer at their Sludge, then complete the page.	Children work together to select the best item of equipment to observe a material, draw it and record the observations they made with it.
5 MINS	**Question** **RESOURCE:** Workbook (Page 9) ('How to' video optional) Offer teacher definition with explanation that a process is **a series of steps, things you need to do, to achieve a particular result.** What other processes can we think of in real life? Recap on the children's challenge – to extract salt from the Sludge. Working in their teams, using the sticky notes, ask the children to discuss their challenge and write down questions they want to find the answer to through this scientific process. Encourage them to use the words 'materials', 'processes', 'separate' and 'mixture' in their questions. Teams choose one 'best' question to investigate and stick this into the workbook on page 9.	Children offer suggestions on what other things are processes. Children work together to come up with questions they might be able to answer through this experiment.
10 MINS	**Plan** **RESOURCE:** Workbook (Pages 10 & 11) **PAGE 10** Ask the children to consider which processes are best suited to which materials. **PAGE 11** Ask the children to decide which order they want to complete the processes in.	Children work together to decide which is the best process for taking out each material. Children work together to decide which is the best order to complete the 5 processes in and why.

COMPLETING THE SCIENTIFIC PROCESSES		
It is now time for the children to complete the 5 scientific processes in the order they decided upon on page 11 of the workbook. Teams will discover for themselves if their order isn't necessarily the most practical and can adjust as they go along if they wish. *NB If you want the children to get the best experience of the sieving process you may wish to guide them away from completing a wet process prior to sieving.*		
TIMING	**TEACHER TASKS**	**CHILDREN TASKS**
75 MINS	**Complete the Scientific Processes** **RESOURCES:** Scientific equipment and materials ('How to' video optional) Guide the children through the completion of the five scientific processes with each child in role leading on their job.	Children understand the intended Learning Outcomes (see page 1 of lesson plan).
40 MINS	**Measure, Record, Conclude, Consolidate** **RESOURCES:** Workbook (Pages 12, 13 & 14 & wordsearch) **Measure – PAGE 12:** Children record the quantities of water used for Filtering and Evaporating. **Record – PAGE 13:** Children record the materials they seperated and the processes they used to take each material out of the Sludge. **Conclude – PAGE 14:** Children record their processes and reflect on their enquiry question on page 9 of the workbook. Did they answer it? What did they do? **Consolidate – PAGE 15:** Teacher tests groups of children to see if they can describe the scientific processes they have learnt. Children work in teams. **Wordsearch:** Children complete the wordsearch to further consolidate the language learnt.	Children work together to record the measurements of water used. Children work together to record the material extracted with each process. Children work together to consolidate their learning by reflecting on the order in which they completed the processes and the scientific language they have learnt.