

Lessons for Challenge in Science

The participants planned these lessons during Day 3 of the Excellence in Cities Training Programme for Gifted and Talented Co-ordinators: Primary.

Many thanks to all who contributed to this work.

Science

Example 1

Objective: How can we change the brightness of a bulb?

Post-it: Brainstorm things that could be changed
eg. number of bulbs/batteries
type of bulbs/batteries

Core Outcomes

- Compare circuits changing 2 factors
- Compare circuits fairly by changing one factor at a time

G&T Outcomes

- Make comparisons using more components eg. 2 batteries / 3 bulbs

Data Handling

Core

- Complete table of results
- Record observations and measurements

G&T

- Make predictions
- Table of results
- Compare outcomes
- Repeat experiment and check results
- Pose another question for future investigation

Example 2

Unit 3E Investigating magnets and springs

Learning objective: To investigate an aspect of the behaviour of magnets

Challenge: Which magnet is the strongest?

Resources: Making sense of Primary Science Investigations
(The Association for Science and Education)

Example 3

Objective: To explain how to make familiar objects move faster or slower
To distinguish between a scientific explanation for results and descriptions or other statements

Activity:

- Put children in ability groups
- Give them a box containing different materials, ie. ramp, bricks, board, various surfaces including carpet, lino, cork, vehicles, metre stick, tape measure, stop watch
- Place 'red herrings' in MA group
- Give various options on how to record results. MA's to devise own way of recording
- Children to investigate effect of either gradient or materials. Choose appropriate materials and method of recording results.

Extension: To be able to stop the vehicle at a given distance. Explain process used.

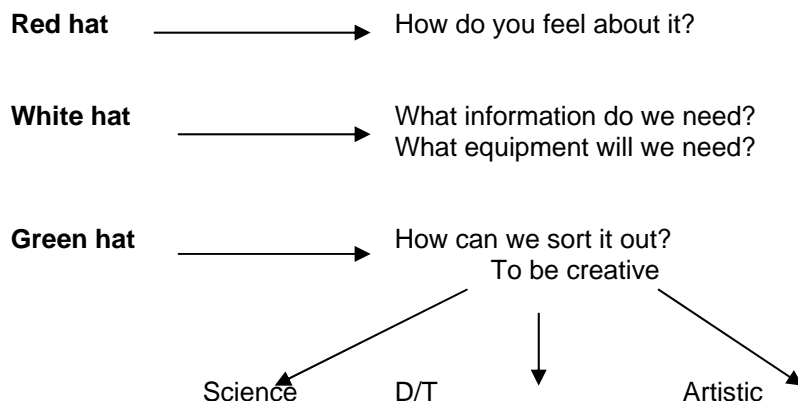
Example 4

Year 4 Science – Unit 4D

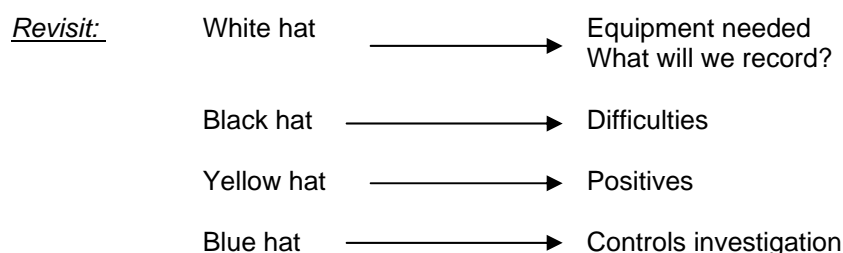
Objective: That solids can be mixed and that it is possible to get the original materials back
To choose appropriate apparatus for separating a mixture of solids

Problem: There has been an accident in school. The caretaker bumped into the cook resulting in a mixture of sand, nails and rice spilling all over the floor.

Let's put our Thinking Hats on to sort this problem out



Go down the scientific path and explain that we will be writing a science investigation to solve this problem.



refer to throughout, especially to direct children to relevant hat

Example 5

Materials

Objective: Children should learn that materials are suitable for making a particular object because of their properties (Sc3 la)

Activities:

Warm up

- 'Feely bag' containing different objects. Children to describe materials using key vocabulary – hard, soft, flexible, etc

PMIs

- An umbrella made from glass
- A house made of steel
- A car made from plastic

Which material would be most suitable to make a lamp-shade?

- Brainstorm in groups (ability?)
- Range of materials including red herrings
- Focus more able group to design a child's bedroom lamp – what else would they need to consider?

Cross curricular – DT – children to make their lamps

Plenary: Various sentences put on the board. Children discuss in groups and decide if it is:

- A scientific explanation
- A description
- A statement

eg. cars with big wheels go faster
cork offers less friction so the vehicle travels faster
carpet is rough so the car goes slower

Example 6

Year 4 Lesson Plan

<u>Objective:</u>	To use a thermometer to make careful measurements using standard measures.
<u>Introduction:</u>	Key question "Why do we need to use a thermometer?" Pair talk - CT to scribe ideas Maths link - Do you know how to read the scale?
<u>Activity:</u>	Only using senses, order a selection of fluids from hottest to coldest. Children arranged in mixed ability groups with defined roles; resource manager, reporter, observer/timekeeper, challenger
<u>Extension:</u>	If you changed the order of testing would it affect the results? Carry out again using thermometers to confirm/test prediction and produce a graph of results. Answer question: Are the results the same? Why?
<u>Resources:</u>	For safety use insulated and sealed containers with a finger hole. Make explicit the idea that fluid returns to room temperature and stays there. Link with insulators
<u>Plenary:</u>	Why do we need to use a thermometer? (more accurate) Test question showing inaccurate readings "Can you tell me what was done wrong?"

Example 7

<u>Learning Objective</u>	To make a complete circuit using a battery, wires and bulbs. To explore how to make a bulb light, explaining what happened.
---------------------------	--

Children. to go into ability groups with a box of equipment.

Aim: To make the bulb in your box light up.

HA – 3 bulbs. MA – 1 bulb LA – 1 bulb (supported)

Challenge to keep 2 bulbs lit while 1 bulb is turned off. How did you do it? Children to feedback & explain / demonstrate to others.

Is there a better/different way to do this? How would you do it? try ideas out on interactive discuss, & share next lesson.

Example 8

<u>Objective:</u>	That seeds can be dispersed in a variety of ways. To make careful observations of fruits and seeds to compare them and use results to draw conclusions.
<u>Activity:</u>	Show seeds Poem – language and vocabulary Cartoon recording of types (SEN/EAL) Transfer of knowledge – look at seeds, odd one out, decision tree GT Pictures – could it happen? e.g. bird and coconut

Example 9

QCA Unit 5A : Keeping Healthy Shipwrecked!

<u>Objective:</u>	To stay healthy we need an adequate and varied diet. To present information about diet and health.
-------------------	---

Introduction: You are shipwrecked n a tropical island completely alone. Whilst searching the shore you discover:

a box of matches, an old exercise book, a pencil, a metal dinner plate.

Whole class activity: List all problems you need to overcome by nightfall in order of priority and give explanations.
Research what humans need to maintain a healthy diet.
List what type of food do you hope to find on the island.

G&T group: You need to have sufficient drinking water on the island to survive (there is none on the island). Plan how you would solve this problem. Time dependent – carry out or test solution.

Plenary whole class: If you had been on the island for 10 years, what do you think your body would be like when you are eventually rescued?

Plenary G&T: Discuss concept cartoon (p83) Salty Water.

Example 10

Objective: To know that we have two sets of teeth and adult teeth have to last.

Key question on board: 'Why do your teeth fall out?'

Discussion involving 'think, pair, share' re: what is it like to lose a tooth / how it feels / what happened / other ways of losing teeth. Draw out that children lose milk teeth, replaced by another set.

Introduce PMI for: 'What would it be like to have no teeth?'

Prompt: think of grandparents (possible hot seat)

From positives and minuses found – draw out that it is beneficial to have teeth and that adult set can't be replaced.

Independent task:

Strip cartoon child loses a tooth
adult loses a tooth

Each cartoon has to have different ending. Children choose which to do / both or in working groups.

Plenary: Share cartoons – reinforce different endings of cartoons in order to reinforce objective. Introduce implications of caring for teeth / healthy eating → next lesson.

Example 11

Science QCA Unit 3E Magnets and Springs

Objective: To make and test predictions about whether materials are magnetic or not.
That magnets attract some metals but not others and that other materials are not attracted to magnets.

Introduction:

Give children variety of materials (HA – all metals. Red herrings)

- Predict – classify into yes, no, not sure.
- Explain why?
- Define magnetic.

Main: Outline activity. Children carry out activity.
Question – What is a magnetic object?
Choose a method of recording.

Conclusion: What have we found?
Relate to predictions.
PMI – What if you were a magnet?

Example 12

4E - Friction

6E - Forces in Action (end of unit lesson)

Objective: To plan a fair test; to carry out a fair test.
To be able to communicate your findings in an interesting and informative manner.

Introduction: PMI – ‘A World where there is no Friction’ – p84 Challenges in Primary Science.
Discuss in mixed ability groups and feed back to class.

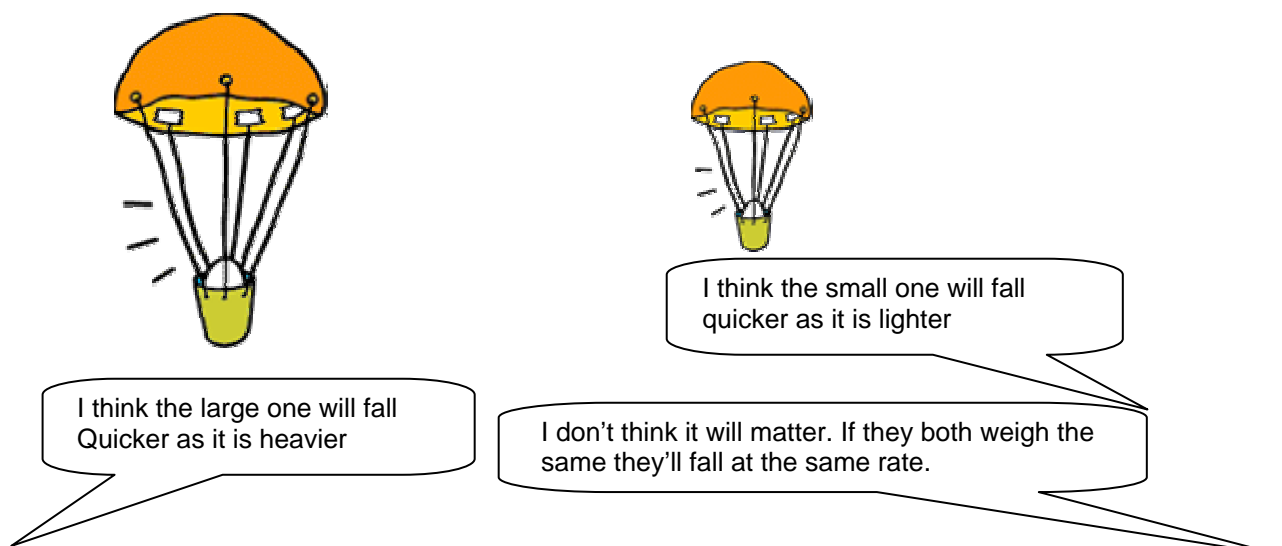
Main activity: Carry out an investigation to show how friction affects the lorry’s movements.
Carry out investigation in groups.
Conclusion – drawn/written; oral.

Gifted and Talented: Develop their own investigation into the friction of the lorry and what other factors affect the lorry’s movements.

Resource box: model car, slope, card, washing up liquid, weights.

Example 13

Objective: When an object falls air resistance acts in the opposite direction



Who can make this weight fall the slowest?

Discussion/scenario.

Draw a variety of designs
How can these be tested fairly? – Share & discuss

Experiment with own designs – record results

Group discussion in ability groups: Now consider what is happening. What have we found out? .

Using knowledge how can we apply this to the original question?

HOT – explain:

- does shape affect fall?
- does size affect fall?
- why?
- also the effect of different materials
- What happens if the weight is changed?

Example 14

Science Unit 2D Grouping and Changing Materials

Objective: That materials often change when heated.
To make observations and simple comparisons.

Challenge: 'Odd one out' – chocolate, ice cube, egg.

'Why change happens' – G&T pupils research movement of atoms and perform, in a drama, to rest of class.

PMI – make a house of sweets then a house of ice, then discuss changes.

Example 15

Unit 6F How we see things (short unit)

Objective:

- that when a beam of light is reflected from a surface, its direction changes
- to make careful observations and comparison

Possible Teaching activity suggested

- demonstrate to children what happens when a torch with a powerful beam is placed on a piece of white paper. Children trace path of beam and explore what happens when light hits a mirror.

Challenge (HOT)

- turn this into prediction that can be tested (regards to mirror)
- say what evidence shows and whether supports prediction
- put into a context i.e. maze of mirrors; light source at one end. How to direct light using mirrors?
- Identify possible practical applications and their benefits. (any historical applications)

Example 16

Foundation Stage Knowledge and Understanding

Objective:

- Learning to investigate and manipulate materials
- To observe and to foster curiosity
- To develop a hierarchy of questions & language skills

Task:

- Children to use their senses to explore dry soap flakes (not being told what they are). The talk about what they feel, see, smell

Questions:

- What does it feel like?
- What does it look like?
- What do you think will happen if we add water?

Task: Children add water and explore, using their senses.

- Models can be made from damp snow flakes (eg a snowman, polar bear) to extend their creativity

Assessment opportunities: Photographs, observation record

Core: What language did the children use?

More able: Comparisons, opinions, evaluation & higher order thinking

Extend into independent play activities – key questions

Example 17

QCA Unit 6e

Objectives:

- When an object is submerged in water, the water provides an upthrust (force)
- To make careful measurements of force, using a force meter
- To use a table to present results, identifying patterns and drawing conclusions

Introductory activity: Children demonstrate equal/unequal forces in pairs and act them out

Think, pair, share: What is gravity? Answers on post-its on board

Main teaching: Demonstrate how to use a forcemeter.

Investigation:

- What difference do you think the water will make to the pull downwards on the object?
- Can you generalise your findings and predict what will happen with other objects?

Less able will only be given objects that sink

More able will be given the following objects: stone, potato, cup, plasticine, orange (ie some float which will create an interesting situation regarding the pull down on the object in water! The pull will seem to be zero when the object floats)