



Developing shared understanding

PSTT conference, June 2023

Dr Sarah Earle
@PriSciEarle

Teacher Assessment in Primary Science (TAPS)

- Assessment as **embedded** part of teaching and learning
- Building a **shared understanding** of progression in primary science
- Working with teachers since 2013 across the UK to develop:

Pyramid model: eggs of wide range of approaches

Focused Assessment activity plans & pupil work eggs



RESPONSIVE TEACHING
Eg. Clear focus, questions, feedback

Teachers gather **evidence** of their pupils' learning through study of the products of activities and tasks (T4)
E.g. focused recording, models, sorting

- FOCUS ON PRESENTING FOR RESEARCH
- FOCUSED RECORDING
- CHOICE IN PRESENTING CRATERS INVESTIGATION
- SKELTON MODELLING
- SHARING HOME LEARNING
- POST-IT PLANNERS

TAPS Plan for Focused Assessment of Science

Topic: Properties and changing materials | Year 5 | Title: Sugar cube stacks

Working Scientifically
Do: Gather and record data of increasing complexity using tables

Assessment Focus
• Can children create their own table for recording results?
• Can children record data clearly and accurately?

Activity
Ask children to explore what happens when they place a stack of three sugar cubes in a small pool of coloured water (water with a small amount of food colouring). Pause and discuss what they notice and what they could investigate e.g. does the number of cubes/amount of water make a difference? What if you place a material between the cubes (e.g. paper/foam/straw)? How will you know if it makes a difference – what should we measure? (e.g. time for water to reach x time to fall). Ask groups to investigate one of their ideas and create their own table to record their findings. (Use fresh water each time if possible to avoid a saturated sugar solution). Share recorded results, discussing what has been found and reflect on what makes a good table.

Adapting the activity
Support: Question children to ensure they are clear about what they are changing and what they are measuring. Remind children to provide table titles so that they can be understood by others.
Extension: Repeat readings or try a different measure to check results.
Other ideas: Investigate different types of sugar; different temperatures of water...

Questions to support discussion
• What are you changing?
• What are you measuring?
• How are you recording your results?
• What are you putting in this column?
• Can you explain what your table shows?
• How clear is this table?
• How could the table be made more clear?

Assessment Indicators
Not yet met: Children note times, but recording is not clear, e.g. measuring time to absorb or time to fall/dissolve.

Meeting: Pupil recordings clearly show what was investigated. Results are recorded systematically in a table.

Possible ways of going further: The results table follows the science format of 'change' in the left column and 'measure' in the right column(s). Pupils recognise the need to repeat measures if they had more time and/or problems with the reliability of their data e.g. it was hard to tell when it had fallen so we should have done it again to check.

TAPS Cymru Focused Assessment example

Topic: Properties and changing materials | Year 5 | Title: Sugar cube results tables

Enquiry Focus
Do: Gather and record data of increasing complexity using tables

Concept Context
Know that some materials will dissolve in a liquid to form a solution.

Example
Children were asked to record data in their own table when investigating sugar cube stacks (see TAPS lesson plan).

Time for 3 cubes	Try 1	Try 2	Average
	18.53	15.53	17.03

Children meeting the objective would be able to record results in a table which could be understood by someone who was not in their group. They recognise the need for repeat readings (even if they ran out of time to record them).

Next steps for these children are to state the units in the table title (rather than the body of the table).

Example from St Fagans Primary School, Cardiff

TAPS Focused Assessment approach

Skills focus in the context of a whole enquiry

Evaluate

What happened?
Some blobs slipped from Mathew's biggest hand-span didn't lift smallest didn't lift the least

What have we found out?
We found out that it doesn't matter what size your hand is. We think the material being lifted might make the blob wet large and on a side



Ask Qs



Interpret results > draw conclusions

Control variables

Ideas

Variables we could change:

Our Method

We will change:

We will measure or observe:

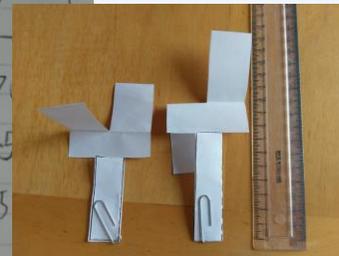
We will keep these things the same:

Accurate measurements

FALL (Seconds)

Does the shape affect the time it takes to fall?

Shape of Wings	1	2	3	4	AV
Wiggly line	1.15	0.59	0.92	0.35	0.77
Straight	0.90	0.79	0.50	1.19	0.845
Spiky	2.12	1.83	0.30	0.9	1.0875
Gagedy	0.73	2.41	0.99	1.03	1.29



Question: will a upside be...

Prediction: ...

How will we test this? ...

What we did:



Close observation

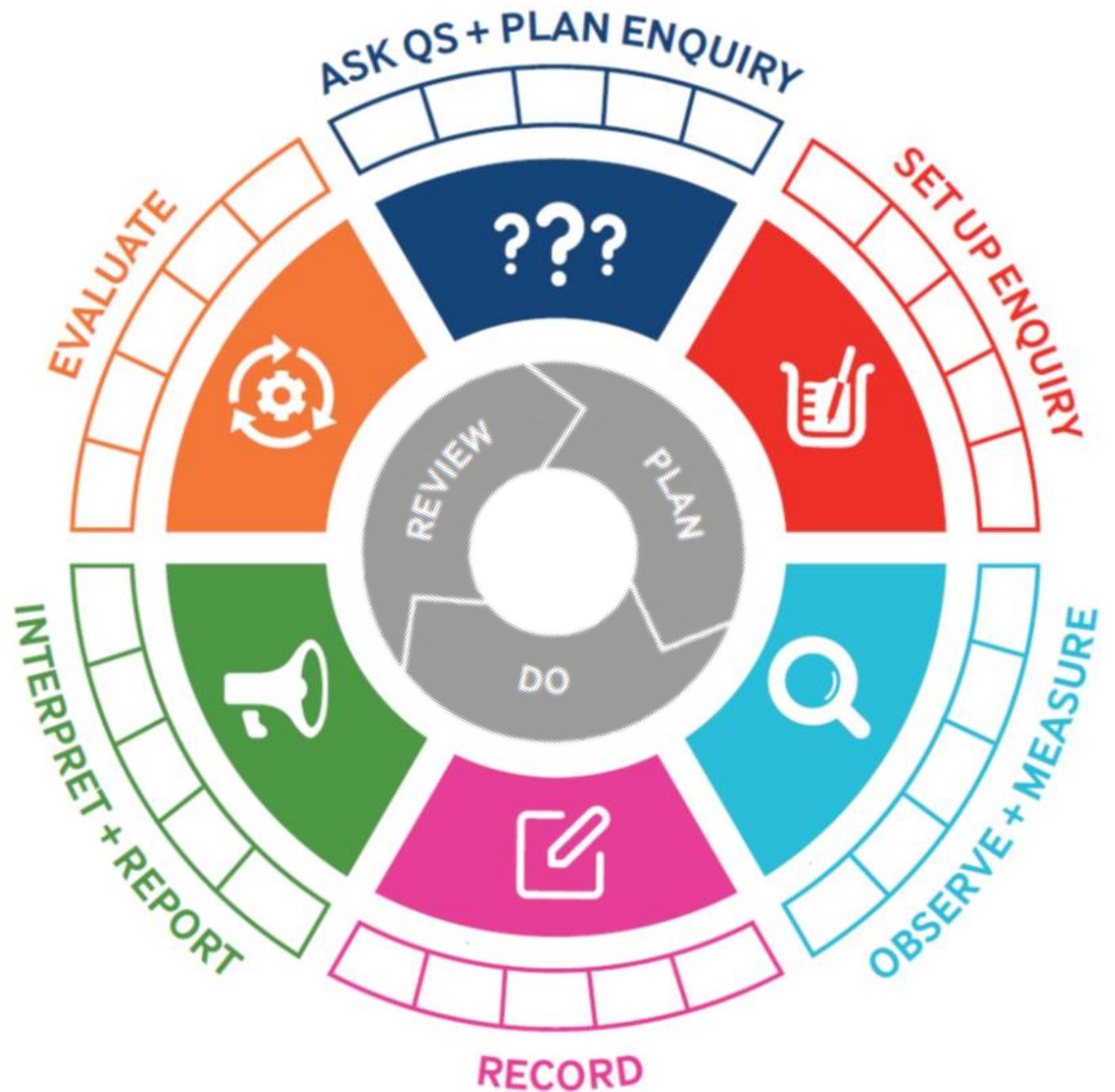


After salt

cracks rough
Hard bumpy

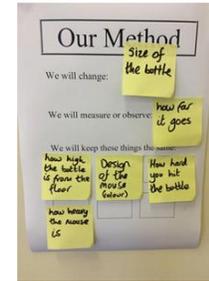


TAPS Working Scientifically Cycle



Our science skills working wall

Remember when we planned our own Rocket mice investigations?



Remember when presented our research about life cycles?



Remember when we measured which material let through the least water?



Material	Number of drops
Paper	18
Cling Film	100
Tin Foil	100
Kitchen Roll	22
Tissues	2
Socks	2
Blue Paper	56
Cotton Wool	43



Remember when we evaluated the way we dunked biscuits?

Would something like this wheel help with WS coverage?

Ongoing formative assessment
can be summarised more easily
if there is a FOCUS

Whole sch
processes

Summative reporting

Ongoing rich
formative
assessment can be
summarised from a
range of contexts

Shared understanding

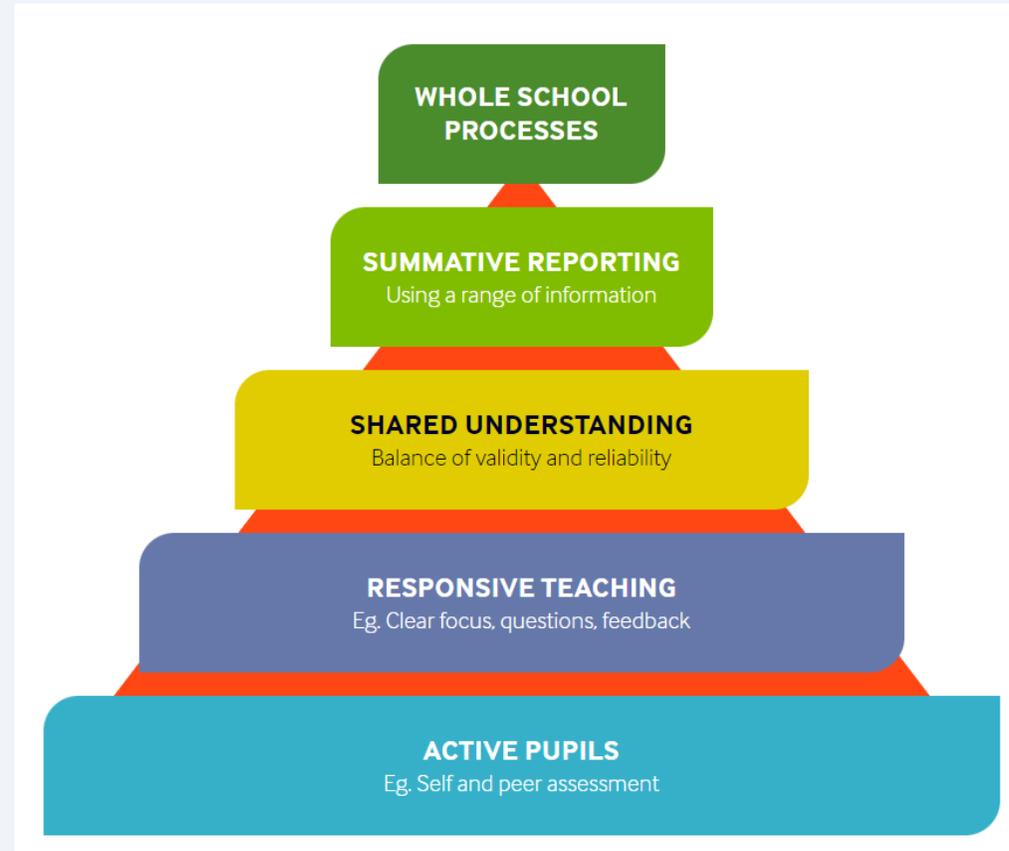
Assessment
to support
learning

Responsive teaching

Active pupil involvement

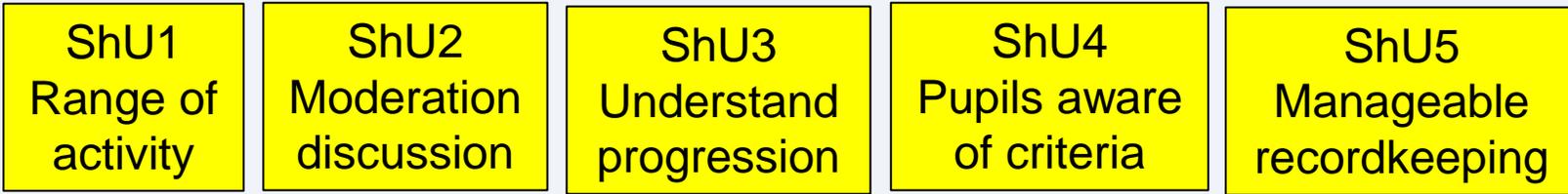
Key principles of TAPS

Developing shared understanding



Key to supporting progression and utilising assessment info

Developing shared understanding



number	Time it takes of water to fall
84	21.72
43	12.16

TAPS-All Progression in Science Skills

Topic links: Water, Recycling, Toys
 Primary 5/6 Age 8-10
 Activity title: Bottle flip

Science skill focus: Recording and communicating
 Curriculum link: Movement and Energy
 Force is needed to make an object move, change speed or direction (ME1)

Activity: Children investigate how the amount of water affects landing a bottle flip. They collect and record results to communicate their findings. A [lesson plan](#) for this activity can be found on the [PSTT website](#) at [www.pstt.org.uk](#)

Example from Primary 6 (age 9-10)
 Groups were asked to decide on their own method to compare bottle flip landings when the amount of water inside the bottle is changed. For example, some chose to count the number of successful landings from a set number of throws, whilst others counted the number of throws to reach 3 successful landings. All groups were asked (and reminded) to record their results clearly so that others could understand their investigation findings.

Children meeting the objective would record clearly to show what was investigated e.g. yes/no is recorded next to names/attempts or number of successful flips is clearly linked to an amount of water.

Example from Fairview Primary School, Ballyclare, Co. Antrim

Overview of TAPS plans for Focused Assessment of Working Scientifically
 (Any focus can be chosen for open-ended enquiries, these are only suggestions)

PLAN	DO	REVIEW	EVALUATE
Ask Qs + plan enquiry	Set up enquiry	Observe + Measure	Record
8 plans	Brain storm	Focus failures	Summarise sort
9/11	Ask simple Qs and recognise what they can be answered in different ways	Observe closely using simple equipment	Gather and record data to help in answering questions
11 TAPS	Materials: reflection test plane	Materials: floating and sinking	Materials: seasonal change
12 TAPS	Materials: water/soap/foam	Materials: water/milk	Materials: bridge/canals
13 TAPS	Materials: water/soap/foam	Materials: water/milk	Materials: force
14 TAPS	Materials: water/soap/foam	Materials: water/milk	Materials: force
15 TAPS	Materials: water/soap/foam	Materials: water/milk	Materials: force
16 TAPS	Materials: water/soap/foam	Materials: water/milk	Materials: force
17 TAPS	Materials: water/soap/foam	Materials: water/milk	Materials: force
18 TAPS	Materials: water/soap/foam	Materials: water/milk	Materials: force
19 TAPS	Materials: water/soap/foam	Materials: water/milk	Materials: force
20 TAPS	Materials: water/soap/foam	Materials: water/milk	Materials: force



• Where does it grow?
 • What happens to it during different seasons?
 • What differences can you see between these plants?
 • Why might the plants look different?

Assessment Indicators

Not yet met: Describe what they can see using everyday language. With support, label the basic structure of a plant.

Meeting: Can describe and point to the basic structure of a plant and a tree using scientific language, e.g. leaves, flowers, petals, fruit, roots, bulb, seed, trunk, branch, stem. May begin to explain what the parts of the plant are for.

Exceeding: Can use their observations to make comparisons between different plants or between different plant parts, e.g. that plant has a thicker/taller stem than that one, the petals are smaller than the leaves.



Judgements draw on range of activities

ShU1
Range of
activity

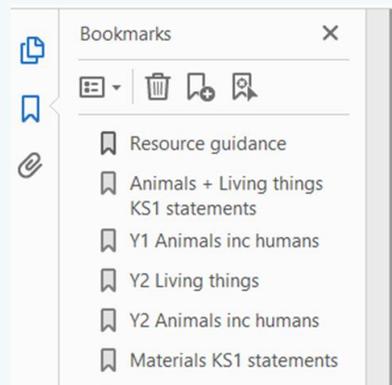
- Judgements can be more valid if based on a range of information.
- Range activities can provide information which can be used formatively or summatively.
- For example, during the latter half of a Year 3 topic on healthy eating the pupils:
 - investigated egg shells, predicting and collecting results about which liquid would stain teeth;
 - made models of teeth and 'chatterboxes' to name teeth and their functions;
 - and designed posters to promote healthy eating and dental care.
- The teacher used information from these tasks and her own observational notes to support her summative judgements.



Year 3
Edwardsville Primary, Merthyr Tydfil

NEW: Stoke exemplification for primary science (SEPS)

- Pupil work collections for KS1 and KS2
- Support for end of KS judgements
- Use bookmarks on left to jump to your topic or year group



Science Across the City Stoke exemplification for primary science (SEPS) BATH SPA UNIVERSITY

Topic: Materials	Year 1 Age 5-6	Title: Property sort
Working Scientifically Do: gather and record data (grouping and classifying)	Science content describe the simple physical properties of a variety of everyday materials	

Context: After discussing some examples of materials and different properties, children were asked to do their own sorting with hoops and property cards (rough/smooth, transparent/opaque, soft/hard, stretchy/nonelastic, bendy/rigid etc).

Children meeting the objective would be able to group materials by their properties.



<https://tinyurl.com/SEPSwork>

Science Across the City Stoke exemplification for primary science (SEPS) BATH SPA UNIVERSITY

Key Stage 1: Materials

Teaching of the National Curriculum (NC) leads to a summative teacher assessment judgement against the Teacher Assessment Framework (TAF) of 'meeting' or 'not yet meeting'. These exemplification materials provide examples of the kinds of things pupils could do in class to support ongoing assessment.

NC Year 1: Everyday materials

Pupils should be taught to:

- distinguish between an object and the material from which it is made
- identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock
- describe the simple physical properties of a variety of everyday materials
- compare and group together a variety of everyday materials on the basis of their simple physical properties.

NC Year 2: Uses of everyday materials

Pupils should be taught to:

- identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses.
- find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching.

Moderation discussions

Look at a snapshot (single activity):

- Can a judgement be made?

Look at a collection > summary:

- What feeds into an overall judgement?

Look at examples from different year groups:

- Is there progression?
- What evidence can you see for WS?

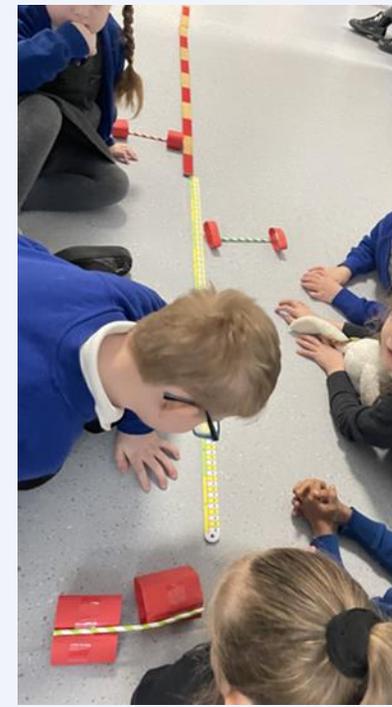
		Stoke exemplification for primary science (SEPS)	
Topic: Materials	Year 1 Age 5-6	Title: Property sort	
Working Scientifically Do: gather and record data (grouping and classifying)		Science content describe the simple physical properties of a variety of everyday materials	
<small>Context: After discussing some examples of materials and different properties, children were asked to do their own sorting with hoops and property cards (rough/smooth, transparent/opaque, soft/hard, stretchy/nonelastic, bendy/rigid etc).</small>			
			
<small>Children meeting the objective would be able to group materials by their properties.</small>			



Whole school investigations

- New example from Scotland
- O wings across the school
- Shows increasingly systematic control of variables

ShU3
Understand
progression



Sidlaw View Primary School, Dundee, Scotland

ShU4
Pupils aware
of criteria



Taste testing FS St Colmcilles

EVALUATING

From: talking about what they have done...
To: drawing conclusions and explaining accuracy



Shades of colour FS Ballyclare

OBSERVATION

From: describing using senses...
To: suggesting reasons



Separating colours KS1 Doagh

QUESTIONING

From: being curious...
To: asking questions which build on ideas





New PSTT website

Guidance, Lesson plans, Pupil work examples



sserc **TAPS Scotland** **why how? BATH SPA UNIVERSITY**
Focused assessment of scientific skills

Topic: Forces	Primary 7 Age 10-11	Activity title: O-wing
---------------	------------------------	------------------------

Scientific skills focus
Carry out: Minipup identified control variables to ensure validity of results.

Curriculum link
By investigating how friction, including air resistance, affects motion, I can suggest ways to improve efficiency in moving objects. SCN 2-07a

Assessment focus

- Can children identify what is changed (independent variable), measured (dependent variable) and kept the same (control variables)?
- Can children pay attention to the control variables during testing?

Activity Today we are aerospace engineers
Make and fly an o-wing: small loop (wing) at front, larger loop at back. Straw between (fuseage).
Give children some time to make their own and explore how it flies.
Pause to discuss variables e.g. wing size, fuseage size. Identify how to measure it (changing one (independent variable) of these would make a difference (dependent variable) e.g. flight time or distance.
Small groups to choose 1 change (indep). 1 measure (dep) and list variables which they need to keep the same (control). A **planning board** could help with this.
Observe groups as they carry out their investigation and support as necessary.
Discuss which variables are possible to control.

Adapting the teaching
Support: Use planning boards or planning questions.
Extension: Repeat readings. Consider different numbers of loops or different designs.
Other ideas: Explore paper planes.
Linked scientists: Wright Brothers, William Foose from Wales, Emma England (current cat)

Questions to support discussion

- What are you changing (independent variable)?
- What are you measuring (dependent variable)?
- Which variables do you need to control?
- Which control variables are hard to keep the same?
- Did your independent variable make a difference to the dependent variable?

Benchmark indicators
Working towards: Pupils need to be continually reminded to keep their control variables the same.
Achieved: Pupils can identify the variables when asked. They make a reasonable attempt at controlling the variables when carrying out and recording their results.
Possible ways to go further: Pupils recognise that some variables are harder/easier to control and/or some variables are more/less important for the outcome.

Teacher box 5 - adapt teaching. See TAPS pyramid for more examples.

BATH SPA UNIVERSITY **why how? BATH SPA UNIVERSITY**
Focused Assessment of Science

Topic: Forces	Year 3 Age 7-8	Title: Car track conclusion
---------------	-------------------	-----------------------------

Working Scientifically Focus
Review: using results to draw simple conclusions

Conceptual Knowledge Focus
Compare how things move on different surfaces

Example
Children worked in groups to release a car down a ramp and measure the distance it travelled on different surfaces at the bottom. They then individually wrote a short conclusion to explain which surface they thought had the most friction.

Conclusion 30.16
Which surface will produce the most friction?
The sandpaper had the most friction because the car only went 4cm to the rough and sticky properties of sandpaper.

Children meeting the objective would be able to relate their results to the properties of the materials or the slowing/stopping caused by the material. For example, above the child relates the car only going 4cm to the 'rough and sticky' properties of sandpaper.

Example from Shaw Primary School, Melksham

Primary Science Teaching Trust

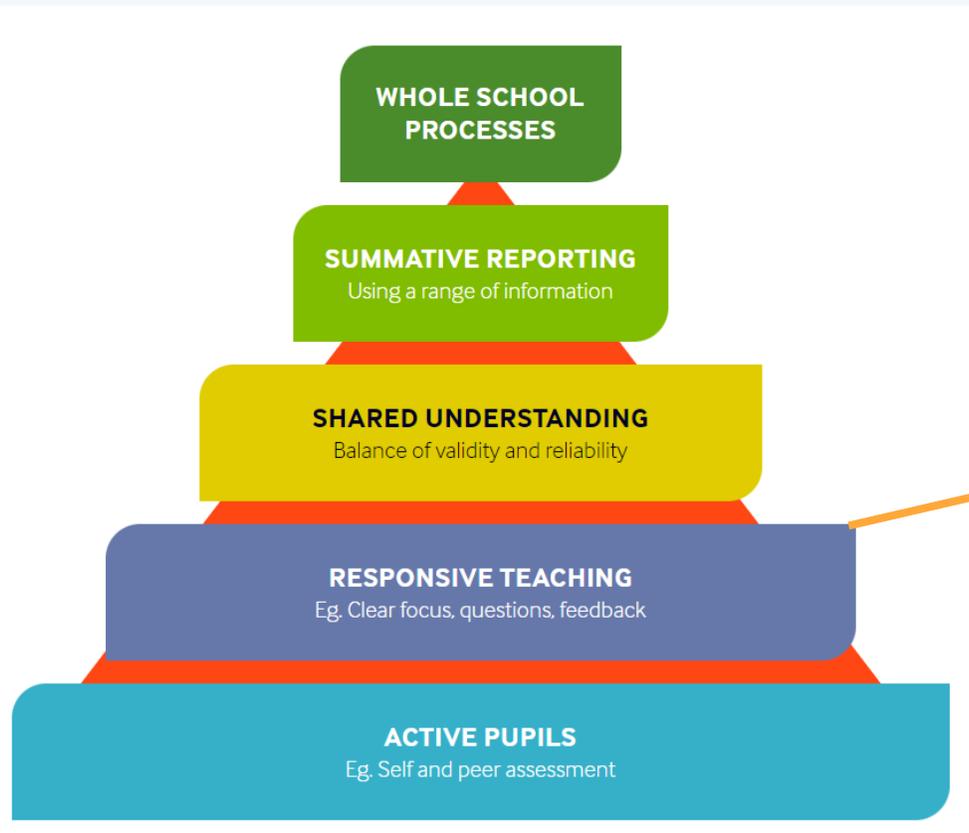
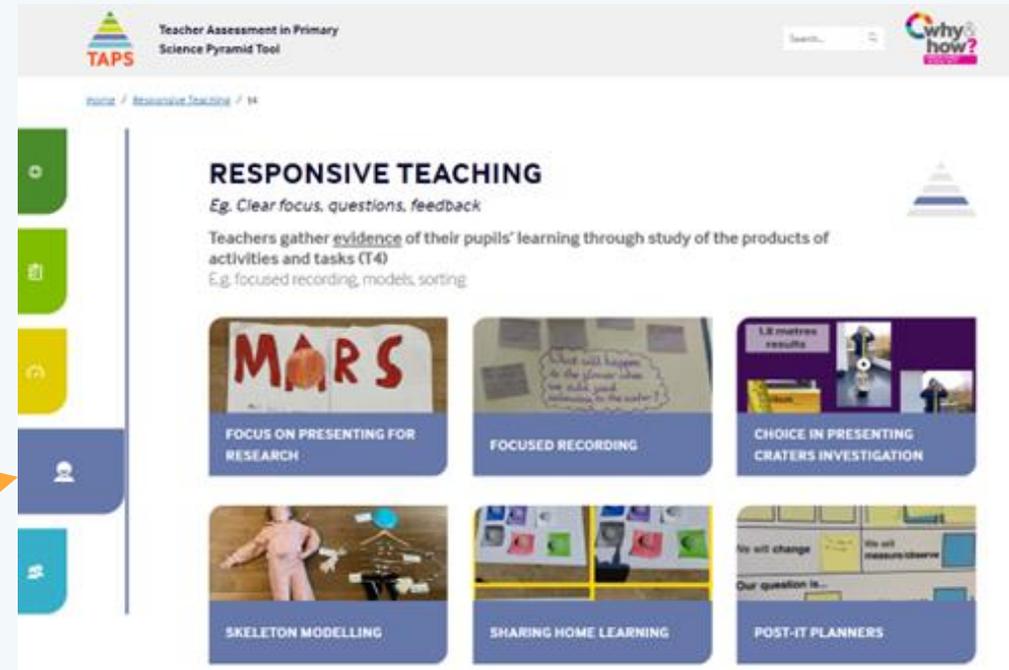
Focused Assessment Plans, Examples and Guidance documents

- All Types of resource
- All Age Ranges
- All Topics
- All Enquiry
- Country / Language

<https://pstt.org.uk/unique-resources/taps/>



Plus pyramid site with examples of practice from across the UK



<https://taps.pstt.org.uk/>

Any questions?

- To offer new examples:
- s.earle@bathspa.ac.uk