Re-building pupils' practical and enquiry skills

Welcome to the webinar. We will start at 3pm.
In the meantime, feel free to introduce yourselves, your role and location in the Q&A

8th July 2020

Sue Daley and Raj Joshi

s.daley@stem.org.uk RJoshi@e21c.co.uk slp@newsteadwood.co.uk

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Welcome and introductions

- Presenting: Sue Daley and Raj Joshi
- Please post your name, role and location in the chat
- Other experts in the room: CLEAPSS, STEM Learning, London STEM Ambassador Hub

1 Black Country
2 Cambridge and Peterborough
3 Central and West London
4 Central Midlands
5 Cheshire and The Wirral
6 Cornwall
7 Derbyshire and Nottinghamshire
8 Devon
9 Dorset and South Wiltshire
10 Durham and Tees Valley
11 Gloucestershire and North Wiltshire
12 Greater Bristol
13 Greater Lincolnshire
14 Greater Manchester
15 Greater Merseyside and Warrington
16 Hampshire and Isle of Wight
17 Hertfordshire and Essex
18 Kent and Medway
19 Lancashire and Cumbria
20 Leicestershire, Leicester and Northants
21 Norfolk and Suffolk
22 North and East London
23 North and West Yorkshire
24 North Midlands
25 Northumberland Tyne and Wear
26 Oxfordshire and Reading
27 Somerset
28 South and East Yorkshire
29 South Central
30 South London
31 Southend, Essex and Thurrock
32 Surrey
33 Sussex

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CLEAPSS is the guiding authority for everything science (and DT/Art practical)

We have now created a series of new guides to support schools during the COVID-19/Coronavirus Pandemic :-

GL336 - CLEAPSS Advice during the COVID-19 / Coronavirus Pandemic - Version 23 (Updated 29/05/20)

GL338 - Practical activities for pupils attending school during extended periods of closure

GL339 – Practical activities for pupils at home during extended periods of school closure

GL343 – Guide to doing practical work during the COVID-19 Pandemic – Science - Ver. 1.11 (3rd July)

GL345 – Guidance for science departments returning to school after an extended period of closure - Ver. 1.3 (26th June)

Search Science site: Search

- Log Out
- Helpline
- Site Feedback
- CLEAPSS Home Page
- > Science Home
- Bulletins
- Courses
- Equipment
- Guides
- HazCards
- Laboratory Handbook
- Join CLEAPSS
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- Recipe Sheets
- Student Safety Sheets
- Subject Areas
- Supplementary RAs
- Teaching Resources
- Technicians
- Useful Links
- What's New

Welcome to the new CLEAPSS Science Website

What is CLEAPSS

CLEAPSS resources give teachers ideas for exciting and engaging practical activities that fire pupils' imaginations and then, unlike many other sources of ideas, go on to show teachers and technicians in detail how to translate the ideas into safe and exciting experiences in the classroom.

CLEAPSS advice and documentation is recognised by the Health and Safety Executive and the Department for Education.. (read more)

Find Resources..

Search: Go

Latest news from CLEAPSS..

COVID-19 (Coronavirus) in Schools - Updated 03/07/2020

Latest News

CLEAPSS office is closed following government advice.

We will however continue to answer ALL helplines, and continue to develop both emergency guidance for COVID-19 and longer term developmental guides across all the areas we cover.

CLEAPSS

The best pieces of guidance are the two below, which should answer many of the questions (and possibly prompt some more!) :-

http://science.cleapss.org.uk/Resource-Info/GL343-Guide-to-doing-practical-work-in-a-partially-reopened-school-Science.aspx

http://science.cleapss.org.uk/Resource-Info/GL345-Guidance-for-science-departments-returning-to-school-after-an-extended-period-of-closure.aspx

Key questions:

- What's the role of practical work and scientific enquiry?
- What tools do we have for developing progression in practical skills?
- How can we adjust the science curriculum in the short term and improve the way we deliver science lessons in the longer term?
- What strategies, resources and tools can we draw on to enhance pupils' development of these skills?

Building progression in practical skills development

What came before?

Gathering and recording evidence	• taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate • recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, bar and line graphs	• use appropriate techniques, apparatus, and materials during fieldwork and laboratory work, paying attention to health and safety	• carry out experiments appropriately having due regard to the correct manipulation of apparatus, the accuracy of measurements and health and safety considerations
		• apply sampling techniques.	• recognise when to apply a knowledge of sampling techniques to ensure any samples collected are representative
		• make and record observations and measurements using a range of methods for different investigations; and evaluate the reliability of methods and suggest possible improvements	• make and record observations and measurements using a range of apparatus and methods

KS3 – 4 progression overview: what comes next?

KS3 - Experimental skills and investigations (ES)

1. ask questions and develop a line of enquiry based on observations of the real world, alongside prior knowledge and experience
2. make predictions using scientific knowledge and understanding
3. select, plan and carry out the most appropriate types of scientific enquiries to test predictions, including identifying independent, dependent and control variables, where appropriate
4. use appropriate techniques, apparatus and materials during fieldwork and laboratory work, paying attention to health and safety
5. make and record observations and measurements using a range of methods for different investigations
6. evaluate the reliability of methods and suggest possible improvements
7. apply sampling techniques

KS4 - Experimental skills and strategies (ES)

1. use scientific theories and explanations to develop hypotheses
2. plan experiments or devise procedures to make observations, produce or characterise a substance, test hypotheses, check data or explore phenomena
3. apply a knowledge of a range of techniques, instruments, apparatus, and materials to select those appropriate to the experiment
4. carry out experiments appropriately having due regard to the correct manipulation of apparatus, the accuracy of measurements and health and safety considerations
5. recognise when to apply a knowledge of sampling techniques to ensure any samples collected are representative
6. make and record observations and measurements using a range of apparatus and methods
7. evaluate methods and suggest possible improvements and further investigations.

STEM Clubs opportunities – applying the skills

Applying simple principles to real world scenarios and developing the skills of tinkering, patience and tweaking

Justifying practical science at a whole school level

EEF recommendations	• https://educationendowmentfoundation.org.uk/tools/guidance-reports/improving-secondary-science/ • Recommendation 5 - Use practical work purposefully and as part of a learning sequence
Gatsby benchmarks	• https://www.gatsby.org.uk/education/programmes/support-for-practical-science-in-schools • 10 Benchmarks and 10 Recommendations strongly support by research
Carrot-gate	• AQA GCSE trilogy Biology paper 1H Question 4 • 55% of students achieved at least one mark, but only 27% achieved two or more marks [out of 6] • There were a few very good responses which demonstrated that the definition for osmosis had been learnt.
Cleapss	• Usually features in whole school H&S plan • Have release Covid specific guidance throughout the different phases of school closure

Education Endowment Foundation

IMPROVING SECONDARY SCIENCE

Summary of recommendations

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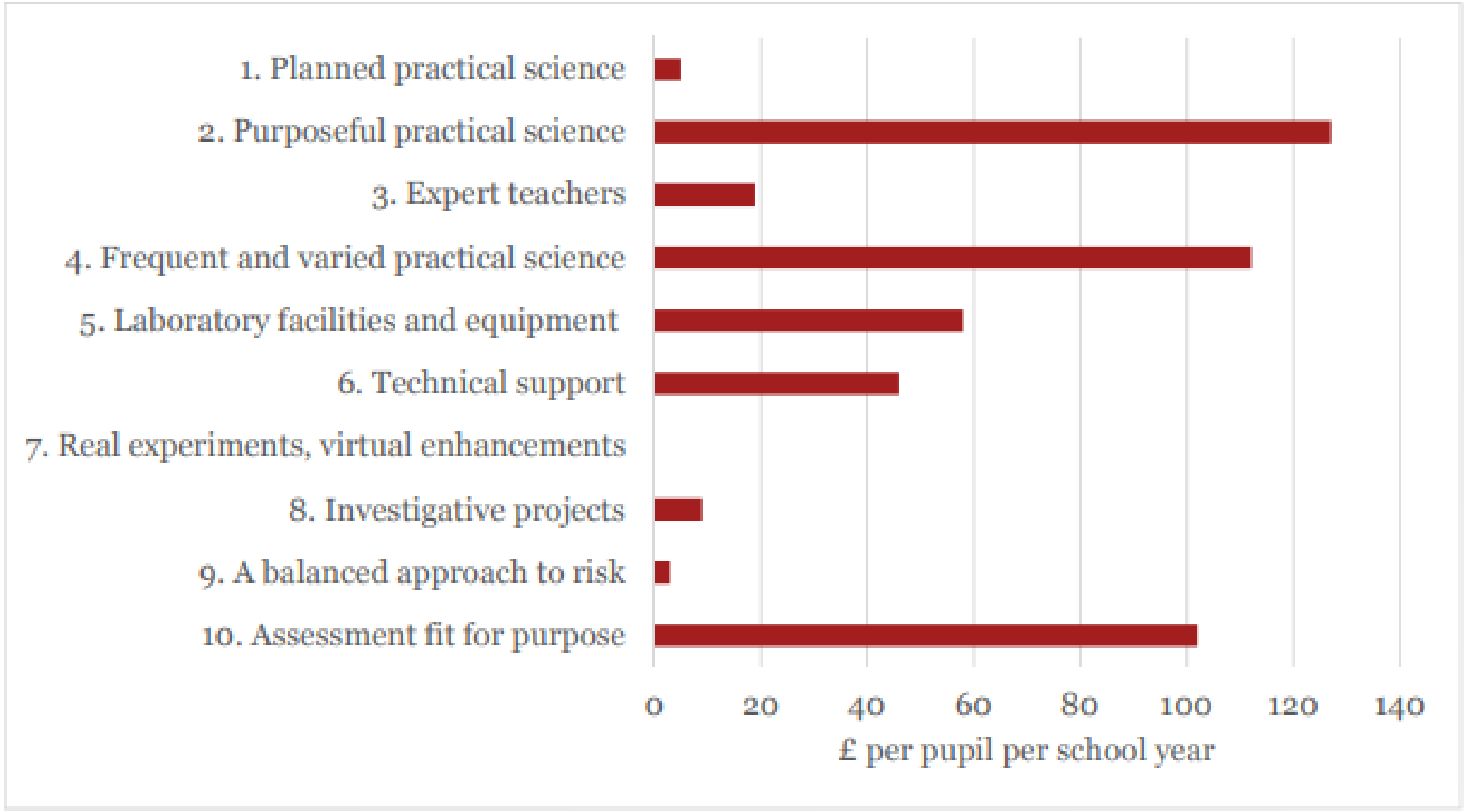
Audit Tool

RECOMMENDATION 5
Practical Work

	Ineffective	Intermediate	Exemplary
Using practical work purposefully	Teachers use practical work as a lesson activity rather than thinking about the reason that they are using it.	Teachers understand the different purposes that practical work can have. They consider why they are doing a particular activity and make this clear to pupils.	Teachers carefully select practical activities to support the aims of the lesson. They are clear about the purpose of the practical activity and make this explicit to pupils. Teachers use a range of practical activity types according to the purpose, this includes virtual experiments and open-ended investigations.
Linking practical work with other learning	Practical work is seen as a stand alone activity and is not clearly linked to the rest of the lesson. Teachers expect pupils to learn scientific concepts through practical activities alone.	Teachers link the practical activity to the aims of the lesson. They remind pupils through the activity what they should be observing and the ideas they should be using.	Teachers link the practical activity to the aims of the lesson. They remind pupils through the activity what they should be observing and the ideas they should be using. After the activity teachers discuss with pupils what was observed and how this adds to their understanding of the ideas being taught.
Using practical work to develop scientific reasoning	Limited opportunities for scientific inquiry are provided.	Opportunities for scientific inquiry are provided but these could be unfocused or are often pupil-lead.	Opportunities for scientific inquiry are frequent. These are teacher-lead and focus on skills which develop science specific reasoning skills.

Gatsby benchmarks	Gatsby recommendations
1 PLANNED PRACTICAL SCIENCE	1 THE 10 BENCHMARKS
2 PURPOSEFUL PRACTICAL SCIENCE	2 TRAINING EXPERT TEACHERS
3 EXPERT TEACHERS	3 CONTINUING PROFESSIONAL DEVELOPMENT FOR TEACHERS
4 FREQUENT AND VARIED PRACTICAL SCIENCE	4 ACCOUNTABILITY AND PRACTICAL SCIENCE
5 LABORATORY FACILITIES AND EQUIPMENT	5 VALID ASSESSMENT
6 TECHNICAL SUPPORT	6 PROJECTS IN THE CURRICULUM
7 REAL EXPERIMENTS, VIRTUAL ENHANCEMENTS	7 RECRUITING, RETAINING AND DEPLOYING SPECIALIST TEACHERS
8 INVESTIGATIVE PROJECTS	8 VALUING SCIENCE TECHNICIANS
9 A BALANCED APPROACH TO RISK	9 PLANNING FOR SUCCESS
10 ASSESSMENT FIT FOR PURPOSE	10 MANAGING RISKS



pwc

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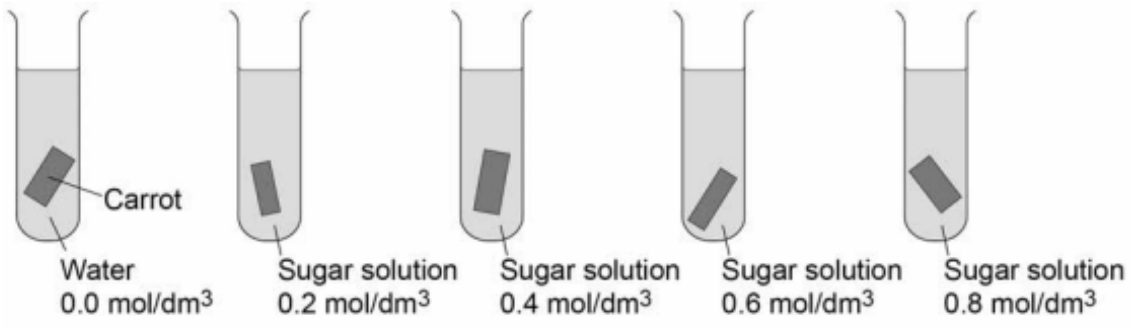
0 4 A student investigated the effect of different concentrations of sugar solution on pieces of carrot.

This is the method used.

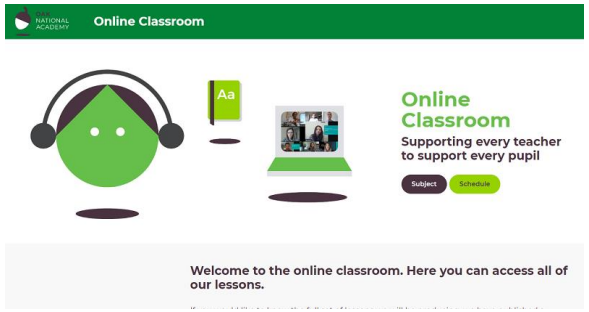
1. Weigh five pieces of carrot.
2. Place each piece into a different tube.
3. Into each tube add 20 cm^3 of water or one of the sugar solutions as shown in **Figure 6**
4. Leave the apparatus for 2 hours.
5. Remove the carrot and dry each piece on paper towel.
6. Reweigh each piece.
7. Calculate the percentage (%) change in mass of each piece.

Figure 6 shows how the investigation was set up.

Figure 6



The national picture



Synchronous

Students learn at the same time.

Communication happens in real time.

Possibly more engaging and effective.

Allows for instant feedback and clarification.

Examples
Video conferencing, live chat, live streamed videos.

Asynchronous

Students learn at different times.

Communication is not live.

Possibly more convenient and flexible.

Allows students to work at their own pace.

Examples
Email, screencasts, Flipgrid videos, blog posts/comments.

edublogs

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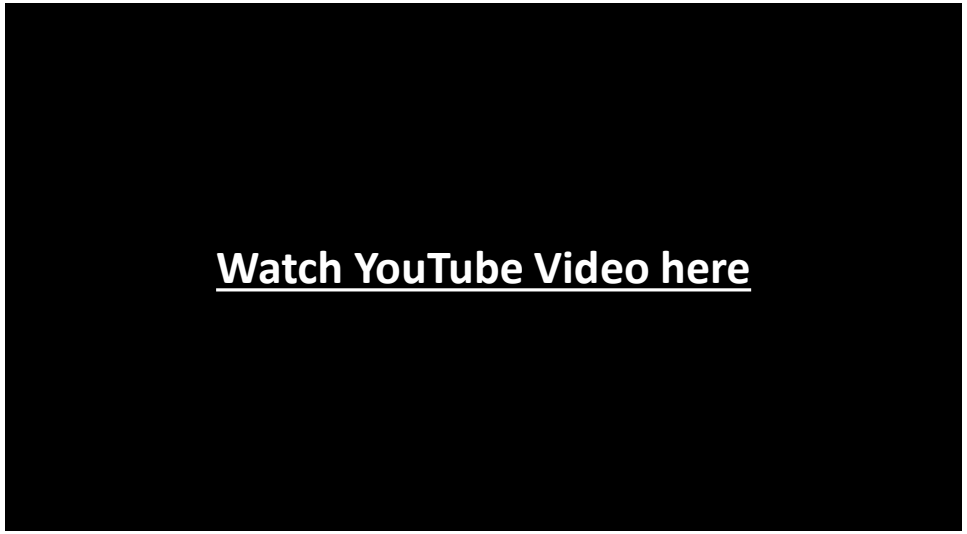
Remote learning policy for a blended approach

Launch the learning	Task	Feedback
Video or live learning – could be collaborative or use an external source such as Oak Academy, BBC Bitesize or STEM learning	Each student to be set a task linked to the launched learning. This is completed in the student's own time – does not need to be completed in a specific time slot. Work can be differentiated within the class. Some students will need support to manage their time. Deadlines should be clearly set	Each student should receive feedback - Every piece to be acknowledged by the class teacher - Every 2 weeks www/ebi (could be through whole class feedback)

Weekly/fortnightly basis depending on timetable allocation of subject

Use of video and PEOE (predict, explain, observe, explain) strategies

Use of video to collect data: rates of reaction by Primrose Kitten



Use of demo to prompt discussion & elicit thinking

Watch YouTube Video here

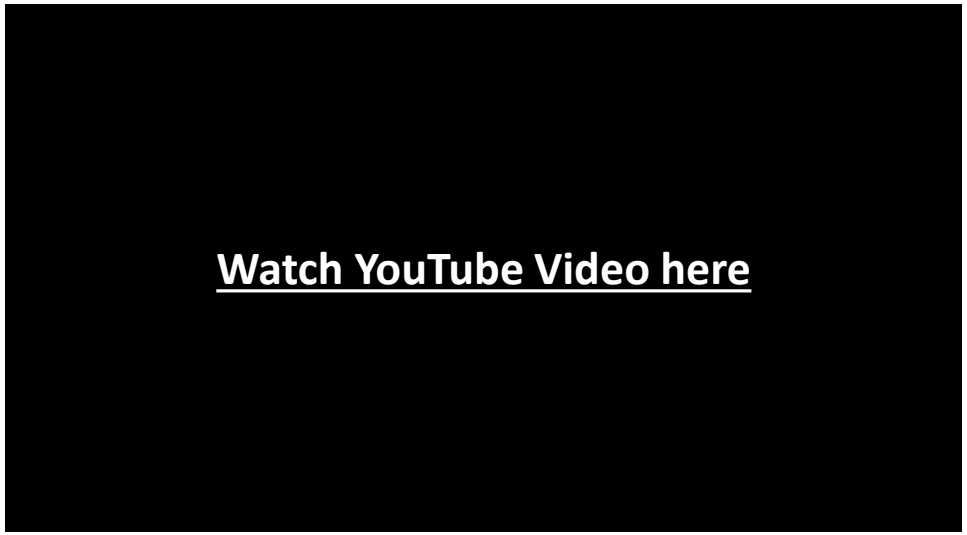
Sparks and charge by Lewis Matheson

Mind over matter

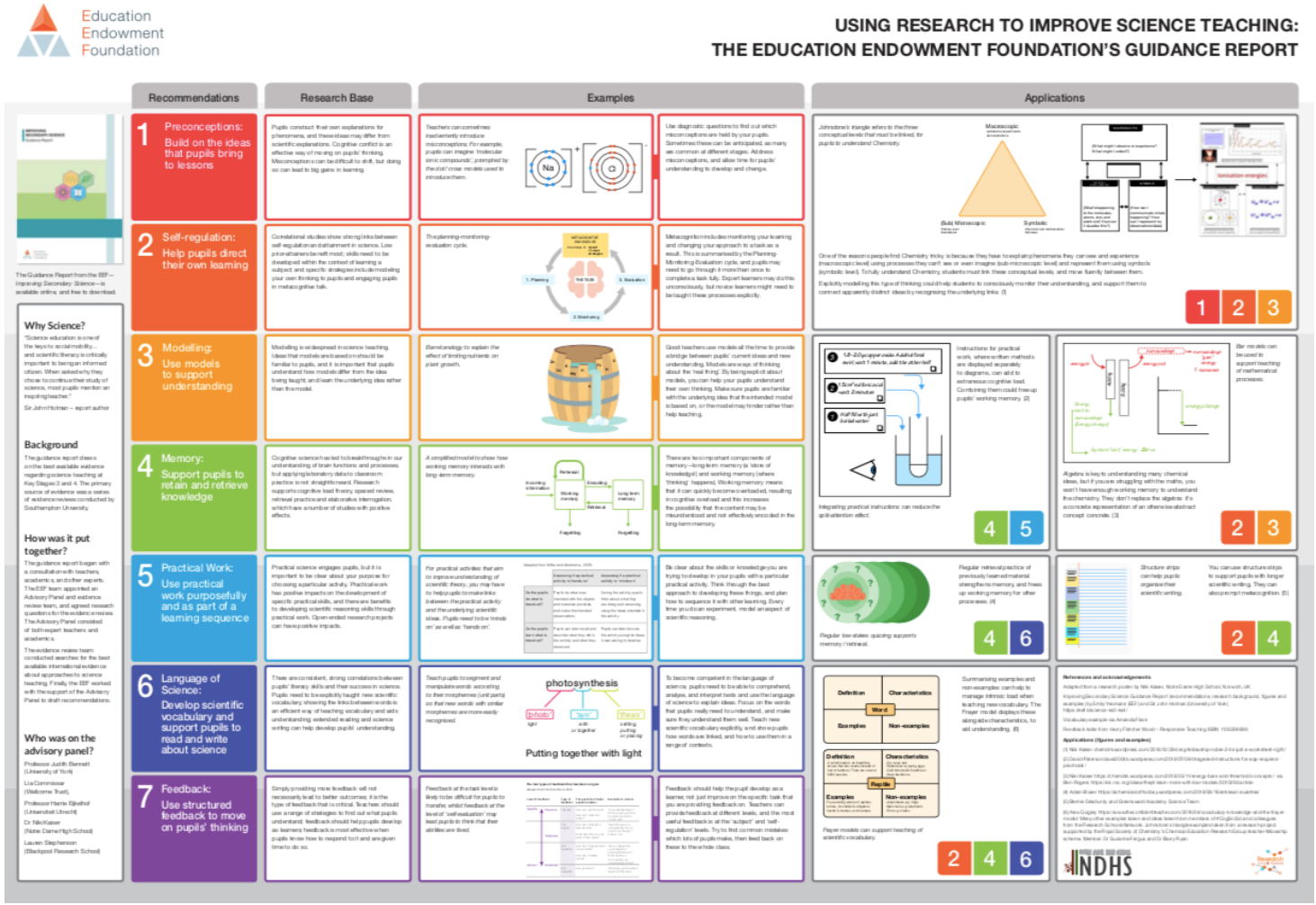
The challenge: to balance a can on its edge. One is full, one is empty and one has 50ml water in it:

1. Predict and explain

2. Observe and explain



Cognitive load and lists of instructions



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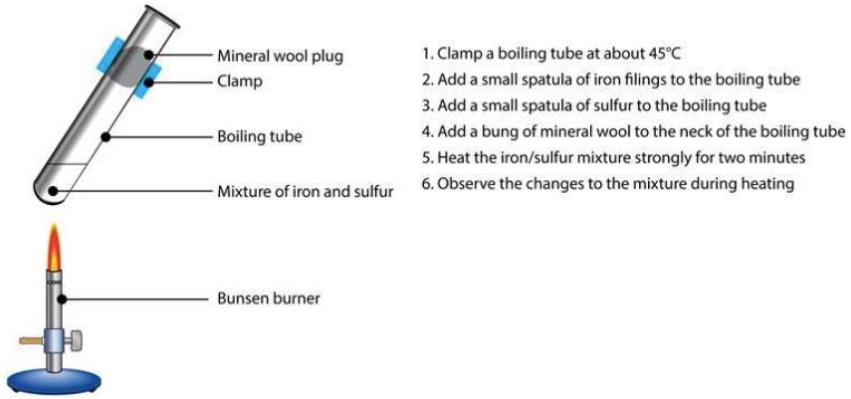
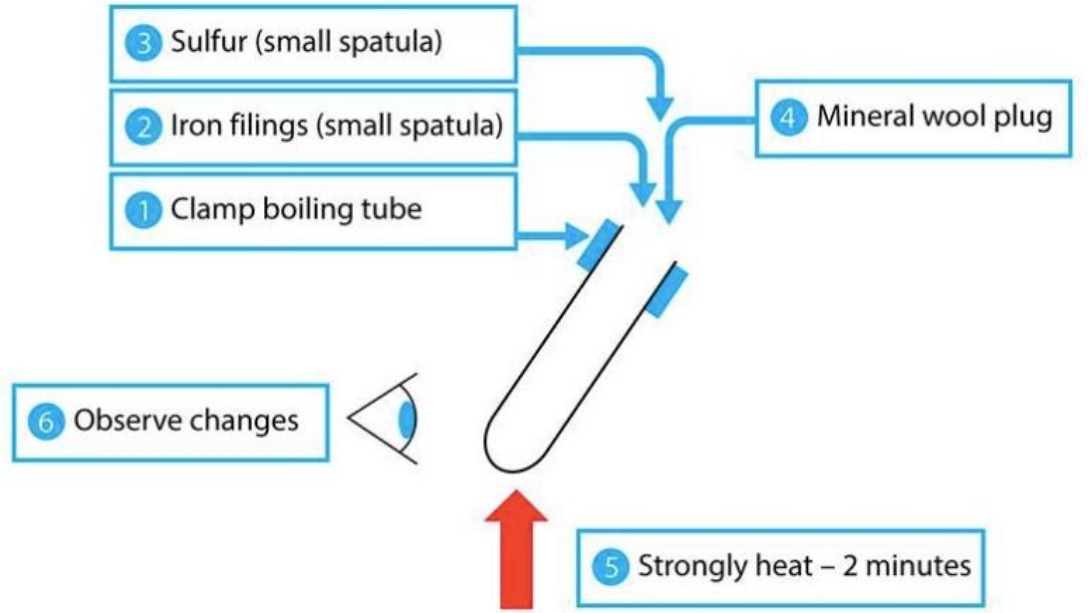
Improving practical work with integrated instructions



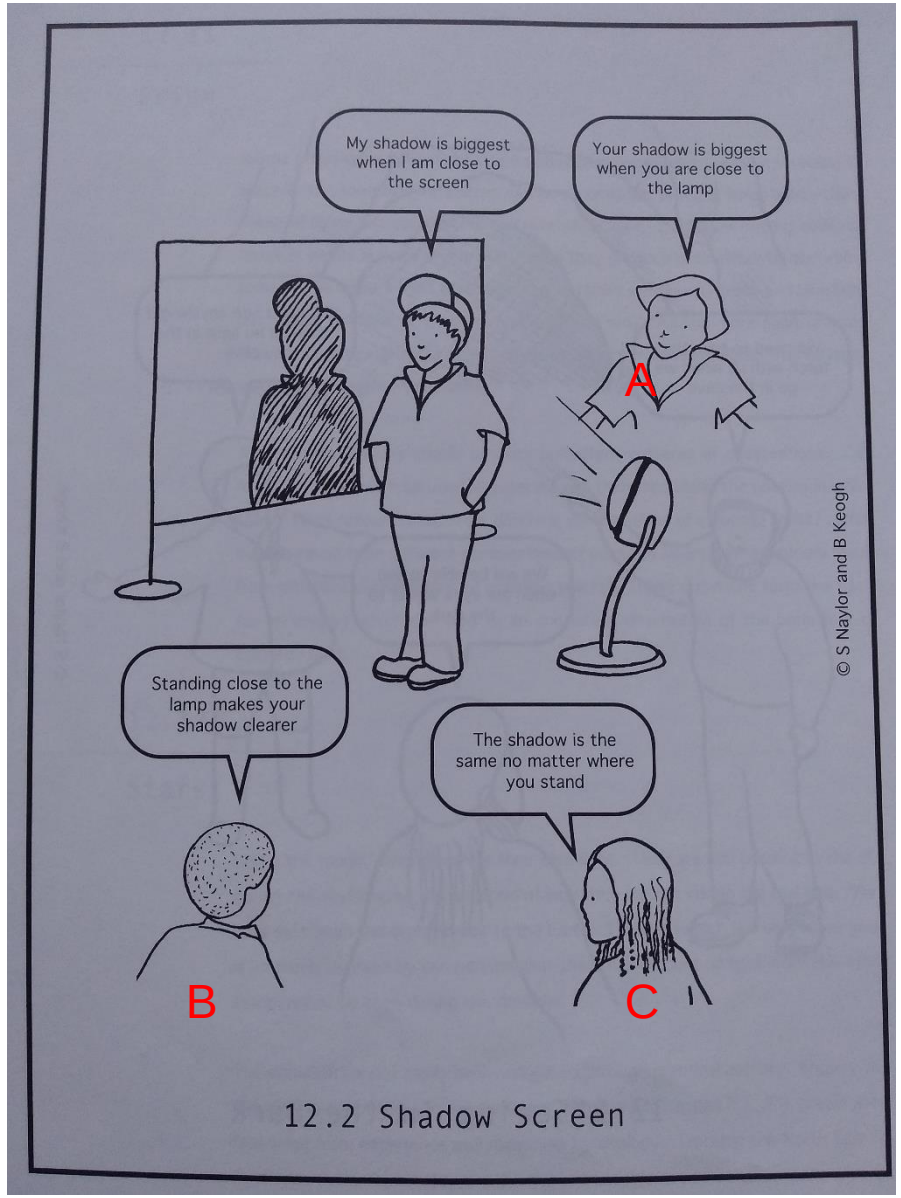
1. Clamp a boiling tube at about 45°C
2. Add a small spatula of iron filings to the boiling tube
3. Add a small spatula of sulfur to the boiling tube
4. Add a bung of mineral wool to the neck of the boiling tube
5. Heat the iron/sulfur mixture strongly for two minutes
6. Observe the changes to the mixture during heating



Integrating simple text instructions with simple apparatus diagrams

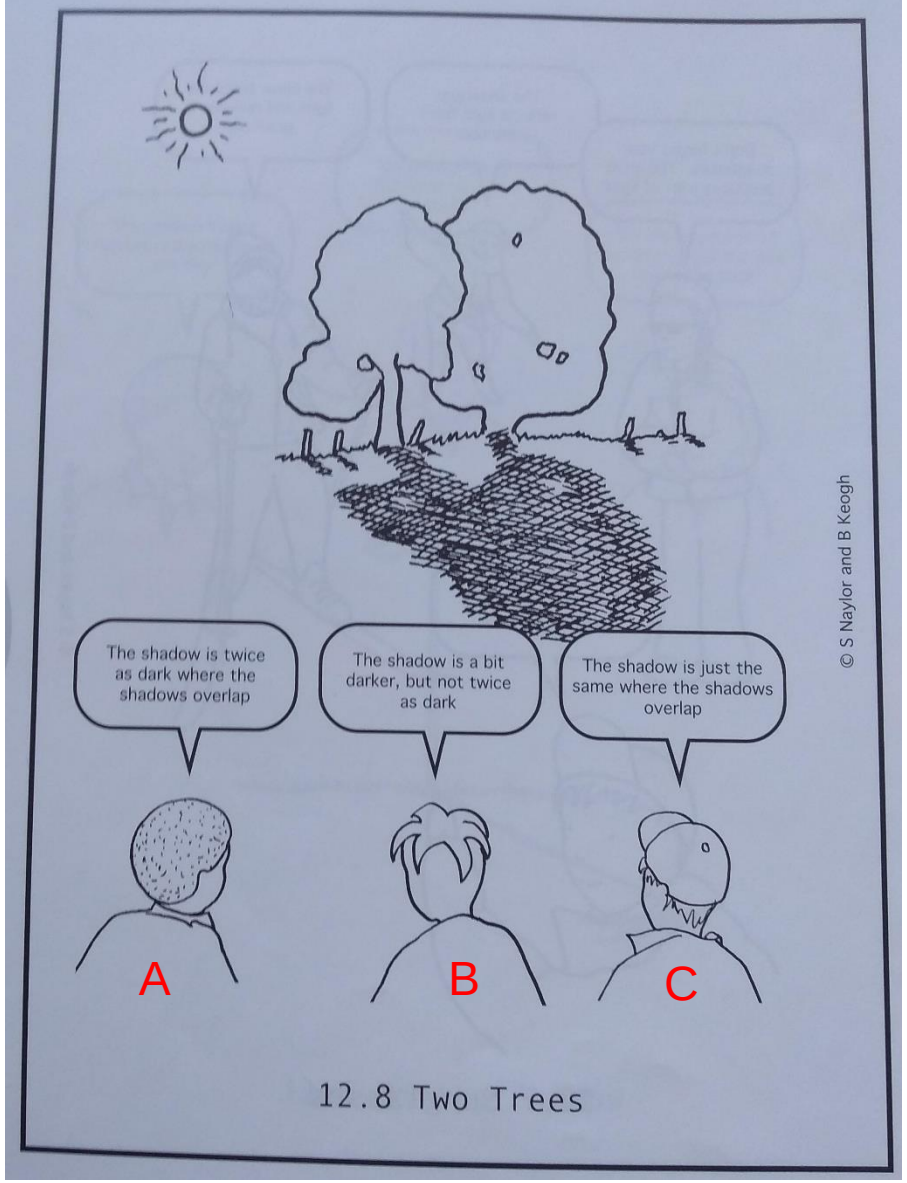
David Paterson
with RSC

Use of concept cartoons and simulations



Person	Why do they think that?
A	
B	
C	

What I first thought was the right answer	
An experiment I did to find out the answer	
What I think the answer is now	



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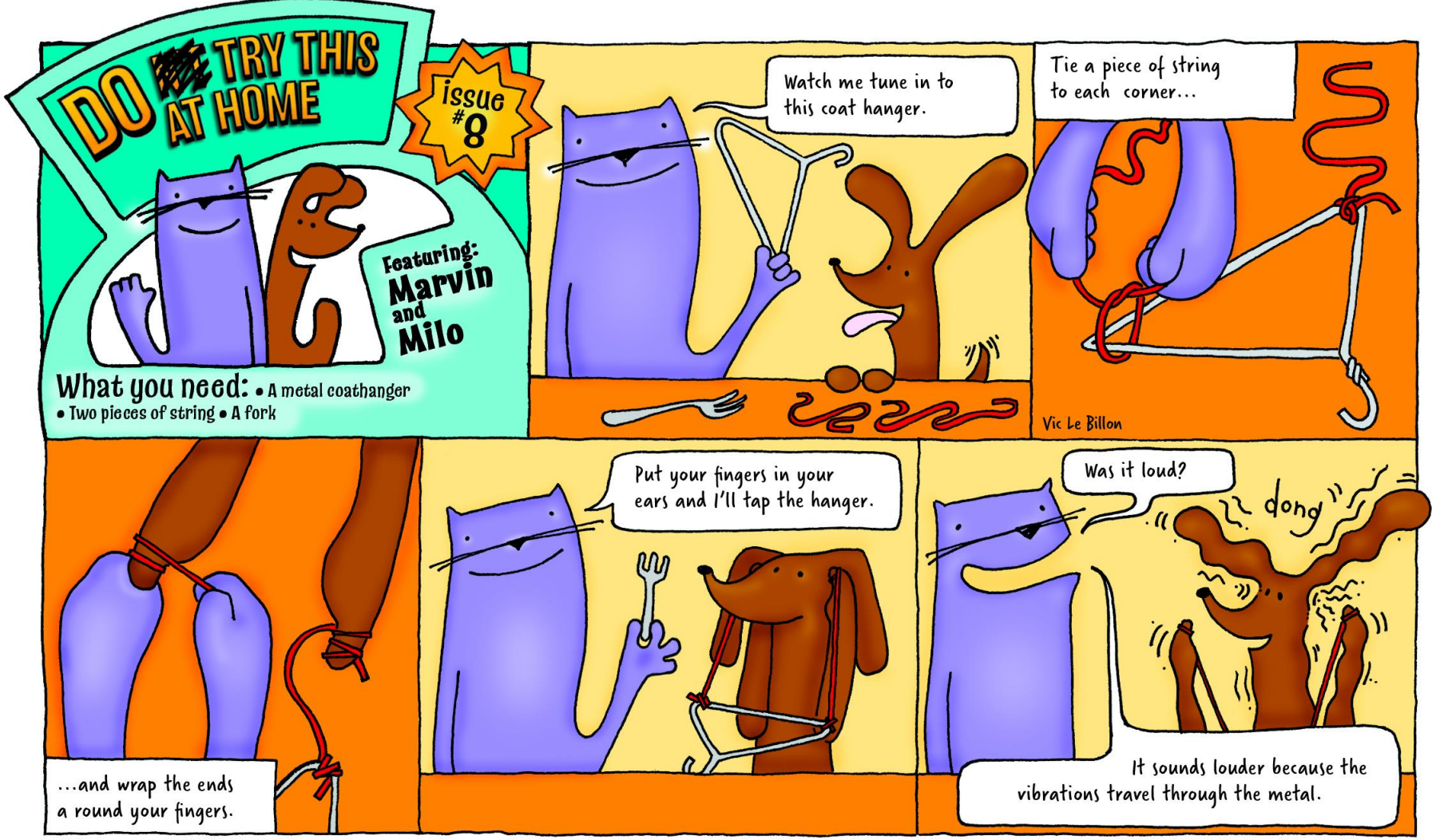
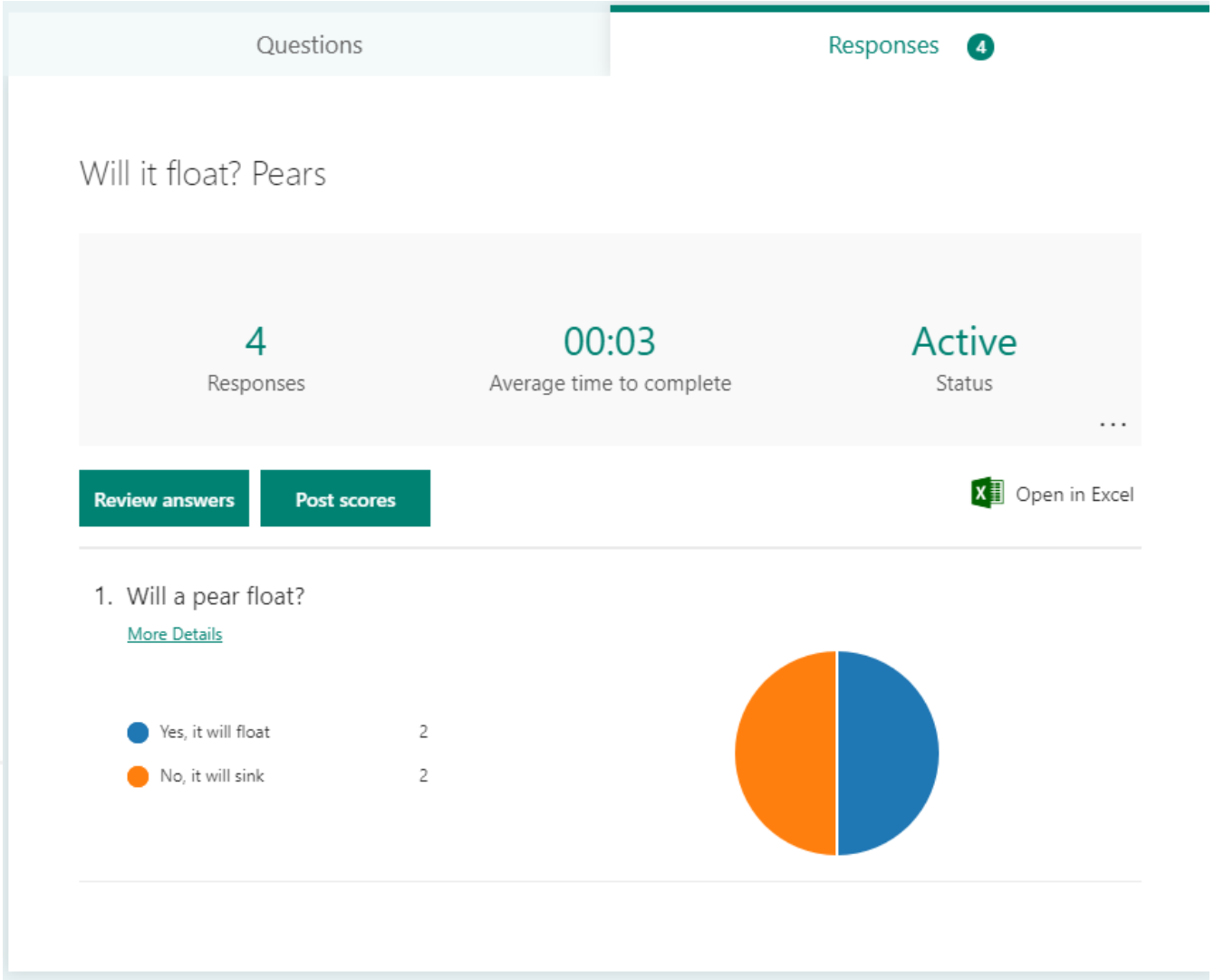


Download more Marvin and Milo activities at iop.org/marvinandmilo

https://web.microsoftstream.com/video/691f2b79-3a75-452c-94cb-d80e3711e780



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https://phet.colorado.edu/en/simulation/buoyancy

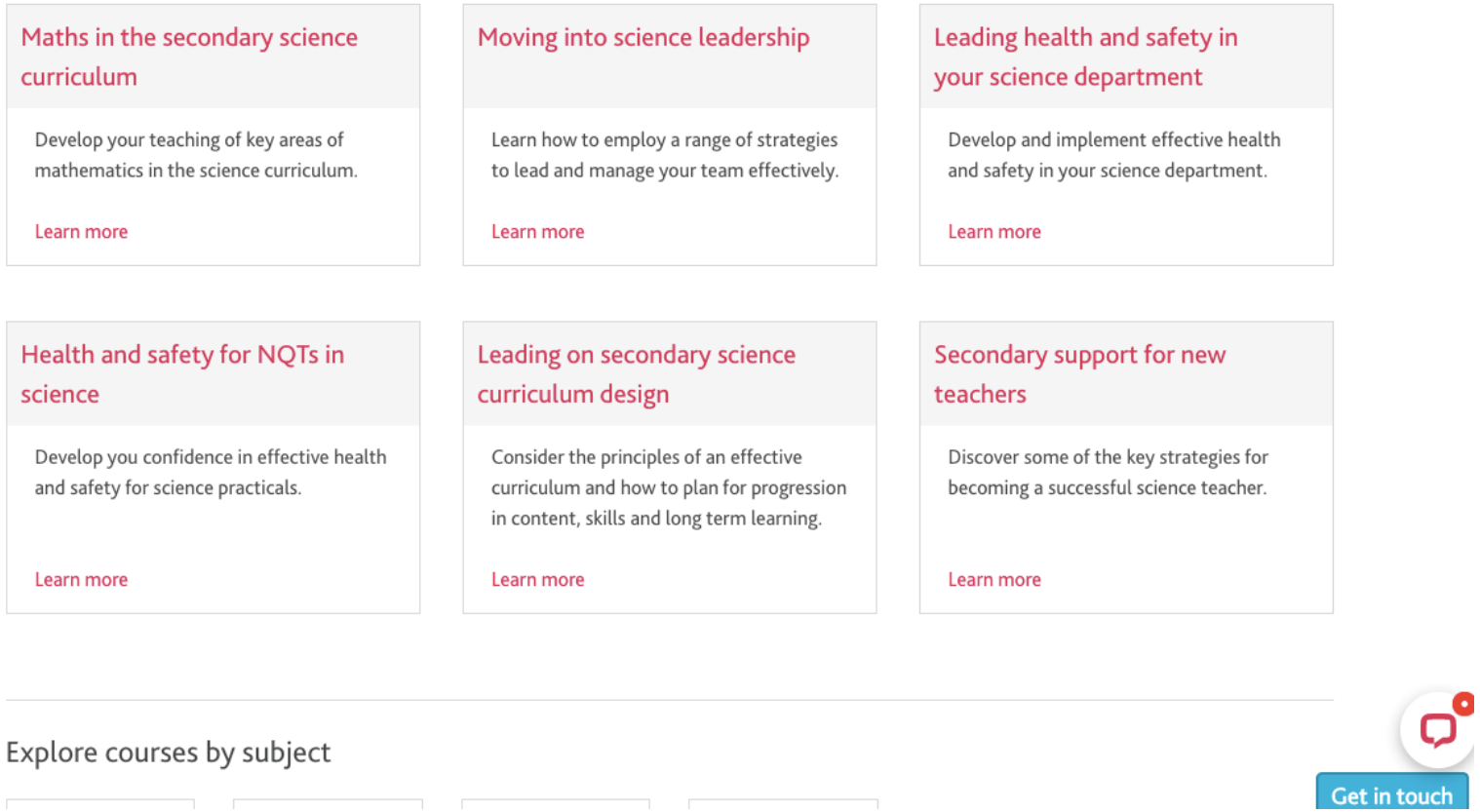
Lab Procedure: ***Part 2***

1. For each of the objects, determine the density at which it sinks in kg/L.
2. **Use a mass of 4.5 kg.**
3. List this value in the table.

	Air	Gasoline	Olive Oil	Water	Honey
Styrofoam					
Wood					
Ice					
Brick					
Aluminum					

Next steps

STEM Learning - remote learning



[STEM Learning remote learning]

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Future learn – online CPD

New

Teaching for home learning: Primary science

Learn teaching strategies and tools to make the transition to online primary science teaching easier during the COVID-19 pandemic.

Teaching for home learning: Secondary science

Ease the transition to teaching science to secondary pupils during the COVID-19 pandemic with online and offline approaches.

Developing your teaching

The science of learning

Improve the way you support your students to achieve their potential by exploring the science of learning.

Join now on FutureLearn

Planning for learning: formative assessme

Improve you assessment students.

Join no

Linking curriculum learning to STEM

Online Courses

A range of FREE TO ACCESS online courses, hosted by FutureLearn, designed for teachers at every stage of their career. Participants can:

- access real classroom footage.
- discuss lessons with colleagues.
- learn from leading experts.

Search all our online CPD at **www.stem.org.uk/online-cpd**

[STEM Learning online CPD]

LIVE CHAT

If you need any help, our subject experts are available weekdays from 8:30 am to 4.30 pm via our webchat, which you can find on the bottom right-hand corner of all our web pages.

They can help answer your questions, point you in the right direction and give advice.

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Other support available

REMOTELY DELIVERED LESSONS FOR YOUNG PEOPLE

Remotely-delivered, curriculum-linked science lessons accompanied by live Q&A sessions with our subject experts. Lessons are accompanied by 'live chat' Q&A sessions to provide secure 1:1 support for teachers, parents and learners, and signpost additional resources were appropriate.

- www.stem.org.uk/remote-lessons

FREE RESOURCES FOR HOME TEACHING

A selection of primary, secondary and post 16 resources organised into topic area and year group. Many of the resources also include opportunities for working scientifically at home to help young people's learning.

- www.stem.org.uk/home-teaching#free-resources-for-home-teaching

LIVE CHAT

If you need any help, our subject experts are available weekdays from 8:30 am to 4.30 pm via our webchat, which you can find on the bottom right-hand corner of all our web pages.

ACTIVITIES TO SUPPORT CONTINUING IN-SCHOOL DELIVERY

We have curated a selection of cross-curricular activities that can be used in school to engage young people of all ages. All these resources can be adapted for use with individual students, small groups or mixed-age classes.

- www.stem.org.uk/home-teaching#activities-for-in-school-delivery

STEM CLUBS

We now offer a free new short online course focussing on how to run and deliver a STEM Club remotely along with two remote workshops for secondary schools and FE colleges on 'Getting started' and 'How to be successful and thriving'.

- www.stem.org.uk/stem-clubs

STEM AMBASSADORS

Teachers can now request an online activity with a STEM Ambassador. This support is for available for schools which are currently open and remote teaching, however a teacher must supervise each activity. For more information visit:

- www.stem.org.uk/stem-ambassadors/find-a-stem-ambassador

STEM Ambassadors - Overview

Approx. **30,000** STEM Ambassadors in the UK

Approx. **3,000** in London

- **34%** BAME
- **54%** Women
- **65%** Under 35

19 Regional Hubs in the UK

STEM Ambassadors during Lockdown

STEM AMBASSADORS

spark! KICK STARTING CAREERS

BT

METROPOLITAN POLICE

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STEM Ambassadors Online Activities

[Make your Computer Skills Legal with Cyber Choices: Thursday 16th July 14:00 – 15:00]

Hear from a member of the Metropolitan Police Cyber Choices Team talk about the work they do and how to keep your student's computer skills legal through the summer and through catch-up curriculum activities.

[Myth Busting Apprenticeships Webinar with BT: Tuesday 21st July 13:00 – 14:00]

Open for teachers, parents and students to find out more about apprenticeship opportunities at BT and have the opportunity to ask BT apprentices questions to bust common myths and misconceptions!

[STEM Sessions Podcast: The UK STEM Careers Podcast]

Every episode you'll hear from one of our London STEM Ambassadors and get to find out more about their STEM job, how they got there and how young people today can get there too!

Big Bang Digital 2020 Tuesday 14th July

Big Bang Digital 2020 – science, engineering & Covid-19
Tuesday 14 July

Big Bang Digital 2020 – science, engineering & Covid-19 celebrates the amazing work of scientists and engineers in a pandemic.

Mark it in your calendar for a day of inspiring online sessions to give young people a front row view of the incredible contribution of scientists, healthcare professionals, engineers, technicians and students in responding to Covid-19.

Join us as we hear from the people working to develop a vaccine, the teams involved in building the Nightingale hospitals, those keeping transport networks going and the companies innovating to respond to the UK ventilator challenge.

We'll meet inventive young people supporting frontline efforts across the world, get an insight into the environmental benefits of staying at home and celebrate healthcare heroes and learn how their jobs have changed.

With interactive polls, live Q&A sessions with guests and associated activities throughout the day, there are lots of ways to get involved and even prizes to be won!

We'll be announcing more #BigBangDigital details in the run up to the day, meanwhile get the date in your diary and spread the word.

Visit www.digitalbigbang.co.uk to find out more.

South West London Practical Science

Established by Saba Tyson in 2012 with the aim of creating a warm and expert local network for science technicians. It has grown over the years into a large network with members across:

Surrey; Sutton; Merton; Morden; Croydon; Purley; Beckenham; Camberwell;

Kingston; Richmond; Hounslow; Wandsworth; Wimbledon

Our aims and activities include

- Sharing ideas, expertise and training
- Termly newsletters and advertising of vacancies
- Co-operation for problem solving and assistance with ideas and equipment or chemicals loans
- Liaise and coordinate chemical waste disposal and equipment repairs and servicing to reduce costs
- Annual summer CPD conference with workshops, outside speakers & suppliers exhibition

SWELPS

Saba Tyson
Team Leader Science
Greenshaw High School
SWELPS Science Technician Forum Coordinator
Tel: 020 8715 1001 Extn 256
Mobile 07734 257350

Email : styson@greenshaw.co.uk

Newstead Wood Technician conference 12/2/21

SCIENCE TECHNICIAN CONFERENCE

Newstead Wood School
Orpington.

Bring a packed lunch. Coffee/tea/water will be provided. Parking on site to be confrimed.

Keynote Speaker:

Simon Quinnell

CSciTeach; Chair of ASE 2020-2021, Science education consultant and PGCE Science Lead, previously **a Senior Professional Development Leader at National Technicians Lead and STEM Learning**

Hands-on, and make and take workshops and Biology, Physics and Chemistry focus sessions.

- Jane Major CLEAPSS – "Working with glass"
- Simon Quinell - Chemistry (title tbc) Chemistry post COVID
- Robert Birke IoP – "Make and take ultrasound transmitters"
- Mary Philpott Ex CLEAPSS Biology Advisor (title tbc) Biology post COVID
- Lab on a Bus Kingston University Outreach
- Medical Mavericks
- Lablogger
- Labexpert
- ASE RsciTech accreditation advice
- Drop in session of supplier equipment highlights
- Biology hints and tips for getting those difficult practicals to work
- Datalogging and required practicals
-

- Southern region SLP- STEM
- Suppliers exhibition and raffle
- ASE Bookstall

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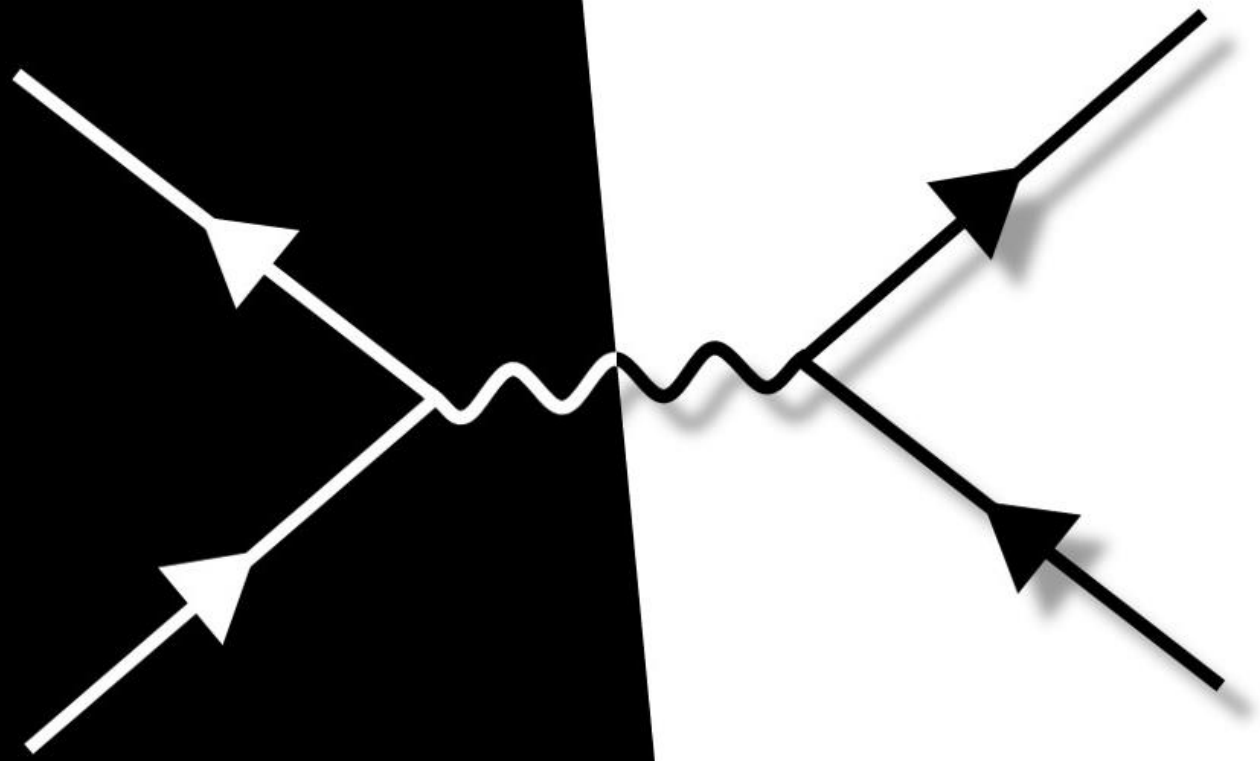
GCSE and A Level Physics Online.com



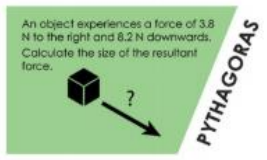
The most comprehensive video resource for Physics, trusted by thousands of students and teachers.

Website with hundreds of videos for GCSE and A Level Physics, arranged by topic and exam board.

Individual Access - GCSE £9.99 / A Level £19.99

School Subscriptions also available from <50p per student

/physicsonline



GCSE and A-Level course from £1 per student for a years access

Free online GCSE Science lessons

Primrose Kitten

YouTube tutorials for GCSE and A-Level

Free guides

Predicted papers

Next steps:
What key actions will you take away from today?

Go to menti.com

Use the code 29 23 47

Check out EEF audit

All of the different resources and links were extremely useful. I will definitely look over them and delegate within the science team. Thank you so much

lots of websites to browse for practical resources and demonstrations. i also liked the IOP Marvin and Milo cards to prompt discussions

Making use of PHET simulations whilst

Use recorded practicals

Circulate some of the key information to Science colleagues

Look at online practicals

use recorded practicals

Plan in videos of different versions of practicals

have vital discussions with technicians regarding practical work

will have a look at the resources provided as they were really good

Discuss with the team, a way forward with the limited time we have to cover the specifications and how to include practical work and forward details of networking to technicians.

use recorded practical

Making use of PHET simulations whilst we will not be able to use labs and still show practical work. Before and after ideas to extend their thinking.

Think about making recorded videos of demos and practicals to use in lessons and at home. Using concept cartoons to engage students in practical thinking more effectively

practicals

More ideas about online learning. Check EEF audit. Share information with teaching staff.

Really liked the Integrated Instructions demonstrated. Will look into those.

use recorded practical

Online videos built into lessons in September, promote more talking with a purpose linked to practical and investigation skills

Check out the EEF auditCirculate some of the information to colleagues