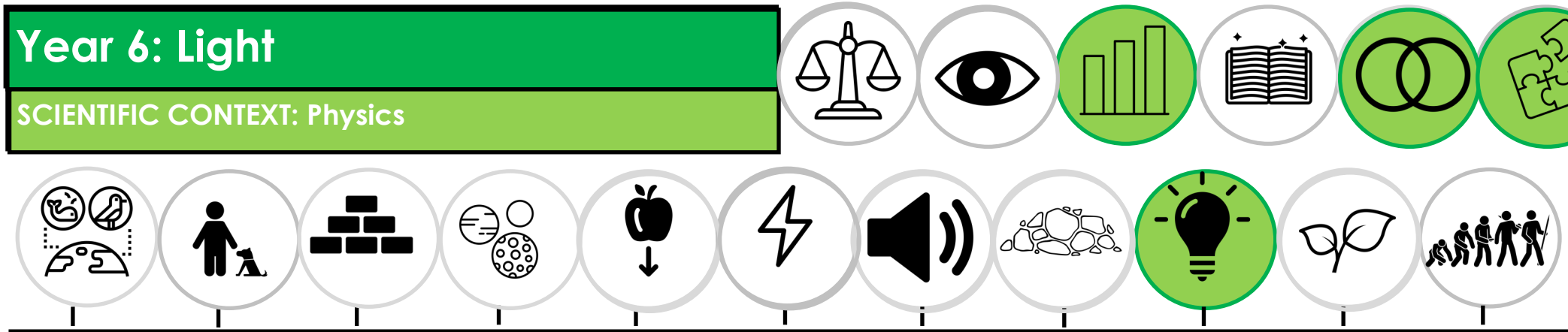
Year 6: Light

SCIENTIFIC CONTEXT: Physics



KEY VOCABULARY:

Light source	A source of light makes light. The Sun and other stars, fires, torches and lamps all make their own light and so are examples of sources of light.
Reflect	When light from an object is reflected by a surface, it changes direction.
Shadows	Shadow forms when an opaque, or non-transparent, object blocks light from passing through and reaching a surface on the other side.
Transparent	Allows light to pass through.
Translucent	Allows a small amount of light to pass through.
Opaque	Does not allow light to pass through.
Straight lines	A line that does not curve.
Light rays	A ray is a term used to show the movement of light from its origin source to a surface or object.
Surface	A surface is the outer layer of an object.

As Scientists we will...

Pupils should be taught to:

- recognise that light appears to travel in straight lines,
- use the idea that light travels in straight lines to explain that objects are seen because they give out or reflect light into the eye,
- explain that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes,
- use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them.

Working scientifically:

- Use scientific diagrams and labels,
- report and present findings, including explanations,
- Take accurate measurements and record data on a graph.

Key Questions:

1) **How does light travel?**
2) **How are objects seen?**
3) **Why do shadows have the same shape as the objects that cast them?**

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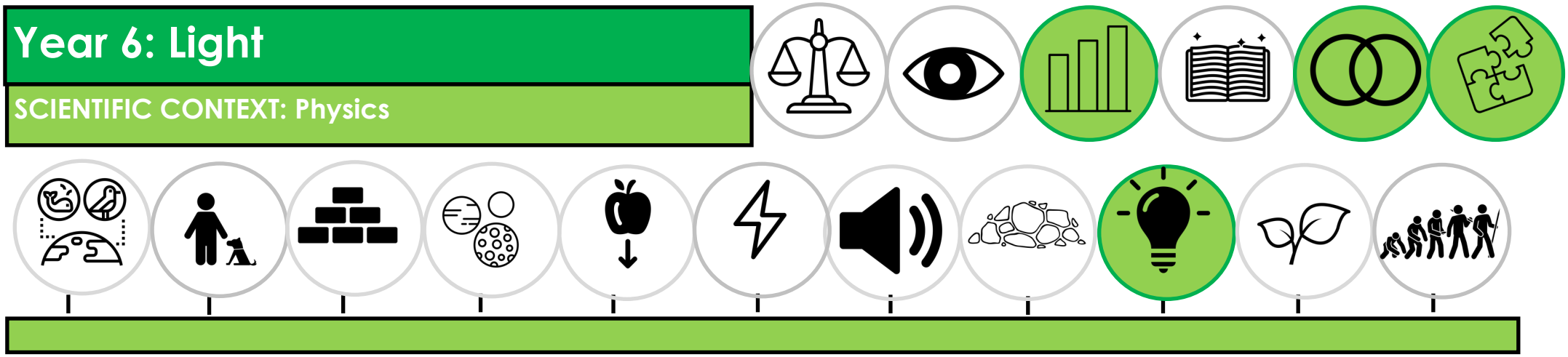

What I need to know:

Light appears to travel in straight lines, and we see objects when light from them goes into our eyes. The light may come directly from light sources, but for other objects some light must be reflected from the object into our eyes for the object to be seen. Objects that block light (are not fully transparent) will cause shadows. Because light travels in straight lines the shape of the shadow will be the same as the outline shape of the object.

Opportunities for science capital

Potential for trips to We are Curious: A trick of light workshop and/or Light Fantastic show.

Part of science capital includes scientific media consumption- documentaries, reports etc. Here are links that provide daily science news for children. Checking in on these every now and then would be beneficial to help children see science in the wider world.

https://www.sciencenewsforstudents.org/

https://www.sciencejournalforkids.org/

Assessment:

By the end of this unit, pupils will be able to: explain that light appears to travel in straight lines; use the idea that light travels in straight lines to explain that objects are seen because they give out or reflect light into the eye; explain that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes; use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them.

When working scientifically, pupils will be able to: use scientific diagrams and labels, report and present findings, including explanations, take accurate measurements and record data on a graph.

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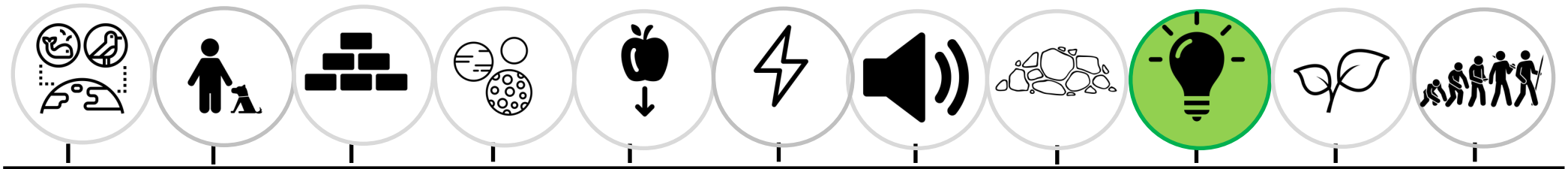

Theme 1: How does light travel?

Starter:

Time machine starter: rewind to Y3 objectives. Can children answer:

What do we need to see?

What happens when light hits surfaces?

How can we protect our eyes from the sun?

How are shadows formed?

What patterns can be found in shadow size?

Complete first part of KWL grid

Main:

Substantive knowledge

Lesson materials from Grammarsaurus

Work through presentation Presentation.pdf stop at slide 6.

Discuss light sources, non-light sources and address common misconceptions about these, such as the moon being a light source.

Make a light pinhole. This experiment will show pupils how light travels in a straight line by filtering it through a hole . Get children to note down observations on post-it-notes.

Focus on slide 7, study the two different diagrams and really highlight that light cannot bend, it only travels in straight lines. However, a light source omits hundreds of light rays in different directions.

Slide 8– complete light source sorting activity in partners (to go in floorbook)

Activity- Partner Sorting Activity Cards.pdf pupils need to draw their own grouping table

Plenary:

Disciplinary knowledge

Working scientifically objective: using scientific diagrams and labels

Draw an annotated diagram of one of the light sources discussed to show how light travels from a light source. Get pupils to also write a short explanation of how the light is travelling.

Provide LA/SEN with a list of key vocabulary and stem sentences.

Record in science books.

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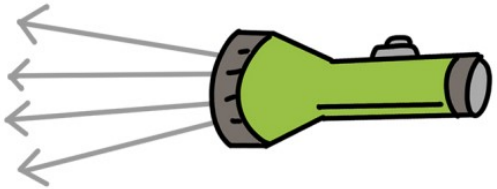
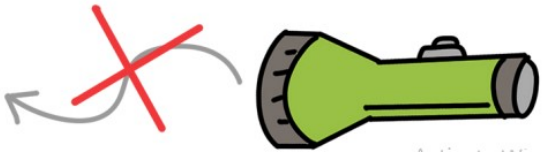
Theme 2: How do we see?

Starter:

Deeper thinking opportunity: light sources odd one out https://explorify.uk/en/activities/odd-one-out/shine-a-light

Recap: explain what the diagram is demonstrating





Main:

Substantive knowledge

On whiteboards, ask pupils to draw a diagram in pairs showing how we use light to see objects.

Modelling: using an object, a long piece of ribbon (or string) and a light source, model how light travels in a straight line and the object is seen because it reflects light into the eye.

Allow children to have a go at setting up similar models themselves in groups of 3. Using a ribbon isn't a perfect construction for light, as ribbon bends or go round a corner and light can't. However, the discussions that should come out of this activity should be incredibly helpful. E.g. ask, that ribbon is bending, do you think it should be? This conversations should allow for misconceptions to be addressed on the spot.

Peer assessment: pair up two groups and ask them to give feedback on each others models. Is there anything they could've improved on? Is the model accurate?

Plenary:

Disciplinary knowledge

Working scientifically objective: using scientific diagrams and labels

Draw an annotated diagram to show that light travels in straight lines from a light source, to an object and these are then seen because they reflect light into the eye.

Write short explanation.

Provide LA/SEN with a list of key vocabulary and stem sentences.

Record in science books.

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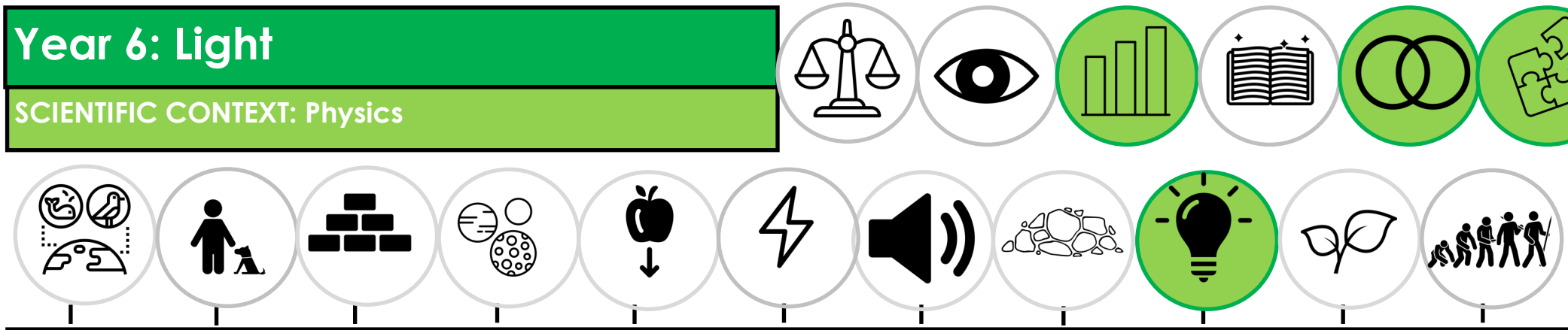

Theme 2: How do we see?

Starter:

Recap, deeper thinking opportunity:

Have you ever?

https://explorify.uk/en/activities/have-you-ever/been-somewhere-where-you-couldnt-see-anything-when-you-woke-up-in-the-night

Push children to use what they learned about light so far to explain why they couldn't see anything.

Main:

Substantive knowledge

Recap how we see objects. Recap what we know about how light travels. Ask children:
Does light bend?
How can we see behind us?
How can we see around corners?
Discuss experiences of being to do these things (e.g. a rear-view mirror in a car, or a periscope on a submarine).

Modelling: similar to the previous theme, using an object, a mirror, a long piece of ribbon (or string) and a light source, model how light travels in a straight line explaining that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes. In groups, children draw a quick annotated diagram of this.

Now, give children time to explore this idea with periscopes and mirrors. What do they notice? What questions do they have?

Plenary:

Disciplinary knowledge

Problem solving: see round the bend

Working scientifically objective: reporting and presenting findings, including explanations.

Follow link for full details on how to run the activity: https://explorify.uk/en/activities/problem-solvers/see-round-the-bend

At the end of the activity, children need to discuss the success of their creations and think about why it worked, or didn't using their scientific knowledge.

E.g. Our creation worked because light rays from the source travelled to the first mirror which then reflected the light rays onto the second mirror, which then reflected the light rays to our eyes so we could see.

Or, our creation did not work because the mirrors weren't angled correctly and light cannot bend, so it could not travel to our eyes for us to see.

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Theme 3: Investigating shadows

Starter:

Recap: last lesson, last week, last month, last year.

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Deeper thinking opportunity for HA: concept cartoon 'Mirror Box'

Main:

Substantive knowledge:

Watch clip, stop at 30 seconds: https://www.bbc.co.uk/teach/class-clips-video/science-ks2-how-are-shadows-made/zgxm6g8

Reinforce point that because light travels in straight lines, shadows are the same shape as the objects that make them. However, this could be changed.

Pose the question: How can the shadow be changed? This will lead into the investigation.

Plenary:

Disciplinary knowledge

Pattern seeking

Working scientifically objective: take accurate measurements and record data on a graph.

Today we are going to be physicists.

Introduce the investigation by shining a light on an object and asking how the shadow of the object could be changed (e.g. size of object/number of blocks, distance/angle of torch). List potential investigation questions. Ask children to select a question which will result in numerical data and carry out the investigation. As a class, generate clear success criteria for taking precise measurements and drawing accurate line graphs to display results.

Groups pick their questions and carry out investigation.

Focus on recording of results. Children could peer assess graphs against the success criteria, giving each other feedback for improvement.

Write a short sentence explaining what they found.

See full TAPS plan 'Investigating Shadows' on Share-point.

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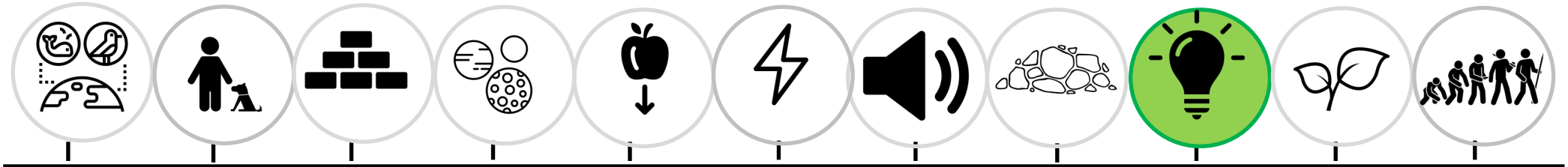

Theme 4: Exploring phenomena (optional)

Starter:

End of topic kahoots quiz

Main:

Children could extend their experience of light by looking at a range of phenomena including rainbows, colours on soap bubbles, objects looking bent in water, and coloured filters (they do not need to explain why these phenomena occur).

Set up as a carousel of activities around the classroom for children to explore the different phenomena (rainbows could be researched based).

Photograph and take notes of pupil's observations for floor books.

Plenary:

Complete KWL grid