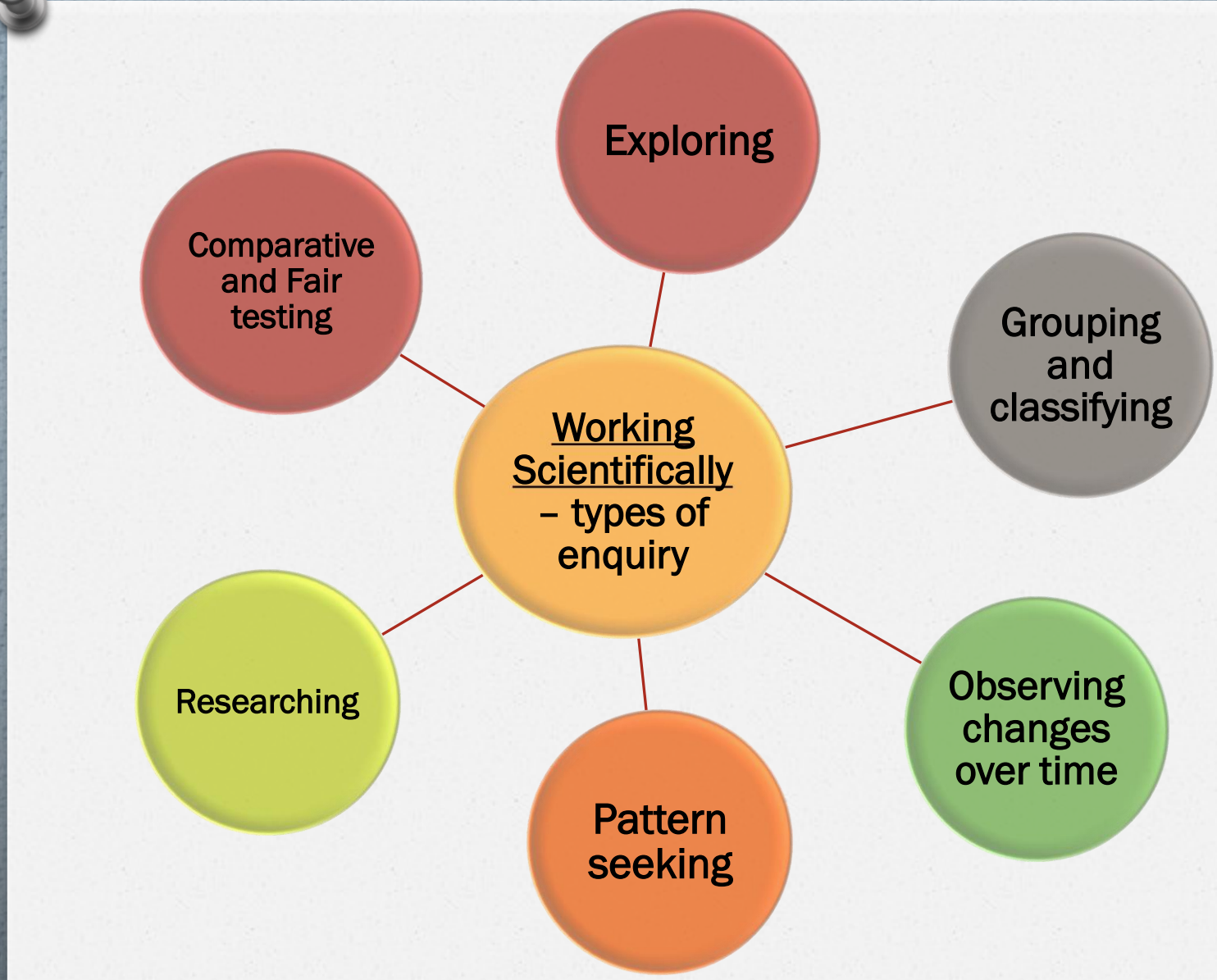
Working scientifically

- What do you think it means to ‘work scientifically’?
- How might you show you are ‘work scientifically’?
- Can you think of examples when you have ‘worked scientifically’ before?


Exploring
Comparative and Fair testing
Grouping and classifying
Working Scientifically – types of enquiry
Researching
Observing changes over time
Pattern seeking

Biscuitology

In your new groups you are going to work scientifically to become 'biscuitologists'

What is your favourite type of biscuit and why?

Exploring

- When scientists are looking at something for the first time, they will explore it in an unrestricted (but safe!) way using their senses (sight, touch, smell, hearing and taste).
- This exploration may lead them to new discoveries or they may think of interesting questions to investigate or research.

Activity 1 - exploring

- Look and touch the biscuits (but don't handle them too much!)
- **Discuss what can you notice/discover about your biscuits?**

- What would you like to find out about the biscuits? Think about what properties a biscuitologist would test when investigating biscuits.
- Make a class list of questions they might answer.

Grouping and classifying

- When presented with a range of items (e.g. animals/rocks/trees/aliens!), scientists sort them into groups. This is called **classification.**
- Th groups can be based on their observable similarities (e.g animals with wings) or properties (e.g. grouping rocks by how absorbent they are).

- **Can you remember the 2 main groups that animals have been grouped into? *(v.. and inv..)***
- https://www.bbc.co.uk/bitesize/topics/zn22pv4/articles/z3nbcwx

Feedback – Activity 2

- How did you sort the biscuits into…

- 2 groups?
- 3 groups?
- 4 groups?

Observing changes over time

- Many big questions in science are about change.
- Changes can take a few seconds (e.g. mixing colours of paint together), minutes, hours or longer (e.g. changes in an oak tree over a year).
- Scientists study these changes by making careful observations.
- They may use a range of equipment including: microscopes, tape measures, scales, stopwatches and more.
- These enquiries (studies) can often lead to other interesting enquiries.

How might scientists record their observations?

- Notes – perhaps in a diary
- Labelled drawings
- Photographs
- Measurements
- Graphs
- These will lead to a conclusion which answers a question (e.g. how do shadows change over the day?).

Observing changes

- Watch the video of baking cookies.
- Discuss how the cookies changed in appearance in the beginning , middle and end of the video.

- https://www.youtube.com/watch?v=YpvM7YKJja4

Activity 3

- Do you think a biscuit will look, feel or taste different in a week?
- What about a month or longer?
- Look at and feel the biscuits that are 3 weeks old.
- Write about your observations:

Pattern Seeking

- Pattern-seeking enquiries involve making measurements or observations to explore situations where there are variables that can't easily be controlled.
- E.g. does the size and shape of a magnet affect how strong it is?
- Scientists are trying to answer 'big questions' by identifying patterns in the measurements and observations they record.
- Often, pattern-seeking enquiries may be early tests that lead on to more systematic enquiries, such as fair tests or comparative tests, where the variables can be controlled.

Activity 4 pattern seeking

Which biscuits make the best dunkers?

- What does '**the best**' mean in this enquiry?
- What are you going to do?
- How will you record your findings for each biscuit?

- Do as a class?

Model looking for pattern in my results

		Dunking rank (1=best)

Comparative and Fair testing

- Fair tests only have one independent variable (the thing that changes), everything else must stay the same.
- All other variables should be controlled and kept the same.
- For example, when we investigated plants in Year 3, each group changed one variable (the amount of water, light or temperature) and kept everything else the same (e.g. the amount of soil, type of soil…)

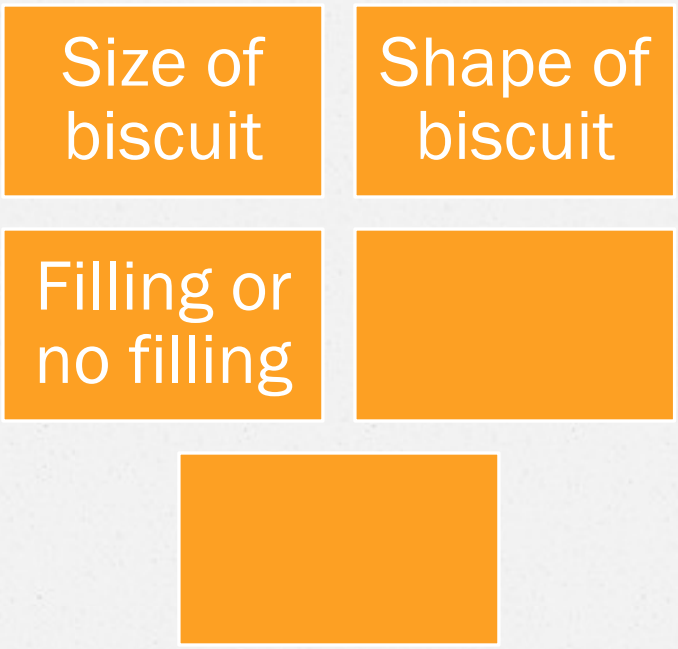
Was the dunking enquiry a fair test?

- Think – how many variables (things) were changing each time? Was it just the biscuit or were there other things that we couldn't control?

- It was NOT a fair test because many variables changed – the type and size of biscuit, the ingredients.
- Because of this it is impossible to know for certain which variable caused the results – we don't know if it is the size or ingredients that made the biscuits good or bad dunkers.

How could we conduct a FAIR test into which biscuits are the best dunkers?

- We need to make sure only one variable is changed and the others stay the same.
- What were some of the variables?
- Can you think of anymore?
- Choose one to be the independent variable that changes.
- What other variables would need to be kept the same?
- We can know use our choices to make a more specific question to answer.



Research

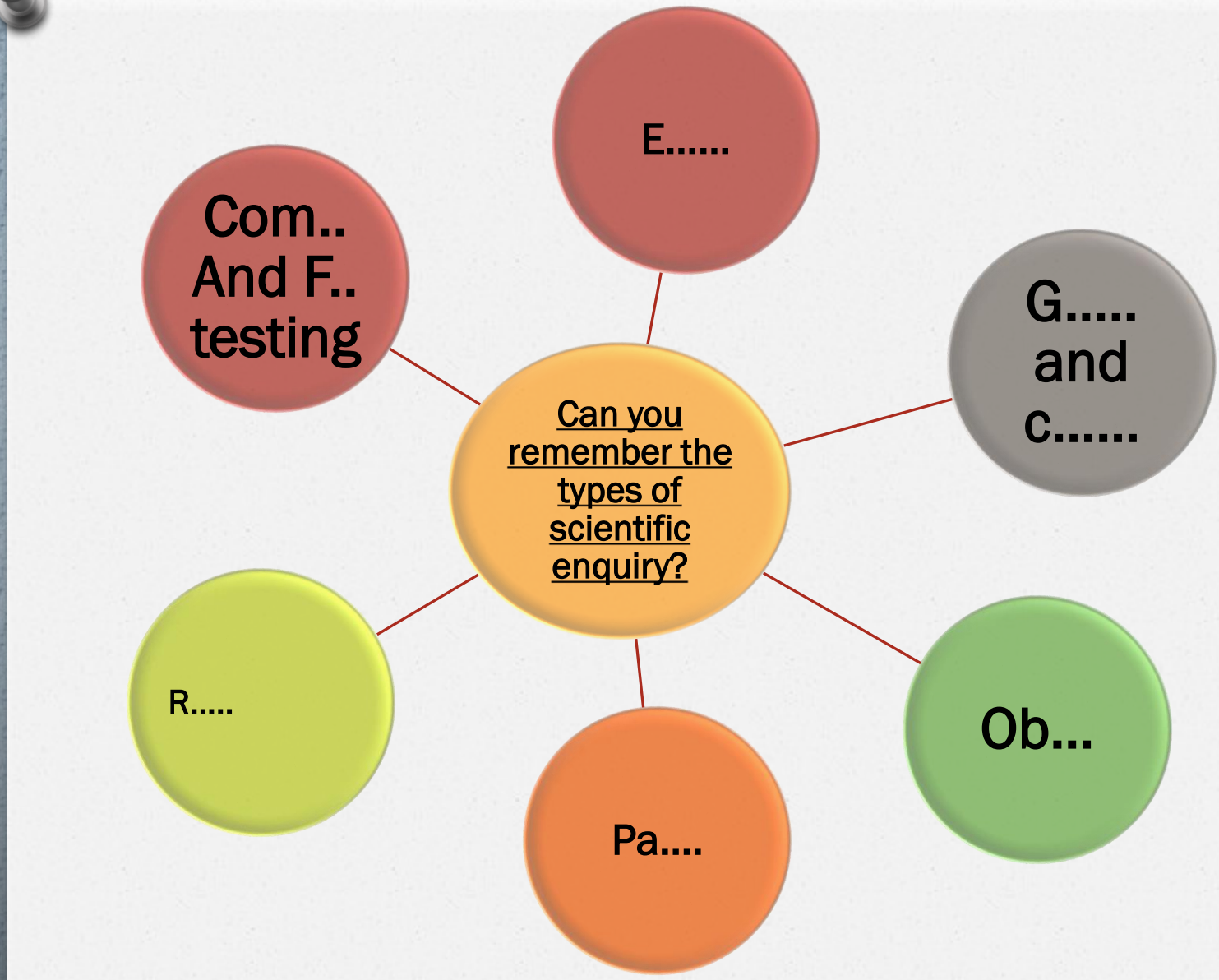
- Scientists will research the answer to a question if it is difficult or not possible to find the answer themselves.
- E.g. Who was Mary Anning and what did she discover? How does a cactus survive in a desert with no water.
- How could scientists research the answers?
- They use a range of secondary sources including: books, the Internet, newspapers, news clips, video clips.
- It is important that they recognize the difference between fact and opinion.

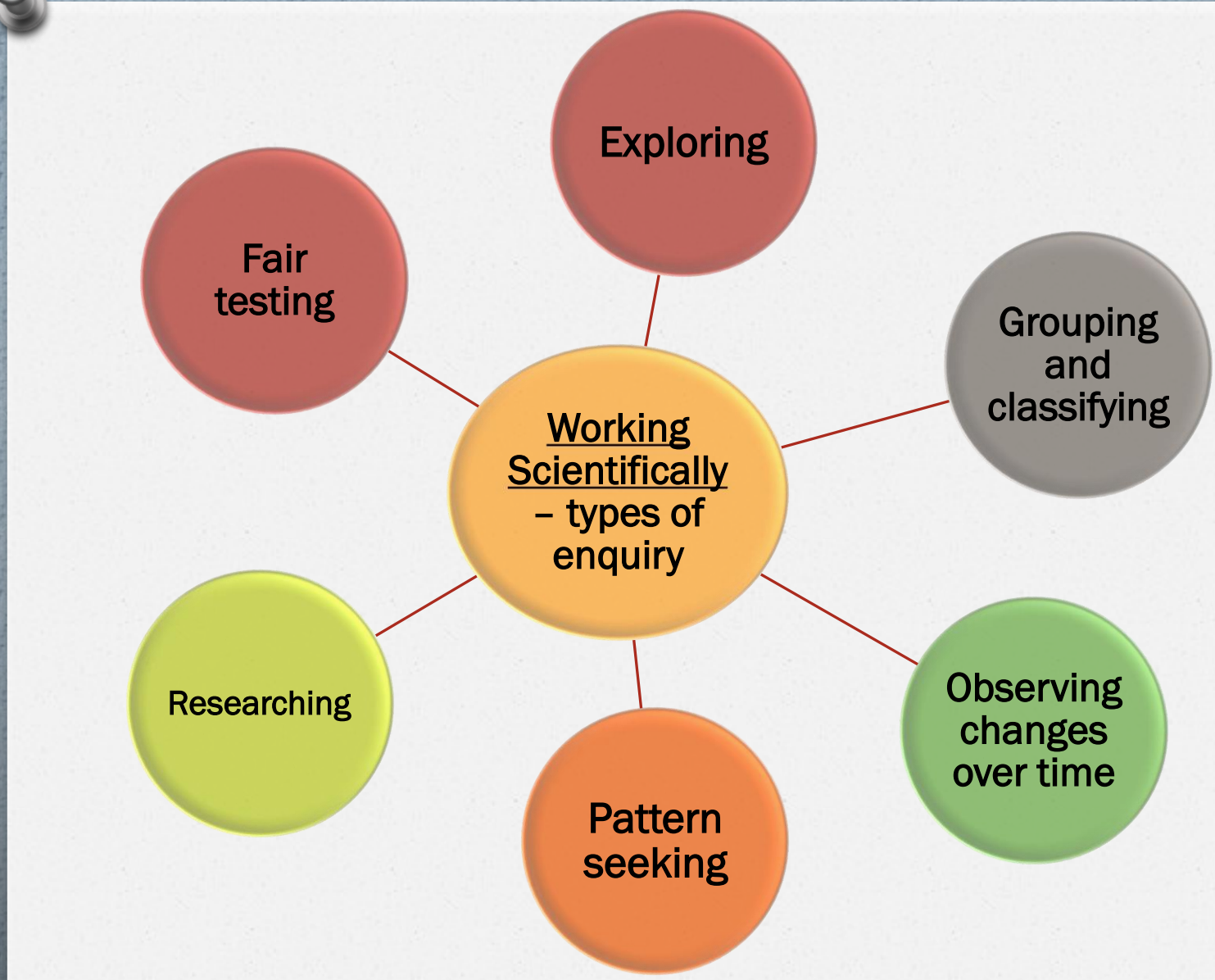
Activity 5 - what questions could you research about biscuits

- Make a list together. Or give a prepared list and ch have to say if they could be researched or ned to be investigated.
- If time, pairs choose one to research – poss in computing lesson.

CONGRATULATIONS!

You are now a fantastic biscuitologist and scientist!


E.....
Com.. And F.. testing
G..... and c.....
Can you remember the types of scientific enquiry?
R.....
Ob...
Pa....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Working scientifically

- NOT JUST ABOUT FAIR TESTS / INVESTIGATION
- Identifying, classifying and grouping
- Observing over time
- Exploring
- Researching using secondary sources
- Pattern-seeking
- Comparative and fair testing