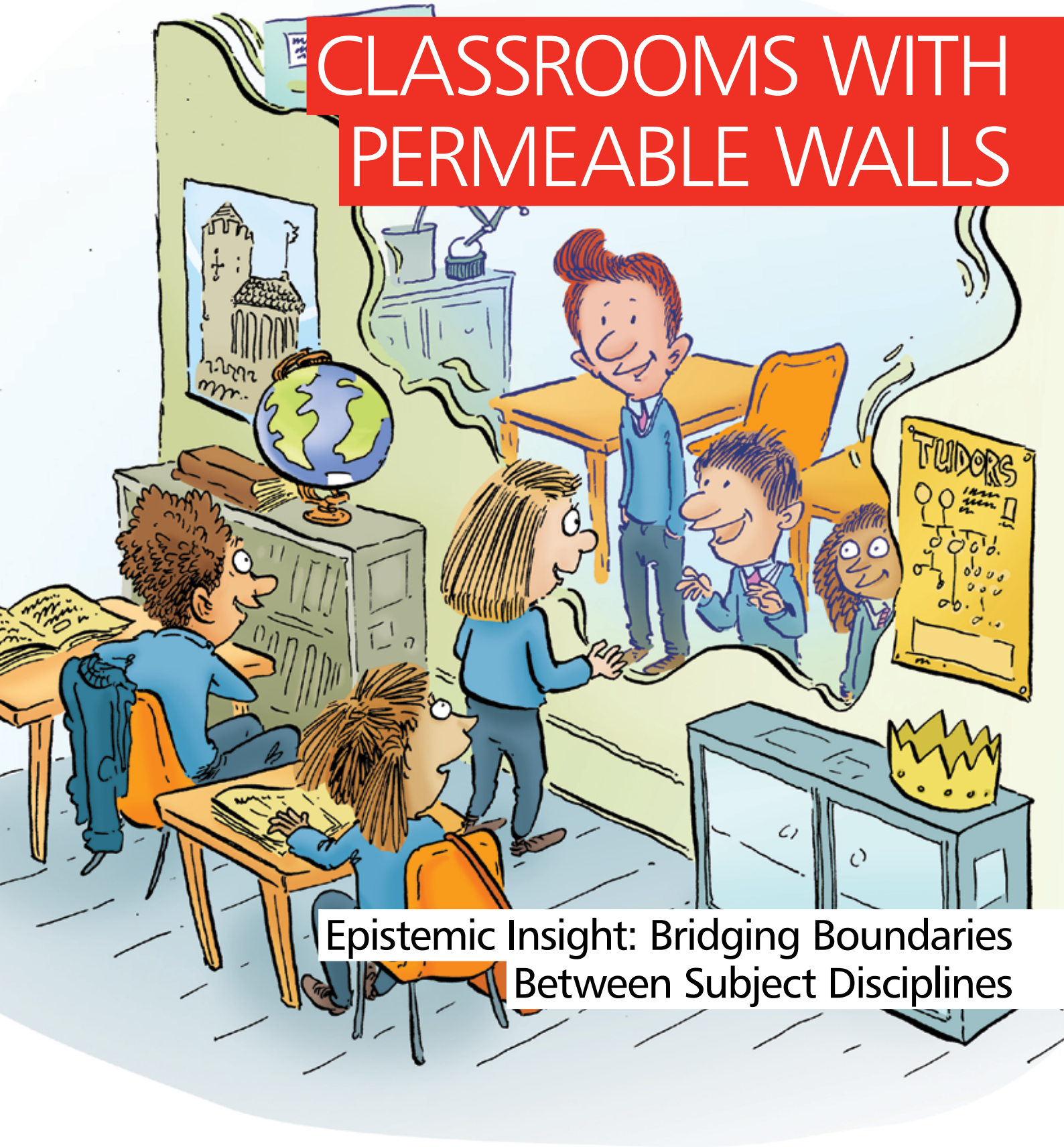
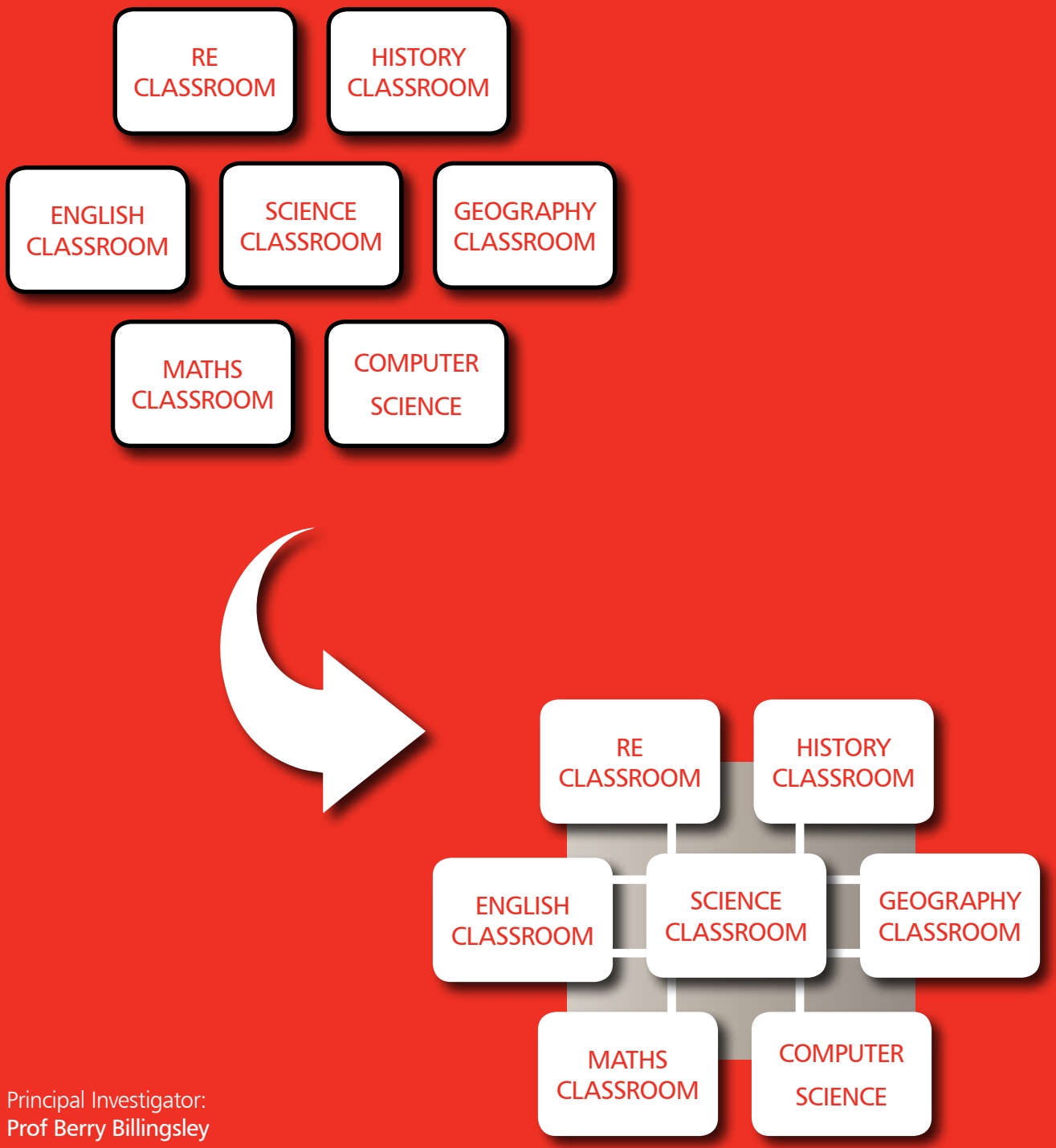
CLASSROOMS WITH PERMEABLE WALLS



Epistemic Insight: Bridging Boundaries Between Subject Disciplines

Canterbury Christ Church University

CLASSROOMS WITH PERMEABLE WALLS



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CONTACT US

You can find more information about epistemic insight and the LASAR Centre on our websites:

www.epistemicinsight.com and **www.LASARcentre.com**

If you would like more information about the pilot in which you are taking part, you can contact the LASAR team on **lasar@canterbury.ac.uk**

WHAT IS EPISTEMIC INSIGHT?

What insights do we expect young people to call on when they address the big questions of life and the universe? How can schools prepare young people for a world that is awash with false facts and exaggerated headlines - and equip them with the best ideas and strategies we can offer to help them make decisions rationally and compassionately? What strategies can schools use to nurture young people's intellectual curiosity and ensure that future great minds of science have the inspiration and stimulus they need?

Epistemic insight refers to 'knowledge about knowledge', and particularly to students' scholarly expertise and their capacities to be wise about how knowledge is and can be formed and tested.

Epistemic insight is developed across many curriculum subjects and at multiple points during students' education journeys as they progress from early years through primary, secondary and in some cases to tertiary and beyond.

To date, educational research looking at how students' epistemic insight develops has mostly explored and discussed what is happening in individual subjects. For example, a vast body of research looks at the significant influences of science teachers' pedagogies on students' developing ideas about the nature of science and what kind of person might want a STEM related career.

There has been much less research looking at students' reasoning on questions which bridge subject compartments – but this is the approach that LASAR (Learning about Science and Religion) has taken. LASAR was established in 2009 to look at how Big Questions are managed in schools. The research has revealed some of the gaps, confusions and misperceptions in students' reasoning that are unintended side effects of pedagogies such as the compartmentalisation of subjects.

The finding that entrenched compartmentalisation in schools can have a significant influence on what students suppose about science is perhaps not surprising. Some of the factors at work are very visible and include text books that are labelled with one discipline or another, a timetable with slots for disciplines in turn and (particularly in secondary) specialist teachers who rarely if ever plan or collaborate together.

The boundary around each of the science subjects tends to be particularly impermeable (Bernstein, 2000). This means for example that it may not occur to the teacher or the students that the question that the class is addressing in science could also be explored in another discipline. In other words, the pedagogy and social structures around science lessons persuade both teachers and students that this subject can operate as a silo with no need to call on any other.

This rationale underpins the Epistemic Insight initiative which aims to create an education system which more effectively:

a. engages students' intellectual curiosity and recognises the value of both single and multidisciplinary questions

b. creates experiences which stimulate young people's natural curiosity, develops their cross-disciplinary scholarly expertise and widens the pipeline from school to science and science related careers

c. equips students (at every level) with the best ideas and strategies we can offer to help them make decisions rationally and compassionately

d. develop teachers' and trainee teachers' research literacy and appreciation of how education, scholarship and knowledge work - in particular - creates research opportunities for the trainee teacher and teacher and teacher educator so that teachers now and in future are not trapped inside narrow compartments within education.

INTRODUCING THE PILOT PROJECT

If you have received this booklet, you have agreed to take part in our Classrooms with Permeable Walls pilot project, where teachers exchange information across subject divides to give students a more joined up experience of education. We are trying to find out how crossing the boundaries of different subjects in the classroom may help to improve attainment, and this pilot project is one step towards finding that out.

Our pilot project is composed of three parts:

1. A pre-intervention survey which you may have already completed (if you have not, please take a moment to complete it. It should not take more than 15 minutes!). You will be asked to complete another survey after the intervention is finished.
2. A week-long intervention, during which you and other participating teachers will trial your choice of strategies to create classrooms with permeable walls.
3. A survey for your students to complete in the classroom prior to the intervention. They will be asked to complete another survey after the intervention has finished.

The strategies you will find here are designed to give students a more joined up approach to learning about the knowledge generating disciplines that they study in school. The aim is not to remove subject compartments or do away with the teaching of individual disciplines, but rather to add strategies to help students to appreciate what makes each of the disciplines distinctive and how they all interact. During the intervention period, you could use a combination of the suggested strategies below and develop and try some of your own.

STRATEGIES YOU CAN USE

QUESTION BOX

Put a designated box in the classroom, encourage students to write questions raised by the lesson which have prompted their curiosity, but which seem to go beyond the boundary of what is currently being taught. These questions can be put in the box when students are leaving and can be reviewed by staff at regular opportunities. They can also pave the way for other strategies, like the Data-centric Mind Mapping, the Discipline Wheel or the Discipline Hats. You can approach the 'question box' strategy in different ways that may be more successful in your classroom. For example, you may choose to have a 'Question Wall' that serves the same purpose.

ASKING ABOUT OTHER LESSONS

As you begin the lesson, take a moment to ask the students about the lesson that came before yours. Encourage interdisciplinary discussion on that topic, making connections to your own.

COLLABORATIVE TEACHING

Plan a lesson with another colleague, bridging science and another discipline. Teach the lesson together, explaining the two disciplinary perspectives to the students at the same time.

SCIENTIFIC CROSS-MATCHING

Science topics can be explored in the context of their links to other disciplines. You can find some examples on page 5. Choose one such topic to discuss and designate a small group of students (two or three) to the other discipline, and give them the background information into the other discipline's perspective on the topic at hand. These Designated Scholars will have the task of contributing that perspective to the lesson.

SCHOLARLY POSTERS

Divide the students into teams of scholars. Assign a scientific topic that they have learned this year to each group, and a contrasting discipline. For example, grab a topic from page 7 such as the water cycle, and assign a team to make a poster linking it to geography. The scholars now have to make a poster linking and contrasting data and evidence of the water cycle from both scientific and geographic perspectives.

DISRUPT THE LABELS

Teach in a different labelled classroom – subvert expectations by teaching history in a science lab, or vice versa. The idea is to dismantle students' perception of compartmentalization. Use the opportunity to explain differences and links between data in different disciplines.

THE DISCIPLINE WHEEL

The discipline wheel can be used to show how different perspectives can work together to produce a richer answer to a wide array of questions, and gives an opportunity to consider the ways in which different disciplines could interact to provide an answer. You can find the wheel on page 9, and a big version on page 10.

DISCIPLINE HATS

Organise the pupils in teams of five and assign a discipline to each: science, geography, history, etc. Each group is now formed of scholars in their assigned discipline. Give them a question which they can analyse – and interpret through each of their disciplines. Suppose they were in competition for research funding – who has the more important question, do they agree?

DATA-CENTRIC MIND MAPPING

Use the discipline wheel as an aid to explain and explore different types of 'evidence' and 'data' from different disciplines. For example: make a mind map about data, and ask the students to think about what data might be and how it could be defined. Link their ideas and examples to different disciplines on the wheel. Later you can use a scientific phenomenon in the wheel, and focus on finding evidence for or against it from different disciplines.

RESEARCHING FOR EVIDENCE

Ask your students to consider the question "Why did the Titanic sink?"

What kinds of evidence would scholars of science and scholars of history call on to construct a response? How would this evidence be obtained? Is there any evidence that both disciplines might find useful and is there evidence that is more likely to be favoured by one discipline and not the other? To prompt students' imaginations, they could begin by researching the incident and list types of evidence that are discussed or that occur to them. They could then create the case that a scholar of each discipline might present to support a perspective on what happened.

Teachers tip - aspects of the story and an indication of the disciplinary shift of emphasis can be found on a science site such as **www.iop.org/news/12/apr/page_54921.html** and a history page such as **www.bbc.co.uk/history/british/britain_wwone/titanic_01.shtml**

SORTING SCIENCE TOPICS

Some questions are more amenable to science than others. On page 8 you will find a Science bubble, into which you can sort different questions to see how much they relate to science. Use it with your students to discuss the extent to which a question can be answered by science. Underneath the bubble you will see some suggestions for questions to sort into the three categories of the science bubble. Encourage the students to discuss data that points towards how science may address each question, think about how they would collect such data and compile the evidence for each case. Page 11 contains a bigger version of the bubble.

EXAMPLES FOR CROSS-DISCIPLINARY TOPICS

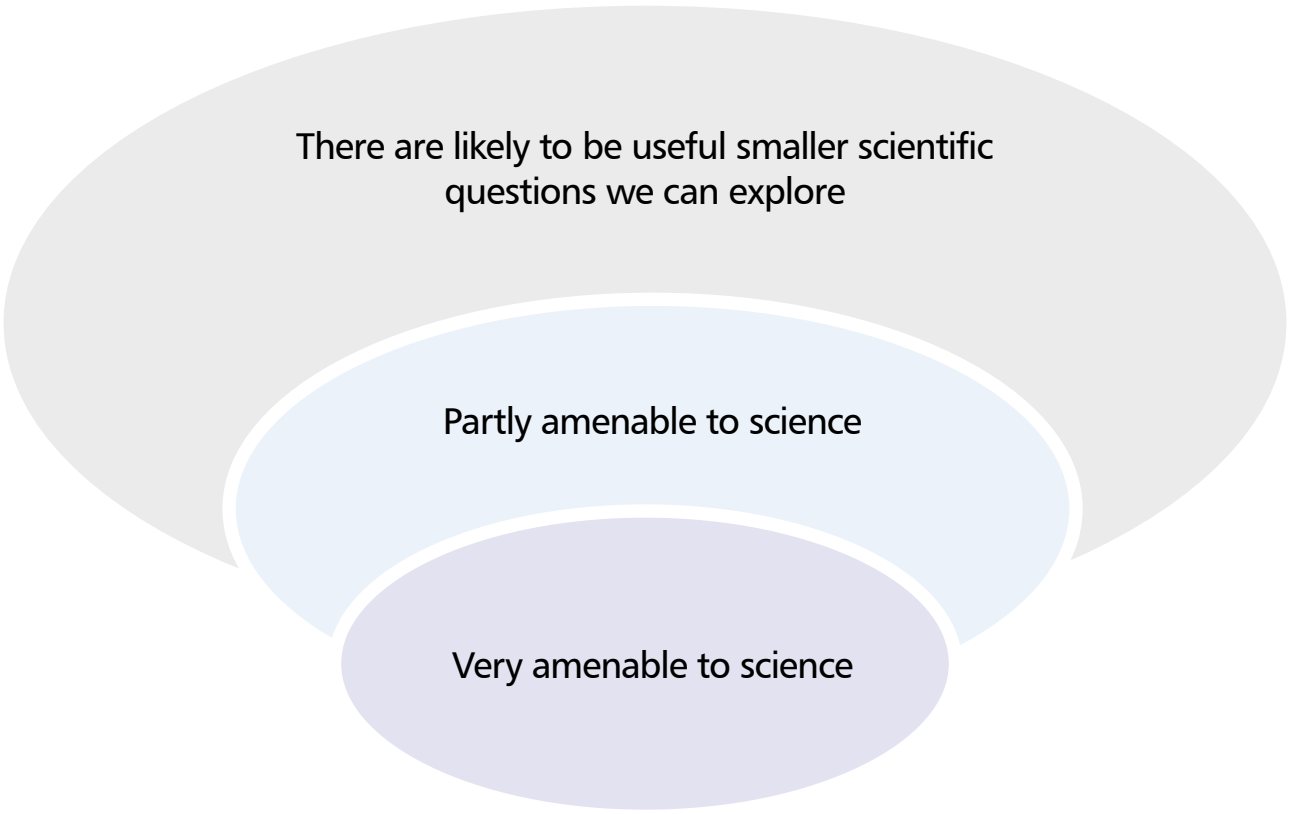
Many different scientific topics have clear links between science and other disciplines. This is just a very short list to inspire you – you probably know many other topics you can use in class to encourage and teach about bridging disciplines:

- Science and history: Hooke's law
- Science and geography: water cycle
- Science and maths: graphs of relationships
- Science and religion: the origins of life and why humans exist
- Science and English: physics and poetry use metaphors to convey perspectives on reality – do you agree? Can an author really have an original idea or do ideas always have natural explanations? What questions about genetics/robotics/cloning have been raised in fiction?

More in-depth questions:

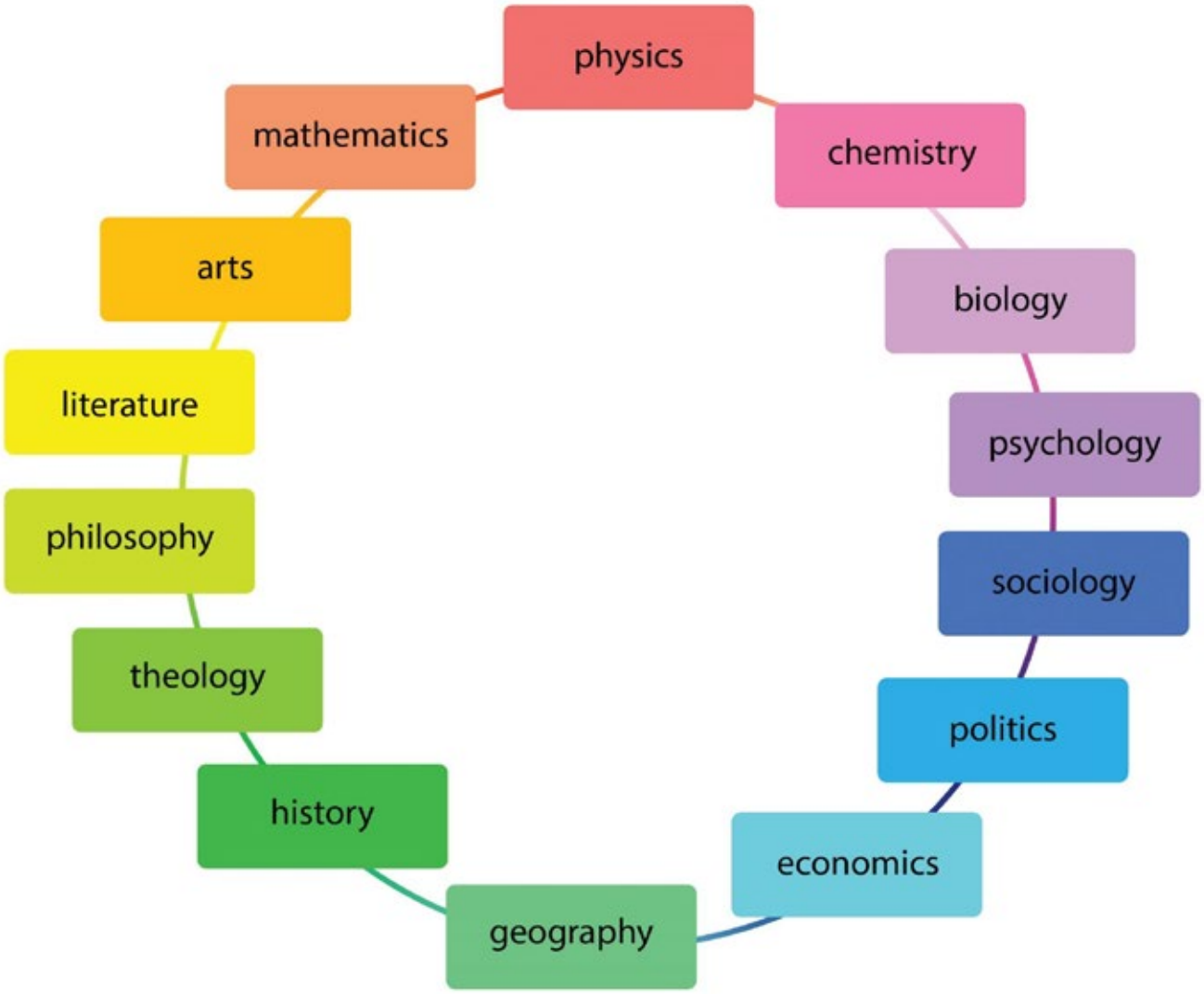
1. Can everything we know via science be expressed using maths – is physics more mathematical than the other natural science disciplines and if so why?
2. Is science less creative than other subjects and where is the creativity in science?
3. Is it possible to live by one or two disciplines alone – which would you choose and why?
4. Is scientific data/evidence different to other kinds of data – and if so is science the only discipline to take this kind of data into account?

SCIENCE BUBBLE



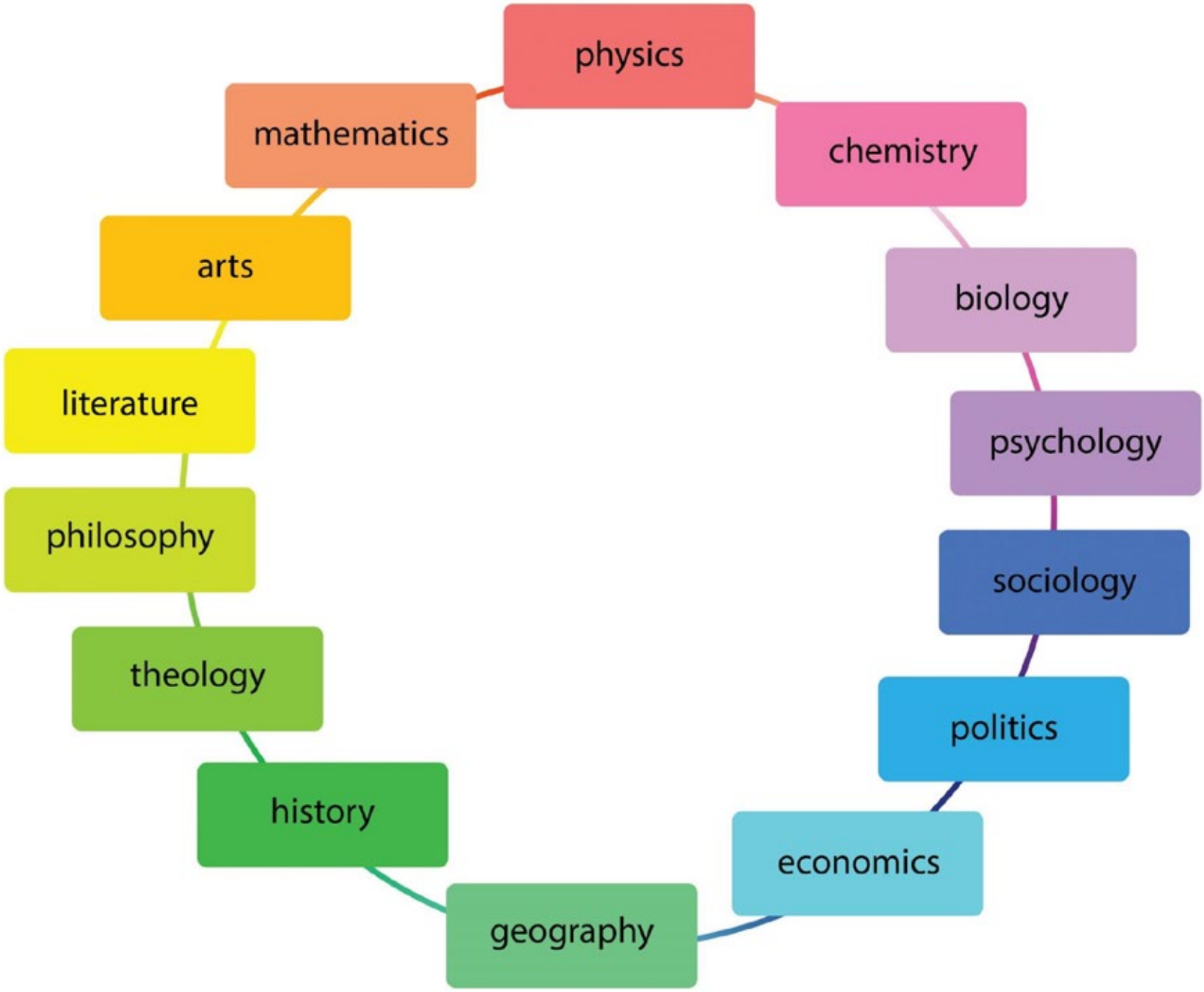
1. Why did the Titanic sink?
2. What is the most interesting book ever written?
3. Why did the great fire of London spread so quickly?
4. Why do things fall to the ground when you let them go?
5. Would a robot ever be given the status of an electronic person?
6. Why did the Romans come to Britain?
7. Will we ever bring back dinosaurs?
8. If Henry VIII's first wife had given birth to a baby boy, would he have remarried?
9. Why did many women authors write under male pseudonyms?
10. How can we measure the speed of coastal erosion?
11. Is trial by jury the fairest way to judge someone?
12. Is it possible to make a square bubble?
13. Can one survive a lightning strike in a moving car?

DISCIPLINE WHEEL



To use the discipline wheel, place a question or topic of discussion in the middle. You can ask a very big question, such as "what makes us human?", or what might at first appear to be a question that is specific to one discipline/subject such as "Why does water boil at 100 degrees Celsius?". You can also pose conundrums such as "why are there flightless birds on all of the continents if birds evolved after the continents separated?"

You can then go through the different disciplines in the wheel, and try to view the question or topic through that particular perspective: how do theology, politics and mathematics seek to answer "what makes us human"? What can the arts, physics, economics and psychology say about this question? In this way, you can show students how the different disciplines connect across topics and questions, and how much is lost if we only use one discipline lens to learn about and make sense of our reality.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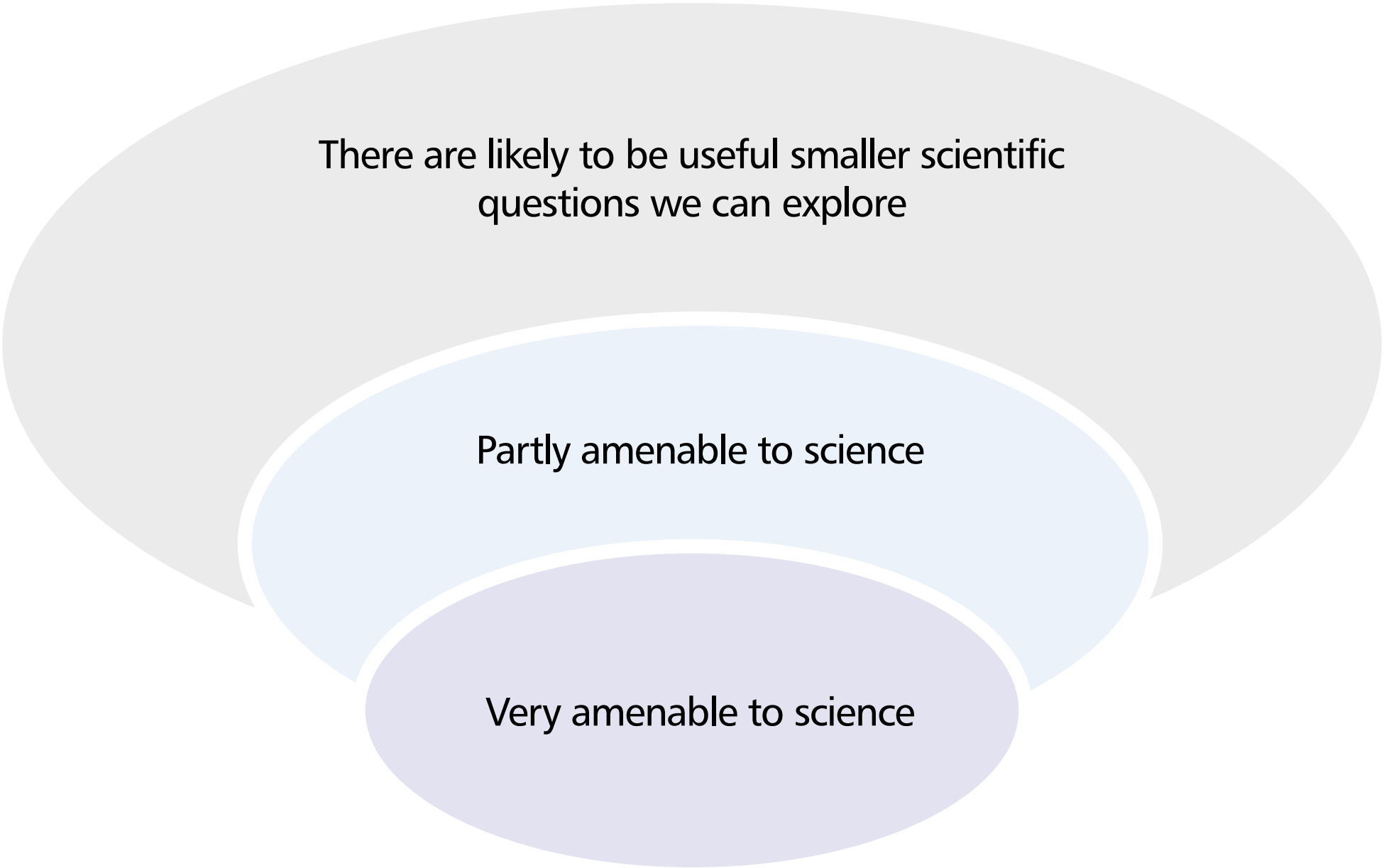
There are likely to be useful smaller scientific questions we can explore
Partly amenable to science
Very amenable to science

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