Epistemic Insight

THE EPISTEMIC INSIGHT FRAMEWORK

FOR KEY STAGE 3

Faculty of EDUCATION

Canterbury Christ Church University

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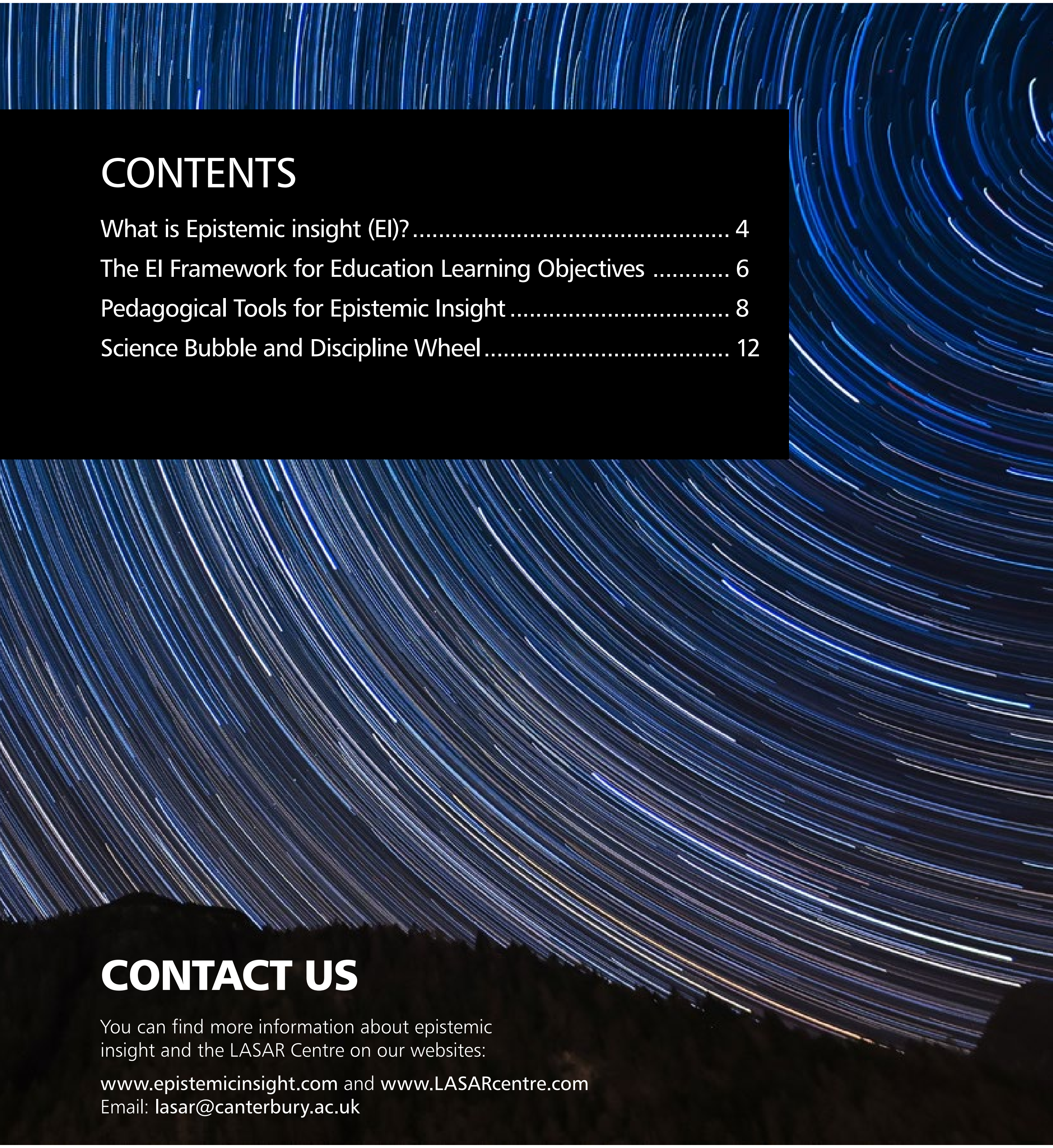

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CONTACT US

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

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WHAT IS EPISTEMIC INSIGHT?

BIG QUESTIONS

WHY DOES THE UNIVERSE EXIST?
CAN A ROBOT BE A GOOD FRIEND?
CAN SCIENCE MAKE BETTER PEOPLE?

These and many more Big Questions occupy the minds of most people at some time during their lives.

In the Epistemic Insight Initiative, we characterise Big Questions in three ways. They are:

- Questions that bridge science, religion and the wider humanities - a characteristic that becomes important because of the way that school subjects are framed and organised.
- Questions about human personhood and the nature of reality.
- Questions on which both science and religion seem to have something to say.

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 investigated 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 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 the nature of knowledge is perhaps unsurprising. Some of the factors at work 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.

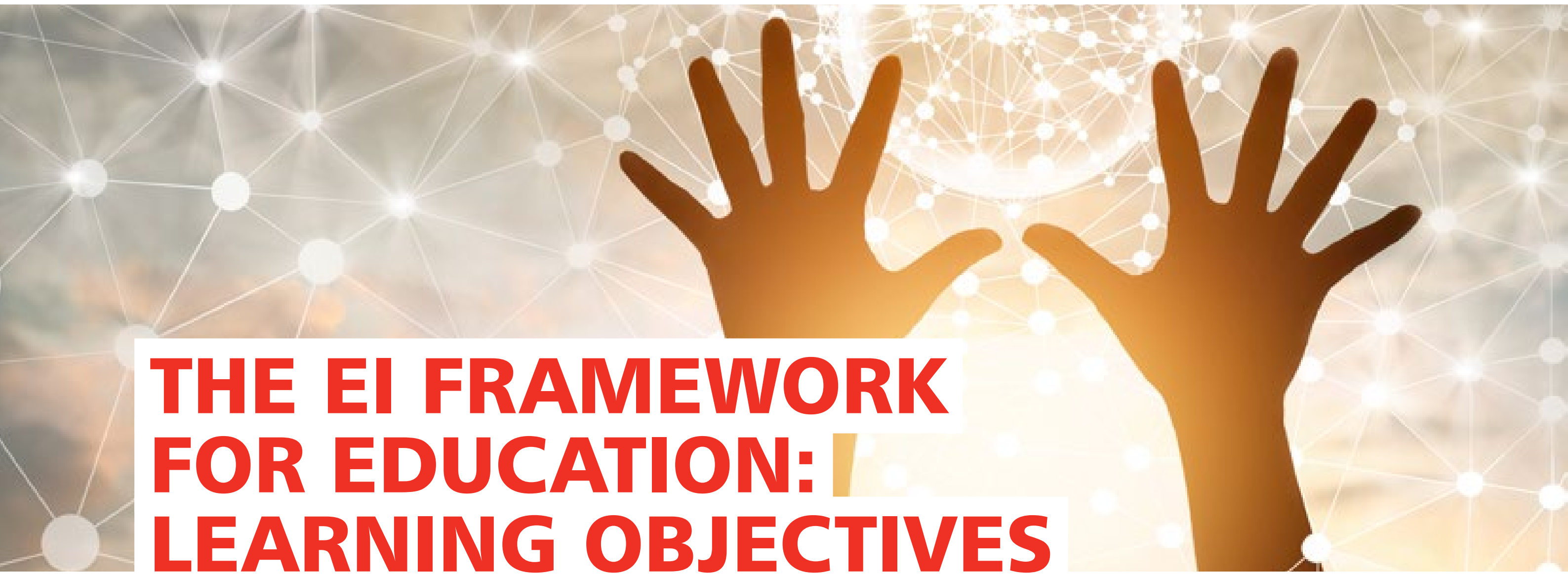
The boundary around each of the science subjects tends to be particularly impermeable (Bernstein, 2000). This means that it may not occur to the teacher or the students that the question discussed in a science lesson could also be explored in another discipline.

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

Develops students' expressed curiosity in Big Questions, helping them to gain epistemic insight and ensuring they can access a range of ways to understand the relationships between areas of knowledge, including positive ways;

Develops students' scientific curiosity and develops their appreciation and understanding of the power and limitations of science in real world and multidisciplinary contexts;

Enhances teachers' expertise and confidence in teaching about Big Questions and helps science and RE teachers to develop approaches to help young people to appreciate that science and religion are not necessarily incompatible.



THE EI FRAMEWORK FOR EDUCATION: LEARNING OBJECTIVES

Via the research funded by our current grants, we will refine a draft framework for enabling the development of Epistemic Insight. It sets out a learning sequence with objectives in each of three categories (Billingsley et al., 2018).

- One category focuses on ways to develop students' interest in Big Questions and ways to teach about the relationships between science and religion.
- A second category has strategies to teach about cross-discipline relationships between science and other disciplines studied in school and ways to explore questions about the power and limitations of science.
- The Framework has a third category with strategies to develop students' understanding of different ways of knowing and how they interact.

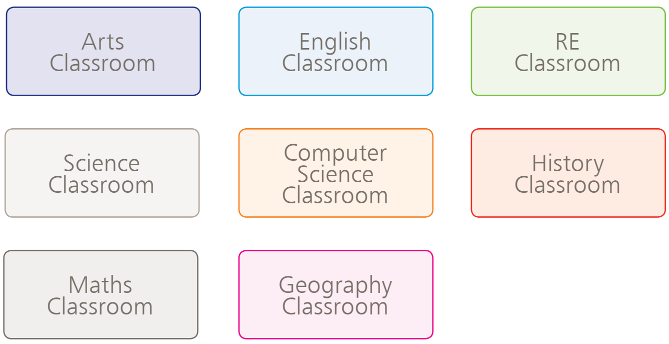
Year Level	Relationships between science and religion	The nature of science in real world contexts and multidisciplinary arenas	Ways of knowing and how they interact
Primary Learning Outcomes	Science and religion are mostly concerned with different types of questions, including different types of why question.	Science begins with observations of the natural world and constructing ways to explain our observations.	Science has some similarities and some differences with other ways of knowing that we learn about in school.
Lower secondary Learning Outcomes	Some people say that science and religion are compatible and some people say they are not.	Some questions are more amenable to science than others.	Different disciplines have different preferred questions, methods and norms of thought.
Upper secondary Learning Outcomes	Science and religion are not necessarily incompatible.	Scientism is not a necessary presupposition of science.	Some questions are more metaphysically sensitive than others.

Example learning outcomes:

- I can explain why some people say that science and religion are compatible and some people say they are not.
- I can explain using examples why some questions are more amenable to science than others.
- I can explain using examples how science and history can both inform our thinking about a cross-disciplinary question and their similarities and differences.
- I can give an example of a 'why question' that has more than one type of answer

EI AND CURRICULUM SPECIFICATIONS

The programmes of study for GCSE (upper secondary school) offer ample opportunities for teachers to create bridges between subject compartments in their teaching.



Disjointed subjects operating as silos

Firstly there are many words associated with scholarly ways of working that appear in more than one subject. These are words such as 'knowledge', 'methods', 'data' or 'evidence', and words such as these appear across multiple subjects and indeed are inherent to a range of disciplines. This creates an opportunity to bridge subject boundaries and to look with students at what each of that range of disciplines mean by 'evidence'. For example, how do the types of evidence we look at in history compare with those we work with in physics? We refer to these types of words as 'scholarly' words because they refer to the discipline underlying each school subject and its nature. Examples of scholarly words are: methods, data and evidence, and also research, methodology, hypothesis, enquiry, critical, creative, analysis, thinking and innovation.

As well as looking at curriculum documents to see what are some of the shared words, it is also useful to look at them to see what is distinctive about different disciplines. One notable feature of the science curriculum is the number of times 'observe,' 'observing' and 'observation' appear, for example, in contrast with the history curriculum, across the different stages of schooling, from Key Stage 1 (comprising years 1 and 2 of primary education) to Key Stage 4 (Years 10-11, the final two years of compulsory secondary education in England). This emphasis on observations in science can be compared with the wider filters that apply in other subjects and help students to consider - what counts as evidence in each discipline. Comparing the questions, methods and norms of thought in each of a range of disciplines can help students to see why multiple answers do not necessarily mean competition between their differing perspectives.

	Science	History
Key Stage 1 (Years 1-2)	20	0
Key Stage 2 (Years 3-6)	31	0
Key Stage 3 (Years 7-9)	7	0
Key Stage 4 (Years 10-11)	7	0

PEDAGOGICAL TOOLS FOR EPISTEMIC INSIGHT

Below are some tools and strategies we have developed with the purpose of helping teachers to bridge subject compartments and help students to think across disciplines. The tools are divided into three categories: tools for detection and evaluation, tools for teaching and tools for creating more effective learning spaces.

TOOLS FOR DETECTION AND EVALUATION

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.

You can set up the 'question box' in different ways to tailor this strategy to your classroom. For example, you may choose to have a 'Question Wall' that serves the same purpose.

MOTIVATING QUESTIONS

You can use different strategies to stimulate students to ask questions. One approach is to start with an image, diagram, or other prompt, and base questions around it. Ask students to ask questions using models that call for deeper thinking, such as "What if…", "Why" or "How" types of questions.

You can also stimulate students to ask questions in the context of an experiment, by stimulating students to ask questions that manipulate the experiment. For instance, if presented with an experiment, you could invite students to pose questions that manipulate, change, eliminate, increase or decrease the variables involved.

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.

TOOLS FOR TEACHING

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 13, and a blank version on page 14.

SCHOLARLY POSTERS

Divide the students into small groups of scholars. Give each group a Big Question or invite them to suggest one themselves. Students use the discipline wheel to generate ideas about how to investigate their Big Question: they put their question in the centre and choose four disciplines. For each discipline, they frame one or more questions and explain what method they would use in each case to investigate. Methods of investigation could include - observing directly, researching existing knowledge or surveying their peers. Once students have constructed an answer, they discuss how each method of enquiry has revealed another angle. Do any of the ideas compete or seem to contradict when viewed across the disciplines?

SCIENTIFIC CROSS-MATCHING

Designate a small group of students (two or three) to science and two or three to another discipline. Ask the students to come up with a shared question or topic that we can study in both disciplines. Then ask each group to discuss how their discipline would frame and investigate an in-discipline question or topic. What methods does each discipline prefer? And if you bring these investigations back together, how do they interact and inform our understanding of the topic?

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 12 you will find a Science Bubble. Students can sort questions using the graphic. Underneath the bubble you will see some suggestions for questions to sort into the three categories of the science bubble. Use it with your students to discuss the extent to which a question can be investigated and answered by science.

EPISTEMOLOGICAL ANALYSIS

Encourage students to discuss and analyse a multidisciplinary question, such as “Can we see a painting by a celebrated artist in the way the artist intended?” To address this question, students call on different methods and ways of knowing from different disciplines, such as art, history and science.

This is a rich or so-called ‘wicked’ problem with multiple points to consider: for example, one may question why we would suggest that we are not seeing it as such at the moment, what conditions would be necessary to achieve that (lighting, environment, pigments used, the passage of time, what we presume were the intentions of the painter), and what methods one may use to accomplish this.

The Epistemic Insight website has a related workshop - called, 'what's the best way to restore Renoir's faded painting'. The workshop showcases the way that values from science and art interacted when scientists came up with a way to investigate and address this question.

TOOLS FOR CREATING MORE JOINED-UP AND EFFECTIVE LEARNING SPACES

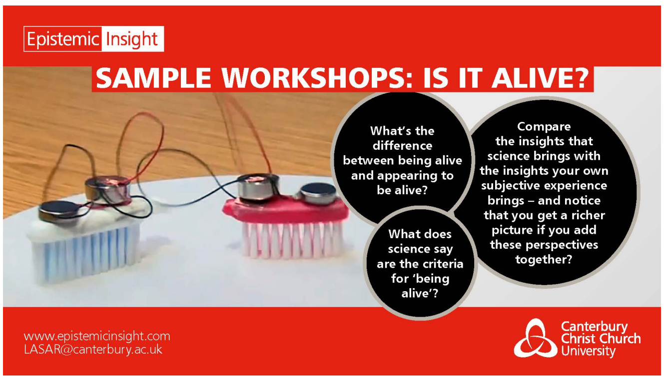
ASKING ABOUT OTHER LESSONS

While students settle into their places, take a moment to ask them about the lesson that came before yours. Show interest! You could also link your classroom with another by using the corridor to show a transition from questions that work in your classroom to cross-discipline questions and then questions for the other classroom.

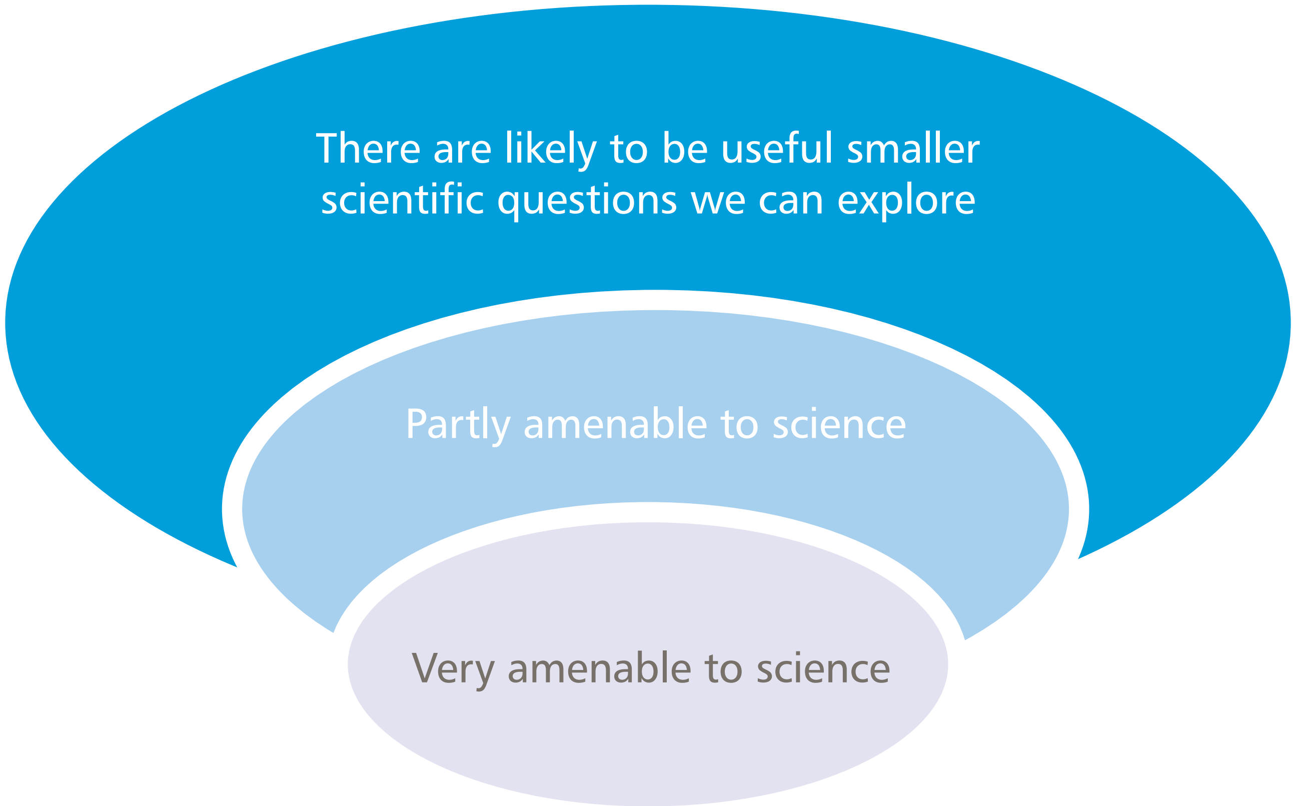
COLLABORATIVE TEACHING

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.

FURTHER SUGGESTIONS
More strategies and a selection of workshops are available at **www.epistemicinsight.com**



SCIENCE BUBBLE AND DISCIPLINE WHEEL



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?

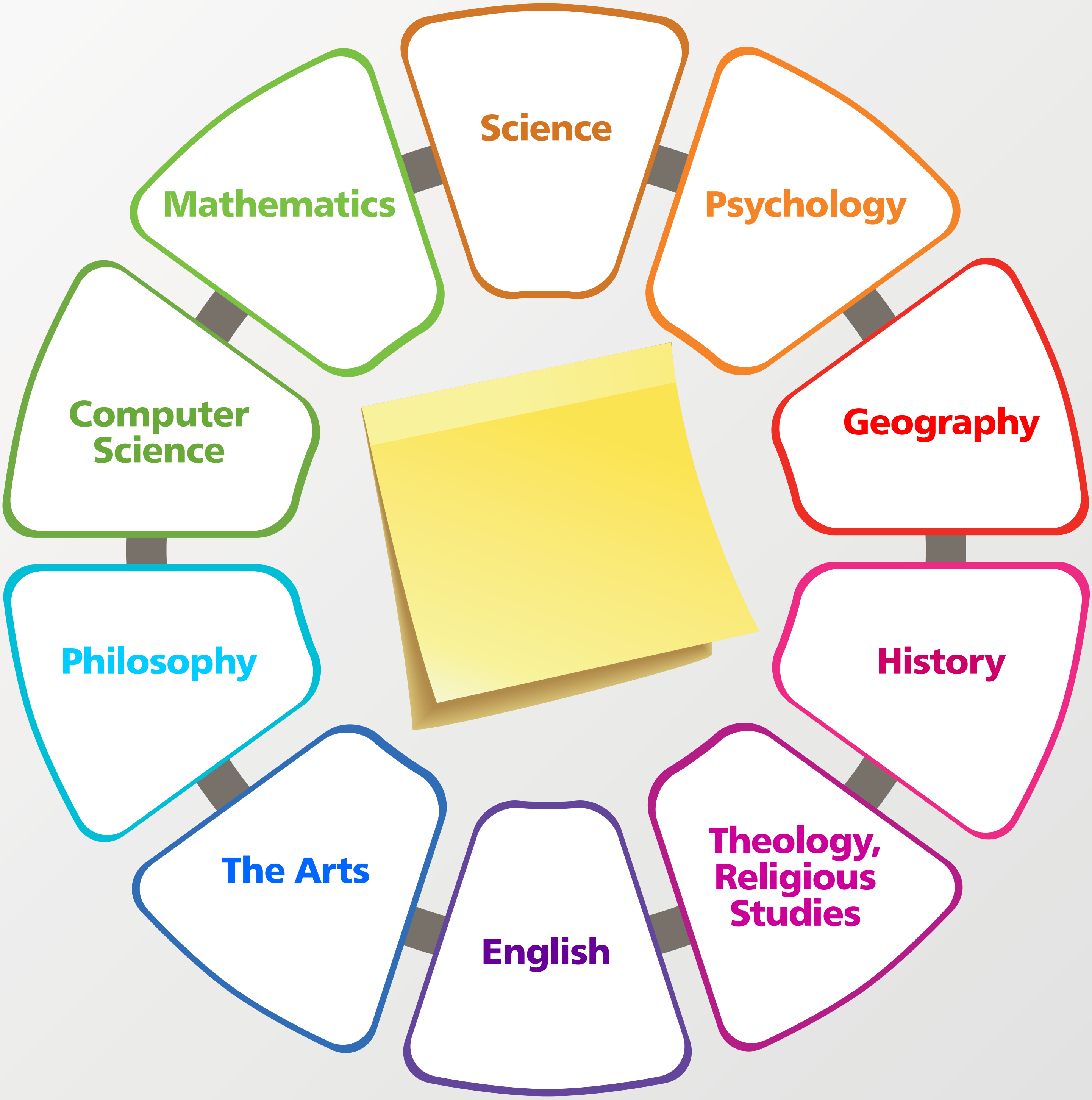
10 How can we measure the speed of coastal erosion?

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?

Epistemic Insight



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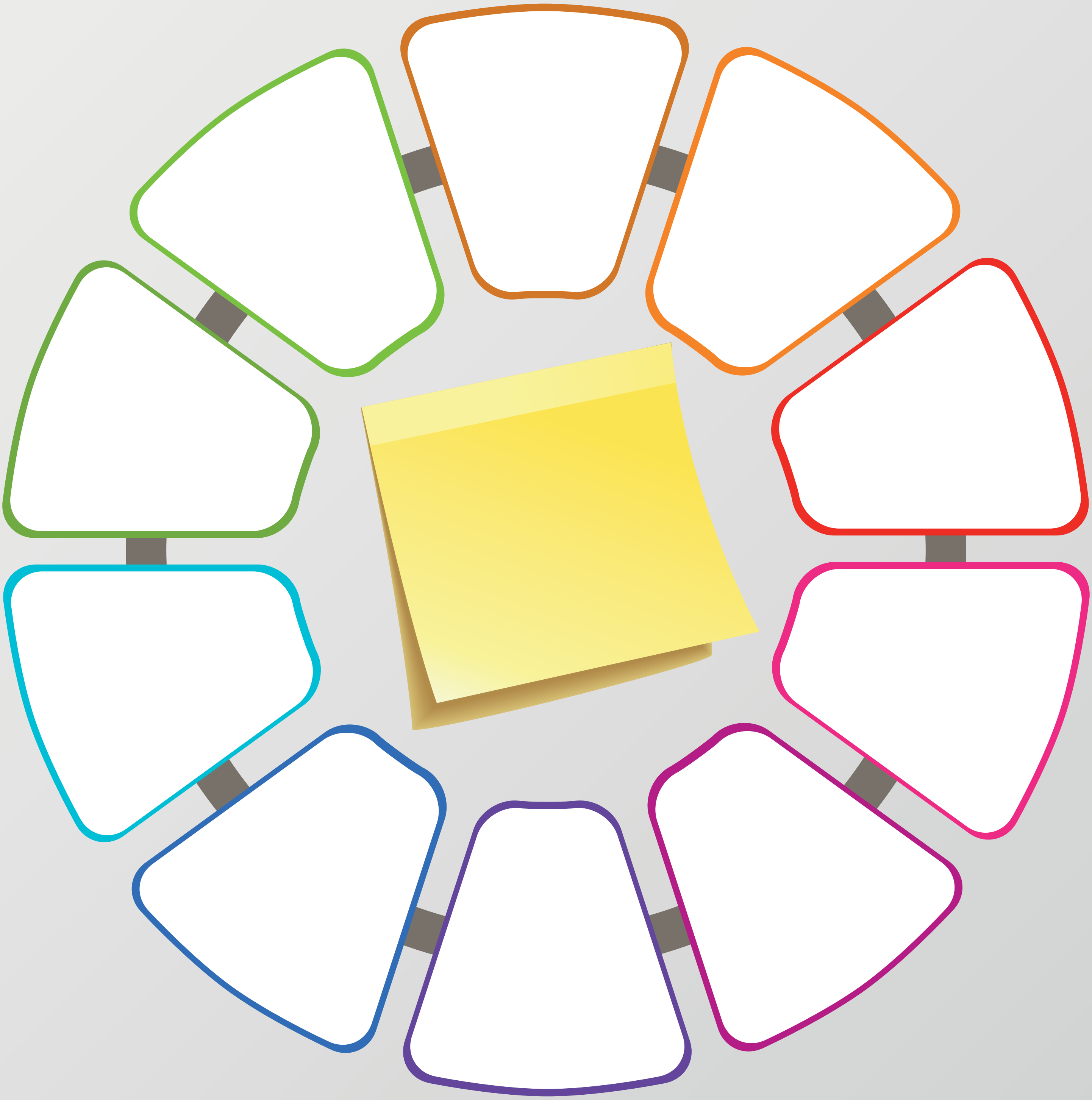

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