

Argumentation in Science and Religious Education

Resources for Teaching and Learning
in Secondary Schools

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Details about the project can be found at <https://oarseducation.com/>

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Argumentation in Science and Religious Education

Resources for Teaching and Learning
in Secondary Schools

Jessica Chan and Sibel Erduran

Introduction

The pack consists of lesson guidelines for teachers and resources for students to engage in argumentation in the context of science and religious education (RE). The overall purpose of the pack is to enhance secondary students' argumentation skills and interdisciplinary thinking.

Sets of Materials

The pack consists of four sets of teaching materials which cover topics in physics, chemistry, biology, environment and RE. Each set adopts an argumentation framework and encompasses three topics in science, RE and science-RE (interdisciplinary). The argumentation frameworks are "Discussion of an instance", "Predict-Observe-Explain", "Competing Theories" and "Analysing and Interpreting Data". The overall structure of the pack is outlined in these four boxes:



Set 1 Discussion of an instance

- Physics
What Causes the Four Seasons?
- RE
Religious Clothing in Schools
- Interdisciplinary
The Origin of Life



Set 3 Competing theories

- Biology
Genetics or Environment?
- RE
Is there a Soul?
- Interdisciplinary
Re-defining Personhood



Set 2 Predict, observe and explain

- Chemistry
A Rubbery Egg
- RE
Dietary Rules in Religions
- Interdisciplinary
Meat or no Meat?



Set 4 Analysing and interpreting data

- Environment
Climate and Human Activity
- RE
Human and the Environment
- Interdisciplinary
Humans as Stewards or Exploiters?

Argumentation frameworks

Each framework described below promotes argumentation by using a different way of framing the lesson activities:

Discussion of an instance (Set 1)

Through exploring an instance, the aim of this set of activities is to guide students to organise different arguments. The activities are designed in ways which will help students link various statements to the respective claim derived from science, RE and interdisciplinary contexts, while also making logical inferences which are consistent with the line of the argument.

Predict, observe and explain (Set 2)

The activities in Set 2 aim at developing students' thinking in predicting, observing and explaining (POE). In the context of science, the POE framework may involve prediction of the outcome of an experiment and interpretation of data. In the context of RE, understanding about worldviews can be achieved by reading, interpreting or inferring from various religious texts and practices in order to reach conclusions.

Competing theories (Set 3)

In both science and RE teaching, students' argumentation skills can be strengthened by examining and evaluating competing or alternative claims. There may be different points of views which invite justifications through presenting evidence and reasons. For simplicity, this framework is named as "competing theories", though "theories" can be swapped by "models", "explanations", "worldviews" or "perspectives".

Analysing and interpreting data (Set 4)

This activity set focuses on using, evaluating and applying data. The data can be in different forms in science, RE and interdisciplinary topics. In whatever form the data are, the activities promote the use of data to justify conclusions.

Points to note

Although only one science subject is exemplified in each of the four sets (for example, biology in Competing Theories), all the four argumentation frameworks can be flexibly adapted to different science subjects or topics, given that each of the frameworks is sampled in three subject combinations – science, RE and interdisciplinary in this resources pack.

An 'argument' is conceptualised as connecting a claim to evidence and reasons. In this conceptualisation, evidence and reasons are put forward to justify a claim. The term 'warrant' may be used to refer to the justification of a claim. Scaffolds are designed in each set to introduce the structure of an argument based on everyday examples so that students can learn to construct a logical and reasoned argument.

Within the broad objectives of interdisciplinary learning and argumentation skills, science and RE vary distinctively in terms of epistemic nature, methodology to knowledge generation, curriculum content and pedagogical approach. Teachers are strongly encouraged to adapt or modify any parts of this pack to suit the specific needs of students and teaching contexts.

SET 1

Discussion of an instance

a. Physics

SET 1 - Discussion of an instance

a



What Causes the Four Seasons?



TEACHER GUIDELINE (PHYSICS)

Argumentation framework: Discussion of an instance

What causes the four seasons?

Introduction

According to STEM Learning, students have a lot of misconceptions about seasons. The primary aim of this physics activity is to develop students' understanding of season changes and the relevant concepts, particularly about the reasons for the seasons. Students can learn that a year can be expressed or measured differently. Apart from the day-to-day understanding of a calendar year which students are familiar with, they should know that in space physics a year means one complete journey of the earth's rotation around the sun in its orbit.

Learning goals

Through this activity students will be able to –

- learn the scientific knowledge of earth rotation and the imaginary lines that divide the sphere;
- understand the causes of the four seasons;
- evaluate a list of scientific claims about seasons;
- differentiate true claims from false ones based on the scientific knowledge presented.

Argumentation framework

Exploring this topic enables students to logically link the core concepts in earth-sun relationships. Students then test their understanding by evaluating different claims. The argumentation framework used is 'discussion of an instance'.

Example teaching sequence

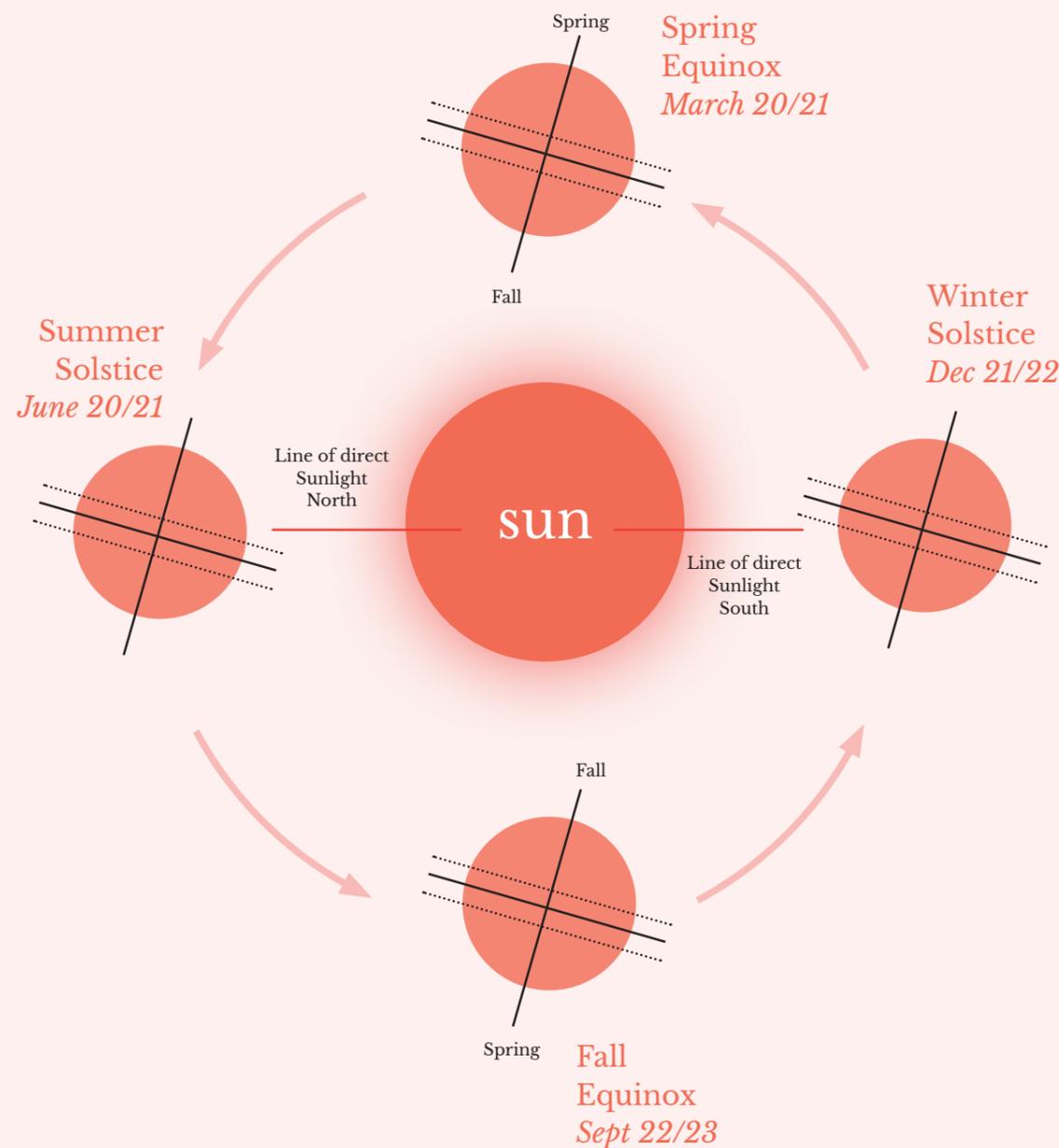
- Students may need to brush up their prior knowledge about the earth, for example, that the earth rotates around its axis and around the sun, and the spherical planet is divided by a hypothetical line called the 'equator'. Provide brief overview of this background knowledge through a starter activity.

- Students also need to understand the imaginary axis because the earth spins in a sloping position (i.e. tilted). This is an important concept before they move on to explore the rotation part. The following website explains the concept of earth's tilt clearly <https://education.nationalgeographic.org/resource/season>
- A short video clip may be useful to demonstrate the actual motion of the earth. This website contains a few video links <https://spaceplace.nasa.gov/seasons/en/>. After showing the video, students should be able to go through the claims in the task. The task can be individual or in pairs.
- Ask students, in pairs, to discuss the discrepancies of their choices, e.g., why Student A chooses 'true' whereas Student B chooses 'false' for the same claim. Students can also amend their choices as a result of pair discussions.
- Students can go further to learn about time change in a day and different time zones, that the earth rotates approximately 15 degrees every hour. In fact, it actually takes less than 24 hours (23 hours 56 minutes) for the earth to complete one full rotation itself.
- Ask students why UK is not in the same hour with her neighbouring countries such as France and Belgium, before introducing the new concepts such as latitude and longitude.

STUDENT RESOURCE

What causes the four seasons?

We know that earth rotates around the sun at 23.5 degrees on its axis. This diagram illustrates how seasons happen in different parts of the earth moving by its rotation orbit.



Decide if the ten scientific claims below are 'true', 'false' or 'don't know'. You can tick in one box only for each statement.

Statement	True	False	Don't know
1. The equator is the imaginary line that divides the earth into the Northern and the Southern Hemispheres.			
2. When one hemisphere is exposed towards the sun, the other hemisphere is in the shadow turning away from the sun.			
3. Season change is due to variations of direct sunlight a particular part of the earth receives.			
4. Summer happens in the Southern Hemisphere when it receives the most direct sunlight on June 20 th or 21 st .			
5. Winter occurs in the Arctic Circle (the furthest part north of the earth) when it receives the least direct sunlight between May and July.			
6. The extreme ends of the seasons are indicated by Solstices, when the line of direct sunlight is either the farthest north or the farthest south that it ever goes.			
7. Winter Solstice happens in the UK or other regions in the Northern Hemisphere on December 20 th or 21 st .			
8. Equinox occurs only once a year.			
9. Equinoxes happen when the sun crosses the equator, i.e. the sun appears directly above the equator, therefore the day and night are equal in length.			
10. Countries nearest to the equator (e.g. Kenya and Indonesia) have the slightest seasonal changes regardless of which of the two hemispheres is receiving direct sunlight.			

Find a partner in class. Identify and discuss the similarities and differences between your responses to the ten statements, e.g. why did you choose 'true' when your partner chose 'false'? How can you resolve any disagreements with each other?

SET 1

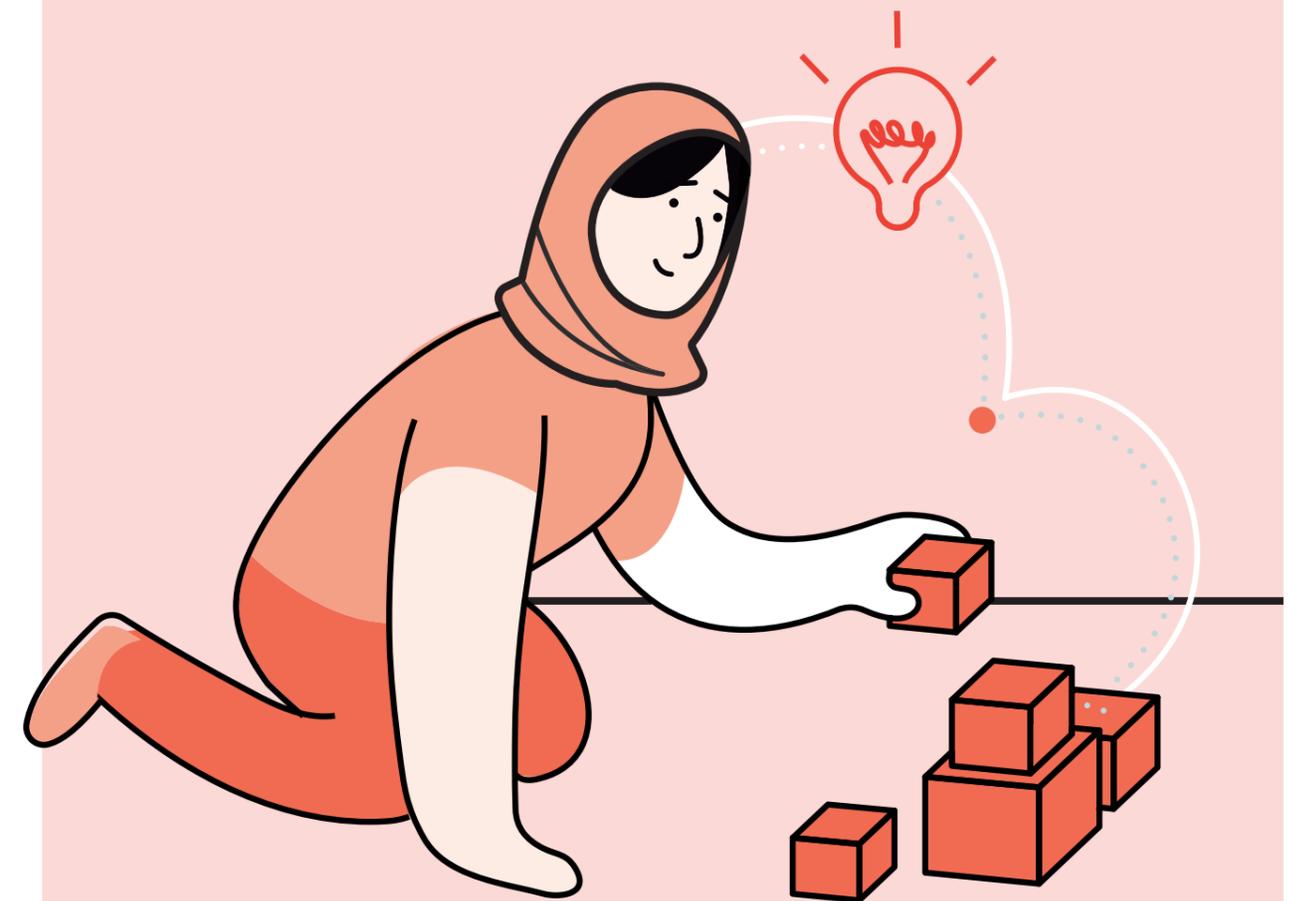
Discussion of an instance

b. RE

SET 1 - Discussion of an instance

b

Religious Clothing in Schools





TEACHER GUIDELINE (RE)

Argumentation framework: Discussion of an instance

Religious Clothing in Schools

Introduction

Religious clothing in schools, especially something that covers part of the body has long been a controversial issue in Europe. In France and the UK, numerous lawsuits have taken place for various reasons and motives. While France has settled its national debate by legislation, schools in England are left with ‘guidelines’ which do not help to alleviate the dispute.

The aim of this activity is to give students a chance to express their stance and views on an issue so closely related to and impactful on them.

Learning goals

Through this activity students will be able to –

- consider the challenges of being a religious teenager in school;
- identify arguments that support either side of the debate;
- make logical inferences based on the characters’ perspectives;
- express their own views on this controversy;
- give reasons to support their views.

Argumentation framework

Through discussing an instance, students are able to sample and compare reasons that support different arguments on an issue which impacts on individuals.

Example teaching sequence

- The lesson can start by a starter activity relating the topic to the school policy or more widely the context in England, for example through a question such as “are students allowed to wear religious items in their own school or some other schools they know?”
- Gather students’ initial views on this topic – if students already have strong opinions on the issue or they have not given much thought on it.

- Students read the arguments of the characters and finish the handout individually.
- Guide a whole-class discussion on two tricky statements, 7 and 11. These statements invite open interpretations. Students can share how they link the statements to Ahmed’s argument.
- Ask students to identify the different perspectives of the two characters – Ahmed’s argument is purely on a personal level (this does not mean ‘his personal interest’. His is about ‘freedom for everybody’ so ‘personal level’); whereas Emma’s perspective focuses on the school level (organisation level).

 **STUDENT RESOURCE**

Religious Clothing in Schools

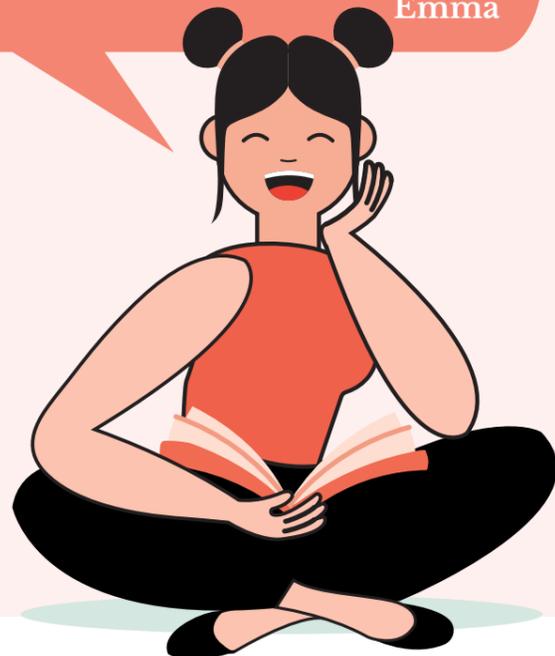
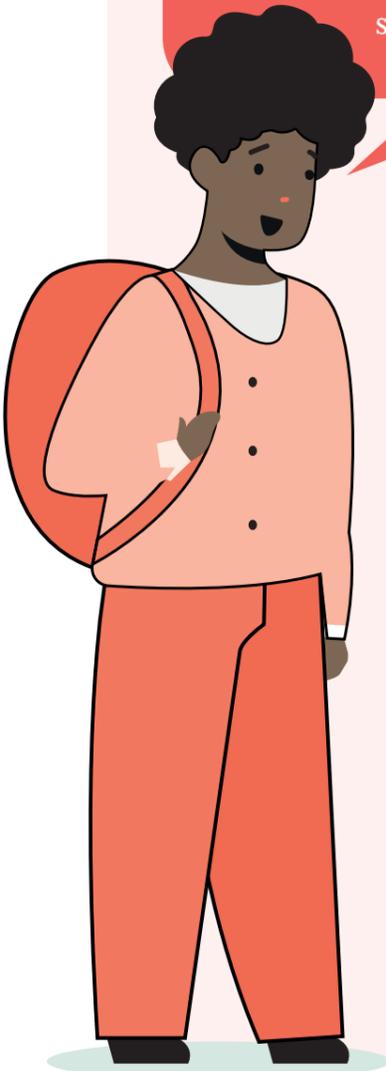
Some people think that religious clothing should not be allowed in schools; whereas some others think schools should allow students to wear religious clothing. A school in your neighbourhood is collecting some opinions from its students on this debate.

Ahmed

Students should have the freedom to express their religious beliefs by wearing religious clothing in schools. Also, people can wear hijab or turban in the streets so students should be permitted to do the same in schools. If others can, why can't we?

Schools should be a place to break down separation and barriers between different communities. Religious clothing in schools would reinforce those barriers and separation. Practically, safeguarding is one of the most important functions of a school. It will be difficult for schools to ensure students' safety if we wear something that covers our body or face.

Emma



Decide if the following statements are 'correct', 'incorrect' or 'don't know'. You can tick in one box only for each statement.

Statement	Correct	Incorrect	Don't know
1. Ahmed supports the idea that students should be allowed to wear religious clothing in schools.			
2. Emma agrees with Ahmed.			
3. Emma thinks religious clothing would reduce segregation in schools.			
4. Ahmed supports the freedom of religious expression.			
5. Emma thinks schools should prioritise safeguarding for students.			
6. Ahmed and Emma disagree with each other on allowing students to wear a hijab in school.			
7. Ahmed wants to wear a turban in school.			
8. Emma believes wearing a burqa (an enveloping garment that covers the face and the body) to school would encourage inclusion between students.			
9. Ahmed thinks if people can wear religious clothing in the streets, so can students in schools.			
10. Emma believes that religious clothing should be banned in schools.			
11. Ahmed thinks safeguarding children is not as important as religious expression in schools.			
12. Emma does not support the freedom of religious expression.			

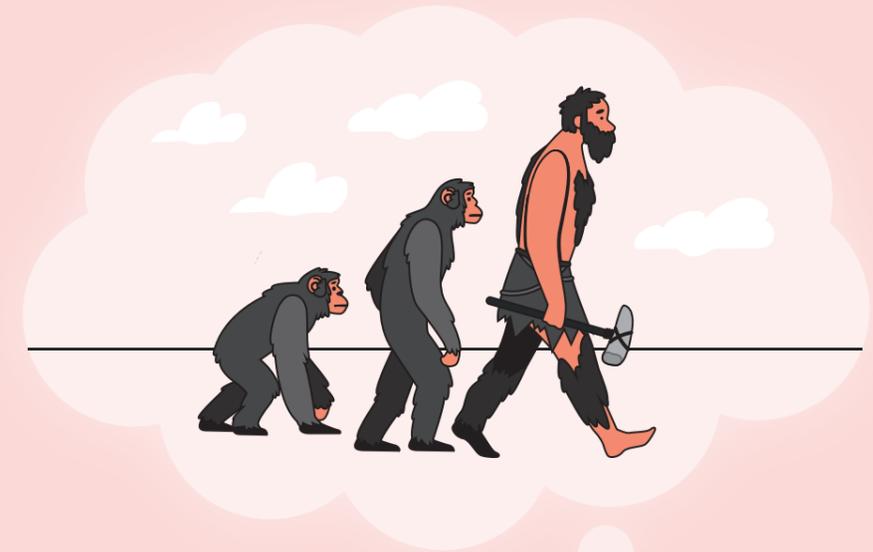
SET 1 Discussion of an instance

c. Interdisciplinary

SET 1 - Discussion of an instance

c

The Origin of Life





TEACHER GUIDELINE (Physics & RE)

Argumentation framework: Discussion of an instance

The Origin of Life

Introduction

'How lives begin' or 'where life comes from' are a classic topic that concerns both science and religion. In this activity, students have the chance to take part in this ongoing debate about the origin of life by linking their knowledge in religion and science together.

The aim of this activity is not to provide an answer to this 'big question' about the origin of life. Neither does the activity aim at reaching a consensus by the end of this activity. Instead, students can be guided to form their position by reviewing what they know (and what they don't know) in pursuit of this question.

Learning goals

Through this activity students will be able to –

- learn about the contrastive arguments on the origin of life;
- connect their understanding in science with RE in the context of arguments about the origin of life;
- develop views about big questions by appealing to evidence and reasons;
- understand that there is no absolute answer for such a big question.

Argumentation framework

The argumentation framework is 'Discussion of an instance' where a particular issue is presented in a table of statements and students are expected to comment on their accuracy.

Example teaching sequence

- Introduce the idea that the origin of life is an ongoing and heated debate between science and religion. Encourage students to provide some explanations for how life originated and to write down their explanations from different perspectives, particularly science and RE perspectives.

- Distribute the student resource and ask students to complete the table.
- Students, working in pairs or small groups, compare and contrast their responses in the table.
- Guide a plenary discussion involving the whole class about some of the key similarities and differences observed in breakout groups
- For homework, students can look up other resources on the internet about the origin of life, especially those presenting opposite or contrastive explanations for this topic.



STUDENT RESOURCE

The Origin of Life

Aisha and Chloe are trying to explain the origins of the existence and changes in the natural world to their friend, Antonio. He is from Ecuador, a country so close to the equator that it has almost no seasonal changes but volcano eruptions. This country also has great biodiversity – many wild animals there are not seen in other countries.



Aisha

Quran tells us that Allah has unlimited power. He created the sun, day and night, heaven and earth, and human beings in six days. With soil, Allah created Adam and then Hawa (Eve). Allah appointed human beings to be guardians of earth and that's why we have to look after it. It's my responsibility to protect the environment because it is holy.

Chloe

Billions of years ago the universe was a tiny spot that contained just matter and energy. Over many years, with enough density and temperature, the universe expanded. Planets including the Earth were formed. With microbes and hydrogen, the simplest form of lives started to evolve on earth. All living things such as plants, animals and human are a result of evolution.



Decide if the following statements are 'correct', 'incorrect' or 'don't know'. You can only tick in one box for each statement.

Statement	Correct	Incorrect	Don't know
1. Aisha and Chloe disagree with each other on the origins of lives and the universe.			
2. Aisha believes humans have a divine steward role to all livings on earth.			
3. Chloe thinks humans are entrusted to guard or protect the earth.			
4. Aisha would support this argument – 'God owns the earth and all lives, humans don't. Humans are servants and act for the environment in God's will'.			
5. Chloe would support this argument – 'Humans are naturally superior to animals because humans are chosen as agents to manage all organisms on earth using different methods.			
6. Aisha believes God created matter, temperature and energy to enable the beginning of any lives.			
7. Chloe thinks no one can claim ownership of lives.			
8. Aisha does not believe in science.			

Whom do you agree with, Aisha or Chloe? Can you give a reason to explain why you support that person's view?

I agree with _____

because I argue that _____

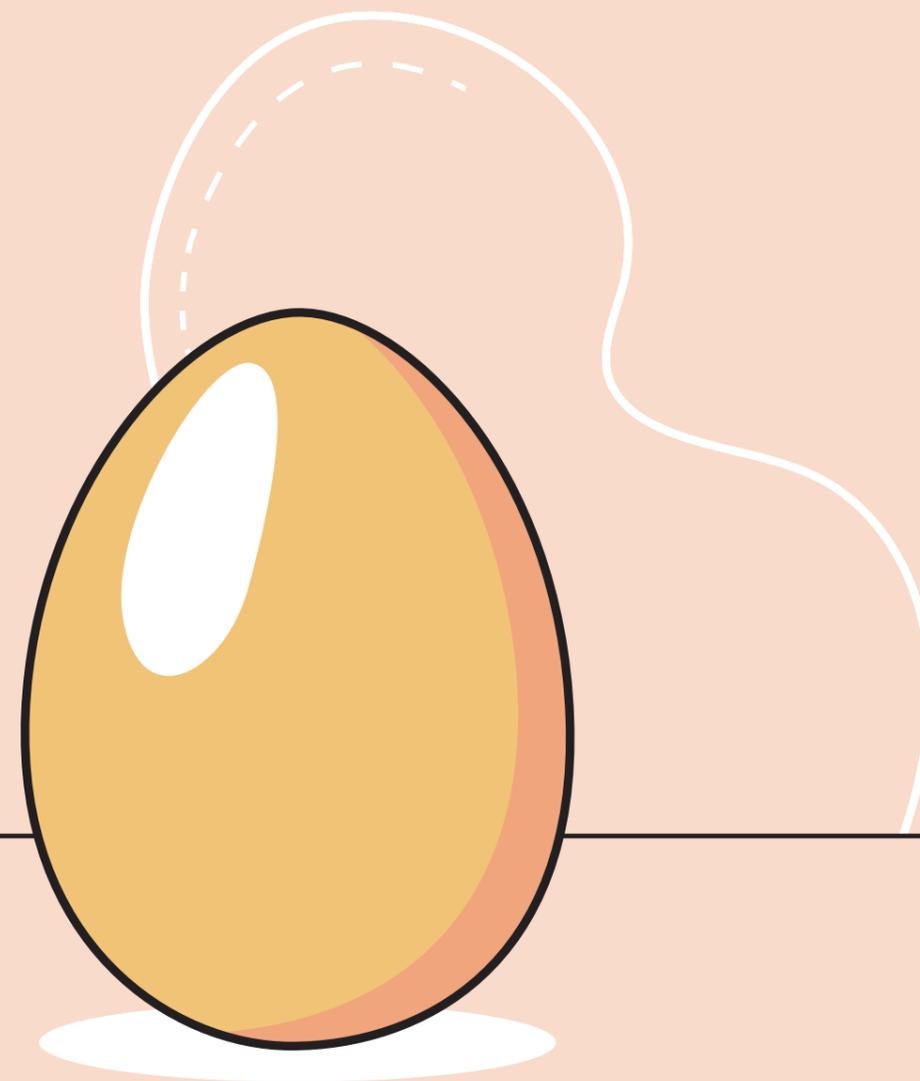
Now share your responses with a classmate. On this disagreement between Aisha and Chloe, are your views similar or opposite to your classmate's? Which of the characters does your classmate support? What is the reason for his/her choice?

SET 2 Predict, observe and explain

a. Chemistry

SET 2 - Predict, observe and explain

a



A Rubbery Egg



TEACHER GUIDELINE (Chemistry)

Argumentation Framework: Predict-Observe-Explain

A Rubbery Egg

Introduction

Scientists use a range of methods for producing scientific knowledge. These methods help justify why some knowledge claims are credible and others not. In this activity, students explore the various scientific methods such as observations and predictions.

Learning goals

Through this activity students will be able to –

- consolidate their understanding of reactants and the Periodic Table;
- generate a scientific argument by using their knowledge in chemistry (predicting);
- justify their prediction by giving a scientific explanation;
- explain the outcome by connecting the observation with their known facts (observing and explaining).

Argumentation framework

The argumentation framework is “Predict-Observe-Explain”. Students can also learn that making predictions, observing and giving explanations are part of what scientists do as they explore the natural world to produce scientific knowledge.

Example teaching sequence

- Ask students to explain what they think basic chemicals and compounds are and as an example, what the compounds might be in an egg.
- Students can write down their predictions on the handout, and the justifications for their predictions.
- Students share the claims and justifications with a classmate. Ample time should be allowed so that they can justify and review their prediction

before the evidence (video link) is shown. An extra activity can be added before revealing to them the second page of the handout.

- Show the short video demonstrating the mini-experiment.
- Students try to explain the result to consolidate their understanding of reactants. Students should learn that providing explanation is important because explanation helps validate the scientific claims in question.
- At the end of the activity, explain that scientific knowledge can be produced through observations.

STUDENT RESOURCE

A Rubbery Egg

Eggs are staple in our daily diet. Some people like them scrambled while some like them fried. After a delicious breakfast, Hannah decided to do a small experiment with her spare eggs. She wanted to test an uncooked egg with another ingredient in her kitchen.

Hannah put an egg into a glass. She was checking her cupboard to see what cooking liquid she has. There she found some vinegar.

What will happen if she pours vinegar into the glass?



Hannah filled the glass with vinegar, just enough to cover the whole egg. She then decided to let the egg sit in the glass for 24 hours.

What do you think will be the result of this mini-experiment at Hannah's breakfast time the next day?

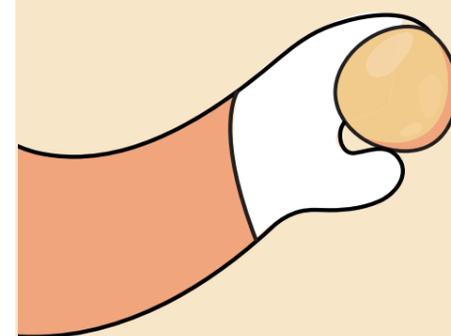
What are the chemical ideas that support your prediction of the egg?

Share your predictions about the egg with a classmate. Are your predictions and explanations different from each other's? What are the chemical processes that support your predictions?

[Hint – Think about the ions of an egg, and how they react with vinegar which is an acidic solution]

Let's observe what the egg will turn into. Watch this video which will show you the result of Hannah's experiment. What happened to the egg after being soaked in vinegar for 24 hours?

<https://www.youtube.com/watch?v=kVfwc3K4tSE>



Now you have seen that Hannah's egg feels soft, rubbery and squeezy. The shell has also fallen off, leaving the membrane to 'hold' the egg.

Explain what you observed – what made the egg as it is as a result of Hannah's mini-experiment?

Compare your prediction about the egg (what you thought would happen) with your observation (what happened to the egg as a result). Are they similar or different? How do you explain any differences between your predictions and observations?

Write the chemical equation to explain your observation about the egg as a result of Hannah's mini-experiment.



SET 2 Predict, observe and explain

b. RE

SET 2 - Predict, observe and explain

b

Dietary Rules in Religions





TEACHER GUIDELINE (RE)

Argumentation Framework: Predict-Observe-Explain

Dietary Rules in Religions

Introduction

At the previous key stage students would have learnt the dietary laws of various religions. This activity aims at strengthening their understanding by guiding them to observe and explain people's dietary choices based on sacred teachings. More importantly, students should consider how people may interpret and practise the same religious preaches differently.

Learning goals

Through this activity students will be able to –

- interpret diet rules based on religious texts;
- take an insider's perspective when applying the rules;
- reason the nuances in practice in the context of contemporary life;
- construct their own responses with reasons (taking an outsider's perspective).

Argumentation framework

The POE framework requires a tweak in RE. While making prediction may not be straightly applicable to teaching the subject, observing and explaining are nonetheless relevant. Students will learn to observe different religious practices and interpretations in a diverse society, and explain why people who come from the same faith behave differently in view of the same teaching.

Example teaching sequence

- Teacher can start by asking students what diet rules they, their family or relatives follow.
- Students read the two extracts. Teacher check if students understand those writings.
- Teachers can provide extra readings from different religious texts about food rules.

- Students write their responses to all questions.
- Teachers remind students to take different perspectives when constructing their responses – that of a Christian, an Islam and their own.
- Teacher can guide students by probing into their lived experiences and observations more widely across contexts.
- Students exchange their views first with a classmate, then in a plenary involving the whole class.
- Teacher guide students to explain their views, and provide reasons that support their views. Those reasons can be drawn from a variety of sources, worldviews and observations.
- Teacher remind students that interpretation of the same rule can vary within the same faith – there are always two sides of the same coin.



STUDENT RESOURCE

Dietary Rules in Religions

Introduction

Different religions have different dietary rules for their followers. In this activity we investigate the general guidance in Christianity and Islam. Bear in mind that there are denominations within each of these two major religions so individuals' actual practices of their diet can vary greatly, even if they believe in the same religion.

Read the following extracts about food rules stated in two sacred books.

From the New Testament

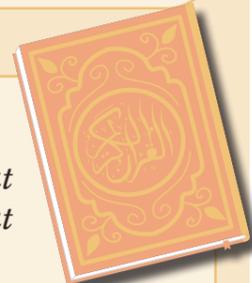


As one who is in the Lord Jesus, I am fully convinced that no food is unclean in itself. But if anyone regards something as unclean, then for him it is unclean. (Romans 14:14)

If your brother is distressed because of what you eat, you are no longer acting in love. Do not by your eating destroy your brother for whom Christ died. (Romans 14:15)

Do not destroy the work of God for the sake of food. All food is clean, but it is wrong for a man to eat anything that causes someone else to stumble. (Romans 14:20)

From Quran



They ask you about wine and gambling. Tell them, there are great sins in them [even though they bring] some profit to the people, but their sin is greater than their profit. (Verse 219)

O you who believe. Indeed, wine, gambling, idols, and divining arrows [a way of gambling] are evil and of Satan's act; therefore, leave them aside in order than you may prosper. (Verse 90)

Tom is a Christian teenager.

Write two rules that may guide Tom's diet and eating behavior.



Jamal follows the Islamic diet rules and never drinks alcohol.

On behalf of Jamal, explain why alcohol would be forbidden in Islam.

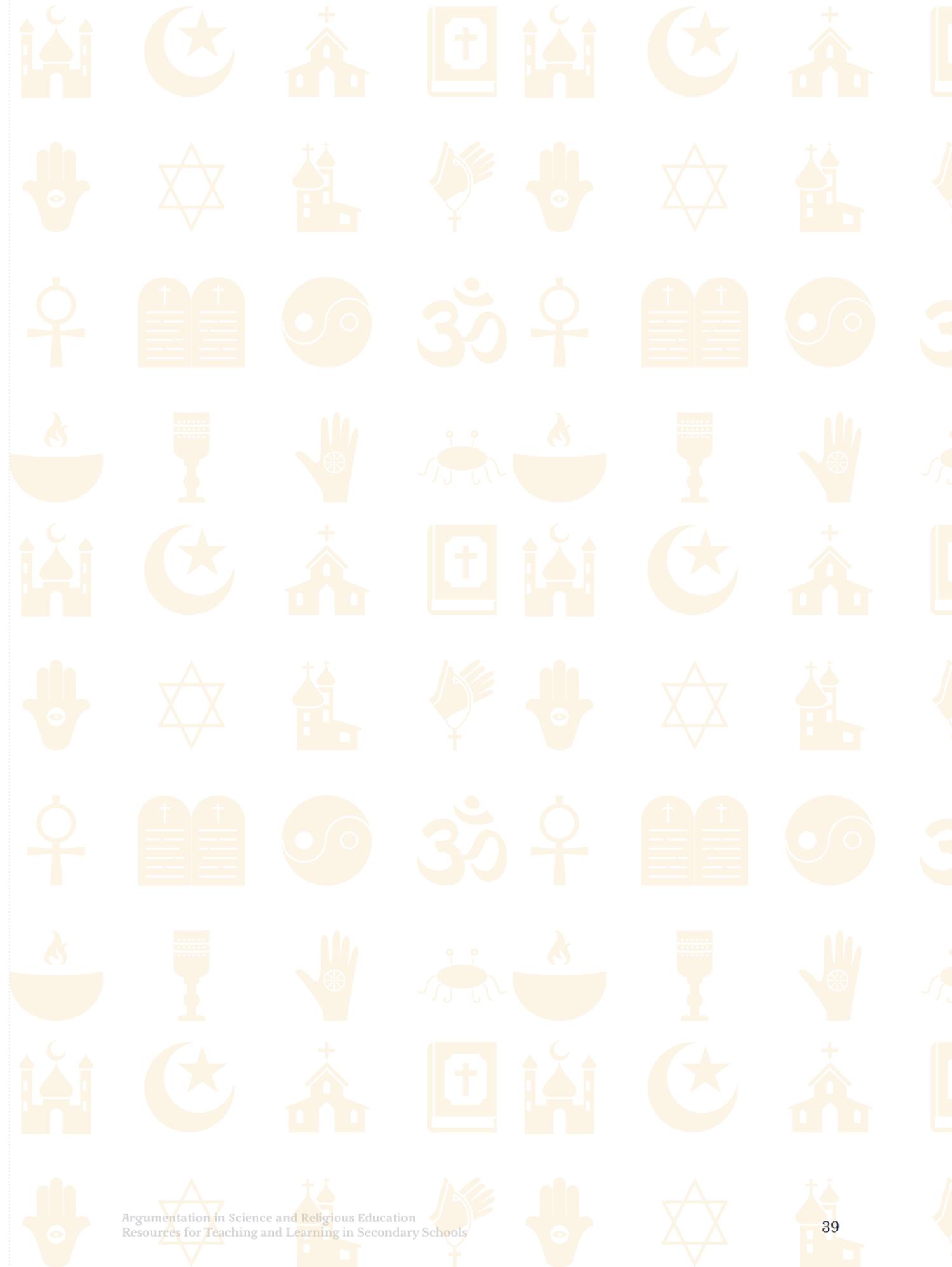
More and more unorthodox Muslims in Britain choose to drink alcohol despite the teachings in Quran. Similarly, some Jewish people may drink wine made by non-Jews. Give two reasons for their behaviour not following the teachings strictly.

[Hint: An Islam or a Jew may interpret the same religious rules differently; or you may compare those teachings with a Humanist perspective.]

Does living biblically mean obeying the whole Bible?
Justify your view by giving a reason and an example.

Lined writing area for student response.

Now share your view with the class. You should first give your stance, then support it with a reason and an example.



SET 2 Predict, observe and explain

c. Interdisciplinary

SET 2 - Predict, observe and explain

c



Meat or no Meat?



TEACHER GUIDELINE (Chemistry & RE)

Argumentation Framework: Predict-Observe-Explain

Meat or no Meat?

Introduction

The aim of this activity is to guide students to evaluate various claims which will inform their own positions about meat consumption. Another aim is to guide students to support their position by using evidence and reasons.

Learning goals

Through this activity students will be able to –

- consider a claim from a range of perspectives;
- evaluate different reasons;
- learn to justify their reason using data or evidence;
- learn to counter-argue by constructing a rebuttal.

Argumentation framework

The Predict-Observe-Explain approach requires a tweak in this science-RE activity. Making predictions may not always be applicable but observation and explanation are highly relevant for constructing an argument and supporting it with reasons.. Students may use observations as evidence to support their argument.

Example teaching sequence

- Start by checking if any students in the class avoid eating meat. If there are any, ask them to give reasons for being a vegetarian or a vegan.
- Invite someone who is a non-vegetarian to give a response to those specific reasons.
- Split the class into two groups – the ‘meat group’ and the ‘no meat group’.
- Explain the claim-reason-warrant structure by giving an example from science. The example should be irrelevant to this topic (not about diet) to avoid swaying students’ position on the matter. A warrant explains

how the reason supports the claim. For example, the claim “I am for zoos” can be supported by the reason “zoos help endangered species”. How the reason supports this claim is explained by the warrant “endangered species need to be protected or they’ll become extinct”. Using both reason and warrant increases the credibility of a claim. Teacher can illustrate this argumentation pattern using students’ arguments and reasons.

- Give an example from RE to illustrate the claim-reason-warrant structure. Again, the example should be outside of this topic about diet.
- Students complete the handout individually.
- Invite students from both camps to present their arguments. Attention should be paid to helping students to construct and present their arguments by referring to the claim-reason-warrant pattern.



STUDENT RESOURCE

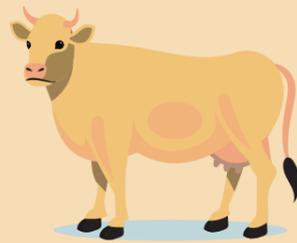
Meat or no Meat?

There has been a heated debate between vegetarian and non-vegetarian people. Many issues discussed in this continuous debate include arguments from scientific, religious and ethical perspectives.

Here are the arguments from some chemical environmentalists and religious groups –

Animal farms in EU produce more emissions than cars and vans combined. (The Guardian, 2020)

Livestock is responsible for 14.5% of global greenhouse emissions... The animals emit gases such as nitrous oxide, carbon dioxide and methane in amounts that have significantly changed our atmosphere. (Science, 2017)



 *Hinduism and Buddhism uphold the principles of nonviolence and no killings so believers in these religions are largely vegetarians. People who support no killings, whether they are Hindu or Buddhist, should follow this food rule as well.*

Judaism does not forbid eating meat but unnecessary pain to animals is prohibited. Vegetarianism is a moral ideal.



Below are arguments from some chemists and non-vegetarians.



Meat and dairy products are highly nutritious. They are packed with protein, calcium, iron, zinc and vitamins that our body needs every day. They also provide minerals such as potassium and selenium. Fish is rich in omega-3 and this nutrient cannot be produced by human body so it can only be obtained from food consumption.

Improving climate change does not require everyone to become vegetarian. We should encourage people who have high consumption of red meat to cut it down instead of a complete give-up by everybody.

There is no reason you have to argue about your diet choice. You don't need to defend your decision of what you eat. Vegetarians don't need to defend their decision either.

Give a scientific reason to argue why people can eat meat.

Give a scientific reason to argue why people should be vegetarian. You may refer to the chemical composition of meat in order to justify your scientific reason.

Give a theological reason to argue why people should be vegetarian. You may refer to some religious teachings from different worldviews in order to justify your answer.

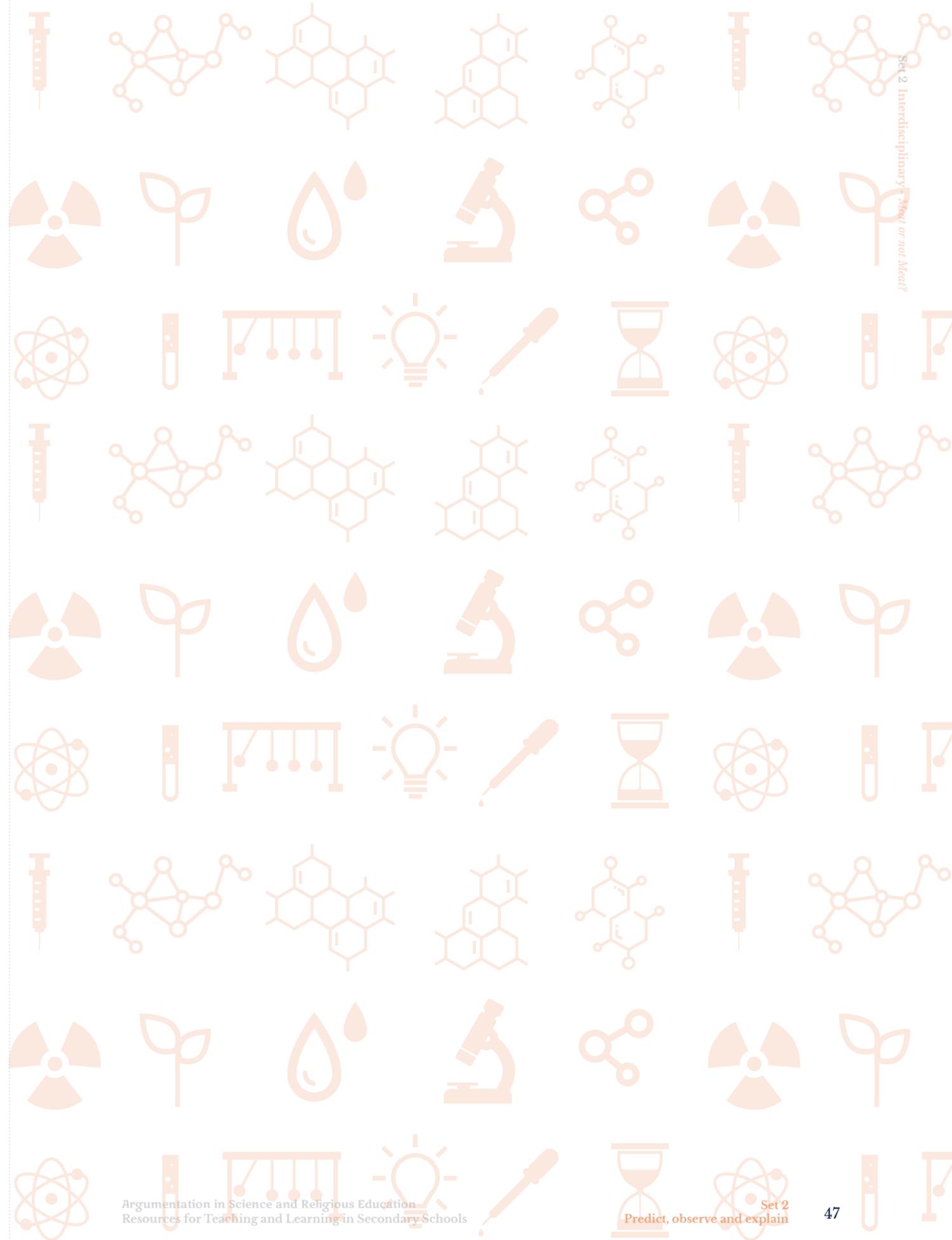
Give a theological reason to argue why people can eat meat. You may refer to some religious teachings from different worldviews in order to justify your answer.

Do you think more people should become vegetarian or it is fine to continue to eat meat? Give two reasons, one theological and one personal, to support your position. Include evidence and reasons to justify your position.

Discuss with a classmate whose position is opposite to yours. What are his/her reasons? Are the reasons based on religious warrants or others? Can you provide a rebuttal to counter-argue his/her reasons? Include some evidence to warrant your reason if possible.

My rebuttal (which counter-argues my classmate's reason) is

The evidence that warrants my rebuttal is



SET 3 Competing theories

a. Biology

SET 3 - Competing theories

a



Genetics or Environment?



TEACHER GUIDELINE (Biology)

Argumentation Framework: Competing Theories

Genetics or Environment?

Introduction

Building on students' learning about reproduction, classification and adaptation of living things, this activity is to expand their understanding by discussing the causes of variations observed in species. The aim of this activity is to guide students to draw on both genetic and environmental influences to examine differences in species.

Learning goals

Through this activity students will be able to –

- examine a range of factors used to explain biological differences in living things;
- understand the complicated nature of a mix of genetic and environmental influences in studying living things;
- review and appraise different evidence supporting the two claims (ie. genetics and environment);
- explain how the relevant evidence explains the perspective in question;
- construct evidence to support a claim.

Argumentation framework

Students' argumentation skills can be strengthened by examining and evaluating two competing claims (e.g. in the form of theories, models) which explain the same observation. Students will learn to link specific evidence or observation in support of a particular claim. Most importantly, students should learn that scientists often engage in discussions using multiple theories to explain a scientific question.

Example teaching sequence

- Carry out a starter activity by asking about different breeds of dogs that students may know about. Questions more familiar to students would be biological differences between their siblings or family members. The purpose of this activity is to get the students to think about variations among organisms.

- Recap students' prior knowledge on reproduction and genes. These are pre-determined factors that cause differences in appearance.
- Ask why siblings of the same gender may have very different height or body shape.
- Distribute the student resource and get the students to read and evaluate the evidence in the activity. They may find it hard to explain 'how the evidence supports that theory'. You may choose to do the first task with the whole class before they can do the task individually.
- Invite the students to share their own evidence in support of the two claims. Collect feedback from the class to improve the evidence or link it closer to support the theory in question.



STUDENT RESOURCE

Genetics or Environment?

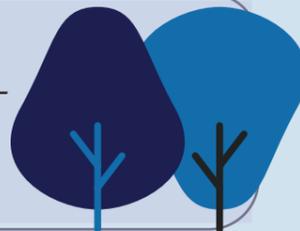
When we observe different organisms, we notice that there are variations within the same species. For example, dogs have different breeds and human beings have different skin and eye colours.

Scientists have proposed different theories to explain the causes of variations in organisms. Here are two different theories:



1. *Genetic reasons – heredity is the process in which genetic information is transmitted from one generation to the next. In this process, organisms inherit different chromosomes, genes and DNA from the parents. These genetic differences are the causes of variations in the same species.*

2. *Environmental reasons – differences in the environment explain the variations of the same species. For example, different climates, cultural rituals, physical activities and food consumption etc. can lead to differences among the same species.*



The two theories that explain biological differences can be supported by various pieces of evidence below. Which particular piece of evidence supports which theory? Match the evidence to the theory.

Evidence	Which theory it supports	How it supports that theory
a. In the case of human, each fertilised egg carries different hereditary information. This explains why siblings having the same parents can look very different.		
b. Eye colour cannot be changed and is the same for life.		

Evidence	Which theory it supports	How it supports that theory
c. Harmful substances in cigarettes and alcohol can damage genes and cause cancer. It is important to maintain a healthy diet.		
d. Type 1 diabetes and Down Syndrome are examples of inherited diseases.		
e. Children's sickness is more common and serious in countries where access to health care is limited.		
f. Typhoid fever and Tuberculosis were more common in Victorian times than 21 st century in the UK.		
g. There are four main blood groups, A, B, O and AB. Group O is the most common, contributing to 48% of the UK population.		
h. Statistics suggest that people with higher education level have longer life expectancy than those with lower education level.		
i. German Shepherd and Husky are both working dogs with different ancestral history. German Shepherd was bred in Germany in the 19 th century; huskies' ancestors are sled dogs, originated in Siberia hundreds of years ago.		
j. German Shepherd can be well-trained dogs for policing and rescue tasks. They are good at detecting drugs, tracking criminals and searching survivors at accident sites.		

Both theories try to explain the causes of variations of the same species. Now construct a piece of evidence to support each of the theories.

Theory 1 – Genetic reasons

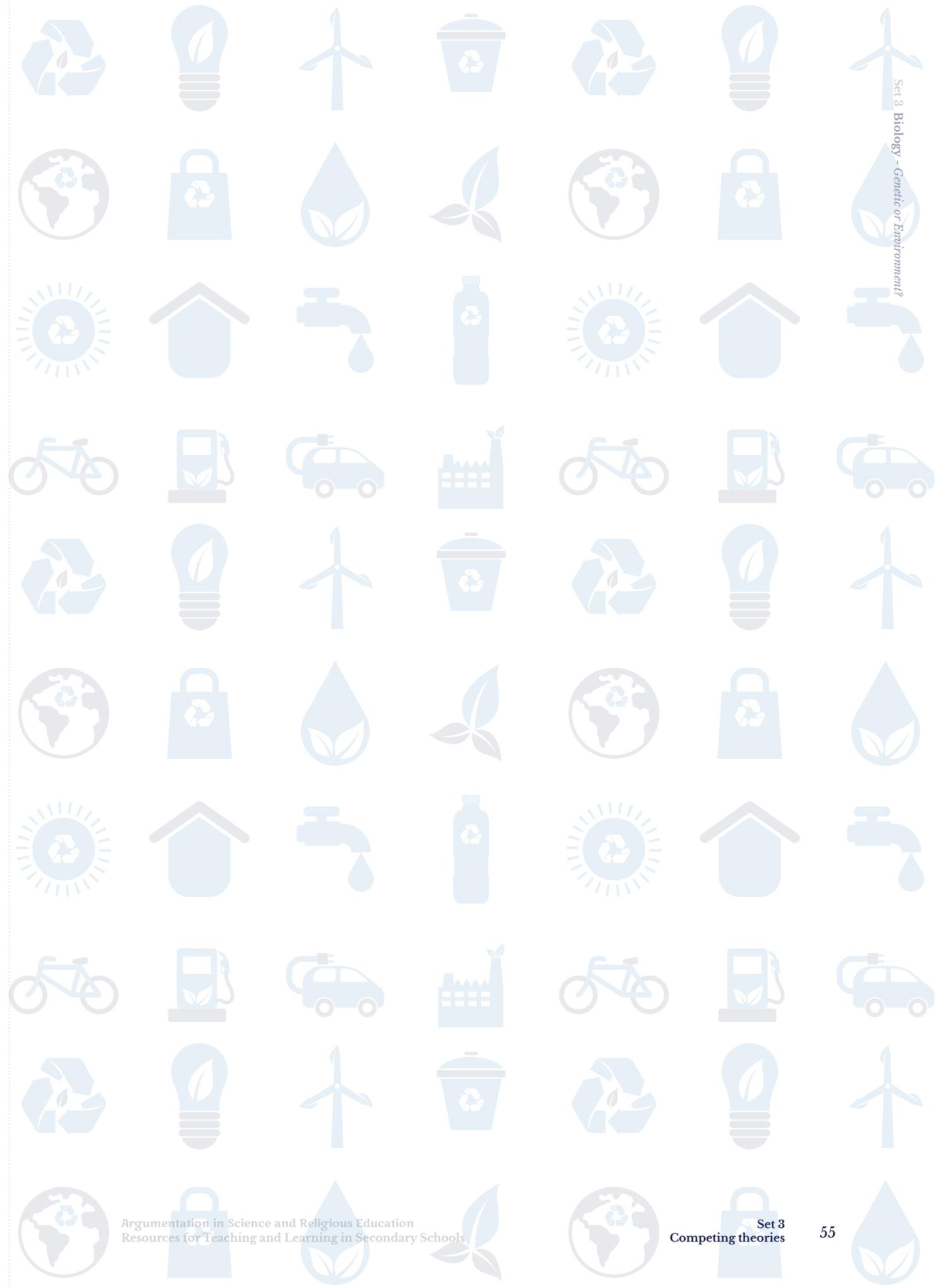
The evidence to support Theory 1 (genetic reasons) is

This evidence supports Theory 1 because

Theory 2 – Environmental reasons

The evidence to support Theory 2 (environmental reasons) is

This evidence supports Theory 2 because



SET 3 Competing theories

b. RE

SET 3 - Competing theories

b

Is there a soul?



Set 3 RE - Is there a soul?



TEACHER GUIDELINE (RE)

Argumentation Framework: Competing Theories

Is There a Soul?

Introduction

An important question for students to discuss in RE is life after death. The aim of this activity is not to reach an agreed answer but to guide students to review and compare understandings from two similar faiths, Hinduism and Buddhism, and a completely different view, atheism.

Learning goals

Through this activity students will be able to –

- explore the question about afterlife through discussing what a soul means;
- investigate the varied understandings from three different worldviews;
- organise and appraise the arguments presented;
- formulate and present their own voice by applying the ideas raised in the lesson;
- justify their views by giving reasons from a range of perspectives.

Argumentation framework

The competing beliefs about soul or life after death will guide students to explore the abstract concept of ‘soul’ from a range of perspectives. Students’ own voice on the question can also find support from these religious teachings or other non-theistic propositions. Whatever worldview students may adopt or reject, they need to give reasons to justify their beliefs and when appropriate, refer to relevant religious teachings.

Example teaching sequence

- Ask the class what they think where people might go after death. Many students may not have thought about this question before. In such case, if appropriate, link this topic to their experience by asking, for example, “where has your deceased grand or pet gone?” Note that some students may find this question sensitive because it reminds them of personal loss.
- Ask students to describe or do a pen portrait of a soul – what is a soul in

their understanding or belief?

- Introduce the topic by a recap on Christianity, reminding them crucial ideas such as judgement, heaven, salvation through Jesus and resurrection, all of which suggest there is life after death in Christian beliefs.
- Guide students to read how the concept of soul is understood in Hinduism, Buddhism and atheism. Further guidance may be needed when explaining unfamiliar concepts such as ‘atman’ or ‘brahman’.
- Students then read other arguments in the activity and complete their writing.
- Invite students to share their own views, and remind them it is not possible and intended to reach a conclusion about this big question. The quest of “is there a soul?” will continue to be discussed among people, be they religious or not.

STUDENT RESOURCE

Is There a Soul?

The dictionary meaning of 'soul' is, "the spiritual or immaterial part of a human being or animal, regarded as immortal." Soul is often understood as something inside a human being that provides the person a moral guide.

Different religions and worldviews have different views about the existence of 'soul'. Let's look at three of them.

Hinduism



In Hindu, *atman* means 'soul' or 'spirit'. Atman is the essence in a living creature but it is not something that can be touched or sensed. Hindus believe that atman is eternal and will live on after the physical body dies. Atman can be reincarnated into the body of any living thing, including an animal, a bird or a human. Gita says, 'no one can cause the destruction of the imperishable soul.'

Buddhism

The idea of 'self' or 'soul' is an illusion. Buddhists believe that nothing is permanent so there is no immortal existence like 'self' or 'soul'. There are no eternal or everlasting souls or gods. Everything changes.

There is no 'self' or 'soul' in a sense of a permanent, integral or autonomous being. According to the teaching in Buddhism, everything is impermanent, all constantly changing. The belief in 'self' or 'soul' is a cause of suffering so should be avoided.



Atheism



Atheists do not use words 'soul' or 'spirit' theistically. Instead, they may use terms like 'consciousness' or 'awareness'. An theist would say, 'when I die, I'm dead and gone. My conscious life will end, my interaction with others will end. And I'll simply be gone. I don't know what causes consciousness, call it 'spirit', call it 'soul'. My afterlife will be in the memories of those I knew, those who loved me, those who carry me in

their hearts. I, myself, cease to exist.' Atheists think soul does not exist. When your brain or consciousness ceases to function, you no longer exist.

Below are some further ideas. You may want to link each of them to Hinduism, Buddhism or atheism.

- Soul is a permanent entity that is independent of the body, which may exist eternally.
- Soul is the part of the person that has *dharma*, obligation and incurs *karma*, debts, throughout his lifetime. The soul is then reborn into whatever shape which will help it to release karma.
- Soul is like a complex system of neurons, so much so that it operates like a computer. If a computer is not powered, it stops operating. Your conscience or 'soul' is shaped by various experiences you have over time.
- 'Soul' is a false belief. Soul is just a product of an impermanent mind or perception. Mind and perception are everchanging. Everything, including self or soul, is ephemeral.
- Atman* is an eternal self that exists in a continual cycle of rebirth. Soul is transmigrate to the next life after the person dies.

Since 'is there soul' is a very abstract and difficult topic, let's think about some arguments before formulating our own views about it. If you think it would help, you can organise the information given above by splitting any sentences into smaller points or justifications and list them in the table below.

Points that support "There is a soul"	Points that reject "There is a soul"
1.	1.
2.	2.
3.	3.
4.	4.

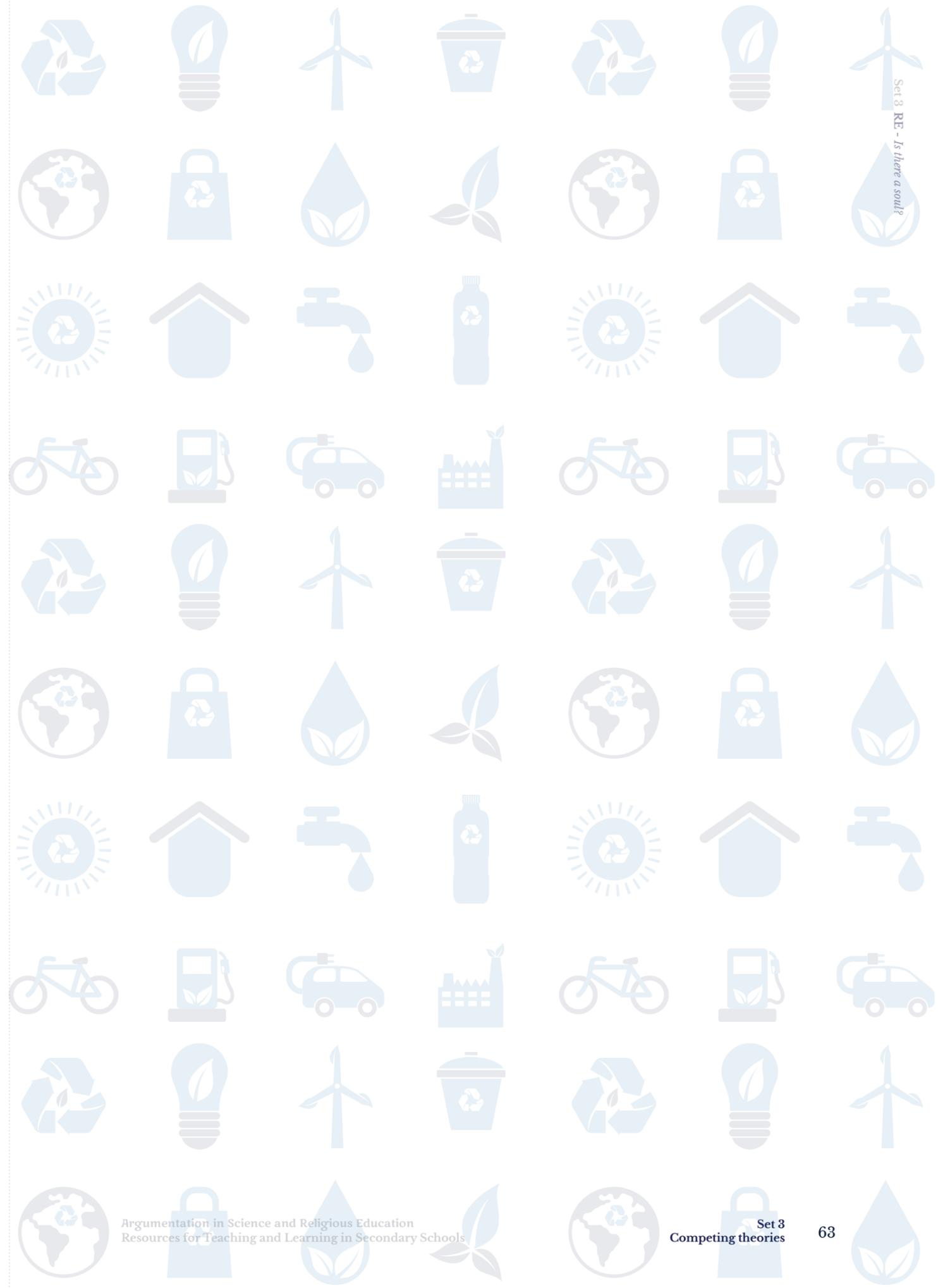
After organising the different points about "There is a soul", you should be more able to formulate your voice on this big question. First, give your view. Then reason your view with examples or observations from different perspectives, e.g. theological, scientific, cultural or personal.

I think there is soul no soul.

I believe this is the case because

a)

b)



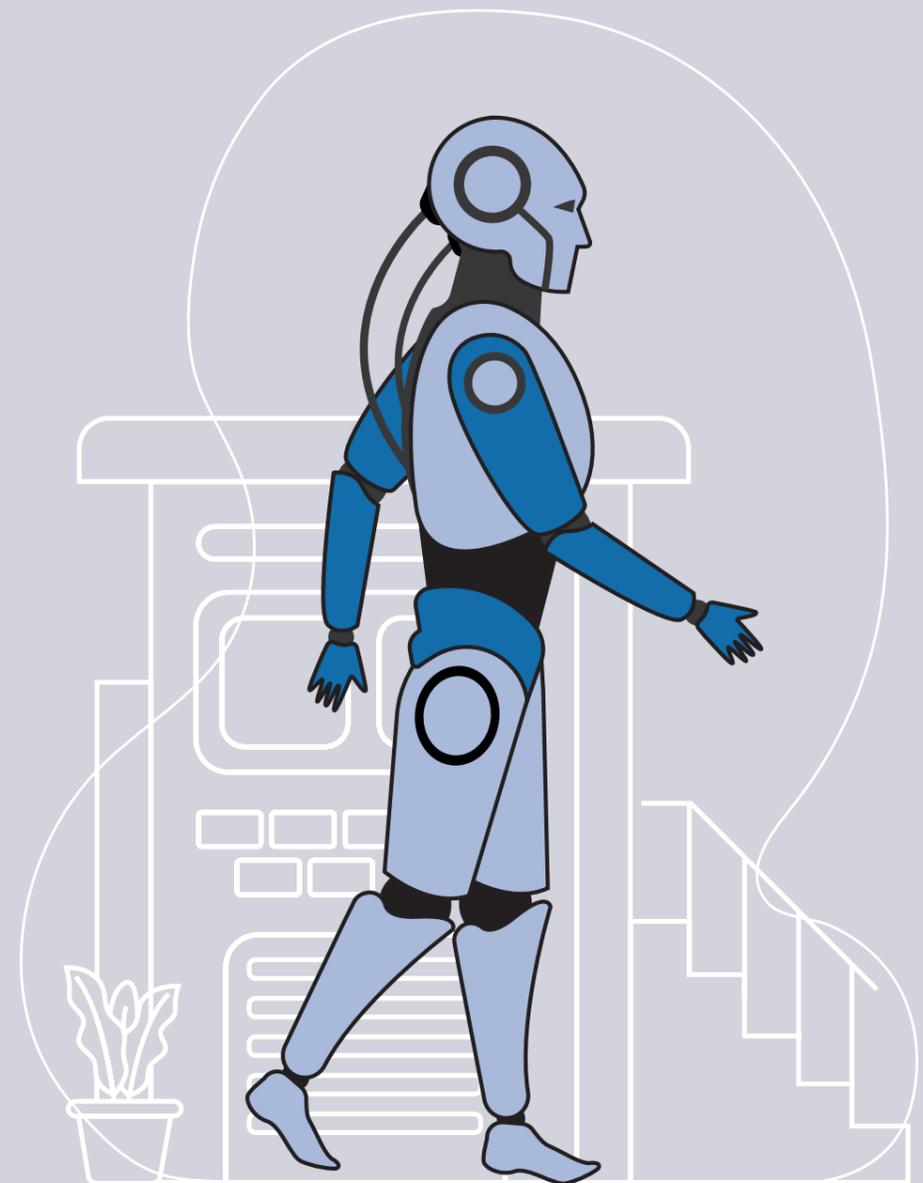
SET 3 Competing theories

c. Interdisciplinary

SET 3 - Competing theories

c

Re-defining Personhood





TEACHER GUIDELINE (Biology & RE)

Argumentation Framework: Competing Theories

Re-defining Personhood

Introduction

Biotechnology is developing at a speed faster than our evaluation of its impacts. Many innovations in the brain-computer interface will fundamentally change our views and understanding about personhood. The issue of 'personhood' is related to a key question: *what makes us human?* This activity aims to guide students to discuss the nature of consciousness and existence from the points of view of religious worldviews as well as artificial intelligence (AI).

Learning goals

Through this activity students will be able to –

- imagine the future by anticipating the impact of human-AI intersection;
- adopt the perspective of an imagined character to make predictions;
- review and appraise various claims before forming their own;
- justify their claims by constructing reasons;
- reflect on the ultimate question about consciousness and human existence.

Argumentation framework

Students will evaluate competing theories about personhood from a range of perspectives – science, religion, a mixture of both and neither. A lack of consensus may be challenging for some students. In such case, they should be guided to acknowledge that the aim of the activity is allowing them to imagine the future, discuss bold ideas and generate reasons for the ideas. The aim is not about reaching a conclusion agreed by everyone.

Example teaching sequence

- Explain the background of chip implant by showing the video 'Watch Elon Musk's Neuralink monkey play video games with his brain' on YouTube. The video explains the design of a chip implant to a monkey's brain (eventually to a human's) and what the monkey can do after the implant.

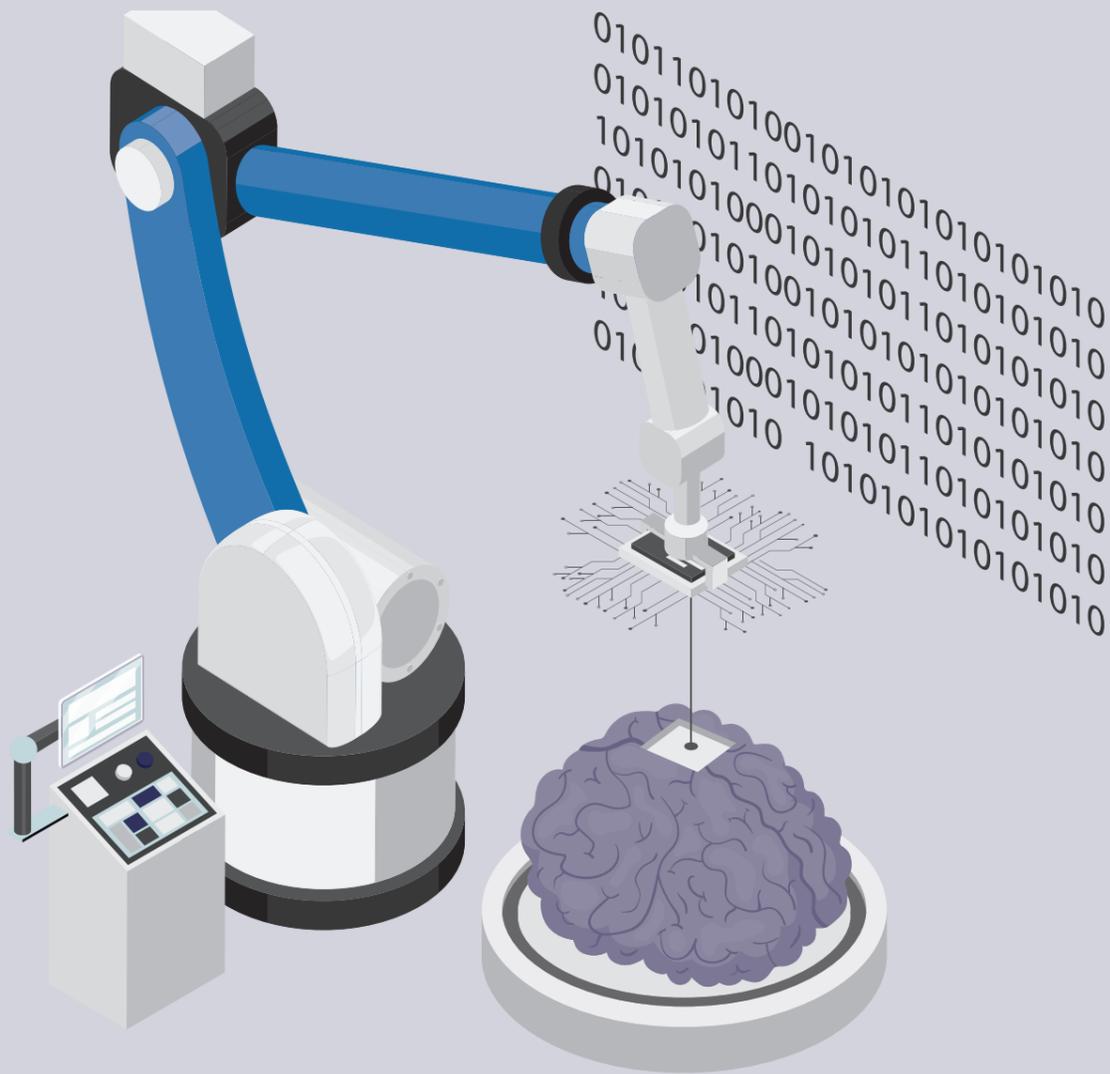
- Students read the information and discuss Activity 1 in small groups. Allocate students to combinations that would facilitate their interaction with peers.
- Invite different groups to share their responses to Activity 1 with the whole class.
- Students read the letter from future and complete Activity 2 individually. Invite individual responses to the questions.
- Guide the class to read the four competing theories. Some students may need assistance in exploring the key claims and justifications. Students can test their initial ideas by sharing with the class or a partner in pair discussions.
- Students complete Activity 3 individually. Students should be reminded of providing justifications for their views. Teacher may want to have small-group discussions afterwards.

STUDENT RESOURCE

Re-defining Personhood

Some people argue that we will be able to re-invent human mind very soon. Advancement in neurotechnology enables us to implant a chip into a human brain.

A chip which is about the size of a coin would be implanted in a person's skull, with electrodes fanning out into the brain. From the chip, an array of tiny wires, each roughly 20 times thinner than a human hair, fan out into the patient's brain. The wires are equipped with 1,024 electrodes which are able to monitor brain activity and electrically stimulate the brain. This data is transmitted wirelessly via the chip to computers.



The two goals for this groundbreaking implant are –

- Treatment of paralysis. The chip can be inserted into the motor cortex (the part of the brain that controls movement) so that paralysed patients can use the implant to wirelessly control external devices by thinking about moving their limbs, which can be applied to tasks like texting, emailing and accessing telemedicine services.
- The goal in the long run is 'whole-brain data transfer'. It sounds like uploading human consciousness to a digital format. This is like transferring your favourite photos or songs from your smart phone to a computer. Yes, human consciousness can soon be transferred and stored – thinking, ideas, memories, emotions etc. The unimaginable will become imaginable!

Back in the 1990s some scientists already suggested discussing the effects of this future invention on human lives, 'we have long used mechanical devices to compensate for physical disability. Soon, it may be possible to augment mental capacity to add memory or upgrade processing power. We should ponder the enormous moral implications of the machine-assisted mind.'

Activity 1

In response to those scientists, what are the pros and cons of this chip implant in the brain in future? Give two points for each side of the argument and discuss in your groups.

Here's a letter from year 2050, written by a 'chipped' person implanted with a chip inside his brain.

Hello, my name is Zeek. I am 15 years old in biological age but my neurological or mental age is three times higher than the actual, because my neurological system is superior to other humans'.

My brain was implanted with a chip when I was five. The chip has stayed in my body ever since. I was told that this implant was to boost my neurological transmission and sensitivity so that I could process data much faster. My memory performs three times better than an old-bred human (we call them 'Chip-less').

Because of this artificial set up I learn everything much faster and remember things much better than the Chip-less. Thanks to the tiny chip and the boosted network of electrical signals, at the age of ten I could speak four languages and solved maths equations like a maths professor. I never need to read a map and I never get lost. My chip is connected to GPS which automatically navigates any routes through my vision. My chip also has an image capture function. If I look at an image for over five seconds, it can be captured (like taking a photo) and stored in my enhanced memory so I never forget anything.

With a powerful brain and memory, I anticipate I'll become a super-human in 10 years' time – by then I'll be just 25 in biological age but my mind and mental capacity is equivalent to a 75-year-old. My brain will have accumulated three times more data processing and intelligence than that of a 25 year-old but without memory decline like a 'Chip-less' at 75 years of age!

Life seemed so good forever until a week ago. My brain was hacked – brainjacking! An unauthorised person gained control of my chip and modified some of its functions without my consent. The chip pushed me to do something stupid in the public and I was made responsible for my unwilling behaviour!

There's no way to remove or deactivate my chip. I worry that this problem will get more serious – would I be accountable for something my chip pushed me to do which was against my will? Who actually owns my brain or my consciousness? I myself? The hacker? The manufacturer or inventor of my chip? Do I have free will at all? I'm feeling terribly upset and anxious. Am I a human by nature? Is my consciousness immortal because it may be transferred and stored somewhere outside my body after I died?

My negative psychological reactions start to grow because these burning questions are really worrying.

Zeek

Activity 2

Imagine you were Zeek. What would be two positive outcomes as a result of your chip implant and increased brain functions?

Outcome 1

Outcome 2

What would be two problems as a result of your chip implant and increased brain functions?

Problem 1

Problem 2

Travelling back to the 2020s, legislators, manufacturers, scientists and theologians are debating the status of chipped person or 'AI-assisted mind': Is it human at all? Who will take responsibilities for its actions? What makes a human human?

Experts make different claims to discuss whether the 'chipped' person is a human being

Claim 1 – from a biologist

All chipped humans or 'AI-assisted minds' are human beings. Biologically they still have a brain, though modified. They have consciousness and can think for themselves to a certain extent. Just because of their more stimulated neurons by a small device doesn't mean that they are not humans. It's pretty much similar to someone who has an implant of cardioverter defibrillator to regulate heartbeat. These people are all human, aren't they? Human is nothing more than neurons and cells. Zeek has neurons and cells so he must be human.

Claim 2 – from a theologian

Any 'chipped' creatures or 'AI-assisted minds' are not humans. Their being is artificially re-designed for man-made purposes against God's will – the sanctity of life is already ruined! Natural differences between people are unnecessarily eliminated. Human body should be treated with respect as it's God's creation. Those meddlers or unorthodox creatures have crossed the line of natural creation so they are not humans. I wonder if these non-human beings like Zeek had a soul for resurrection after death.

Claim 3 – from a neurotechnological scientist-Christian

My answer to this tough question is 'I don't know'. Zeek might still be God's creation... just not original perhaps? His chip implant means he is not the same kind of human in the holiest sense but couldn't Zeek just be made as another image of God? Zeek may have a different brain but the rest of his body is pretty much similar to ours so his life is also holy. His enhanced brain functions will make him much more productive and innovative – this might be the God-given purpose to his extraordinary life. His AI-assisted ability to serve our society will bring good to other lives.

Claim 4 – from a Y11 student

Personhood of this 'chipped' person is debatable. Zeek is a radical challenge to human nature and existence. I don't think Zeek is a human; neither is he wholly a robot or AI. He is a brand new specie in a separate dimension – a neuron-chip hybrid. Zeek is human evolution but our evolution gradually adapts to AI. Eventually the two creatures combined and formed a new specie. We need to think outside the box in bioethical debates so that we can keep up with bio-technological innovations.

Activity 3

a) Do you think Zeek is a human being? Give two reasons to justify your claim.

My claim is that Zeek is / is not a human being. (delete either choice)

Reason 1

Reason 2

b) What would be two possible impacts that chip implant would bring to our future society?

Impact 1

Impact 2

c) What is a desirable mind or consciousness? If a desirable mind is achievable, does it lead to a good 'life'? Why or why not?

A desirable mind means

It leads / does not lead to a good life because



SET 4 Analysing and interpreting data

a. Environment

SET 4 - Analysing and interpreting data

c

Climate and Human Activity





TEACHER GUIDELINE (Environment)

Argumentation Framework: Analysing and Interpreting Data

Climate and Human Activity

Introduction

This activity aims at students learning about climate change based on scientific evidence. While some people may not feel the direct impacts of climate change, the data and activities presented will guide students to relate the impacts of climate change to their day-to-day life.

Learning goals

Through this activity students will be able to –

- analyse and interpret data;
- produce claims using data;
- justify their claims or suggestions based on evidence;
- evaluate their claims by linking them to evidence.

Argumentation framework

The focus is guiding students to generate claims and support their claims with data or evidence. Students should also learn to link their claims directly with the evidence provided. Building on the claim-evidence/data structure, they then learn to make reasoned suggestions or inferences.

Example teaching sequence

- Invite students to share any impacts of climate change they may have felt. Ask them to give examples or evidence to illustrate those impacts.
- Show a news article “Storm Alex: How is it affecting the UK and Europe?” for background understanding <https://www.bbc.co.uk/news-round/54415133>
- Students read the information and the rainfall chart, then complete *Activity 1*.
- Invite students to share their claims with the class, and ask other students to give feedback.

- Shows a 1-minute video for a brief explanation of greenhouse effect <https://royalsociety.org/topics-policy/projects/climate-change-evidence-causes/basics-of-climate-change/>
- Students read the information and the greenhouse chart, then complete *Activity 2*.
- More charts to explain the impacts of climate change can be found at <https://climate.metoffice.cloud/dashboard.html>
- Students discuss in small groups or pairs to evaluate their suggestions and evidence.
- Hold a plenary discussion. Invite students to share claims and give feedback.

STUDENT RESOURCE

Climate and Human Activity

Climate change refers to a large-scale, long-term shift in the planet's weather patterns and average temperatures.

Extreme weather events are impacts of human induced climate change. These events are happening more frequently and seriously in the last few decades.

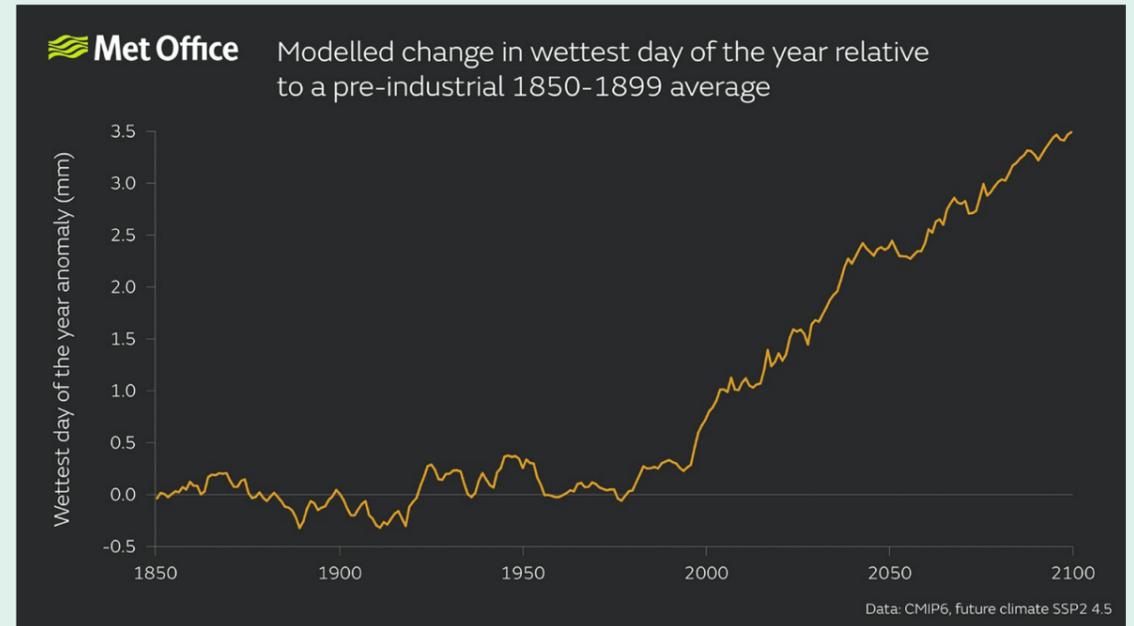
For example, the Head of the Met Office said

The record daily UK rainfall recorded on 3rd October 2020 in the wake of Storm Alex was really quite extreme. The preceding drier conditions through September helped prevent significant widespread impacts but an event like this has the potential to cause damaging effects to infrastructure and services.

Here's BBC news on Storm Alex on 2nd October 2020 –

Winds reach 61 mph along some parts of the south coast with thousands of homes and businesses affected by power cuts. Storm Alex has already caused disruption in France damaging power lines and knocking down trees. Some schools have also had to close. During the weekend (3rd October 2020), parts of Wales, south-west England and eastern Scotland could see more than a month's worth of rain in just three days.

Compared to the pre-industrial age, extreme rainfall in the UK is getting more frequent. This chart shows the data about rainfall in the wettest day of the year based on records since 1850 and predictions til 2100.



Many claims can be generated using the data in the histogram.

For example –

Before year 2000, rainfall in the wettest day of the year did not exceed 0.5mm.

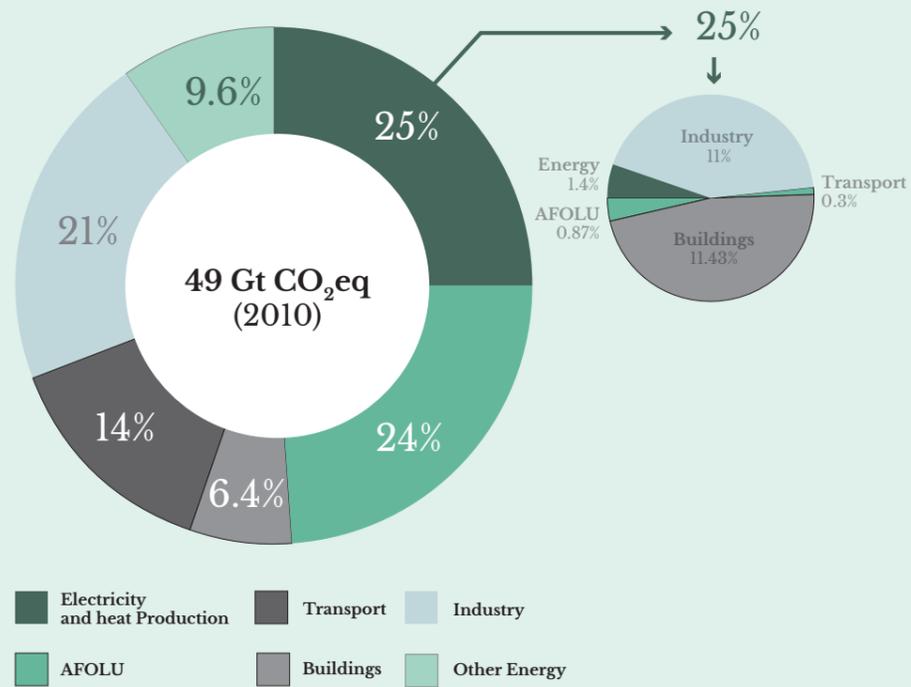
This example focuses on a pattern over a period of time. More claims can also be made focusing on a particular shot of the data.

Activity 1

Make two claims using the data in the chart. One claim should focus on a particular shot of the data and another claim on a pattern or a summary of the data.

Claim 1 (a particular shot)

Claim 2 (a pattern or summary)



Since Industrial Revolution in the mid-1800s, human began to burn fossil fuels such as coal, oil and gas for fuel. These activities have released carbon dioxide, methane and nitrous monoxide into the atmosphere. These gases enhanced the greenhouse effect, which traps heat on earth causing global temperatures to rise and long-term changes to the climate.

For example, the level of carbon dioxide in the atmosphere rose by 40% during the 20th and 21st century and is now over 400ppm (parts per million). In 2019, the level of carbon dioxide in the atmosphere was higher than at any time in 2 million years.

The pie chart illustrates the sources of human-made greenhouse gas in direct and indirect emissions. AFOLU stands for Agriculture, Forestry, and Other Land Use.

Activity 2

Make two claims using the data in the chart.

Claim 1

Claim 2

Suggest two ways how human can reduce carbon emissions in order to mitigate the impacts of climate change. Your suggestions should be supported by the data in either diagram, or other evidence you can find.

Suggestion 1

Evidence that supports Suggestion 1

Suggestion 2

Evidence that supports Suggestion 2

Evaluate your suggestions with a classmate. You should help each other to strengthen the suggestions by linking them directly to evidence.

SET 4 Analysing and interpreting data

b. RE

SET 4 - Analysing and interpreting data

C



Humans and the Environment



TEACHER GUIDELINE (RE)

Argumentation Framework: Analysing and Interpreting Data

Humans and the Environment

Introduction

The relationship between human and nature has great relevance to contemporary life and debate in our society. It also relates to important concepts in RE such as stewardship or dominion by human. Although religions or worldviews have similar propositions on environmental issues, this activity guides students to explore the different bases that may motivate similar propositions.

Learning goals

Through this activity students will be able to –

- interpret texts on the religious concept that humans are stewards entrusted by God;
- justify their interpretations by referring to the sources;
- take an insider's perspective of a religious or humanist follower and make suggestions accordingly;
- identify the different underlying beliefs despite similar propositions on the issues.

Argumentation framework

Students are expected to use excerpts from religious texts as data to back up their claims. It is possible that students may have different interpretations of the same teachings. This is positive to their learning about RE because different interpretations have contributed to the development of various denominations over time. In any case students should learn to justify their claims with data.

Example teaching sequence

- Introduce some basic teachings in Judaism, concepts such as stewardship and avoidance of over-consumption are particularly pertinent to the topic.

- Students read the excerpts with teacher's guidance. Note that in this activity students need to take the perspectives of a Judaist and a humanist, not taking their own views on the issue.
- Students complete the questions. Remind students about supporting their claims by presenting data in the form of religious teachings.
- Conduct small group or whole-class discussions on the different motivations of the two characters, Ron and Olivia. Highlight that although their opinions or motions about the environment look similar, the fundamental beliefs that motivate their ideas or actions are very different.
- Following (d), invite students to share their ideas on protecting the environment, and if their ideas are motivated by religious thinking or otherwise.

STUDENT RESOURCE

Humans and the Environment

Ron follows teachings of Judaism about the environment. Here are the excerpts he is studying.



Bereishit Rabbah 13:3

Rabbi Shimon Bar Yochai Said: Three things are of equal importance, and these are them: earth, humankind, and rain. Rabbi Levi Bar Hiyya said: And these three are from three letters, to teach you that if there's no earth there's no rain, and if there's no rain there's no earth, and without either of them there's no humankind.

Deuteronomy 20:19-20

When you besiege a city for a long time, making war against it in order to take it, you shall not destroy its trees by wielding an axe against them. You may eat from them, but you shall not cut them down. Are the trees in the field human, that they should be besieged by you? Only the trees that you know are not trees for food you may destroy and cut down, that you may build siegeworks against the city that makes war with you, until it falls.

Taanit 23a:15-16

One day, he was walking along the road when he saw a certain man planting a carob tree. Hōni said to him: This tree, after how many years will it bear fruit? The man said to him: It will not produce fruit until seventy years have passed. Hōni said to him: Is it obvious to you that you will live seventy years, that you expect to benefit from this tree? He said to him: That man himself found a world full of carob trees. Just as my ancestors planted for me, I too am planting for my descendants.

Midrash Ecclesiastes Rabbah 7:13

See to it that you do not spoil and destroy My world; for if you do, there will be no one else to repair it.



a. Ron needs to write about the relationship between human and the environment in Judaism. Help him to write his claim.

b. Ron wants to explain his claim by using the excerpts. Which part of the excerpts supports his point in (a)?

c. Ron is suggesting two things that human should do to the environment.

d. Explain Ron's suggestions by using the excerpts. Which part of the excerpts supports his points in (c)?

SET 4 Analysing and interpreting data

c. Interdisciplinary

SET 4 - Analysing and interpreting data

c

Humans as Stewards or Exploiters?





TEACHER GUIDELINE (Environment & RE)

Argumentation Framework: Analysing and Interpreting Data

Humans as Stewards or Exploiters?

Introduction

The disagreement between science and religion can potentially be reconciled in dealing with global threats. Prominent religious leaders around the world have urged for concerted effort to combat climate change. This activity aims at stimulating students to think about the epistemological differences between science and religion, especially in the case of the two subjects agreeing with each other on a certain issue.

Learning goals

Through this activity students will be able to –

- a) analyse and interpret data;
- b) identify claims from texts;
- c) connect claims with the data or evidence presented;
- d) examine the different nature of evidence or data in science and RE in the context of an environmental problem.

Argumentation framework

Argumentation skills can be improved by helping students to link various claims to relevant data and evidence. Students will learn how to analyse arguments by engaging in data that may lead to different conclusions. For example, compatible claims can be based upon evidence or data of very different nature. Identical sources of evidence or warrants may produce incompatible claims.

Example teaching sequence

- a) Begin with a short starter activity by asking students what they can do to protect the environment.
- b) Guide students to analyse their environmental-friendly behaviour: what motivates them to make those suggestions? Is their motivation related to religious beliefs or not?

- c) Guide students to work on the NASA claim and warrant in Activity 1 as example.
- d) Students work on the other three texts (2-4). This activity can be done individually or in pairs.
- e) Invite students' responses to questions 2–4.
- f) Students need more teacher guidance to examine the compatibility of various claims, especially on the different nature of the warrants presented in 1-4.
- g) What counts as 'evidence' or 'warrant' in science and religion is different. Teacher may provide more examples to help illustrate the epistemic differences between the two subjects. In science, non-observable (theoretical) evidence can be used (as in the case of quantum physics); in religion, empirical data such as different religious practices can be accepted as evidence.

STUDENT RESOURCE

Climate and Human Activity

Humans as Stewards or Exploiters?

Different claims and interpretations are made on the topic of climate change. Some of these claims are competing whereas others are consensual. Let's look at the claims made by four parties.

1. NASA (The National Aeronautics and Space Administration)

Scientists attribute the global warming trend observed since the mid-20th century to the human expansion of the “greenhouse effect” — warming that results when the atmosphere traps heat radiating from Earth toward space.

Over the last century, burning of fossil fuels like coal and oil has increased the concentration of atmospheric carbon dioxide (CO₂). This increase happens because the coal or oil burning process combines carbon with oxygen in the air to make CO₂. To a lesser extent, clearing of land for agriculture, industry, and other human activities has increased concentrations of greenhouse gases. The industrial activities that our modern civilization depends upon have raised atmospheric carbon dioxide levels by nearly 50% since 1750. This increase is due to human activities, because scientists can see a distinctive isotopic fingerprint in the atmosphere.



What is the main claim by NASA? What is the warrant used to support their claim?

The main claim by NASA is

The warrant that supports this claim is

2. Encyclical 2015 *Laudato Si* by Pope Francis (before the Paris Agreement)

Never have we so hurt and mistreated our common home as we have in the last two hundred years. Yet we are called to be instruments of God our Father, so that our planet might be what he desired when he created it and correspond with his plan for peace, beauty and fullness.

The climate is a common good, belonging to all and meant for all. [...] All of us can cooperate as instruments of God for the care of creation. [...] We must forcefully reject the notion that our being created in God's image and given dominion over the earth justifies absolute domination over other creatures. The biblical texts are to be read in their context, with an appropriate hermeneutic, recognizing that they tell us to “till and keep” the garden of the world (cf. Gen 2:15). “Tilling” refers to cultivating, ploughing or working, while “keeping” means caring, protecting, overseeing and preserving. This implies a relationship of mutual responsibility between human beings and nature. Each community can take from the bounty of the earth whatever it needs for subsistence, but it also has the duty to protect the earth and to ensure its fruitfulness for coming generations. “The earth is the Lord's” (Ps 24:1); to him belongs “the earth with all that is within it” (Dt 10:14). Thus God rejects every claim to absolute ownership: “The land shall not be sold in perpetuity, for the land is mine; for you are strangers and sojourners with me” (Lev 25:23).

What is the main claim by Pope Francis?
What is the warrant used to support his claim?

The Pope's main claim is

The warrant that supports his claim is



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3. A Christian whose name is Maria

We tend to see ourselves as the centre of the universe and therefore somewhat omnipotent. And we get ourselves into all sorts of mischief when we believe that we're really in control of things. So the dominion is limited because we are creatures and not the creator, that God has entrusted us with a dominion over creation, but it's limited. We're not God. So our job is to maintain the creation and make it into a suitable habitat until the creator comes back to reclaim it. There's sound biblical teaching that we do our best when we recognise the limits of our efforts, but we do them well. And I think there's an old agricultural principle that you pass on the land in better shape that you inherited it to your offspring.

What is the main claim by Maria?
What is the warrant used to support her claim?

Maria's main claim is



The warrant that supports her claim is

4. A Christian whose name is Joseph

While the earth remains, seedtime and harvest, cold and heat, summer and winter, day and night, shall not cease (Genesis 8:22).

God has promised that we will continue to have seasons and that we will continue to be able to grow food. Will climate change? Absolutely. It has in the past, and it will change in the future. But even as the climate changes, we can know the predictable seasons will continue, even if they don't look quite how they looked to previous generations living in a particular area.

Christians should look at climate change biblically. What does the Bible say about climate change? Not much. Likely the closest biblical examples of what could be considered climate change would be the end times disasters prophesied in Revelation 6–18. Yet these prophecies have nothing to do with greenhouse gas emissions; rather, they are the result of the wrath of God, pouring out justice on an increasingly wicked world. Also, a Christian must remember that God is in control and that this world is not our home. God will one day erase this current universe (2 Peter 3:7-12) and replace it with the New Heavens and New Earth (Revelation 21–22). How much effort should be made "saving" a planet that God is eventually going to obliterate and replace with a planet so amazing and wonderful that the current earth pales in comparison?

As Christians, our focus should be proclaiming the truth of the gospel, the message that has the power to save souls. Saving the planet is not within our power or responsibility.

What is the main claim by Joseph?
What is the warrant used to support his claim?

Joseph's main claim is

The warrant that supports his claim is



Whose claims are similar? Can you identify who agrees with who?

NASA / Pope Francis / Maria / Joseph have compatible claims.
(Delete as appropriate)

I think these people made compatible claims because

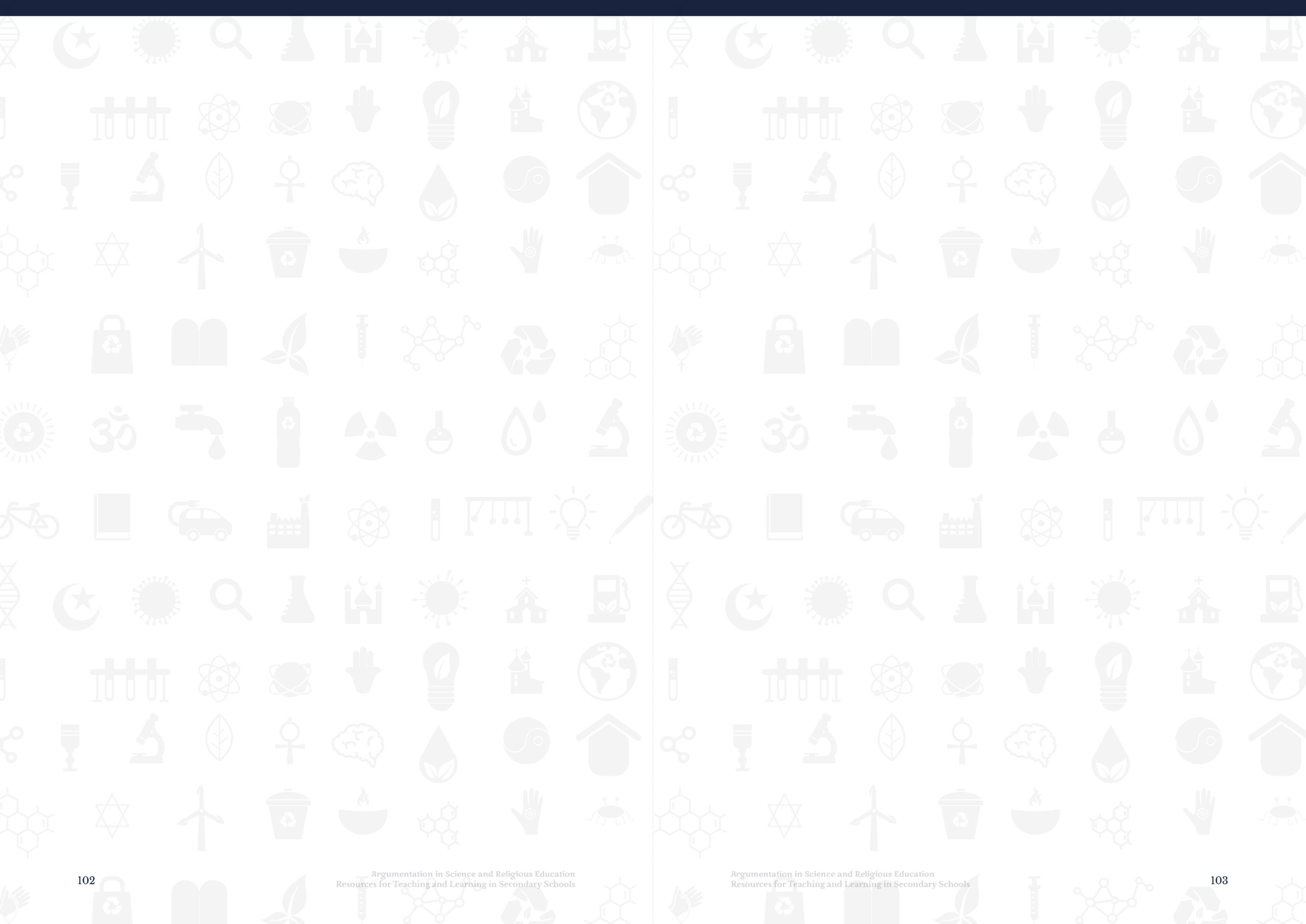
Some claims are compatible despite basing on different warrants (e.g. Pope's and NASA). Some claims are incompatible despite basing on the same sources of warrants. For example, Maria and Joseph made opposite claims though both of them appealed to Christian teachings to support their claims.

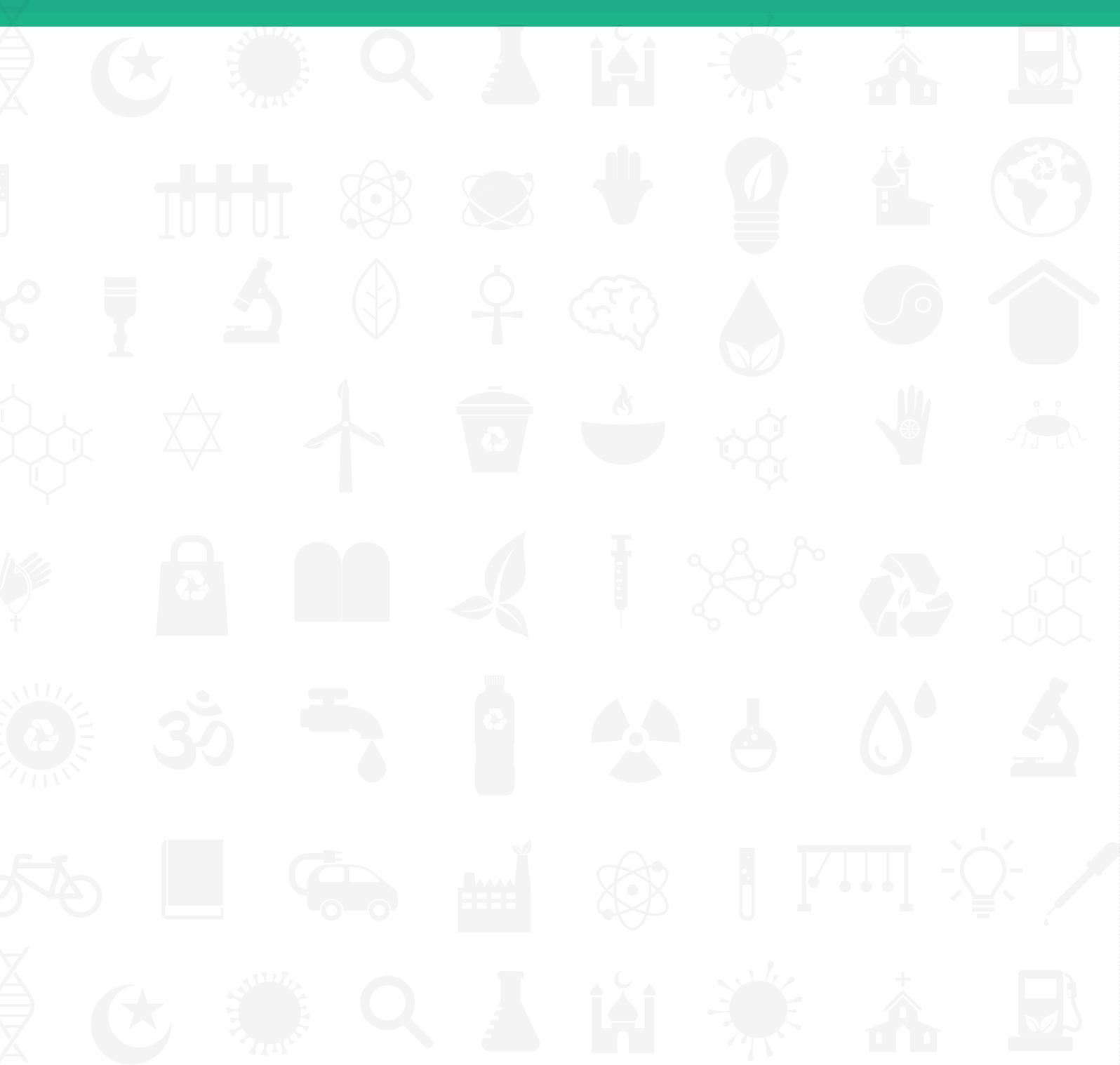
Review the warrants or evidence used by the four characters to support their claims. What do you think is the fundamental difference between those warrants?

The nature of the warrants used by NASA and Christians in the above claims are different. That means what is considered as 'evidence' or 'data' that warrants one's argument can be different.

NASA used empirical and observable evidence to support its claim; whereas the Christians, including the Pope, base their claims on sacred texts or the Bible.

The claims made by NASA and the Pope are compatible. However, their evidence to support their claims are different. What do you think are the differences of their evidence? Think about the sources and the nature of their evidence.





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