Building an interactive system to explore socio-scientific issues

Example: Climate Change

In recent years, many parts of the world have faced increasingly frequent extreme weather events, such as record-breaking rainstorms and heatwaves, rising sea levels, and flooding. These events are closely linked to climate change. Regarding this issue, some scientists have proposed hypotheses to explain it, suggesting that climate change is a global issue driven by both natural scientific processes and human activities.

To explore this complex situation, we need to understand the relationships between different pieces of evidence or phenomena, and try to identify causes and develop solutions like scientists. This activity helps us **explore climate change systematically**, identifying its **key causes, effects, and interconnected components**.

Now we can watch the following video about climate change to understand the different possible factors and processes that make up climate change. https://www.youtube.com/watch?v=qAu8OhWL8F4

Making a concept map

Concept maps are tools that help organise complex information and show how different factors are interrelated.

1. Before exploring climate change, we can first sketch a concept map. Here are some key terms related to climate change for reference:

Fossil Fuel	Carbon dioxide	Methane
Glaciers	Floods	Temperature

Question: How can the relationship between two components in a concept map be effectively represented?

Answer: We can use arrows to represent the causal relationships between components. For example, if B is affected by A, it can be expressed as: A → B

2. While concept maps help us show the relationships between different components, we must carefully examine each item and revise the variables in the concept map to make it usable for constructing interactive systems for quantitative analysis. When revising, pay attention to the following points:

- All components should be measurable variables (e.g., instead of "Glaciers," use "Glacier Area").
- Use "+" and "-" symbols to indicate positive and negative relationships (e.g., if A increases B, show it as A + B).

Now you can review the concept map you sketched, revise the variables, and add new factors not mentioned in the video to more comprehensively describe the relationships between different factors.

Draw the updated version of your concept map in the box below.

Building an Interactive System for Prediction

An interactive system allows us to simulate changes and explore how different factors interact in a complex system. You can use online modeling platforms to predict results for exploration.

3. Refer to the video (scan the QR code on the right), and based on the concept map you created, use an online modeling platform to construct your interactive system. Then, take a screenshot of the concept map you created on the platform and paste it below.

4. A student has the following claim about climate change:

"Burning more fossil fuels will lead to an increase in the frequency of floods."

Use the interactive system built to operate a simulation to explain whether you agree with the student's claim.

_____

_____

_____

_____

_____

Extended Activity:

Use generative AI tools to design and create a poster explaining *three* specific changes that can be made in daily life to help alleviate climate change.

Suggested mark allocation

Items to be assessed \ Marks	0	1	2
• The draft concept map contains at least four components. (Q2)			
• Arrows correctly show causal relationships in the concept map. (Q2)			
• "+" and "-" symbols are correctly used in the concept map to indicate positive and negative correlations. (Q2)			
• Additional of a new variable in the concept map based on existing information. (Q2)			
• Model components are converted into measurable variables. (Q2)			
• Construct an interactive model with interconnected components (Q3) showing – o an outcome can be influenced by more than one factor; o one factor can influence more than one outcome.			
• Propose explanation to the given scenario according to the model stimulation (Q4), with details including – o appropriate variables influencing the outcome in a correct sequence. o the change in magnitudes of the interrelating components that leads to the outcomes.			