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| 1. Christopher Columbus and the crew of the Santa Maria arrived in the Americas in 1492 | 1. Natural vegetation stores more carbon than farmed plants | 1. Solar change and, volcanic eruptions have cooled the Earth’s climate in the past |
| 1. Sulphur from volcanoes can block the sun’s rays if it reaches the upper atmosphere | 1. In the “Great Dying” in the 100 or so years after 1492 - 55 million people died– around 90% of the Indigenous Peoples | 1. The Little Ice Age (LIA) was a generally colder period of climate between 1450-1850. |
| 1. Across the Americas land use for agriculture fell on average 90% | 1. Small changes to the Sun and the Earth’s orbit around the Sun could also have cooled the climate | 1. Volcanic ash can block out some of the sun’s energy |
| 1. When a volcano erupts, its ash reaches high into the atmosphere and can spread to cover the whole earth | 1. Within the Little Ice Age, there were some isolated colder events, which occurred at different places at different times. | 1. In the Northern Hemisphere, temperatures were less than 1°C colder during the LIA than during the late 20th Century. |
| 1. Changes in atmospheric carbon of 7-10 parts per million would lower global surface temperatures by 0.15°C | 1. In 1520, a single smallpox epidemic killed 30-50% of the indigenous population of Mexico. | 1. It is thought that the Americas took in much of atmospheric CO2 during the LIA worth 3.5ppm |
| 1. The Indigenous Peoples of the Americas had many ways of managing the land through farming and forestry | 1. Fewer people means fewer fires used to clear land for fields, natural vegetation started to grow back | 1. As the number of people fell in the Americas, the area of land being farmed reduced |
| 1. When carbon levels fall in the atmosphere the climate cools | 1. Indigenous peoples died as a result of epidemics of diseases such as smallpox & measles, plus war and enslavement | 1. The amount of carbon stored in the soil increases as natural plants regrow |
| 1. In 1492 60.5 million people lived in the Americas | 1. Ice cores reveal that atmospheric carbon dioxide levels fell by 7-10ppm in the late 16th and early 17th centuries | 1. Columbus was sponsored by the Catholic Kings and Queens of Spain |
| 1. Christopher Columbus was an Italian explorer who completed four voyages across the Atlantic Ocean that opened the New World for conquest. | 1. Throughout the Little Ice Age, there was increased volcanic activity. |  |

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|  | About Christopher Colombus |
|  | CAUSE – changes to Earth’s orbit |
|  | CAUSE – Volcanic eruptions |
|  | About the Little Ice Age |
|  | CAUSE& EFFECT – Fewer people and less farming |
|  | EFFECT – The impact of colonisation in indigenous peoples |
|  | EFFECT – on atmosphere and climate |

Students are faced with a mystery in which they have to solve a central question. **In this case “Christopher Columbus is charged with causing the Little Ice Age! Find the evidence to prove or exonerate him!”**

They are given 16–30 pieces of information on individual cards and have to work in groups to solve the question. **These are opposite. Ideally, these should be printed, cut up into individual slips and put into envelopes for distribution to pairs or groups of students.**

They need to sort relevant information from irrelevant; interpret information; make links between disparate pieces of information; speculate to form hypothesis, check, refine and explain. The cards enable the statements to be moved about, so they can process and change their ideas. Mysteries tackle the concepts of cause and effect and classification. **These can be clearly observed in the colour classification above and on the chart.**

The activity encourages students to deal with ambiguity where there is no one right answer and to determine whether information on the cards is relevant or not –it is very like real life! Ultimately the students should write in detail about the central question and should have some thoughtful explanations. **In this case, what caused the mini ice age, of course, this is multicausal, and hopefully many of the students will realise this by the end of the activity.**

This is a challenging activity.It requires a lot of research and planning to create a new mystery, although there are now many examples already developed by teachers. The success of the activity depends on the stimulus introduction to create the need to solve the mystery, the teacher’s timely interventions to encourage the groups to puzzle it out,and the debriefing to analyse how they approached the tasks and what they found out. Success also depends on cooperative group work –students can have strongly held views and there can be dissent in the groups to cope with. Mysteries are an excellent tool for diagnostic and formative assessment, through watching groups handle information, listening to their talk and reading their final product.

**Some hints on managing mysteries**

1. Stress the key question for the mystery at the start, and keep coming back to it.
2. Get students to sort the statements and discard the ones they do not think are relevant, but as they work to keep checking on the discarded ones.
3. Do not give them too much ‘help’–but give support if they do not understand a statement or vocabulary(although such vocabulary should have been covered in previous lessons).
4. Avoid the temptation to over-instruct.
5. Watch for groups that are overwhelmed and start to go off task.

•In the debrief:

1. Start with a group with a reasonable, but challengeable, explanation and invite others to comments. Try not to tell them the ‘answer’but keep it open for as long as you can to get discussion and debate to unpick the detail in the statements.
2. Move on to how they did the task. Did their ideas change during the task? How did their group operate? How did they resolve disagreements?
3. Writing up is important to consolidate learning. Encourage students to tell the story and not just to repeat what was on the cards.

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