TED TALK LESSON

SHOULD WE CREATE A SOLAR SHADE TO COOL THE EARTH?

TEACHER'S NOTES

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Danny Hillisat TED2017
Should we create a solar shade to cool the earth?

https://www.ted.com/talks/danny_hillis_exploring_options_for_solar_geoengineering

Vocab matching answers

1. b
2. a
3. f
4. h
5. c
6. d
7. i
8. e
9. g
10. j

Vocab gap-fill answers

1. Conspiracy
2. Apprehension
3, Back of the envelope calculations
4. A silver bullet
5. Thermostat
6. Shade
7. Plausible
8. Misunderstanding (misunderstands)
9. Chalk
10. Geoengineering

Ted Talk video answers

1. False, many have doubts about it
2. False, it's don't all the time with planes.
3. False
4. True
5. True
6. False
7. True
8. True
9. False
10. False, he is an optimist

Warmer questions

- Do you take an interest in the environment?
- Are you concerned about climate change?
- Do you think enough is being done to either slow or reverse the effects of climate change? Why or why not?
- Have you heard of the word geoengineering?

Reading section

A changing climate

There is constant news on how human activity is changing the climate. Reports are frequently focussed on rising air temperatures, rising sea levels, and the pressures placed on wildlife. Some believe that we do not have enough time to completely change how we (as a global civilisation) change our energy needs and rethink how we pollute the environment. We could, in theory, develop physical solutions to change the environment, and avoid global disaster. Some strongly favour using technology to develop systems and machines which, when working together, will change the climate and cool the planet. Using geoengineering is not a new idea. The concept has been around for some time but only now are some people considering it to avert catastrophe.

Ocean fertilisation

One suggestion to dump huge amounts of iron power into the ocean so that it can feed tiny (microscopic zooplankton) animals. By doing this, the animals can grow and multiply quickly and then die. This will allow the animals to absorb carbon dioxide during their life and upon their death, they sink to the bottom of the ocean where the carbon is kept forever. This method has made the news before, but it angered many people because it is currently illegal under UN rules.

When this was tried off the coast of Canada, it led to a 400% increase in salmon numbers the following year. With fish having so much food, it led to an increase in fish numbers.

Cloud seeding

A method which has become widely known (thanks to Bill Gates funding the research and development for the project) is to generate clouds from sea water. The plan is to use a fleet of ships, which will be solar powered, to continuously convert sea water into a fine mist and direct it into the air. This process will create many clouds which can reflect sunlight bad into space. This will gradually cool the Earth. It is also said this is the 'safest' methods currently available.

Space mirrors

Another idea proposed by Roger Angel, a professor of astronomy and optics at the University of Arizona, is to create ultra-thin mirrors and place them into space. His unique idea is to have a band of mirrors placed between the sun and Earth so that its rays are reflected away and so cools the planet. His calculations show that we need 20 giant guns firing 800,000 reflective ceramic disks every five minutes for the next ten years. Only then will this slow and then reverse global warming.

What's next?

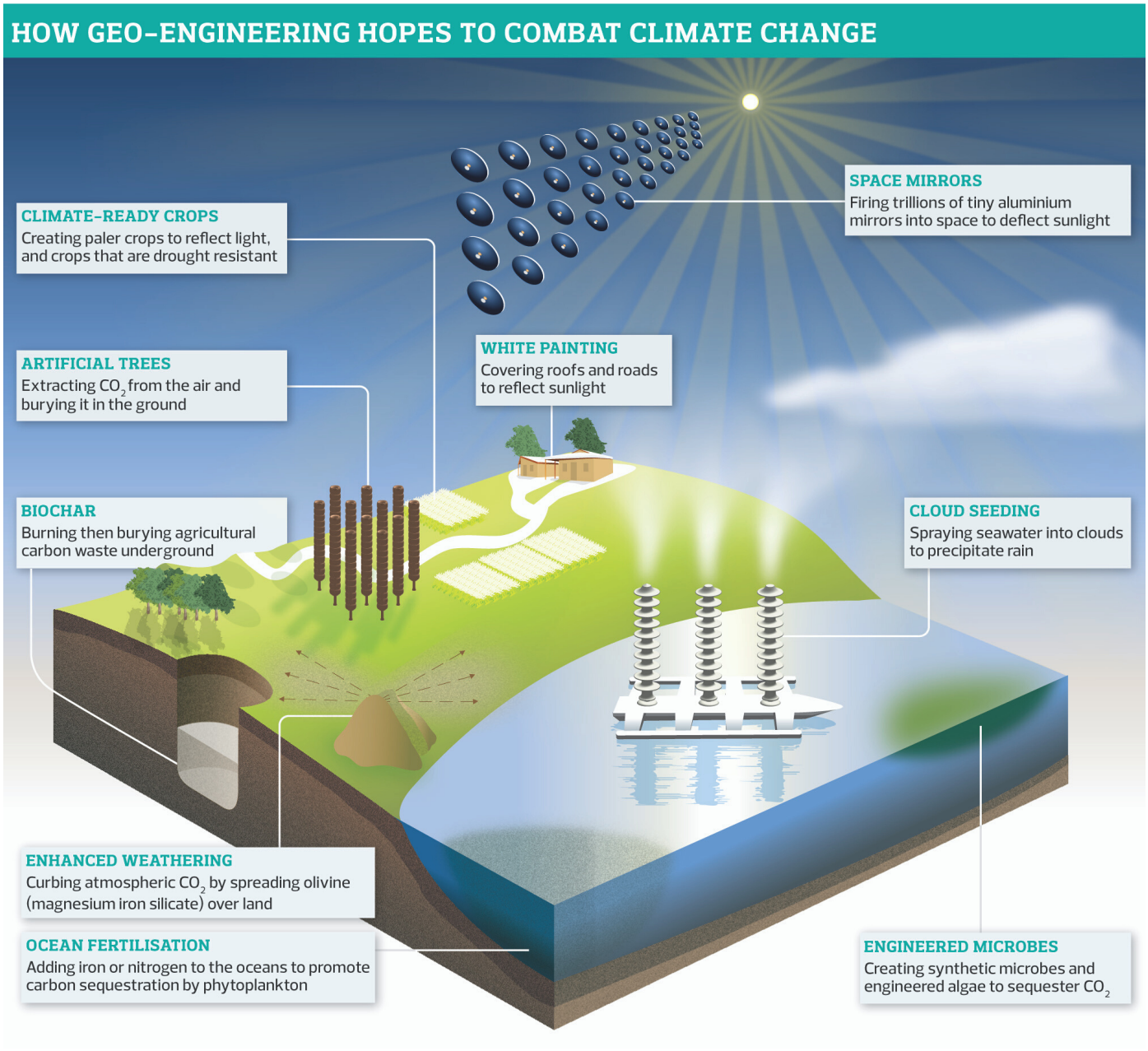
In 2010 more than 190 countries have agreed under a treaty sponsored by the United Nations to ban geoengineering as a part of plans to combat climate change. The treaty provides that "no climate-related geoengineering activities that may affect biodiversity take place, until there is an adequate scientific basis on which to judge such activities and appropriate consideration of the associated risks for the environment and biodiversity and associated social, economic, and cultural impacts" has been determined.

Even in politics, there is still some sanity.

Questions which arise from this

- Do you think it is possible to further damage the climate and environment by using geoengineering?
- Who should pay for the research and development of these projects if they become legal and used widely?
- Does using geoengineering show that we have lost control of the amount of pollution in the environment? Why or why not?
- By using geoengineering, does it also mean we will never have the Earth back to what it was before global industrialisation?
- What ethical reason is there to use or not use geoengineering?

How does geoengineering work?



Task

What other innovative ways can you think of to reduce solar radiation from the sun? Create a short presentation and share with your group.

Vocabulary matching

Using the words on the left match them to their real definitions.

1. Shade	a. To change the environment using machines or technology.
2. Geoengineering	b. A place/space kept out of sunlight.
3. Thermostat	c. When something sounds possible.
4. Misunderstanding	d. A white mineral.
5. Plausible	e. A quick and rough estimate.
6. Chalk	f. A small device which measures the temperature.
7. Apprehension	g. An unofficial and unproven theory.
8. back of the envelope calculation	h. To not understand something incorrectly.
9. Conspiracy	i. Nervousness, concern, fear.
10. A silver bullet (proverb)	j. A single solution which can solve all problems.

Vocabulary gap-fill

1. There are some people around the world who believe in a _____ that NASA never visited the moon.

2. There is great _____ on how geoengineering will change the climate.

3. Danny made a few _____ on how using a solar shade will help to cool the environment.

4. The UN and other agencies do not want geoengineering to be _____ to solve all of the problems related to the environment. They want people to make long-term changes.

5. Every home has a _____ . If you turn down the temperature by only 2 degrees, you can save a lot of money each winter.

6. This umbrella can keep us dry when it rains and give us _____ when it's really sunny outside.

7. Some ideas are really ridiculous but others are _____ and might be helpful.

8. When it comes to science the public generally _____ main concepts.

9. Teachers used to use a piece of _____ on a blackboard to teach their lessons.

10. Bill Gates is funding _____ ideas to help slow global warming and climate change.

Video section

In this perspective-shifting talk, Danny Hillis prompts us to approach global issues like climate change with creative scientific solutions. Taking a stand for solar geoengineering, he looks at controversial solutions with open-minded curiosity.

https://www.ted.com/talks/danny_hillis_exploring_options_for_solar_geoengineering

Watch the video and then answer the questions below

1. Danny believes there is a lot of support for such a project.
2. It is impossible to make clouds.
3. It is a government conspiracy to make clouds.
4. Artificial clouds lower the temperate by one degree.
5. Some have considered using mirrors out into space.
6. Using chalk is the least plausible idea to achieve lower global temperature.
7. A hand full of chalk per swimming pool of water is the amount of chalk needed.
8. Danny thinks that if we use geoengineering to cool the atmosphere it will encourage people to continue polluting the environment
9. Danny thinks using chalk is a silver bullet
10. Danny is a skeptic.

Advantages of using geoengineering

1. A quick and fast solution to prevent further warming in the atmosphere.

2. By using geoengineering technology it gives the world more time to move into sustainable and greener technology and reduce carbon emissions.

3. We could indirectly have a better understanding of the planet's climate and thus improve our scientific understanding.

4. It is affordable and we know it works.

5. Some technologies like the solar shade and cloud seeding is not toxic as it does not use chemicals to make it work.

Disadvantages of using geoengineering

1. It will reduce rainfall because less solar energy means fewer clouds.

2. Some areas of the world will be affected severely and cause environmental damage.

3. If the solar shade is used, mirrors will need to be placed all around the Earth as the North and South poles do not cool by themselves. This increases the cost of using space mirrors greatly.

4. Using cloud seeding may make the skies whiter.

5. It will not stop ocean acidification or any other damage from pollution.

6. Ocean fertilisation will cause zooplankton to multiply so quickly that they might absorb all the oxygen in the water in a large area. This will create a 'dead zone' and kill millions of fish.

7. For these projects to work, it will need long-term (more than 20 years) of international support, and it will require lots of money. The world has never cooperated on such a large project before. It has a high chance to fail.

8. The outcomes are unpredictable and the benefits may not evenly help everyone in the world.

9. It may allow people to be lazy about caring for our plant. It could give an excuse to some countries to not change their output of carbon.

Task

How many more points can you think of that are related to the ideas above? Write your thoughts below and then discuss in your group.

Extended discussion questions

1. If you had the authority to implement any one of these geoengineering technologies, which would use and why?

2. If geoengineering technologies are to be used, who would be in charge to pay and operate these programs?

3. If the decision is to be made to increase sulphur dioxide in the atmosphere (because it reflects light) by forcing a volcano to erupt. How would you decide which volcano in the world to use? How will you ensure it will not affect local populations?

4. Once this technology to change the weather and climate is made, what are the chances it will be converted into a weapon? Should it ever be used as a weapon?

5. By using this technology, would it allow countries to continue to produce carbon? How can they stopped?

6. The world has never cooperated on such a global project before. What do you think will need to be done to have 190 countries politically support and pay for these projects?

Potential debating topics

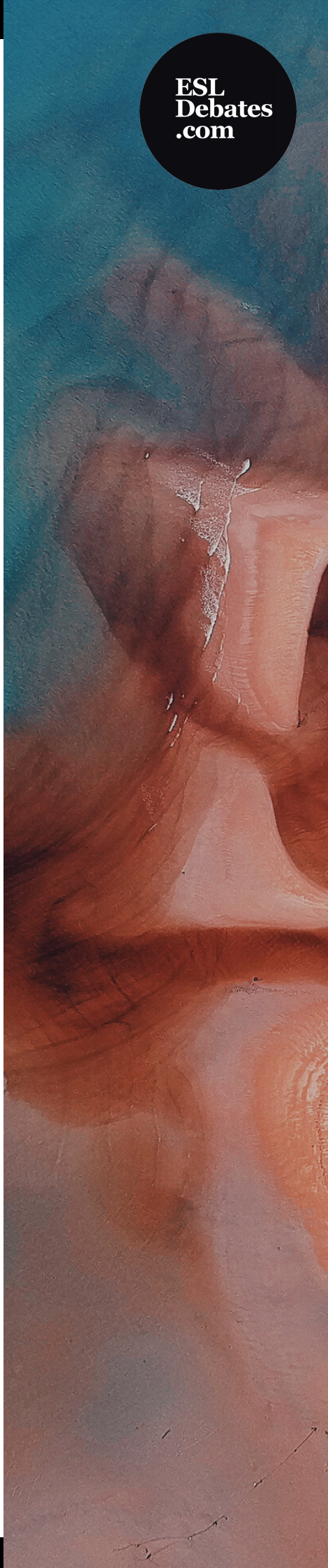
1. The use of geoengineering is dangerous and should be stopped.

2. The Earth can be protected from long-term climate change by using geoengineering techniques.

3. Geoengineering will encourage further burning of fossil fuels.

4. People are not responsible enough to implement geoengineering.

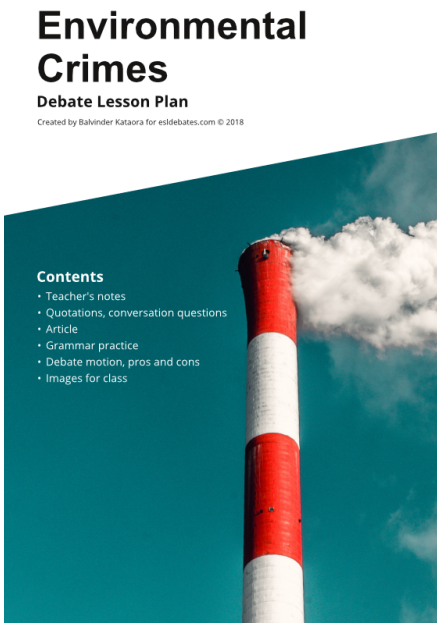
5.Any geoengineering project is doomed to fail as people will never collaborate to make it succeed.



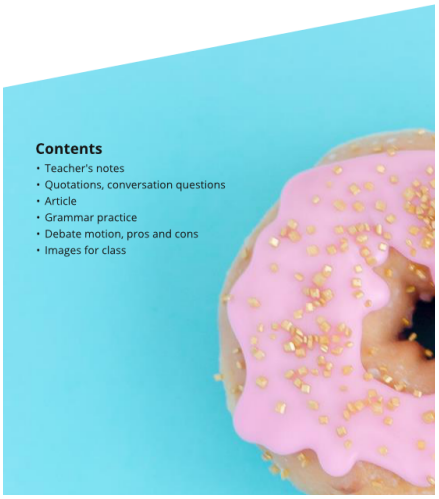
DEBATING PLANS

PREMIUM 30-PAGE DEBATING LESSONS ON DOZENS OF TOPICS

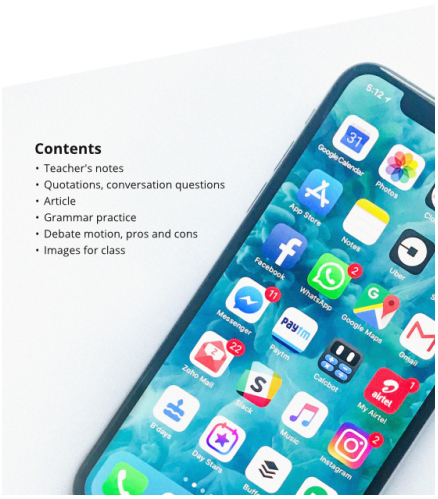
These lessons are extensive and includes a magazine-like introduction, a 2-page article, vocabulary section, grammar exercises, and images for discussion. To help students organize their debate, worksheets are included for appropriate language and pros and cons to get them started. In total these lesson plans offer 30 pages of activities and tasks for students.



Should natural features be given legal rights to protect them from pollution? This debate will target issues relating to how to legally protect the environment and criminalise pollution.



What are the best ways to tackle obesity? Some people advocate better food education, while others want to tax people to change their spending habits. Which is the most effective?



People are becoming increasingly concerned about social media. Discuss the main issues and find out what your students think and why.