

'The more we looked into the mystery of Crispr, the more interesting it seemed'

Scientists have known about the technique for years, but always assumed it was junk. Then Jennifer Doudna began to study it. Her findings could transform medicine

Steve Connor • Wednesday 06 November 2013 22:28 • [Comments](#)

GROUP 1 ANALYSIS

Students' names:
Richelle
Shi Qian
Amos
Saidah
Xinyuan

Article 1

We've been wrong about the origins of life for 90 years

August 18, 2016 12:43pm AEST

NOAA/National Marine Fisheries Service CC BY-SA

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For nearly nine decades, science's favorite explanation for the origin of life has been the "primordial soup". This is the idea that life began from a series of chemical reactions in a warm pond on Earth's surface, triggered by an external energy source such as lightning strike or ultraviolet (UV) light. But recent research adds weight to an alternative idea, that life arose deep in the ocean within warm, rocky structures called [hydrothermal vents](#).

Note: You can annotate the headlines with the  pen function on the left bar.

Article 2

We need to rethink the origins of life on Earth, study suggests

We might not have come from primordial soup after all.

ARUNAS L RADZVILAVICIUS, THE CONVERSATION 18 AUG 2016

Table 1

Look at the headlines and leads of all 3 example articles.	1) What is the author trying to do?	shock value -> interest, intrigue "wow scientists were wrong about something for such a long time?" "Why are we supposed to rethink?" creates an air of mystery around the topic -> deontological appeal highlights the transformative potential of the topic that could affect us all (emphasises the impact of this discovery -> makes it relatable)
	2) What is the role of the headline and lead?	capture the readers' attention to make them continue reading, Also, get the readers to know the main topic of the article, similar to a brief introduction. Move 1: Introduce the key finding Move 2: Highlight/describe the significance/impact
	3a) "Her findings could transform medicine." In what ways? Give two specific examples from the stated sections/paragraphs.	Section 9: gave rise to the potential for precise gene editing, can actually now target the exact sequence that causes these problems instead of introducing gene editing at random positions, hoping for a breakthrough Section 13 can cure human diseases that had no cure before this discovery (we can now treat the root cause of the disease instead of simply lessening the symptoms as we have done up till now) -> can prevent the disease from even appearing (instead of treating it only AFTER symptoms emerge)
Look at the required reading news article.	3b) Why did the author include this in the lead? What did he assume about the readers?	Make the readers curious Highlight the significance of this finding Assumption: readers are non-experts in this field (genetic engineering) and thus he needs to address the importance of the finding to gain attention from the readers. assumes that the readers care about the advancement of medicine?
		  

Move 1
Introduce the key finding
Move 2
Highlight/describe significance/impact



Students' names:
 Fang Yu
 Bo Cong
 Min Jet
 Benedict
 Ryan

GROUP 2 ANALYSIS

News > Science

'The more we looked into the mystery of Crispr, the more interesting it seemed'

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Article 1

We've been wrong about the origins of life for 90 years

August 18, 2016 12:40am AEST

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[Email](#) [Twitter](#) [Facebook](#) [LinkedIn](#) [Print](#)
 140 25 For nearly nine decades, science's favorite explanation for the origin of life has been the "primordial soup". This is the idea that life began from a series of chemical reactions in a warm pond on Earth's surface, triggered by an external energy source such as lightning strike or ultraviolet (UV) light. But recent research adds weight to an alternative idea, that life arose deep in the ocean within warm, rocky structures called [hydrothermal vents](#).

Article 2

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Table 2

<i>Look at the headlines and leads of all 3 example articles.</i>	1) What is the author trying to do? 2) What is the role of the headline and lead?	trying to spark curiosity and mystery trying to disprove pre-existing conceptions --> invoke a need within the reader to review it Headline is CLICKBAIT (Main essence of article) Lead is to tease the readers about what they are about to read, and arouse interest
<i>Look at the required reading news article.</i>	3a) "Her findings could transform medicine." In what ways? Give two specific examples from the stated sections/paragraphs.	Section 13: ""One can envisage taking cells from a patient with sickle-cell anaemia or an inherited blood disorder, and using the CAS9 system to fix the underlying genetic cause of the disease by putting those cells back into the patient and allowing them to make copies of themselves to support the patient's blood." --> Medicine usually targets the symptoms especially hereditary diseases but her findings would now be able to target the root cause of these diseases which is the genetic code --> From adaptation to mitigation Section 15: "Her team is already, for instance, working on possible ways of using the CAS9 system to disrupt the extra damaging chromosome responsible for Down syndrome , or the extra repetitive sequences of DNA that lead to Huntington disease , a lethal inherited disorder that strikes carriers of the defective gene in mid-life. "These are the kinds of genetic defects that one could envisage coming up with strategies to treat, which we haven't really been able to do in the past," Professor Doudna said. "What's exciting is that you can see the potential, and it's certainly going to drive a lot of research to try to explore it as a potential human therapeutic tool." --> in the past these genetic defects were difficult to treat. now, with Prof Doudna's findings, genetic defects have a chance to be treated, thus TRANSFORMING medicine
	3b) Why did the author include this in the lead? What did he assume about the readers?	shes wants to let everyone know that even though certain things look like trash to us, it can be a treasure for others. another mans trash is another mans treasure -group 2 the author wanted to push the notion that the solution was in front of our eyes all along, we just didn't know how to utilise it The author assumes that the readers generally have a bad impression against gene therapy (ie: people are wary of GMO food etc), so the author included "Her findings could transform medicine." to try convince the readers that the gene therapy field can be beneficial too. -> combat negative perceptions

Students' names:
Yx
JiaWei
Tei Kar
Deon
Lara

GROUP 3 ANALYSIS

News > Science

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Article 1

We've been wrong about the origins of life for 90 years

August 16, 2016 12:40am AEST

NASA Photo Library/Flickr, CC BY-SA

For nearly nine decades, science's favorite explanation for the origin of life has been the "primordial soup". This is the idea that life began from a series of chemical reactions in a warm pond on Earth's surface, triggered by an external energy source such as lightning strike or ultraviolet (UV) light. But recent research adds weight to an alternative idea, that life arose deep in the ocean within warm, rocky structures called hydrothermal vents.

Article 2

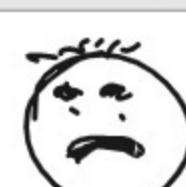
We need to rethink the origins of life on Earth, study suggests

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ARUNAS L RADZVILAVICIUS, THE CONVERSATION 18 AUG 2016

Table 3

<p><i>Look at the headlines and leads of all 3 example articles.</i></p>	<p>1) What is the author trying to do?</p> <p>2) What is the role of the headline and lead?</p> <p>3a) "Her findings could transform medicine." In what ways? Give two specific examples from the stated sections/paragraphs.</p> <p>3b) Why did the author include this in the lead? What did he assume about the readers?</p>	<p>The author is trying to grasp the attention of the reader through the introduction of catchy headlines. By telling the audience that their pre-existing knowledge/understanding may be incorrect, it sparks curiosity in the audience therefore making them want to continue reading further.</p> <p>Section 15:</p> <p>"In the past, when we've tried gene therapy, we haven't had tools that have allowed targeted-gene correction. This will be fundamentally different to what we've had in the past."</p> <p>Her team is already, for instance, working on possible ways of using the Cas9 system to disrupt the extra damaging chromosome responsible for Down syndrome, or the extra repetitive sequences of DNA that lead to Huntington disease, a lethal inherited disorder that strikes carriers of the defective gene in mid-life. "These are the kinds of genetic defects that one could envisage coming up with strategies to treat, which we haven't really been able to do in the past," Professor Doudna said. "What's exciting is that you can see the potential, and it's certainly going to drive a lot of research to try to explore it as a potential human therapeutic tool."</p> <p>Researchers are already talking about using it to change the gene that governs the protein responsible for allowing HIV to infect white blood cells. The idea is to mimic the natural "immunity" some people have to HIV, which prevents them progressing to AIDS.</p> <p>Section 16:</p> <p>"One can envisage taking cells from a patient with sickle-cell anaemia or an inherited blood disorder, and using the Cas9 system to fix the underlying genetic cause of the disease by putting those cells back into the patient and allowing them to make copies of themselves to support the patient's blood."</p> <p>He wanted to induce curiosity from the readers (assuming that the readers are interested in how their standard of healthcare could be improved from CRISPR research).</p> <p>He used it as preface to show that CRISPR is beneficial in the medical field; as he assumed that the readers don't fully understand or have reservations regarding CRISPR. -> concrete examples/impact</p>
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Students' names:
 Meng Han
 Francis
 Kai Lin
 Adinda
 Brandon

GROUP 4 ANALYSIS

News > Science

'The more we looked into the mystery of Crispr, the more interesting it seemed'

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Article 1

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For nearly nine decades, science's favorite explanation for the origin of life has been the "primordial soup". This is the idea that life began from a series of chemical reactions in a warm pond on Earth's surface, triggered by an external energy source such as lightning strike or ultraviolet (UV) light. But recent research adds weight to an alternative idea, that life arose deep in the ocean within warm, rocky structures called [hydrothermal vents](#).

Article 2

We need to rethink the origins of life on Earth, study suggests

We might not have come from primordial soup after all.

ARUNAS L RADZVILAVICIUS, THE CONVERSATION 18 AUG 2016

Table 4

<i>Look at the headlines and leads of all 3 example articles.</i>	1) What is the author trying to do?	Clickbait people into reading the article
	2) What is the role of the headline and lead?	Headline: to introduce the main character/subject of the article Lead: Introduce context and provide the main points of the article
<i>Look at the required reading news article.</i>	3a) "Her findings could transform medicine." In what ways? Give two specific examples from the stated sections/paragraphs.	Section 16: Researchers are already talking about using it to <u>change the gene</u> that governs the protein responsible for allowing HIV to infect white blood cells. The idea is to <u>mimic the natural "immunity"</u> some people have to HIV, which prevents their progressing to Aids.
	3b) Why did the author include this in the lead? What did he assume about the readers?	Section 18: But perhaps the most intriguing and controversial application of Crispr-CAS9 will be the <u>possibility of altering the genes of IVF embryos</u> . Studies on mouse embryos show it is incredibly effective, and some IVF doctors may want to see if it can work on human embryos – which is illegal in Britain at present because it amounts to " <u>germline</u> " gene therapy.



Crispr stands for "clustered regularly interspaced short palindromic repeats", a devilishly contrived acronym which just about sums up why it was ignored for so long. For nearly two decades after Japanese researchers first discovered Crispr in bacteria in 1987, scientists mostly dismissed it as "junk DNA".

In fact, the apparently nonsensical sequences within Crispr, which were repeated in palindromic order (the same backwards as forwards), did have a purpose and were far from junk. About six years ago, scientists discovered that these DNA sequences matched the genetic sequences of various viruses that attack bacteria, which led to the discovery of a sophisticated bacterial immune system.

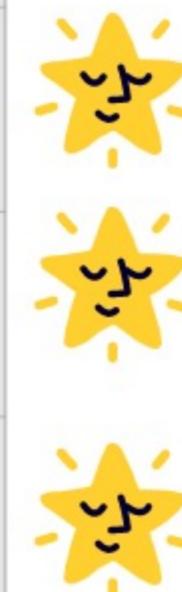
Far from being junk, Crispr was actually a way of storing the genetic information of an invading virus in the form of a palindromic DNA sequence. The bacteria used this genetic memory to target the viral invader by chopping it up with powerful "Crispr-associated" (CAS) enzymes capable of "cleaving" its DNA molecule, just like a pair of molecular scissors.

Instructions: Highlight the words, phrases, or sentences that help you understand Crispr. Use blue for scientists from another field and purple for non-scientists.

Table 1

4) Based on what you have highlighted, what strategies is the author using?	Strategy	Example from the text
	Definitions	"clustered regularly interspaced short palindromic repeats" palindromic = "the same backwards as forwards"
	Analogy	"just like a pair of molecular scissors" "junk dna" "genetic memory" "Viral invader"

Descriptions	"Crispr was actually a way of storing the genetic information" "genetic memory" "chopping it up" "nonsensical sequences within Crispr"
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STRATEGIES
Definition
 explaining a word/term
Description
 explaining a thing/process/mechanism/concept..
Metaphor
Analogy

News > Science

'The more we looked into the mystery of Crispr, the more interesting it seemed'

Scientists have known about the technique for years, but always assumed it was junk. Then Jennifer Doudna began to study it. Her findings could transform medicine

1

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Table 1

5) What makes Jennifer Doudna's discovery noteworthy? What is the area of evaluation being used?	
Example 1: Crispr is not junk!	Crispr was neglected for a long time (20 years?) in genetic engineering, it was even deemed as "junk DNA". Doudna's discovery firstly emphasises the ever-evolving nature of science where new discoveries are always being made that could possibly override past discoveries, changing our understanding and applications of medicine
Example 2: It could transform medicine.	It highlights the many avenues that this technology **may** open up to. And that people should stay tuned for it. It showcases the (endless) possibilities that CRISPR could bring to the table in the medical field



AREAS OF EVALUATION
(Un)expectedness
Possibility

GROUP 2 ANALYSIS

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In fact, the apparently nonsensical sequences within Crispr, which were repeated in palindromic order (the same backwards as forwards), did have a purpose and were far from junk. About six years ago, scientists discovered that these DNA sequences matched the genetic sequences of various viruses that attack bacteria, which led to the discovery of a sophisticated bacterial immune system.

Far from being junk, Crispr was actually a way of storing the genetic information of an invading virus in the form of a palindromic DNA sequence. The bacteria used this genetic memory to target the viral invader by chopping it up with powerful "Crispr-associated" (CAS) enzymes capable of "cleaving" its DNA molecule, just like a pair of molecular scissors.

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Table 1

4) Based on what you have highlighted, what strategies is the author using?	Strategy	Example from the text
	Definition	In fact, the apparently nonsensical sequences within Crispr, which were repeated in palindromic order (the same backwards as forwards)
	Metaphor/Analogy	just like a pair of molecular scissors chopping it up/cleaving comparing CAS enzymes to Scissors

News > Science

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Table 1

5) What makes Jennifer Doudna's discovery noteworthy? What is the area of evaluation being used?	
Example 1: Crispr is not junk!	She discovered a treasure in the genetic world where nobody saw the significance of.
Example 2: It could transform medicine.	open up a new avenue of treatment to cure disease

Required Reading

Connor, S. (2013, November 7). The more we looked into the mystery of Crispr, the more interesting it seemed. The Independent.
<http://www.independent.co.uk/news/science/the-more-we-looked-into-the-mystery-of-crispr-the-more-interesting-it-seemed-8925328.html>

Background Reading

Jinek, M., Chylinski, K., Fonfara, I., Hauer, M., Doudna, J. A., & Charpentier, E. (2012). A programmable dual-RNA-guided DNA endonuclease in adaptive bacterial immunity. *Science*, 337(6096), 816-821. <http://genetics.wustl.edu/bio5491/files/2013/03/Jinek-et-al.-2012.pdf>

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Table 1

	Strategy	Example from the text
4) Based on what you have highlighted, what strategies is the author using?	less technical, simplifies what he was explaining previously	"junk DNA"
	Explains the term palindrome, which is not a common term (defining a key term).	(the same backwards as forwards)
	Using an easy analogy such that readers are able to relate it to something that they understand well.	enzymes capable of "cleaving" its DNA molecule, just like a pair of molecular scissors.

News > Science

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Table 1

5) What makes Jennifer Doudna's discovery noteworthy? What is the area of evaluation being used?	
Example 1: Crispr is not junk!	It shows that she was able to turn previously-thought "trash" into "treasure". She took a technique that had been discovered years ago that people thought wasn't useful and didn't have a great purpose, and developed it into something that could potentially revolutionise the world of medicine.
Example 2: It <u>could</u> transform medicine.	This depicts that Crispr has the potential to be used to treat a wide range of diseases. ----> brings people's hope up

Required Reading

Connor, S. (2013, November 7). The more we looked into the mystery of Crispr, the more interesting it seemed. The Independent.

<http://www.independent.co.uk/news/science/the-more-we-looked-into-the-mystery-of-crispr-the-more-interesting-it-seemed-8925328.html>

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GROUP 4 ANALYSIS

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Table 1

4) Based on what you have highlighted, what strategies is the author using?	Strategy	Example from the text
	analogy	"pair of molecular scissors"
	informal tone	"devishly contrived" "apparently nonsensical sequences"
	definition	"the same backwards as forwards"

News > Science

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Steve Connor · 2 Wednesday 06 November 2013 22:28 · ... Comments



Table 1

5) What makes Jennifer Doudna's discovery noteworthy? What is the area of evaluation being used?	
Example 1: Crispr is not junk!	Challenge the assumption. The general consensus at first was that CRISPR was useless and now because Doudna found out it might have wide-reaching impacts, CRISPR is not useless. More than that, CRISPR is revolutionary. (shift in mindset from seeing something as useless as something beneficial --> mindblowing?)
Example 2: It <u>could</u> transform medicine.	Highlights the great potential it has for mankind and medical research.



Required Reading

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a) Description and Definition

*Which is the most effective example?

Example 1

The shortening effect of the telomere by the sugary drinks is due to the disruptions on several metabolic (**breaking and formation of essential molecules**) pathways that are required for growth.

Effective? Why or why not?

The approach is relatively effective, as it provides a clear flow on how sugary drinks-> do something to the telomere. However there are missing definitions about "Telomere". also, the description of "metabolic" cuts between metabolic and pathways, cutting off the "reading flow"

**Example 2**

The telomere is repetitive sequences that are found at the end of a chromosome (**condensed form of DNA**). Measurement of telomere length is done by subjecting the participant's blood which was collected by NHANES, through a quantitative polymerase chain reaction (**amplification of DNA**).

Effective? Why or why not?

May not be helpful for the non-experts readers because the terms used to define "chromosome" and "a quantitative polymerase chain reaction" are also very technical.

Example 3

The first step involved turning carbon dioxide into methanol – **a less useful, basic molecule** – before further processing. The reaction, however, inadvertently produced ethanol – **the more desirable and complex sister molecule** – all on its own!

**Effective? Why or why not?**

encapsulates the difference between methanol and ethanol (helps to understand the process better) but the terms seem to lose their original meaning? but i guess there's no need to explain those terms too technically since it isn't the main aim of this strategy



a) Description and Definition

*Which is the most effective example?

Example 1 (could be definition)

The shortening effect of the telomere by the sugary drinks is due to the disruptions on several metabolic (**breaking and formation of essential molecules**) pathways that are required for growth.

Effective? Why or why not?

Not effective!! The definition does not help the reader to understand the whole paragraph. The bracketed phrase may raise more questions than it tries to explain.

Maybe instead of just explaining metabolic, he could have explained what metabolic pathway means as readers could understand metabolic but would not understand how the pathways works.

Example 2 (definition)

The telomere is repetitive sequences that are found at the end of a chromosome (**condensed form of DNA**). Measurement of telomere length is done by subjecting the participant's blood which was collected by NHANES, through a quantitative polymerase chain reaction (**amplification of DNA**).

Effective? Why or why not?

Not effective because complex concepts are still mentioned in the brackets which would need another set of brackets to explain, difficult to visualise as DNA exists on an extremely small scale

**Example 3 (description)**

The first step involved turning carbon dioxide into methanol – **a less useful, basic molecule** – before further processing. The reaction, however, inadvertently produced ethanol – **the more desirable and complex sister molecule** – all on its own!

Effective? Why or why not?

Yessirrrr! Gives context to the importance of methanol and ethanol in whatever process the text is mentioning

- It makes the process easier to follow for the reader as the writer clearly distinguishes the desired and undesired products.

The way this strategy is used (using dash lines) helps the paragraph flow better, i.e. the definition/description becomes 'native' to the sentence; readers' thought process is least likely to be broken



b) Metaphor and Analogy

*Which is the more effective example?

Example 1

This is thought to be linked to increased deaths of smell sensors. **The process may be likened to the wearing out of winter car tyres.** In cold countries, studs are often found on tyres to improve the tyres' grip on slippery snow, therefore preventing road accidents. However, these studs wear out over time, eventually rendering them non-functional. Similarly, a spherical structure called the olfactory bulb exists in the nose. Tiny hairs on the bulb act as smell sensors. When we breathe in, air enters the nasal cavity through these hairs. But with ageing cumulative air influxes gradually but irreversibly damage these hairs. Hence it becomes significantly harder to sense familiar smells.



It is a good analogy to pass identical

Effective? Why or why not?

Not really...

The analogy used is too far-fetched (could have used water filter maybe?) — the only similar thing they have are the fact that both are subjected to wear and tear.



The functions/characteristics are too far apart to be used as analogies, one of them is used to avoid skidding while one is used to detect smell

The analogy is too long-winded and it misses the mark. -> not widely relatable

Simple words are used to describe how greenhouse effect is produced by using one-way mirror and the explanation is not too long.

Example 2

Basically, **carbon dioxide gas acts as a screen that allows incoming solar radiation – heat from the Sun – to reach the Earth's surface, but blocks it on its way out**, therefore preventing the heat from leaving our planet. **Just like a one-way mirror, people can see through one side but not from the other.** This is known as the greenhouse effect.



**b) Metaphor and Analogy**

*Which is the more effective example?

Example 1

This is thought to be linked to increased deaths of smell sensors. **The process may be likened to the wearing out of winter car tyres.** In cold countries, studs are often found on tyres to improve the tyres' grip on slippery snow, therefore preventing road accidents. However, these studs wear out over time, eventually rendering them non-functional. Similarly, a spherical structure called the olfactory bulb exists in the nose. Tiny hairs on the bulb act as smell sensors. When we breathe in, air enters the nasal cavity through these hairs. But with ageing cumulative air influxes gradually but irreversibly damage these hairs. Hence it becomes significantly harder to sense familiar smells.

Effective? Why or why not?

both processes are about wearing out

Yes, can immediately picture the literal wearing down of studs on the car tyres, which are metaphors for the hairs on the bulb + likening olfactory bulbs to car tyres (able to picture the decay of the hairs becoming less effective over time due to the exposure to environmental factors)

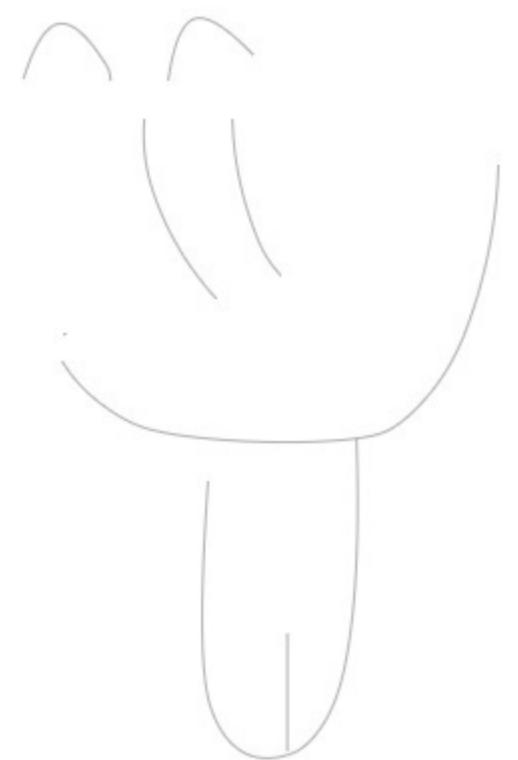
Example 2

Basically, **carbon dioxide gas acts as a screen that allows incoming solar radiation – heat from the Sun – to reach the Earth's surface, but blocks it on its way out**, therefore preventing the heat from leaving our planet. **Just like a one-way mirror, people can see through one side but not from the other.** This is known as the greenhouse effect.

Effective? Why or why not?

2nd part is not as accurate because only brings up the idea of a "one way mirror" - doesn't link it back to how this is like the greenhouse effect, which is more about "trapping"
one is about "seeing" but the other is about "entering and not being able to exit"

How are you all today?
Drop a sticker/emoji here...



"I am Hungry!! I want to eat
me no lunch!! Help!! Thanks

