MAIN INDEX

Using an interdisciplanery MOOC to teach climate science and science communication to a global classroom Bärbel Winkler and John Cook

EGU 2019 – EOS7.1/CL3.16 – Monday April 8, 2019







2 minute madness



Two Minute Madness starts here!

Using an interdisciplanery MOOC to teach climate science and science communication to a global classroom

> Bärbel Winkler and John Cook EGU 2019 – EOS7.1/CL3.16 – Monday April 8, 2019

Skeptical Science



GEORGE MASON UNIVERSITY CENTER for CLIMATE CHANGE COMMUNICATION













2 minute madness





40.000+ participants from 180+ countries since 2015







2 minute madness



Massive Open Online Course



40.000+ participants from 180+ countries since 2015



60 lectures about climate science and debunking misconceptions



UQx DENIAL101x 1.2.3.1 Consensus of Papers





UQx DENIAL101x 1.2.4.1

Knowledge Base

Consensus





UQx DENIAL101x 3.3.3. Reinforcing feedback





2 minute madness



Massive **O**pen **O**nline Course



40 expert

interviews to

go along

with the

lectures

40.000+ participants from **180**+ countries since 2015

60 lectures

science and

debunking





UQx DENIAL101x 1.2.3.1 Consensus of Papers











UQx DENIAL101x 3.3.1.

The greenhouse effect

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JOx DENIAL 101x 3.3 Reinforcing feedback







2 minute madness

Massive

Open

Online

Course



Interactive Exercises which often trigger discussions in the forums

60 lectures about climate 40 expert science and interviews to debunking go along misconceptions with the lectures

40.000+

participants

from **180**+

countries

since 2015





UQx DENIAL101x 3.3.2. IOV DENIAL 101Y 1 2.4 Increasing greenhouse

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2 minute madness

Main slides



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Reinforcing feedbac



Lectures follow the Fact-Myth-Fallacy structure of effective

Massive **O**pen **O**nline Course



40.000+ participants from **180**+ countries since 2015

60 lectures about climate 40 expert science and interviews to debunking go along misconceptions with the









ION DENIAL 101x 3.3.1

The greenhouse effect





Reinforcing feedbac







2 minute madness

Main slides

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UOx DENIAL 101x 3.3.2 10x DENIAL 101x 1 2.4 Increasing greenhouse Knowledge Base offort Consensus

3 ELEMENTS TO AN EFFECTIVE DEBUNKING

FACT

Replace the myth with a factual alternative that meets all the causal requirements left by the myth. Ideally, the fact is more compelling and memorable than the myth.





3 ELEMENTS TO AN EFFECTIVE DEBUNKING

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MYTH/MISCONCEPTION

Mentioning the myth risks a familiarity backfire effect. Here are three techniques to reduce the risk of a backfire effect:

- Emphasise the fact rather than the myth
- Warn people before mentioning the myth
- Explain the myth's fallacy





2 minute	Main clida
madness	Ivialli silue



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FALLACY

Explain the technique used by the myth to distort the fact. This enables people to reconcile the fact with the myth.



















2 minute madness















See you at PICO-spot 04.10! Bärbel Winkler

Email: baerbelw@skepticalscience.com Web: https://www.skepticalscience.com Profile: http://sks.to/BaerbelW MOOC http://sks.to/denial101x





2 minute madness



Main presentation starts here

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Main Index

Click on the elements you'd like to know more about. This will take you to other slides with more details and some examples.

own classes.

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(cc)

Using MOOCs to Debunk Climate Misinformation in a Global Classroom

John Cook, George Mason University

Bärbel Winkler, Skeptical Science



MODCs Maksive Open Online Courses) are a powerful way to educate a large, dwires audience. The MODC Making Sense of Climitel Science Denoid psychological principies in videos debuiking the most common myths about climate change, As well as babut climate change, As well as the scheme, the course explains the and the most effective techniques for responding to misinformation. This interdiscipinary online course has had over \$5,000 enclimed students were secondary and tertiary enclimed students were secondary and tertiary own clisases.

MOOCs (Massive Open Online Courses) are a powerful way to educate a large, diverse audience. The MOOC "Making Sense of **Climate Science Denial**" applies misconception-based learning and psychological principles in videos debunking the most common myths about climate change. As well as teaching fundamental climate science, the course explains the psychology of climate science denial and the most effective techniques for responding to misinformation. This interdisciplinary online course has had over 40,000 enrolments from over 180 countries since April 2015. A number of enrolled students were secondary and tertiary educators, who adopted the course content in their own classes.

Back to

Overview





Main Index

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MOGCs Massive Open Online Courses) are a powerful way to educate a large, dwires audience. The MOGC Moking Sense of Climites Science Dendr psychological principies in videos debuiking the most common myths about climate change. As well as bout climate change. As well as tacking fundamental climate and the most effective techniques for enclimate science well 80 countries. A number of encliments from well 80 countries. A number of enclimate science well 80 countries. A number of enclimate science well 80 countries. A number of enclimate science well 80 countries. An umber of enclimate science well 80 countries. A number of enclimate science well 80 countries. And set and boundors, who adopted the course content in ther

About our MOOC

In public discussions, climate change is a highly controversial topic. However, in the scientific community, there is little controversy with 97% of climate scientists concluding humans are causing global warming.

Why the gap between the public and scientists?

- What are the psychological and social drivers of the rejection of the scientific consensus?
- How has climate denial influenced public perceptions and attitudes towards climate change?

This course examines the science of climate science denial.





Main Index Back to Overview



MCOCS Massive Open Online Courses are a overfluw two ted cates a large, diverse audience, overfluw two ted cates a large, diverse audience, the MCOC Making Sense of Climited Science Denoid openhological principles in videos debuilting the most common myths about climate change. As well as teaching fundamental climate clinice, the course explains the about climate change. As well as the climate of the climate and the most effective techniques for enclimate of the climate and over 35,000 enclimate of the climate of the climate and beaution to the climate of the climate enclimate of the climate of the climate and the most effective techniques for enclimate of the climate of the climate of the ancience of the climate of the climate of the ancience of the climate of the climate of the ancience of the climate of the climate of the ancience of the climate of the climate of the ancience of the climate of the climate of the ancience of the climate of the climate of the climate of the ancience of the climate of the climate of the climate of the ancience of the climate of the climate of the climate of the ancience of the climate of the climate of the climate of the ancience of the climate of the climate of the climate of the ancience of the climate of the climate of the climate of the ancience of the climate of the climate of the climate of the ancience of the climate of the climate of the climate of the ancience of the climate of the climate of the climate of the climate of the ancience of the climate of the climate of the climate of the climate of the ancience of the climate of the climate of the climate of the ancience of the climate of the climate of the climate of the ancience of the climate of the climate of the climate of the ancience of the climate of the climate of the climate of the climate of the ancience of the climate of the climate of the climate of the climate of the ancience of the climate of the climat

What Students learn

We look at the most common climate myths from "global warming stopped in 1998" to "global warming is caused by the sun" to "climate impacts are nothing to worry about".

Students learn both the science of climate change and the techniques used to distort the science. Finally, armed with all this knowledge, they learn the psychology of misinformation which will equip them to effectively respond to it.

With every myth debunked, students learn the critical thinking needed to identify the fallacies associated with the myth.





Main Index

Back to Overview



Students learn:

- How to recognise the social and psychological drivers of climate science denial
- How to better understand climate change: the evidence that it is happening, that humans are causing it and the potential impacts
- How to identify the techniques and fallacies that climate myths employ to distort climate science

Back to

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• How to effectively debunk climate misinformation



rful way to educate a large, diverse audience

he MOOC "Making Sense of Climate Science Denia

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Main Index	E O'
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Structure of an Effective Debunking All debunking lectures (see right for examples \odot

3 ELEMENTS TO AN EFFECTIVE DEBUNKING

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- Explain the myth's fallacy

FALLACY

enables people to reconcile









THE

GOLDEN

RULE OF





Main Index

Back to Overview









Fake experts are people who convey the appearance of expertise without possessing any actual relevant expertise.

Click for an example

The 5 techniques of science denial (FLICC)







Main Index





Logical fallacies are false arguments leading to an invalid conclusion. There are a number of different fallacies commonly found in deniers' arguments.

Click for an example

The 5 techniques of science denial (FLICC)







Main Index





Impossible expectations demand unrealistic standards of proof before acting on the science.



Click for an example



A

Main Index





Cherry picking involves focusing on select pieces of data while ignoring anything conflicting with the desired conclusion.

The 5 techniques of science denial (FLICC)

Click for an example



FLICC



Conspiracy theories are created when science deniers accuse the world's scientists of a massive, global conspiracy.

The 5 techniques of science denial (FLICC)





Click for an

example



Main Index



FACT

Between 90 and 100 % of climate experts agree that we are mostly responsible for current global warming.

MYTH

More than 31,000 scientists disagree with the consensus.

FALLACY

The myth relies on fake experts and a magnified minority. Just about 0.1 % of signees are actively publishing climate scientists while most of them work in other areas.







Minority

Magnified

Fake

Experts



Main Index

Back to

http://sks.to/consensus

Brian Angliss – Scholars & Rogues (2015)

We are causing global warming

FACT

Satellites measure the warming effect from CO2. The increased greenhouse effect is an observed reality. It was predicted before it could be measured.

MYTH

 CO_2 is a trace gas so it's warming effect is minimal.

FALLACY

The fact that CO2 is a trace gas is irrelevant to whether it can impact climate. Trace amounts of substances can have a strong effect.

Main Index

FLICC



Skeptical Science - https://skepticalscience.com/graphics.php?g307

http://sks.to/trace



Red Herring



Past and future climate change

FACT

In the 1970s, the majority of climate papers were predicting warming.

MYTH

In the 1970s, climate scientists were predicting an ice age.

FALLACY

Confuses mainstream media reports with scientific papers which overwhelmingly pointed towards warming.





Misrepre-

sentation



Main Index

Back to FLICC

http://sks.to/1970s



Past and future climate change

FACT

Past climate change tells us climate is sensitive to the warming effect of CO_2 .

MYTH

Natural climate change in the past implies current climate change is also natural.

FALLACY

Past climate change actually sends the opposite message than what the myth concludes.

Jumping to conclusions





Main Index

Back to FLICC

Humans have died

naturally in the past ...

http://sks.to/past



...so this death must be natural!

We are causing global warming

FACT

Ice cores tell us warming causes the ocean to emit more CO_2 . Combined with greenhouse effect, this is a reinforcing feedback.

MYTH

CO₂ lagging temperature means greenhouse effect is minimal.

FALLACY

It's not one or the other but both. CO_2 causes warming and warming causes CO_2 to rise.



Vostok Antarctic ice core records for carbon dioxide concentration (Petit 2000) and temperature change (Barnola 2003)



False

Dichotomy



Main Index

Back to

http://sks.to/lag



Past and future climate change

FACT

Models are based on fundamental physical principles.

MYTH Models are unreliable.

FALLACY No model is perfect but they are useful tools that can reproduce the past and provide insights into the future. **Expectations**



One of these panels shows observed weather (as estimated by Era-Interim); the other three weather simulated by three different climate models (HadGEM2, CCSM4, and MIROC5) - which is which? Click to find out! Video from Philip Brohan - https://vimeo.com/213117747



Impossible



Main Index

Back to **FLICC**

http://sks.to/model



We are causing global warming

FACT

The Sun has been getting colder for the last 30 years as the Earth has been warming. Sun and climate are moving in opposite directions.

MYTH

The sun is causing global warming.

FALLACY

Ignores human fingerprints and recent period where sun and climate move in opposite directions.



Skeptical Science - https://skepticalscience.com/graphics.php?g=5



Cherry-

picking



Main Index

Back to FLICC

http://sks.to/sun



Conspiracy Theory





"A paper came out in a journal which I suspect was created just so that they could publish this paper because no proper peer reviewed journal would have published it."

CHRISTOPHER MONCKTON

ERL has published more than 1,000 research papers since 2006
 Skeptical Science exists since 2007 and our consensus study (Cook et al.) was published in May 2013.

Main Index





"So they've said there's a consensus and of course they fiddled the consensus as well. A paper came out in a journal which I suspect was created just so that they could publish this paper because no proper peer-reviewed journal would ever have published it. And the paper claimed that 97% of nearly 12-thousand extracts from scientific papers supported the consensus that more than half the warming of the last sort of 50 years was caused by us. But in fact, a closer analysis of the paper shows, it wasn't 97 percent it was naught point 3 percent of the abstracts that actually agreed with their consensus."

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Main Index



Video Lectures Youtube videos (around 7 minutes long) explain he basics of climate science while debunking common myths about climate change.



Video lectures

60 Youtube videos explain the basics of climate science while debunking common myths about climate change.

Course Syllabus

WEEK 1: Understanding The Climate Controversy

We introduce the course content, interact with each other and complete an introductory survey. The week continues with an exploration of scientific consensus, the drivers and psychology of climate science denial and an overview of the controversy surrounding this topic.





Back to Overview





Course Syllabus - continued

WEEK 2: Global Warming Is Happening

We look at the indicators of global warming and myths related to temperature and glaciers.

WEEK 3: We Are Causing Gobal Warming

Week three focuses on the ways in which humans cause climate change and the myths associated with the greenhouse effect and the rise in carbon dioxide.

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Main Index	Back to
Main muex	Overviev



Video Lectures /outube videos (around 7 minutes long) explain he basics of climate science while debunking common myths about climate change.



Course Syllabus - continued

WEEK 4: The Past Tells Us About The Future

We look at the history of climate change in order to model future climate change. We also address myths related to models.

WEEK 5: We Are Feeling The Impacts Of Climate Change Week five covers climate feedbacks and the impacts of climate change on the environment, society and the weather.



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Main Index	Back to
Main muex	Overviev



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Main Index	Back to
Main muex	Overviev



/ideo Lectures os (around 7 minutes long) explai he basics of climate science while debunking



Course Syllabus - continued

WEEK 6 and 7: Responding to Denial

The final weeks of the course look more closely at the psychology of science denial and debunking techniques. We also complete a peer assessment that asks students to practice debunking strategies on real myths that can be found in today's media.

Bottom line

This isn't just a climate MOOC; it's a MOOC about how people think about climate change.

Back to





Main Index Overview

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Expert Interviews Interviews with leading scientists & communicators complement video lectures with more in-depth details.



Expert Interviews

40 interviews with leading scientists and communicators complement video lectures with more in-depth details.

All videos are available on Wakelet http://sks.to/denial101xexperts

WEEK 1 - Understanding The Climate Controversy









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Main Index	Back
Main muex	Overv



Expert Interviews

Interviews with leading scientists & communicators complement video lectures with more in-depth details.



Expert Interviews - continued WEEK 2 – Global warming is happening















WEEK 3 – We are causing global warming



Expert Interviews

Interviews with leading scientists & communicators complement video lectures with more in-depth details.













WEEK 5 – We are feeling the impacts of climate change



Expert Interviews

Interviews with leading scientists & communicators complement video lectures with more in-depth details.



Expert Interviews - continued WEEK 6 – Responding to Denial











All expert interviews are available as a collection on Wakelet http://sks.to/denial101xexperts





Main Index

Back to Overview



Interactive Exercises Online activities allow students to interact directly with climate and psychological data.



Interactive Exercises

Online activities allow students to interact directly with climate and psychological data.

"Where do you fit?"

Students are asked to fill out a short 8-question survey and can then discuss where they fall in a simple worldview grid.

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Main Index

Back to Overview



Interactive Exercises Online activities allow students to interact directly with climate and psychological data.



Interactive Exercises

"Why is climate change so controversial?"

Students are asked to provide the first word which comes to mind and a wordcloud is generated from their responses.



Interactive Exercises Online activities allow students to interact directly with climate and psychological data.



Interactive Exercises - continued

"Check your understanding: Temperature record" Students are asked to work with temperature data and do some calculations. The tool is also available at http://sks.to/temptool







Main Index

Back to Overview



http://sks.to/fmf

Global warming is happening

FACT	MYTH	FALLACY	VIDEO				
Our planet has continued to build up heat since 1998 - global warming is still happening.	" <u>Global warming stopped in 1998.</u> "	Cherry picking Looking at one region or a short period ignores the full picture.	UQx DENIAL101x 2.2.1.1 Heat Buil 🔇 A				
Global warming is like rigging the weather dice, making it more likely to get hot days.	"It's cold outside, so global warming must have stopped."	Impossible Expectations Global warming doesn't mean no more cold weather, just fewer cold days compared to hot days.	UQx DENIAL101x 2.2.2.1 Hot recor \checkmark				
Overall, glaciers across the globe are shrinking at an accelerating rate,	"Glaciers around the world are increasing, disproving global	Cherry picking Picking a handful of growing	UQx DENIAL101x 2.3.1.1 Shrinking 🕓 🍌				
threatening water supplies for millions of people.	Main Ind	glaciers ignores the vast major ty of glaciers that are shrinking. Overview					

http://sks.to/fmf-slides



Massive open online course (MOOC) Denial101x

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Courses - Programs - Schools & Partners About -

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BaerbelW •

Home > All Subjects > Communication > Making Sense of Climate Science Denial



Making Sense of Climate Science Denial

Climate change is real, so why the controversy and debate? Learn to make sense of the science and to respond to climate change denial.

Enroll Now

Self-Paced

I would like to receive email from The University of Queensland and learn about other offerings related to Making Sense of Climate Science Denial.

THE UNIVERSITY OF QUEENSLAND Current self-paced run will be open until

About this course

December 17, 2019

In public discussions, climate change is a highly controversial topic. However, in the scientific community, there is little controvers with second control of the scientist second on the scientific second of the scientist second of the scientific global warming.

- Why the gap between the public and scientists?
- What are the psychological and social drivers of the rejection of the scientific consensus?
- How has climate denial influenced public perceptions and attitudes towards climate change?

This course examines the science of climate science denial.

We will look at the most common climate myths from "global warming stopped in 1998" to "global warming is caused by the sun" to "climate impacts are nothing to worry about."



lessons are to be learnt from past climate change as will as bet and kstan how dict future climate impacts. Wi Beach both the stience of climate change and the techniques used to distort the science.

Length:	7 weeks
Effort:	2 to 4 hours per week
Price:	FREE Add a Verified Certificate for \$49 USD
Institution:	UQx
Subject:	Communication
Level:	Introductory
Language:	English
Video Transcripts:	English
	Length: Effort: Price: Institution: Subject: Level: Language: Video Transcripts:



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Skeptical Science



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John Cook

Center for Climate Change Communication George Mason University



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MOOC http://bit.ly/Denial101x







Resources & References

The Debunking Handbook: http://sks.to/debunk

Cook, J., Lewandowsky, S., & Ecker, U. (2017). Neutralizing misinformation through inoculation: Exposing misleading argumentation techniques reduces their influence. PLoS ONE, 12(5): e0175799. https://doi.org/10.1371/journal.pone.0175799

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