Making Sense of Climate Science Denial

DENIAL101x

Course Report 2015

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Introduction

DENIAL101x: Making Sense of Climate Science Denial is an introductory level course led by John Cook, Climate Communication Fellow for the Global Change Institute at The University of Queensland. In DENIAL101x, students are presented with 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 social science of how people think about climate change.

With every myth that the lectures debunk, students learn the critical thinking needed to identify the fallacies associated with the myth. Finally, armed with all this knowledge, students learn the psychology of misinformation. This will equip students to effectively respond to climate misinformation and debunk myths.

DENIAL101x was offered as a UQx course on edX in April-June 2015. The course was led by John Cook and lectures were provided by a team of experts from the UK, Canada and the US. Discussion forum moderation was provided by volunteers from the Skeptical Science website as well as members of the course team.

Course Information

Overview

Registration Open: 16 September 2014
Launch Date: 28 April 2015
Close Date: 16 June 2015

Report Generated: 30 July 2015
Course Length: 7 weeks

Estimated Time: 2-4 hours per week
Languages Offered: English

Pre-requisites

None.
Course Team

John Cook
Climate Communication Fellow for the Global Change Institute
University of Queensland

Daniel Bedford
Professor of Physical Geography and Climate Science
Weber State University, Utah

Gavin Cawley
Senior Lecturer in Computing Sciences
University of East Anglia

Kevin Cowtan
Research Fellow, Department of Chemistry
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Sarah A. Green
Professor of Chemistry
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PhD Student, Department of Environmental Science and Policy
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Scott Mandia
Professor of Earth and Space Sciences and Assistant Chair of the Physical Sciences Department
Suffolk County Community College, New York

Dana Nuccitelli
Environmental Scientist
Skeptical Science

Mark Richardson
Researcher
University of Reading, Currently at NASA JPL

Keah Schuenemann
Meteorology Professor
Metropolitan State University of Denver

Andy Skuce
Independent Geoscience Consultant
Skeptical Science

Robert Way
PhD Candidate in the Department of Geography
University of Ottawa, Canada

Ove Hoegh-Guldberg
Director of the Global Change Institute (GCI) and Professor of Marine Science
University of Queensland in Brisbane, Australia
Course Structure

Figure 1. Course Structure. This course structure graphic highlights the course components in the order that they appear in the course. (This graphic is adapted from the MITx Course Reports.)

Unique Structures

This course followed a similar pattern each week that mixed videos with polls, brief quizzes, timelines, discussion forums and other activities. Each subsection of lectures was followed by compilation videos of interviews with experts talking about topics covered in that subsection. This not only added to the credibility of the course, but it also allowed students to further their understanding of course concepts.
Learning Objectives

The learning objectives for DENIAL101x state that students will 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
- How to effectively debunk climate misinformation

Other uses of the course

Introduce psychological research and principles of evidence-based science communication to the education and physical science community.
Course Demographics

Total Registrations

16,861 students.

Figure 2. Registrations. Red line represents cumulative number of enrolments, grey line represents daily number of enrolments.

UQx Course Registration Comparison

Figure 3. Registration Comparison, as of 30 July 2015.
Enrolment Types

Figure 4. Enrolment Types. Two types of enrolment pathways (and associated certificates) are offered through edX. These are honor certificates (which are free and awarded if the student passes assessment), and verified certificates (there is cost associated with verifying that the student is who they say they are).
Student Demographics

Certified students are students who earned a certificate.

Gender Distribution

![Gender Distribution Chart](image)

Figure 5. Gender Distribution

Age Distribution

![Age Distribution Chart](image)

Figure 6. Age Distribution
### Education Distribution

**Figure 7.** Education Distribution

- **Unspecified**: 1654/62
- **Other**: 307/16
- **Doctorate**: 1453/122, (4616/320)
- **Masters**: (4978/307)
- **Bachelor**: (716/46)
- **Associate**: (1997/84)
- **High S.**: (163/4)
- **Middle S.**: (15/1)
- **Primary S.**: (15/1)
Country Distribution

United States (6201 registrations)
Australia (2443 registrations)
United Kingdom (1147 registrations)
Canada (842 registrations)

India (395 registrations)
Germany (292 registrations)
France (210 registrations)
Netherlands (192 registrations)

New Zealand (186 registrations)
Brazil (171 registrations)

Figure 8. Country Distribution (per enrolment) 160 countries with registered users
Course Activity

Student Progress and Certificates

Figure 9. Student Progress and Certificates

Registered: Registered for course but did not access any content.

Viewed: Anyone who accessed the 'Courseware' tab (the home of the videos, problem sets, and assessment) within the edX platform for the course. Note that there exist course materials outside of the 'Courseware' tab, such as the Syllabus or the Discussion forums.

Explored: Anyone who accessed at least half of the chapters in the courseware (chapters are the highest level on the "courseware" menu housing course content).

Certified: Anyone who earned a certificate.
Active Days

Figure 10. Activity over days. An ‘active day’ is one on which a student accessed the course and spent any time engaged with it.
Last Activity Over Days

![Graph showing last activity over days]

**Figure 11.** Last activity over days. This graph represents the last interaction with the course by each student. The black line represents the number of students whose last event was on that day (Left Y axis) and the red line represents the number of total students who were still interacting with the course on that day (Right Y axis).

### Interesting Activity Patterns

During the course, the University of Queensland Sustainability Club organized and hosted a weekly screening of each week’s video lectures, with questions and discussions between the audience and course team leader John Cook. This proved to be an enjoyable and stimulating period leading to many thought-provoking discussions about the lecture content.

A small number of climate science deniers enrolled in the course and posted denialist arguments in the MOOC forum. This provided an opportunity for other students to identify the fallacies in their arguments, thus putting into practice the course lectures.

One of the more vigorous student discussions on the forum arose from the lecture on political ideology and the survey instruments used to measure ideology. This was sparked by an interactive survey where students filled out an 8-item survey, then their political ideology was plotted amongst a cloud of other students.

### Special aspects of the course

This course included A/B testing in Weeks 2-5. This A/B testing presented different groups of students with one of two versions of one lecture in the week. One lecture began with a myth and then covered the fact; the other video started with the fact and
then addressed the myth. The results of this data will be combined with additional survey data to determine more effective formats for refuting myths or misconceptions. Some of the additional survey data include pre-course and post-course surveys measuring acceptance that climate change is happening, acceptance of human-caused global warming and belief in the severity of climate impacts.

**Discussion Posts Evaluation**

![Figure 12. Discussion posts per enrolment type](image)

Figure 12. Discussion posts per enrolment type
Course Evaluation Findings

What We Learned

Elements of the course that received the strongest feedback from students were:

- Psychology lectures, with a number of students requesting more psychology content be included in future iterations. In particular, the FLICC framework mapping denialist characteristics and the Fact-Myth-Fallacy structure for debunking received enthusiastic feedback and is already been adopted by educators and communicators.

- Expert interviews offered both high quality content and unique insights into the research and lives of leading experts researching climate change. Scientists’ personal accounts of the attacks they receive from deniers made a strong impression on students.

- Interactive features such as the political ideology graph and the temperature record tool.

A number of students reported being educators (at high school or university) and already adopting our content in their classrooms, or redesigning their lectures based on the psychological research presented in week 6.

A number of students commented that insufficient time was allocated for the final assignment (students had one week to watch the week 6 lectures then submit a 300 to 500 word debunking.

The feedback received from students will impact future course design.

Plans for the Future

After the course closed, some elements of the course were revised or updated and then the course was reopened as a self-paced course.

Teachers who enrolled in the course and reported using our content will be contacted to learn how they’re using the content and how the course content could be better designed for use in the classroom.

Students also struggled with identifying fallacies in false arguments. More time would be spent explaining fallacies, plus giving students more opportunities to practice identifying fallacies in interactive exercises.

Given the popularity of the interactive political ideology graph, a powerful addition would be further interactive visualisations of student beliefs to reinforce lectures about psychological research. For example, plotting political ideology versus climate beliefs, or visualising change in belief from the pre-course to post-course survey.