



HYPER-FLIPPED CLASSROOM – PERSONALIZED ON-LINE EDUCATION IN THE COVID-19 PANDEMIC

OSUN Connected Learning Contest Winner

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Course: Climate Change

The following excerpt from my modified syllabus for NATS 150 Climate change is not a single lesson, but rather an approach to making a discussion-oriented class work in a virtual environment. Each week was scheduled as follows:

Tuesday: a seminar-styled, on-line class, largely consisting of student-led discussion on the topic of the week. Four samples are listed below. “One-pager” essays were due the previous Friday, although I gave students more time, usually until Sunday late evening. I read papers Friday and Sunday, and sent the students critiques as well as asking them to lead portions of the discussion the following Tuesday.

During the week: Asynchronous availability, synchronous informal discussion sessions, and two labs: A “lab” where the students began work on a solar cooker in order to both learn about factors affecting how much heat the sun generates on earth (varying albedo and how much sunlight is captured) and about developments from south Asia, and an interactive computer lab where the students worked on a socially just approach to mitigating climate change with the widely-used¹ climate simulator En-ROADS (<https://www.climateinteractive.org/tools/en-roads/>).

We (students and I) discussed their writing on Google docs and via email and were asked to present selected portions of their work the following Tuesday.

Climate change (NATS 150)

This course examines the science of the Earth’s climate, with a focus on understanding the recent scientific realization that human activity could be changing it in profound ways. Topics include solar radiation, the carbon cycle, greenhouse gases, measuring the climate of

the past, and predicting the climate of the future. We will also discuss ways that humans might lessen or correct their impact on the climate. The course is designed to be suitable for all students, regardless of previous science background.

Practical and pedagogical value

The success of this extended activity was based on a high level of interactivity, using students to lead discussions, and giving them the confidence and support to do so.

This approach seemed to excite most of the students, including some who had been quieter in regular, in-person classes. I plan to use similar ideas as part of future “general education” introductory science classes, whether in-person or on-line. This approach can be used across the OSUN network with some attention to time zones.

The assignment

Four sample topics.

1. **Due 3 April.** Read one of the following and write a “one-pager” summary and critique.

a. Belay A et al., "Smallholder farmers' adaptation to climate change ... [farming in Ethiopia] . Available at

<https://agricultureandfoodsecurity.biomedcentral.com/articles/10.1186/s40066-017-0100-1>.

b. "The world wants air-conditioning" [cheaper or more efficient air conditioners, a focus on India]. Available at

<https://www.nytimes.com/2018/05/15/climate/air-conditioning.html>.

c. McQuaid, K et al., "Urban climate change" [Uganda] Available at

<https://www.cambridge.org/core/services/aop-cambridge-core/content/view/F0A0189F8EB3E6616AED6BBEA91178DF/S0001972017000547a.pdf/urban-climate-change-livelihood-vulnerability-and-narratives-of-generational-responsibility-in-jinja-uganda.pdf>.

d. Popovich, N and B Plumer “How Does Your State Make Electricity?”.

Available at

<https://www.nytimes.com/interactive/2020/10/28/climate/how-electricity-generation-changed-in-your-state-election.html>

[We were thus able to discuss several articles in one class.]

2. **Due 10 April.** Find an article on melting ice sheets, and write a “one-pager” summary and critique. Evaluate the credibility of the source and article? Does melting of ice sheets represent a tipping point? **Note the date of the article so we can see how the science evolved.** [Addresses assessing credibility of what you read, as well as the science itself.]
3. **Due 17 April.** Write a position paper on nuclear power. Pro or con – should we use nuclear power to reduce our carbon footprint? Note that the share of total energy production which is nuclear varies widely among countries (e.g. M. Ripani, Energy from nuclear fission, EPJ Web Conf. 189 00013 (2018). DOI: 10.1051/epjconf/201818900013. Available at https://www.researchgate.net/publication/328024867_Energy_from_nuclear_fission/figures?lo=1.) **Note.** First of two debates. Student were split on the use of nuclear power.
4. **Due 24 April.** Write a position paper (pro or con) on geo-engineering as an interim step in mitigating climate change. (Read and cite appropriate sources. Be prepared to defend your choices.) **Note.** Most students favored afforestation and similar “natural” approaches but were opposed to modifying the albedo of the upper atmosphere.

¹“En-ROADS is a transparent, freely-available policy simulation model that provides policymakers, educators, businesses, the media, and the public with the ability to explore, for themselves, the likely consequences of energy, economic growth, land use, and other policies and uncertainties, with the goal of improving their understanding. The simulation, developed by Climate Interactive, Ventana Systems, and MIT Sloan, runs on an ordinary laptop in a fraction of a second, is available online, offers an intuitive interface, has been carefully grounded in the best available science, and has been calibrated against a wide range of existing integrated assessment, climate and energy models.

“A wide range of people have used En-ROADS, including members of the U.S. Congress, HSBC bank, the Hewlett Foundation, local community groups, the UN Secretary-General’s Office, university professors around the world, leading science educator Bill Nye, and many others.” (<https://www.climateinteractive.org/tools/en-roads/>).