Course Schedule

8:30-4:00 with 30 min lunch; 2--15 min breaks

8:30-9:00 Badging

9-10 Georgia & Peggy: Intros; learner hat; collegial versus congenial research by Tamara Homeland (WSU); norms--how to work collaboratively; no dumb questions

Bio break

Intro (starting at ~10:15)

* Remind teachers to ask a lot of questions, especially if we miss glazed over looks
* T-charts on wall related to 4 topics; goal understand teacher starting point about climate
  + What would you like to get out of workshop?
  + Do you have any specific/general questions about climate?
  + Do you ever get the question and how do you answer as an earth science teacher: “Do you believe in climate change?”
* Radiation (Radiation drives climate; intuitive feel for IR and vis; exposure to solar/terrestrial blackbody curves)
  + (Laura) Introduce blackbody curve picture in a discussion setting
  + John--satellite IR/Vis
  + (John) Iron/IR thermometer/Edison-bulb
  + IR thermometer walk--set them up to collect data in some kind. Set up a chart ahead of time.
  + Phenomenological discussion activity - think of a phenomenon you have experienced that is relevant to what we are learning about radiation
    - Does this segment give you new understanding of that phenomenon?
    - **e.g., Colder/warmer nights with cloud cover; humidity (water vapor)**
    - **e.g., Snow overcast--inversion**
    - **e.g., car outside on clear winter night -- window(s) on tree/house side won’t frost (sky side will) because tree/house is radiating**
    - **[...]**
  + Science behind blackbody curve figure (John will put together PPT) of Blackbody radiation
* Tour: Atmospheric Measurements (this could be on Monday or Tuesday, depending on what works better in the schedule)
  + Homemade radiometer
  + AML tour
* Energy Balance (greenhouse gasses are selective absorbers; forcings and feedbacks)
  + Greenhouse gas/Trenberth figure?
  + Phet simulation with lesson plan from online
    - <https://phet.colorado.edu/services/download-servlet?filename=%2Factivities%2F4038%2Fphet-contribution-4038-7300.pdf>
  + Phenomenological discussion
    - Analogy with visible: Discussion of visible (color absorption, semi transparent, etc)
    - Inside your car--don’t leave your car/baby inside the backseat
  + Greenhouse gas selective absorption (different wavelengths of radiation interact with matter differently
  + (Laura) Simple energy balance simulation
  + Science behind Energy balance (Laura PPT?)
    - Arrhenius paper--we have understood CO2 absorbs
    - Return to Trenberth figure--global average
* Climate Model
  + Weather Experience Discussion Activity--pair and share/turn and talk--each teacher describes weather experience; as a group we then talk about how those weather experiences are related to climate patterns; analogy of boiling water pot
  + Return to satellite data to describe local patterns?
  + Talk about how patterns will change in a warmer climate. Robust patterns include:
    - Warmer atmosphere → moister atmosphere
    - Sea level rise from thermal expansion of ocean and melting ice
    - etc
  + Visualization of global changes/climate model output
    - Questions about a climate model on a computer
    - NASA movies
* Impacts/Mitigation
  + Prep for Ian’s visit
  + (Laura) Talk from Ian--integrated assessment models; regional stakeholders; emissions scenario
  + (Laura) Multiple simulations/computer activities for teachers to choose from
    - WEDGES--STEMSCOPE

Miscellaneous Notes:

A lot of science is learning how to see things you can’t see

Activities:

* AML tour
* IR thermometer during walk

1. Radiation
2. Greenhouse Gas
3. Climate Modeling
   1. How do we use climate modeling?
4. Impacts/Mitigation

Tchart--what do i know, what do I want to find out

What do i currently teach?

What are you confused about?

\*Walk and Talk

Regional Climate?

4 Goals:

* Exposure to climate research
* Deeper understanding of content knowledge
* Access to resources
* Feedback/sharing on curriculum (Chiawana, Kennewick alternative, Walla Walla, )

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**Props**

Edison bulb, with rheostat

clothes iron

parabolic radiant heater

FLIR-60

hand-held IRT

Kestrel

**Handouts**

Blackbody radiation graph

Electromagnetic spectrum diagram (properties vs. wavelength)

IR thermometer/imager walkabout worksheet

- what is the hottest object you can find (and it's temperature)?

- what is the coldest object you can find (and it's temperature)?

Trenberth diagram

PhET simulation worksheet

**Send by email**

list of links and resources