Monday Morning

8:00 – 8:30 Breakfast

8:30 – 9:15 Course Overview and Pre-Test

- Introductions / Teachers / Course presenters (10 minutes), then photo (5 minutes)
- Overview of course structure / assignment / credit / instructional approach (5 Es) / mixing / question and suggestion box / ducks (Brian, Sheila, Nisse — 10 minutes)
- Practical details: stipends, meals, bathrooms, etc. (Melissa – 5 minutes)
- Pre-test (10 minutes)
- Overview of syllabus (Scott – 10 minutes)

Energy & Radiation

9:15 – 9:45 Engage / Explore / Explain (LSOP)

- Forms of energy / Energy toys
- Energy transfers & transformations
- Conservation of energy

9:45 – 10:00 Break - Ask for commitment for New Belgium

10:00 – 11:00 Engage / Explore / Explain (LSOP)

- Hot objects emit radiation: Feel the Heat
- Thermal radiation: Demonstrations
- Thermal radiation: Using to measure temperature
- Radiation as a means of energy transfer: Thermal images
- Radiation as a means of energy transfer: Color and cooling

11:00 – 11:45 Extend (Scott)

- Follow the Energy
- Planetary Energy Balance

11:45 – 12:00 Evaluate: Cubes

12:00 – 12:45 Lunch

Monday Afternoon

Radiation and Seasons

12:45 – 1:00 Different Voices

- Cubes—Connections to Culture (Melissa)

1:00 – 2:00 Engage / Explore / Explain (LSOP)

- Rainbow glasses (spectrum), rainbow glasses and filters (transmission / absorption)
- Sunset eggs
- Near IR goggles
- Near infrared vs. thermal
- Writing with light
- Sunburn beads
- Spectrum recap: Infrared Insects: Filters, different bulbs

2:00 – 3:15 Explain (Scott)

- Electromagnetic waves & energy
- Spectrum of emitted radiation
- *Activity: Seasonal variations (Kinesthetic activity, with LSOP)*
- Angles, gradients and seasons

3:15 – 3:30 Break & Diversity Discussion

3:30 – 4:15 Extend (Melissa)

- Angle variation with insects (with LSOP)
- Solar cells and basketball / measure current vs. angle, see how angle affects current.
- Peak of radiation vs. Peak of temperature

4:15 – 4:30 Evaluate (Cubes & Questions on Board)

Evening Tie Dye at Brian's Place

Tuesday Morning

Pressure, Density, Temperature, Buoyancy

8:00 – 8:30 Breakfast

8:30 Answer Questions

8:30 – 9:30 Engage & Explore (LSOP)

- Weighing air
- Pouring air
- Ideal gas laws (Molecules in a box)
- Marshmallow masher
- Peep poofer
- Temperature changes on compression / expansion

9:30 – 10:45 Explain (Scott)

- Gas laws, buoyancy
- Temperature structure of the atmosphere
- Parcels & the environment
- *Activity: Launch hot air balloon (with LSOP)*
- *Activity: Tipping point (with LSOP)*
- Lapse rates & stability

10:45 – 11:00 Break

11:00 – 12:00 Extend / Evaluate (James)

- Temperature profiles of the atmosphere, and consequences for the weather
- Matching graphs and pictures

12:00 – 12:45 Lunch & Discussion of Wednesday's Diversity Activity

Tuesday Afternoon

Phases of Water, Latent Heat, and Clouds

12:45 – 1:00 Different Voices

- Quotes (Melissa)

1:00 – 2:00 Engage & Explore (LSOP)

- Transferring energy with water vapor
- Transpiration (fish tank over grass)
- Heat packs
- Supercooled water
- Cloud in a bottle
- Vapor pressure, "Why can hot air hold more moisture than cold?"
- Hand boiler

2:00 – 2:45 Explain (Scott)

- Phases of water & latent heat
- Saturation, relative humidity, dew point
- Fog and clouds
- *Activity: Liquid Nitrogen Ice Cream*

2:45 – 3:00 Break

3:00 – 3:30 More Explain...

- Moist vs. dry lapse rates and vertical motion
- Conditional stability

3:30 – 4:15 Extend (Melissa)

- Moisture in the air / Evaporative cooling / relative humidity / dew point

4:15 – 4:30 Evaluate (Clouds in a glass of beer)

Evening New Belgium Tour

Wednesday Morning

Convection and Precipitation

8:00 – 8:30 Breakfast

8:30 – 9:30 Balloon Launch

- Describe and launch balloon
- *Explorations:* Thomas Birner - discovery of the stratosphere.
- As the balloon rises, we'll watch data come in. It will keep going… We'll analyze the data later.

9:30 – 10:00 Engage & Explore (LSOP)

- Why are clouds white?
- Wax block mystery
- Terminal velocity vs. water drop size (Rain drops)
- Convection and convection cells / cloud in bottle with laser slice

10:00 – 10:15 Break

10:15 – 11:00 Explain (Scott)

- Precipitation processes
- Structure of clouds
- Rain and storms

11:00 – 11:45 Extend (James)

- Analyzing data from balloon / also Denver.

11:45 – 12:00 Evaluate

12:00 – 12:45 Lunch

Wednesday Afternoon

Forces and Winds

12:45 – 1:00 Different Voices

- Weather, climate, place.

1:00 – 1:30 Explore (LSOP)

- Friction tug of war
- Forces in circular motion (Coriolis circle, waiter's tray)
- Angular momentum (Hoberman spheres)

1:30 – 3:00 Explain (Scott)

- Pressure gradient, gravity, friction
- Forces due to the earth's rotation
- *Activity:* Force Balance (with LSOP)
- *Activity*: Force Balance Line Dance (with LSOP)
- *Activity:* People in circles / high and low pressure centers. (with LSOP)
- Balances: Hydrostatic, geostrophic, gradient
- Flows around highs and lows at the surface and aloft

3:00 – 3:15 Break

3:15 – 4:15 Extend (Dan)

- Force balance diagram—do resulting winds.

4:15 – 4:30 Evaluate (Cubes)

Evening Lagoon Concert

Thursday Morning

Rotation and Global Circulation

8:00 – 8:30 Breakfast

8:30 – 9:15 Explain (Scott)

- Review ideas of the poleward energy transport and the forces due to the earth's rotation
- How the rotation of the earth affects the motion of air, water and energy in the atmosphere

9:15 – 10:00 Extend (LSOP)

- We'll see these ideas in action by looking at the motion of fluids in a spinning tank.

10:00 – 10:15 Break

10:15 – 10:45 Explain (Scott)

- How the motion of air, water and energy in the atmosphere explains the earth's climate zones

10:45 – 11:30 Extend (Dan)

- Go over principles: Do a practice wind sheet, do resulting winds in north and south. Do pressure bands on world map, where you get convergence and divergence. See how this leads to climate zones.

11:30 – 11:45 Evaluate (Cubes)

11:45 – 12:30 Lunch

Thursday Afternoon

Fronts and Storms

12:30 – 1:00 Explorations

- Thomas Birner: Discovery of the tradewinds

1:00 – 1:15 Engage & Explore (LSOP)

- Warm and cold fronts activity

1:15 – 2:00 Explain (Scott)

- Temperature gradients
- Life cycle of a midlatitude cyclone
- Convergence and divergence

2:00 – 2:15 Break

2:15 – 2:30 Weather Stories

- What examples of extreme weather had you seen?

2:30 – 3:15 Explain (Scott)

- Warm and cold advection
- Cold and warm fronts

3:15 – 4:15 Extend (Kate)

- Weather map: Find lows and highs, find warm and cold front.

4:15 – 4:30 Evaluate (Cubes)

Evening LSOP Tour

Friday Morning

Climate Change & Global Warming, Impacts, Mitigation

8:00 – 8:30 Breakfast

8:30 – 9:30 Engage & Explore (LSOP)

- Why CO_2?
- Radiative transfer and layers of the atmosphere
- Making a model
- Feedback tracks

9:30 – 10:45 Explain (Scott)

- Simple physics of increased CO_2
- Positive and negative feedbacks
- Climate observations
- *Activity:* Weather vs. Climate (candy) (with LSOP)
- *Activity:* Weather vs. Climate (chaos) (with LSOP)
- *Activity:* Chaotic pendulum (with LSOP)
- Climate models
- Climate predictions
- Dealing with skeptics

10:45 – 11:00 Break

11:00 – 11:45 Extend (Kate)

- Simple climate model

11:45 – 12:00 Evaluate (Post Test)

12:00 – 12:45 Lunch

Friday Afternoon

Mitigating and Adapting to Climate Change

12:45 – 1:00 Different Voices

- Diversity activity (Melissa)

1:00 – 1:15 Engage & Explore (LSOP)

- How much energy things use
- Energy & efficiency

1:15 – 2:00 Explain

- Carbon cycle and greenhouse gases
- Economics of energy and CO_2
- Alternative energy and energy conservation

2:00 – 2:45 Extend (LSOP)

- Carbon mitigation initiative activity

2:45 – 3:00 Cups, Cake, Goodbye