Topics for lessons are on each table. Please sit at a table with a topic for which you could see yourself designing a lesson in an entry-level course.

• Climate change
• Earth resources
• Earthquakes
• Geochemical cycling
• Mass extinctions

• Formation/age of the Earth
• Thunderstorms
• River floods
• Mountain belts
• Planets
Lesson Design: Preparing for a Class Period
Rachel Beane, Josh Galster and Cynthia Hall
With material from Heather Macdonald and David McConnell

• Elements of lesson design
• Lesson planning activity
• Framework for review
What did your favorite teachers include in their lessons that helped you learn?
One Approach to Lesson Design

Frame the lesson
- Importance
- Prior knowledge
- Goals

Student Activity
- Promotes learning
- Peer interaction
- Time needed?

Assessment
- Learning goals met?

Organize Lesson
- Outline & review lesson
- Prepare slides & materials
- Practice

Student Reflection
- Opportunity to think about their learning
1. Start your planning

- **Importance**: Why should students care?

- **Prior knowledge**: What knowledge do students bring to this lesson (from this course and from other experiences)?

- **Goals**: What should students know/be able to do by the end of the lesson?
## Example verbs for writing lesson goals
*(Students will be able to...)*

<table>
<thead>
<tr>
<th>Knowledge Dimension</th>
<th>Cognitive Dimension (version of Bloom’s Taxonomy)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Remember</td>
</tr>
<tr>
<td>Facts</td>
<td>list</td>
</tr>
<tr>
<td>Concepts</td>
<td>recall</td>
</tr>
<tr>
<td>Processes</td>
<td>outline</td>
</tr>
<tr>
<td>Procedures</td>
<td>reproduce</td>
</tr>
<tr>
<td>Principles</td>
<td>state</td>
</tr>
<tr>
<td>Metacognitive</td>
<td>use</td>
</tr>
</tbody>
</table>

2. Continue your planning

- What **activities** will be in your lesson?
- How will you **assess** student learning?
Examples of Interactive Activities

• Project
• Gallery Walk
• Think-pair-share
• Lecture Tutorial
• Debate
• Jigsaw
• Concept Map
• Discussion
• ConcepTest (group)
• ...

http://serc.carleton.edu/NAGTWorkshops/earlycareer/teaching/toolkit.html
3. Outline your lesson

• Beginning – “Hook”

• Middle – interactive activity

• End – students discuss/synthesize/reflect
4. Review your lesson plan

Will students/learners...

– see a clear framework?
– use & be assessed on prior knowledge?
– investigate/explore science through an activity?
– interact with each other?
– reflect on their learning?
– be listened to and responded to?
Review your lesson plan

• Is the **framework** clear to students?  
  *(Question of day, outline, learning outcomes, concept map ...)*

• Does the lesson use/assess **prior knowledge**?  
  *(brainstorm, everyday experiences, ConcepTest, previous lessons ...)*

• Is there an **activity** that allows students to explore or investigate?  
  *(predict, hypothesize, assess, represent/interpret data...)*

• Will students **Interact with each other** about course content?  
  *(Think-pair-share, gallery walk, jigsaw ...)*

• Are students asked to **reflect** on their learning?  
  *(minute paper, concept map, how do you know? ...)*

• Will you have an opportunity to **listen & respond**?  
  *(question-response, listening to discussions, ConceptTests ...)*
Class Prep as the Blob

• Class prep will expand to fill whatever time you allow it: one more image, one more example...
  – Limit prep to a set time.

• Try not to over-prepare: have confidence!
  – Allows for creative class discussions and unexpected directions
    – Including interactive exercises easier than lecturing

• Powerpoint is not always your friend
Sample lecture notes on surface runoff

- Runoff vs. infiltration over time curves: when does runoff happen?
- Infiltration rates constant?

- Runoff
- Infiltration
- Throughflow
- Baseflow

- Factors affecting permeability
  - AMC
  - Time since last rainfall, Frozen ground, Clays, Vegetation, Fires, Slope, Hydrophilic substances (fire, clays)

- Sheetwash/overland flow
- Rills
- Channelized flow

- Erosion: movement of material
  - Bed Shear stress depends on depth and slope
  - \( \tau = \rho ghS \)

- Positive feedback cycle of channel development
- Discharge: volume per time
- Different ways to measure discharge
  - \( A \times V = Q \)
  - Velocity profile (0.6 * d)

- Smaller and smaller boxes
- Hydrograph: depth or discharge over time
  - Basic hydrograph and rain
  - Lag time, Precip
  - Baseflow
    - Rising limb
    - Falling limb
    - Groundwater recession (linear portion of hydrograph)

- Effect of land use change
- Baseflow and peakflow
5’ Paper: Reflecting on Lesson Design

• What is the most important concept that you learned?

• What aspect of this session was most helpful for your learning?

• How will you approach planning for your next class?