Lesson Design: Preparing for a Class Period
Cynthia Hall and Josh Galster
With material from Rachel Beane, Heather Macdonald, & 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>Cognitive Dimension (version of Bloom’s Taxonomy)</th>
<th>Knowledge Dimension</th>
<th>Facts</th>
<th>Concepts</th>
<th>Processes</th>
<th>Procedures</th>
<th>Principles</th>
<th>Metacognitive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remember</td>
<td>list</td>
<td>recall</td>
<td>outline</td>
<td>diagram</td>
<td>reproduce</td>
<td>state</td>
<td>use</td>
</tr>
<tr>
<td>Understand</td>
<td>paraphrase</td>
<td>explain</td>
<td>contrast</td>
<td>defend</td>
<td>give an example</td>
<td>convert</td>
<td>interpret</td>
</tr>
<tr>
<td>Apply</td>
<td>classify</td>
<td>demonstrate</td>
<td>identify</td>
<td>critique</td>
<td>relate</td>
<td>solve</td>
<td>discover</td>
</tr>
<tr>
<td>Analyze</td>
<td>outline</td>
<td>contrast</td>
<td>critique</td>
<td></td>
<td>identify</td>
<td>differentiate</td>
<td>infer</td>
</tr>
<tr>
<td>Evaluate</td>
<td>rank</td>
<td>criticize</td>
<td></td>
<td></td>
<td>critique</td>
<td>conclude</td>
<td>predict</td>
</tr>
<tr>
<td>Create</td>
<td>categorize</td>
<td>modify</td>
<td></td>
<td></td>
<td>design</td>
<td>revise</td>
<td>actualize</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
  - \( \tau = \rho g h S \)

- 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?