Modified Bloom’s Taxonomy

- **Evaluative Writing**
  - Refers back to the goal
  - “What’s it all mean?”

- **Analytical Writing**
  - Focus on accurate interpretation of data

- **Descriptive Writing**
  - Focus on detail and accuracy of observations and experience

Increasing cognitive ability
Science Writing Activities: Cognitive Tasks

GRADES 7-12: Introduce new Science Writing Tools: Memos and Op-Ed Articles

Focus should be on description, analysis & evaluation of science phenomena using oral/sign and written communication with increasing sophistication (i.e. detail and accuracy) as students mature; include all tools (i.e., Lab Reports, Cognitive Maps, Posters, Lab Notebooks, “2 minute” papers, Lab Journals, Skill Lists [lab procedures/technology], Instant Messaging, Memos, & Op-Ed pieces); Additional tools might include Reports of Info Searches/Lit Searches, and use of Spreadsheets.

GRADES 5-6: Introduce new Science Writing Tools: Science Journals*, Skill Lists and Instant Messaging

- Record opinions and conclusions
- Analyse objects by properties (classification)
- Record estimations and predictions
- Record analyses and inferences

* continue use of Lab Notebooks to record data

GRADES 3-4: Introduce Science Writing Tools: Lab Notebooks and “2 Minute Papers”

- Record opinions and conclusions
- Record estimates and predictions
- Record trial data
- Record observations
- Record evidence
- Record numerical data and calculations
- Record outcomes

GRADES K-2: Begin with Writing Tools: Mapping, Posters and Lab Reports

- Describe sequence of events & sequence photos of events
- Describe measurements
- Describe predictions
- Label drawings
- Describe phenomena by recording data

- Draw or become (living) bar graphs
- Copy labels
- Describe phenomena or images
- Draw observations
- Dictate observations

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Science Writing Activities: Tools

- Grades 7-12
- Grades 5-6
- Grades 3-4
- Grades K-2

- Science Literacy
- Written Literacy
- Lab Reports: K-12
- Mapping: K-12
- Posters: K-12
- Lab Notebooks: 3-12
- "2 Minute Papers": 3-12
- Journals: 5-12
- Skills List: 5-12
- Instant Messaging: 5-12
- Memos: 7-12
- Opened Articles: 7-12

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Writing Tools & Cognitive Level

Evaluative

Analytical

Descriptive

Lab Report

Skill Techniques

Mapping

Memo
Hands-on Activities

- Write a brief description of the following demonstration.
Invisible Ink

- How did that happen?
  - Acid and base reaction
    - Reaction with chemicals
What is color?

- Different types of light that we can see (visible region)

http://eosweb.larc.nasa.gov/EDDOCS/Wavelengths_for_Colors.html
Wavelengths

- Colors have different wavelengths
  - Start walking in a wavelike fashion for long or short distances.
    - This ‘wavy’ walk is like a wavelength.
  - Visible light is in the 400 nm – 700 nm range
    - These are the colors we can see

[Image: Wavelengths for Colors diagram]

http://eosweb.larc.nasa.gov/EDDOCS/Wavelengths_for_Colors.html
Wavelengths and The Color Wheel

- Colors that you see are emitted
- Colors that are absorbed are the opposite color of what you see (complementary)
Reaction Demos

- Glowing ink?
  - Fluorescence
  - Tonic Water
    - Reaction with light
  - Oscillating Reaction

http://www.calvin.edu/academic/chemistry/faculty/muyskensmark/F1%20Bookmarks%20W63%2006.html
Create your own unique color!

- What happens when you mix colors?
  - They make new colors

- Now that you are a color scientist, create a new color!

- How will we measure your new color?
  - Spectrophotometer
    - ‘spec’ – spectrum (rainbow)
    - ‘photo’ – light
    - ‘meter’ – measurements
  - The instrument will excite the molecules of color and measure their wavelengths, which we will see on a graph (spectrum).

http://www.che.uc.edu/sensors/facility.html
Summary Observations

- Science is experience (hands-on)
- The student needs to make meaning out of the experience
- Writing facilitates student processing of experience (i.e.- meaning-making)
  - Description
  - Analysis
  - Evaluation
Recommendations

- Include frequent structured writing assignments
- Pay attention to the cognitive clues that one gets from student writing
- Focus on the appropriate cognitive level when responding to student work
- Match writing assignments to the cognitive ability and step up to more challenging levels (i.e., use laboratory reports, skill techniques, pre-laboratory mapping, and memos; see “Science Writing Activities: Tools”)
- Use “multiple revisions” format