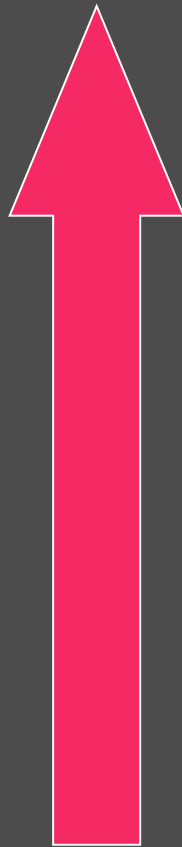


Professor Annemarie Ross
Professor Matthew Lynn

WRITING IN THE
SCIENCES AND SCIENCE
IN WRITING

Modified Bloom's Taxonomy

Increasing cognitive ability



- ⦿ 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

Science Writing Activities: Cognitive Tasks

Evaluative Writing
Analytical Writing
Descriptive Writing



Science Literacy Written Literacy

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 predications
- Record analyses and inferences
- Describe observations of phenomena (orally/writing/signing)
- Draft written "pre-labs" (focus=detail)
- Record data (tables, graphs, labeled diagrams/images)

* continue use of Lab Notebooks to record data

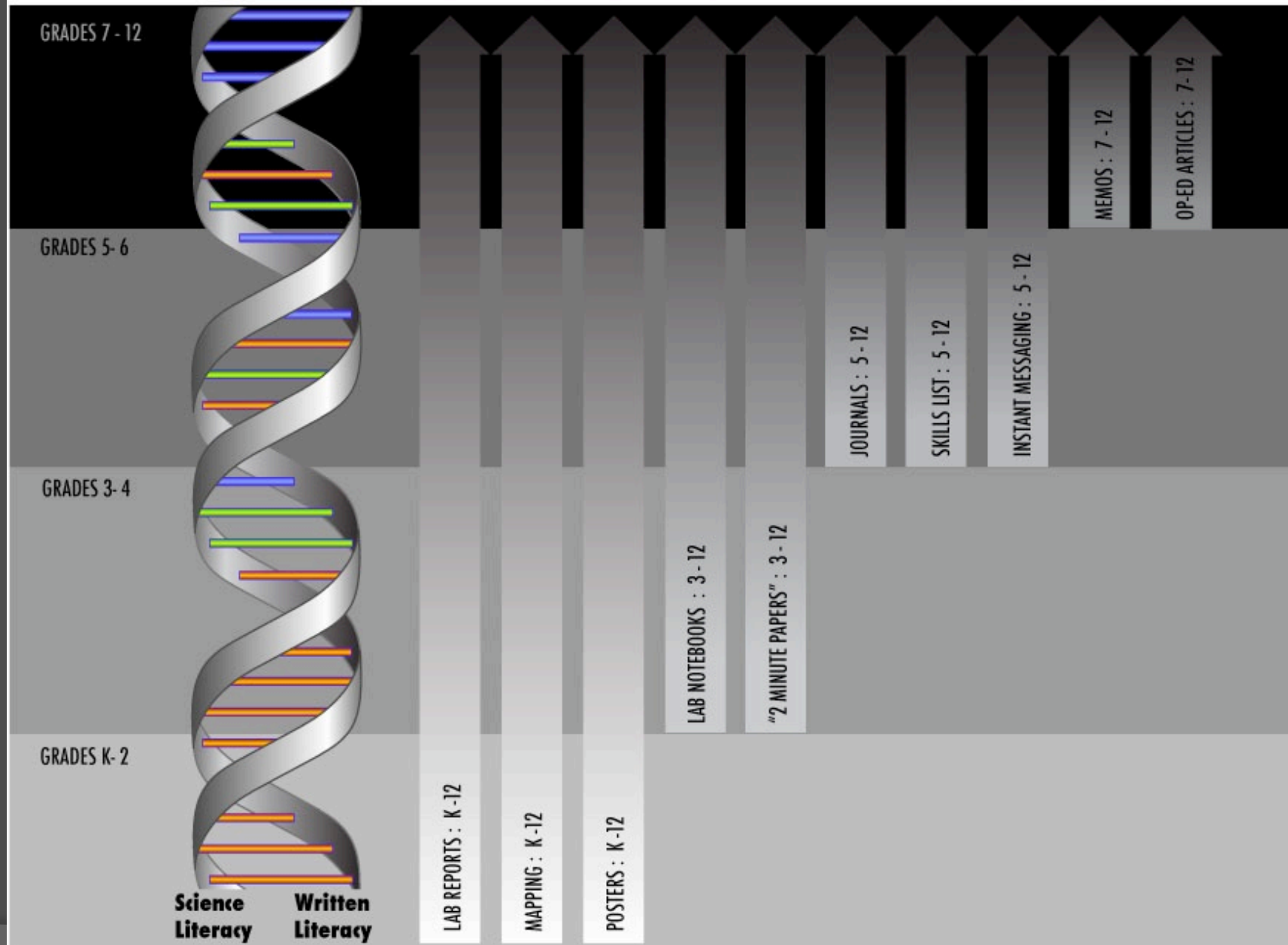
GRADES 3- 4 : : Introduce Science Writing Tools: Lab Notebooks and "2 Minute Papers"

- 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

Science Writing Activities: Tools



Writing Tools & Cognitive Level

Evaluative

Memo

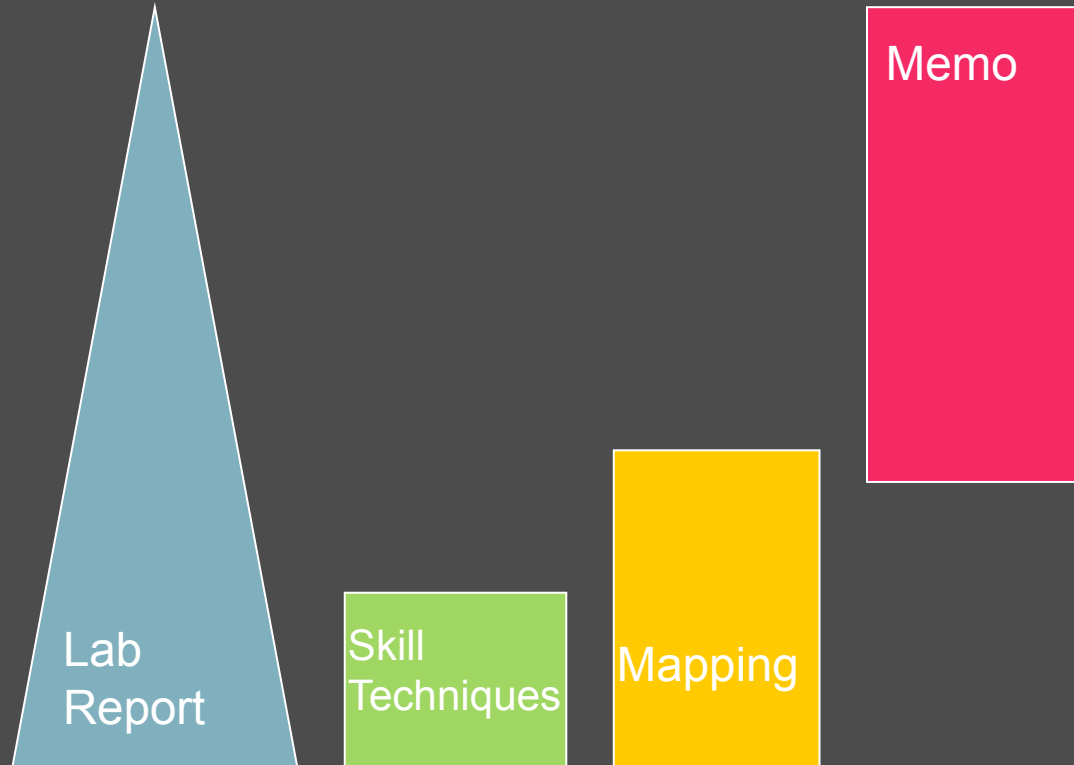
Analytical

Descriptive

Lab
Report

Skill
Techniques

Mapping



Hands-on Activities

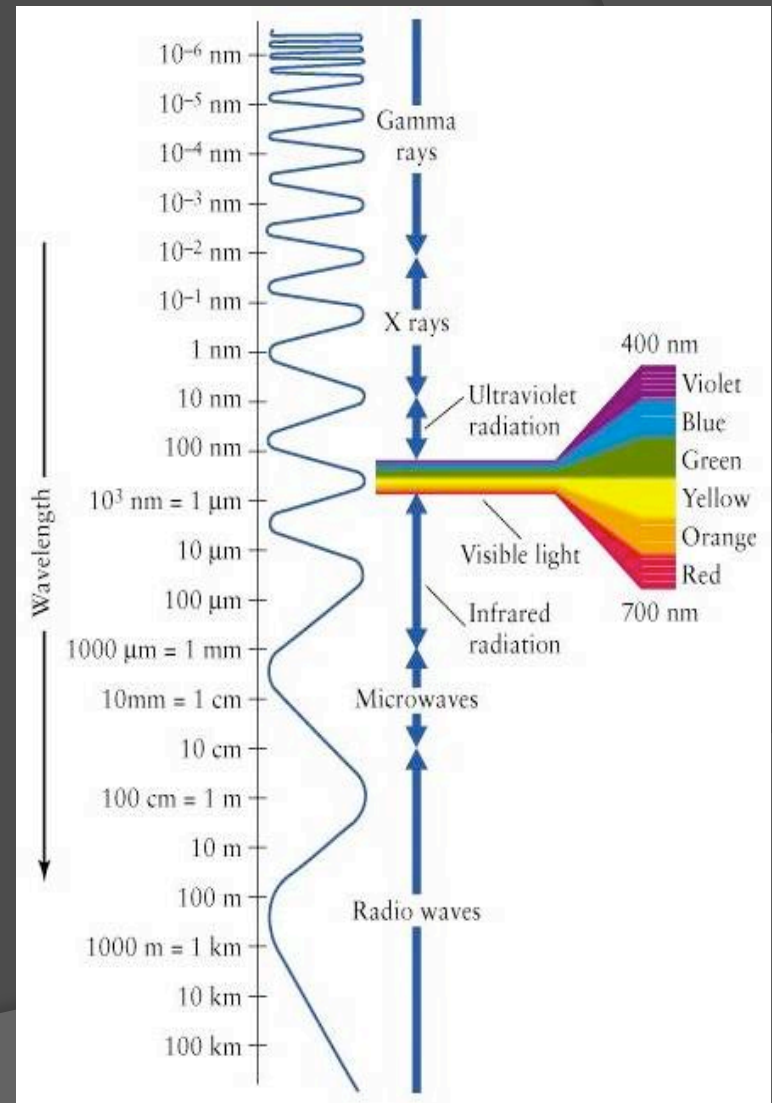
- ① Write a brief description of the following demonstration.

Invisible Ink

- ◎ **How did that happen?**
 - **Acid and base reaction**
 - **Reaction with chemicals**

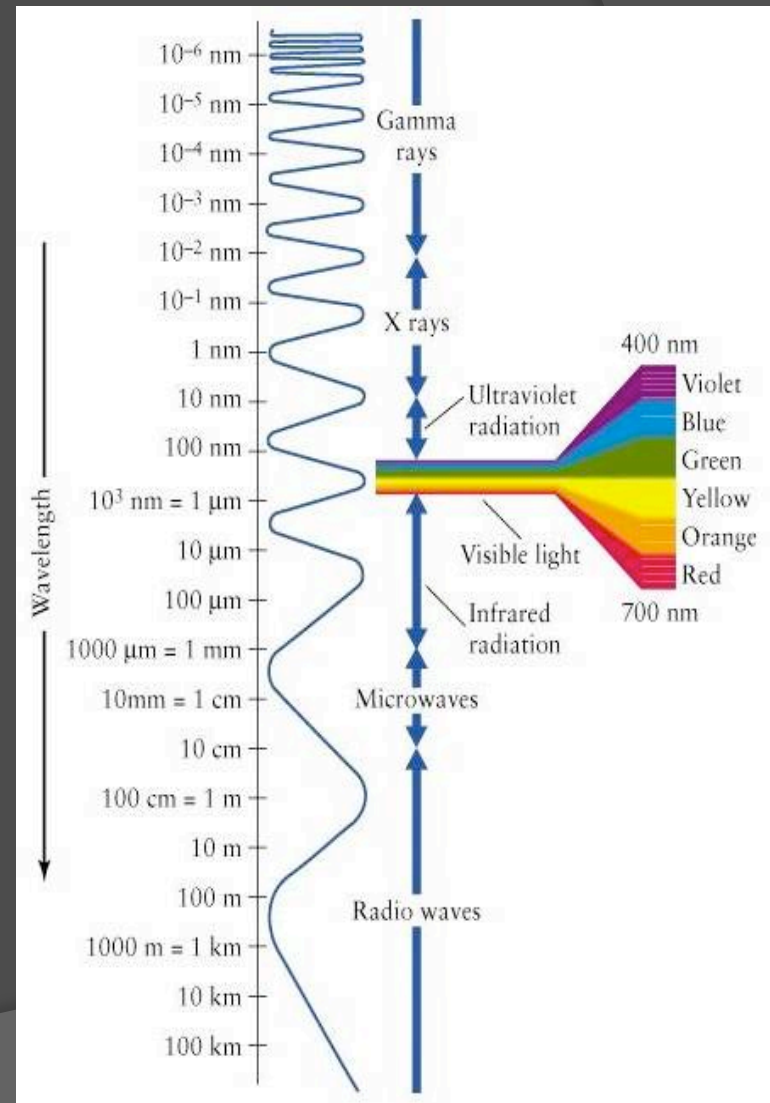
What is color?

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



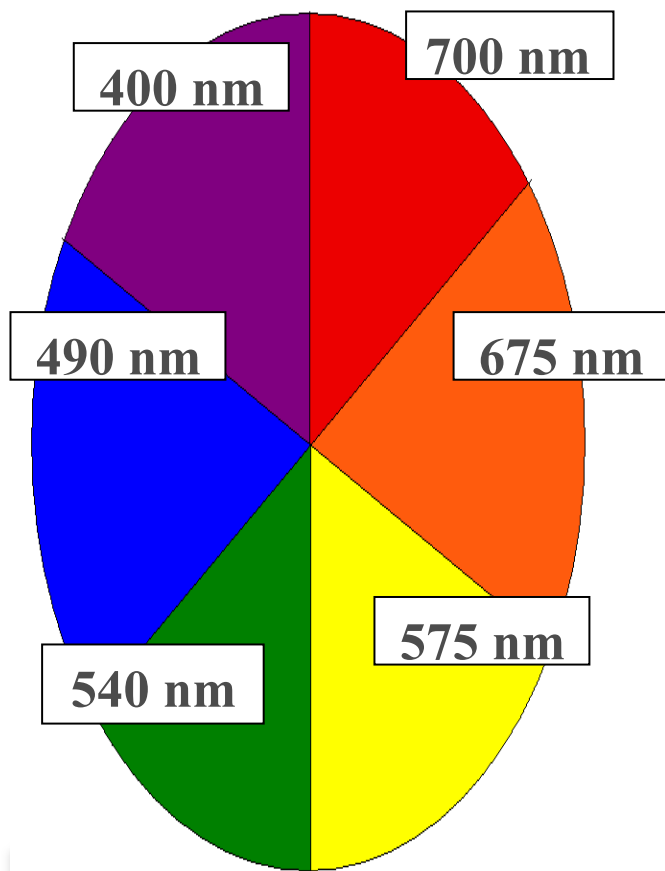
Wavelengths

- ⦿ 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



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/FI%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