

## LEARNING TOOLS

**You can lead a student to knowledge, but you can't make 'em think!**

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1. text
  - a. read beforehand (30% of students will never read the text)
  - b. define and understand boldface words (understand vocabulary)
  - c. try to not read all material just before test
    - retention from reading (10-15%)
2. class notes
  - a. review main points (33% of students will never review class notes)
  - b. write down additional information that will trigger **YOUR** memory
3. instructor
  - a. ask questions early and often
  - b. participate in class
    - retention from listening and writing (5-15%)
    - retention from discussing and asking questions (50-70%)
    - retention from answering questions (95%)
    - **DO NOT WORRY ABOUT MAKING MISTAKES**
      - “Take chances. Make mistakes. Get messy.” – Miss Frizzle from *Magic School Bus*
4. fellow students
  - a. explain material to fellow students
    - retention from explaining/teaching material (95%)
5. groups
  - a. figure out material yourself and with others
  - b. retention from making sense of and discussing material (70%)
  - c. retention from teaching each other (95%)
6. computer exercises and end of chapter questions
  - a. test your knowledge
  - b. learn what you need to learn
7. practice tests
  - a. test your knowledge some more
  - b. some of these questions may show up on the quizzes
8. review the material often
  - a. the more often you are exposed to the information, the more likely you are to remember it
9. **Most importantly, connect new information with old knowledge**

## LAB ADVICE

1. Read laboratory exercises BEFORE coming to lab.
  - a. Labs are busy, hectic, and require completing of several experiments during one period.
    - Understand the experiments that you will be performing.
    - **Prepare a plan/order of operation for the period.**
  - b. **If something is unclear, ask at least three other people before asking me.**
    - I am in demand from many students, so I cannot answer a question immediately.
2. Arrive in lab on time
  - a. Last minute changes are announced at the beginning of lab.
3. **Clean and organize your work area after the experiments are completed.**
4. Maintain a record of your observations in a bound or spiral notebook.
  - a. Thorough observations include:
    - Date
    - Detailed descriptions and drawings of macroscopic and microscopic observations.
    - Description of manipulations and tests performed on samples.
      - Identification of media and temperatures used.
    - Conclusions from your observations.
  - b. Notes **MUST** be written in lab the day they are performed.
    - Do not try to remember what you did at home or during the next lab.
    - **I WANT YOUR ORIGINAL NOTES – DO NOT TYPE UP LAB REPORTS**
  - c. **Divide the notebook into sections – one for each exercise**
    - e.g, in microbiology
      - *Bacillus* Isolation from Soil
      - Development of an Identification Key
      - *Pseudomonas* Enrichment from Soil
      - *Staphylococcus* Isolation from Skin
      - Identification of fungi
      - Identification of Unknown

**Yes, this class is challenging. But in the end, a beautiful, exciting and important world will become visible to you.**