Adapted from Teaching First-Year College Students (Jossey-Bass Higher and Adult Education) Bette LaSere Erickson (Author), Calvin B. Peters (Author), Diane Weltner Strommer (Author)

How the students learn It appears we have complex filtering systems that enable us to ignore stimuli unrelated to our immediate concern and focus only on relevant information. Students are largely in charge of what they focus on, but we can help them by directing their attention to goals, stressing relevance, minimizing distraction, and presenting the same information via multiple sensory registers.

Sort term memory and long term memory **Short-term memory**, or working memory as it is sometimes called, keeps information temporarily in mind while we try to make sense of it and decide what to do with it. Short-term memory, how- ever, is severely limited in the amount of information it can hold

A simple experiment illustrates both the limits and the possibilities for short-term memory. Show this sequence of thirteen letters to a few colleagues: SATIQGPAABCDF. Let them look at it for a few seconds, and then ask them to recite the sequence. Chances are good that they will not be able to repeat the sequence accurately. Then, repeat the experiment, but present the letters in this way: SAT IQ GPA ABCDF. Most faculty will exhibit perfect recall of the sequence because the information is organized into "chunks" that are meaningful to them.

If new information in short-term memory has meaning or can be made meaningful, it is transferred to long-term memory. **Long-term memory** is somewhat like the filing system many of us use. We collect ideas and information, put them in a file, and affix a label indicating the file's contents.

In short, our ability to think and solve problems depends a great deal on whether the information and ideas in long-term memory are interconnected.

Students integrate, elaborate, and extend new ideas by connecting them to what they already know, considering them in other contexts, thinking of new examples and applications, noting similarities and differences.

Suggestions for Presenting and Explaining

- Abandon the Nonstop Fifty-Minute Lecture
  - *Students also need to be weaned from their conviction that material cannot be important if it is not covered in class.*
  - We make more productive use of class time if our presentation lasts no more than ten or fifteen minutes before we allow time for students to work with the ideas presented.
  - Ten minutes is usually enough time to introduce a concept or procedure and give an example or two. Then students need time to think about the ideas—to summarize the material in their own words, come up with their own examples, or try using the ideas to solve a problem or analyze a situation. Once students have tried their hand at working with the material, we can come back to elaborate and extend or move on to the next topic.
- Define Objectives
  - Knowing what they are expected to do with information presented in class influences how students listen to a presentation. Most first-year students assume that they will be asked to recall the information, so they go to great lengths to get it all down in their notes, and they memorize every definition, example, and de- tail presented. Many students assume this is all there is to it.
- Guide Note Taking
  - In the beginging, it may useful to do a skeletal outline of the main points covered
  - Pause from time to time and ask students to paraphrase what they have written in their notes in their own words,
- Check for Understanding
  - Instead of asking, "Are there any questions?" we might better assess students' understanding if *we* ask the questions. For example, to determine how well students understand a concept, we might say: "We have gone over several examples. Look at one more and tell me whether it illustrates this concept and why." If we want to know how
- Summarize Often
  - At least once, we all should try asking students at the end of class to jot down the main ideas discussed that day.
- Assess Learning and Request Feedback Frequently
- Creating Involvement in the Classroom: **How ?**

In the classroom

- Show up early, ask questions about the lecture, the hw, etc. (initiate a dialog)
- Look at students in the eye.
- Speak slowly and clearly
- You do not have the responsibility to fill every second of class time with a voice
- Show enthusiasm. Math is beautiful. Try to share the appreciation of the beauty.
- Include pieces of historical info in your lecture (like Leibniz - Newton , or the 1+2..+100 story, or Simons...)
- Don't be defensive when you make a mistake.
- Use your flaws (if you have any!) as part your your lecture.
- If you are going to work on a problem that a student asked about, ask the student to remind the class the statement of that problem. Make sure that what the student said was heard.
- Questions questions questions
  - Encourage questions. **How?**
  - When a question is asked, make sure that everyone has heard it before proceeding. **How?**
  - Rephrase the question if necessary.
  - Make sure that your answer do not "degenerate" on a discussion between you and two or three students in the first row.
  - Listen carefully
- IMPORTANT: When you ask a question in class,
  - give the students time to think the answer.
  - point a person, or a "subset" of hte classroom, for the answer. (like somebody in the third row or somebody wearing blue...) . Also, you can ask a question, give a couple of minutes so they can discuss with a neighboor and then ask for the answer.
- QUESTIONS asked by the students: **How?** would you proceed if...
  - Can you do number 46? (an standard problem from the book)
  - Why sin(x) is always equal to cos(x)?
  - Why sin(x)^2+cos(x)^2=1? (in precalculus)
  - Why you replaced 2+3 by 5?
  - ajajfajfa jfljsflajsfla ;ajsfla sf
  - Can you solve number 666? (an extra credit, extra hard, that you cannot solve immediately)
- SOLVING PROBLEMS
- (From How to solve it by George Polya)

A. Understand the problem
   1. Read the problem
   2. Read the problem again
   3. Draw a picture or diagram
   4. Find and label and unknowns - what you are looking for
   5. Findand label the known quantities

B. Study how items are connected: Write down all the formulas and relations between the known and unknown.
C. carry out computation
D. check the answer. (You can also discuss about how to generalize the problem)

- Blackboard:
  - Write slowly
  - Repeat what you are writing.
  - Start at top left, if necessary divide the blackboard . Keep writing top down, left-right.
  - Try to avoid standing in front of what you wrote.
  - Write solutions as you expect them to copy (remember to guide note taking)
  - Emphasize the distinction between statement of a problem and the solution.
  -