7

Reading for Results

21st Century Rules for Studying Textbooks

Questions I Would Like to Be Able to Answer

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What Are the Worst Learning Strategies for Remembering What I Read?

"Some students try to make their approach to reading such that they will always read without difficulty," says one writer. "No strategy can guarantee that reading will proceed without difficulty."[1]

Nevertheless, many students try to take the easiest way when reading textbooks. The result? *Mindless reading*—reading without purpose and without learning.

What are the worst learning techniques for trying to retain what you read?[2]

- ***Rereading: "I read the text once, and then read it again later."*** Rereading is a popular technique, but it is much less effective than some of the better techniques you can use, as discussed in this chapter.
- ***Underlining or highlighting: "When I'm reading, I underline or highlight as I go along."*** Underlining actually works well—*if you read the material first*, then go back and underline. The same is true of highlighting. But if you use these techniques on the first reading, you may end up emphasizing a lot of things that are not important.
- ***Summarizing: "I write down the main points contained in the text."*** Summarizing can be helpful for those who are skilled at it, but there are better ways to spend your study time.
- ***Cramming: "I just sit down and read everything the night before a test so it'll stay fresh in my mind."*** This time-honored (and inefficient) last-minute technique may get you through the immediate test, but the material will quickly disappear from your mind—so you'll have to do it all over again for the final exam.[3]

7.1 Printed Books, E-books, & Active Reading

Question: How do print and digital textbooks differ, and what is active reading?

The Big Picture

Printed textbooks are easier than electronic books for readers to use to absorb material, focus on broader ideas, and read more quickly, but e-books are becoming more available. The secret to using both is *active reading*—actively engaging with the text you are reading.

"Reading a college textbook takes skill," points out one college success tip sheet. "It is not enough to simply read the text; you must interact with it. . . . Skimming or passive reading is not an option."[4]

Whether paper or digital, textbooks are an essential part of your college education. Thus, since you'll have to spend so much time reading, it follows that you should become good at it. This chapter shows you how.

Printed Textbooks versus Digital Textbooks: Which Is Better?

Textbooks are traditionally produced as ink printed on paper, often with the pages bound together or in loose-leaf (unbound) form.

Now many textbooks are appearing as e-books—electronic books with material that can be read on laptops, tablets, and smartphones, as well as Amazon's Kindle™.

E-books are often better alternatives to printed books because they are cheaper, lightweight, and easier for publishers to update. Moreover, their many formats allow students "to interact with the material more, with quizzes, video, audio, and other multimedia to reinforce lessons," as one writer notes.[5]

However, remember that . . .

your main purpose in reading a textbook is to be able to retain information on which you will be tested later.

Thus, you need to know that research shows that print books and e-books have these differences:

- **Print books seem to help readers absorb material better than screens do.** Books have more landmarks, such as where on the page information occurs (left-hand or right-hand side? near a graphic?), and these landmarks help readers recall information. Because screens have fewer spatial landmarks, more repetition is required to absorb the same information, according to research.
- **Screens limit readers' focus.** Reading something on a screen rather than on paper causes people to focus on "just the information you're getting this moment, not the broader context," says one researcher.[6]

  "Screen learning helped solidify the details," says another writer, "paper learning helped readers better understand abstract concepts."[7] (This is why some students print out parts of their digital texts.)
- **Students are able to read paper versions more quickly than screen versions.** Comprehension is the same with both electronic and paper textbooks, according to some studies, but students are able to read the paper version more quickly. They also report greater fatigue after reading electronic textbooks.[8]

No wonder about 75% of college students say they prefer reading paper books over e-books.[9] Nevertheless, in this chapter, we'll show the best ways to learn from both forms.

The Secret to Engaging with Textbooks: Active Reading

"Professors assign more than you can possibly read in any normal fashion," points out one writer. Thus, "you have to make strategic decisions about what to read and how to read it."[10]

These are the kinds of decisions that go into ***active reading*, the process of actively engaging with the text you are reading.** Active reading is *deep reading*, which is the opposite of *passive reading*, the kind we do when reading for pleasure or when looking at screens. And it's certainly miles away from *mindless reading*, when your eyes roam over a page or screen and you later realize you recall very little of what you read.

The more you become accustomed to reading on your smartphone, tablet, or other electronic devices, the more your mind shifts toward "nonlinear" practices such as browsing and scanning, skimming the screen, or having your eyes dart around a web page.[11]

By contrast, active reading requires that you try to . . .

actively think about what the text means by reading slowly and carefully, pausing to question the main idea, and reexamining passages you find confusing.

"All my textbooks are eBooks but I forgot to charge my e-Reader so I could not do the assignments."

(Aaron Bacall/Cartooncollections.com)

7.2 Getting Ready to Read: Setting Yourself Up for Success

QUESTION: How do I get ready to begin reading, and what prereading strategy should I follow?

The Big Picture

To get going on reading, visualize the rewards you'll get when done and figure out the number of pages and amount of time it will take to read. There are two strategies for prereading (skimming the chapter of a textbook to locate key ideas): (1) read the chapter backward, looking at the questions, summary, headings, artwork, and introduction; (2) take the THIEVES approach, checking the Title, Headings, Introduction, Every first sentence in a paragraph, Visuals and vocabulary, End-of-chapter questions, and Summary.

Success comes from preparation. Here are some ideas, conventional and unconventional, on how to prepare to read for success.

Ways to Get Going

Let's assume you have used your study plan and to-do list to schedule (a) a time and place for reading and (b) a particular reading assignment (a chapter of your psych textbook, say). What if you're now in place but have negative feelings about the subject, the assignment, or reading in general, making it hard to get started?

Some suggestions:[12]

- **Visualize the rewards.** Decide you're going to approach this reading session with curiosity and without distractions. Shut off and put away your phone. Then think of the reward you've planned for when you're done (a snack, talking with friends, or playing your guitar, for instance).

- **Multiply the number of pages you have to read by 5 minutes.** The total gives the amount of time the average student needs to spend on a reading assignment. For example, if you have to read 15 pages, then multiplying 15 pages times 5 minutes gives you 75 minutes—the total time required to finish the assignment. (It could be longer than 5 minutes per page for difficult subjects.)
- **Plan to divide the reading into 10-page chunks.** You should read (using the methods we'll describe) in 10-page chunks, take a break, then move on to the next set of pages. Follow your own pace.
- **Plan to spread out the reading over different times, if necessary.** If you calculate 4 hours of reading, you might not want to read from 7 to 11 p.m. straight through (even with breaks). Consider spreading out the assignment, for instance, taking an hour before class in the morning or over your lunch break.
- **Try doing a Google search of the subject you're about to read.** If you don't know anything about the material you're about to read, you might try doing a Google search on the topic of the chapter. This will give you some background information.[13]

Prereading Strategy #1—Work Backward: "Let's Skim the Chapter in Reverse!"

Everyone is used to reading front to back, as with a novel. But with a textbook, it's more important to *get an overall understanding*. Thus, it's best to have a *prereading strategy*.

***Prereading*—also known as *previewing or surveying*—is the process of skimming the chapter of a textbook to locate key ideas before reading the complete chapter from start to finish.** "Prereading provides an overview that can increase reading speed and efficiency," says one expert.[14]

In this first strategy, make things interesting and . . .

preread the chapter FROM BACK TO FRONT.

Follow these steps, as proposed by Skylar Anderson of StudyRight:[15]

- **Start by trying to answer the end-of-chapter questions.** Most textbook chapters have questions at the end. Read them and try to guess the answers—even if you know very little about the subject.

  This follows the learning strategy (discussed in Chapter 4) of *elaboration*—connecting new ideas to what you already know.
- **Next read the chapter summary.** The summary, which also appears at the end of the chapter, "will give you a general background as to the Big Ideas in the chapter," points out Anderson.
- **Then look at the headings and artwork.** Go through the chapter and look at the headings and subheadings to get a sense of the overall organization. Section headings often contain the Big Ideas of the chapter.

  While you're at it, glance over any pictures, charts, or graphs.
- **Finally, read the chapter introduction.** Go to the first page of the chapter and read the introduction.

  Now you would read the chapter, focusing on the Big Ideas. Read from front to back. Don't get lost in the details. Read for the Big Ideas first and foremost. Read out loud.

Prereading Strategy #2—THIEVES: "Let's Rip Off the Essential Parts!"

Another prereading strategy is abbreviated ***THIEVES***, **for Title, Headings, Introduction, Every first sentence in a paragraph, Visuals and vocabulary, End-of-chapter questions, and Summary.**[16]

If you don't have a chance to read all of an assigned chapter before going to a lecture, try ripping off the text for as much meaning as possible, using this prereading strategy.

In the THIEVES strategy, you should survey each of the following chapter elements *in the following order*:

- **T = Title.** The chapter title tells you what the chapter is about. As you read it, ask, "How does this connect to the last chapter?" "What do I already know about this topic?" "What do I think I'll be reading about?"
- **H = Headings.** The section headings tell you the specific topics covered in that section.
- **I = Introduction.** Go to the start of the chapter and read the introduction, which will probably tell you what you'll be reading about. It may also provide a list of chapter objectives (such as "When you finish reading this chapter, you should be able to identify . . .").
- **E = Each paragraph's first sentence.** Now skip through the chapter and read the first sentence of each paragraph, which is often the topic sentence—it tells you what the paragraph is about.
- **V = Visuals and vocabulary.** Visuals—such as graphics, photos, maps, charts, and tables—aren't just to make the book look attractive (generally speaking). They are supposed to support and elaborate on the topic under discussion. Look at the graphics, including the labels and captions.

  Also pay attention to the vocabulary, especially key terms (often set in boldface type) and their definitions. In addition, pay attention to italicized terms.
- **E = End-of-chapter questions.** These questions give you an idea of what the author thinks is important. They often are used as test questions.
- **S = Summary.** An end-of-chapter summary will help you learn what Big Ideas are covered in the chapter.

7.3 Three Reading Strategies: The SQ3R, S-RUN-R, & P2R Systems

QUESTION: Which reading systems are best for me to use with the textbooks I'm reading now?

The Big Picture

Three reading strategies are: (1) SQ3R, for reading books of medium to great difficulty, which stands for Survey, Question, Read, Recite, Review; (2) S-RUN-R, for books of medium difficulty, which stands for Survey, Read, Underline, Note-taking, Review; and (3) P2R, for books of easy or medium difficulty, which stands for Preview, Read actively, Review.

Active reading is *thinking intensive*.

"It involves thinking as you read and directing that thinking to achieve certain reading goals," as one article states.[17] Basically, active reading involves thinking about what you've read rather than simply trying to memorize it.

Does "thinking intensive" also mean *time intensive?* (So you could use that as an argument against doing the work of learning effectively through reading.) Actually, it's not.

Indeed, *active reading has been shown to SAVE time*—by eliminating "the wasteful and often mindless repetition that is necessitated by forgetting what you have read," says the same article.

Among systems for putting this into practice are the SQ3R, S-RUN-R, and P2R systems, as shown below. You'll notice that the first step in each of them is "survey" or "preview," which is the same as "prereading." You may want to use different systems for different classes or kinds of textbooks.

SQ3R—for reading that is of medium or great difficulty	S-RUN-R—for reading that is of medium difficulty	P2R—for reading that is easy or of medium difficulty
Survey	**S**urvey	**P**review
Question	**R**ead	
Read	**U**nderline	**R**ead actively
Recite	**N**ote-taking	
Review	**R**eview	**R**eview

SQ3R: For Textbooks That Are of Medium or Great Reading Difficulty

SQ3R **stands for Survey, Question, Read, Recite, Review.**[18]

This system takes more time than the two other systems, but it can be most effective for texts in medium to difficult subjects, such as some in math or science or those that are densely packed with facts, names, dates, and the like.

- **Survey—get an overview of the chapter contents.** This is the prereading we just discussed. You glance over (and think about) the title, headings, introduction, visuals, end-of-chapter questions, and summary for the chapter. Determine what aspects of the reading look familiar and what will be difficult to grasp.

  Now take the next three steps in 10-page chunks.
- **Question—turn each heading into a question.** Next go through the chapter and turn each heading into a question. (Example: The heading "Fringe Benefits" might become "What are the principal kinds of fringe benefits?")
- **Read—read to answer those questions.** "This is not a passive plodding along each line, but an active search for the answer," says one piece of advice.[19]

- **Recite—try to recite the answers to the questions in your own words.** At the end of that headed section, recite—*in your own words*—the answer to the question you created. If you have trouble, read the section again.

  A word about taking notes:

  If you're the kind who prefers taking notes while reading, NOW is the time to take notes—that is, after you have read the section and answered your question.

  Repeat the Question/Read/Recite steps for each 10-page chunk.
- **Review—go back over the chapter or your notes and check your memory.** When you have finished the entire chapter, look over your notes or the chapter for a few minutes. Check your memory by covering up your notes and trying to recall the main points.

S-RUN-R: For Textbooks That Are of Medium Reading Difficulty

S-RUN-R **stands for Survey, Read, Underline, Note-taking, Review.**

This system is not as time-consuming as SQ3R and can be used on textbooks that are of medium reading difficulty, such as many introductory psychology and sociology texts.

- **Survey—preread to get an overview of the chapter.** As discussed, you preread by glancing over the chapter title, headings, introduction, visuals, end-of-chapter questions, and summary. Determine what aspects of the reading look familiar and what will be difficult to grasp.

Now take the next three steps a paragraph or section at a time in 10-page chunks.

- **Read—read the paragraph or section while writing down the headings.** Read the paragraph or section, focusing on both the Big Ideas and the supporting details.

Write the first section headings in the left margin of your notebook paper, allowing plenty of space between headings.

- **Underline—underline or highlight important material.** After you finish reading a paragraph or section, think about what was important, then go back and underline or highlight that information.
- **Note-taking—take notes of the underlined or highlighted information.** After you've finished underlining or highlighting, take notes of this key information by summarizing it, writing it next to the heading you previously wrote out in your notebook paper
- **Review—go over your notes and check your memory.** Look over your notes and check your memory by covering up the notes and trying to recall the main points.

P2R: For Textbooks That Are Easy or of Medium Reading Difficulty

P2R **stands for Preview, Read actively, and Review.**[20]

This system is the least time consuming and can be used on textbooks or other readings that are easy or of medium reading difficulty, such as those that aren't densely packed with facts, names, dates, and the like.

- **Preview—preread to get an overview of the chapter.** As with the other reading systems, you preread by glancing over the chapter title, headings, introduction, visuals, end-of-chapter questions, and summary. Determine what aspects of the reading look familiar and what will be difficult to grasp.
- **Read actively—read while asking questions, then take notes.** While reading, determine what the Big Ideas are and what the supporting details are.

  On the second read-through of a paragraph, underline or highlight the important points. Take notes of any important information.

- **Review—recall mentally the highlights of what you have read.** Try to summarize the main points in your own words. Use the headings as questions and answer them as if they were test questions. Review your underlined or highlighted material as well as your notes.

Ticket to Success

The Textbook-to-Study-Guide Method

This method is a seven-step system that produces a study guide you can use to prime yourself before exams.

- **Step 1: Preview and question.** A preview is a 2-minute or 5-minute skimming of the entire chapter to establish relationships between major segments and learn where you're going.

  As you skim, make up questions. Use a pen to turn every heading into a question, adding words such as *what* or *how*.
- **Step 2: Read actively.** Now actively read the chapter or section. Active reading is reading to answer the questions you posed in the headings.
- **Step 3: Reread and underline.** Now reread the material, using a pen (or highlighter) to underline (a) key terms, (b) main ideas, and (c) conclusions. (Don't mark examples, tables, and illustrations, unless they're important.)
- **Step 4: Write keywords and short-answer questions in the margins.** Now go through the material and write keywords and short-answer questions in the margins. (This will create a study guide for use later in preparing for tests.)

  Keywords are important terms or names, often in **boldface** or *italics*, that you're expected to know. Short-answer questions are those that might appear on a test; the answers appear in the text (underlined) near where you wrote the questions.

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- **Step 5: Recite.** Return to the beginning, and cover the text with a piece of paper, leaving keywords and questions exposed. Now go through and ask "What does the keyword mean?" and "What is the answer to the question?" This reciting should be done aloud (or almost aloud). Check your answers by lifting the paper.
- **Step 6: Reflect.** After reciting for a section, raise your eyes and reflect on the knowledge you've acquired. Reflecting means thinking it over, bringing your own ideas to what you've learned, making your own personal associations with it.
- **Step 7: Review.** Reviewing is of two sorts—immediate and later.

  In *immediate reviewing*, before ending your study session, do one last leisurely sweep through the chapter. Use your newly created study guide to look at the keywords and questions you've written, and visualize the definitions and answers. If you have difficulty, say the answer one more time, then put a check mark in the margin so you'll know to pay particular attention to this question in the future.

  In *later reviewing*, right before the test, do a last run-through, reciting and reflecting. Cover the text with a piece of paper and go through, looking at the keywords and questions in the margins. Recite aloud the definitions and answers, then lift the paper to check your results. Pause and reflect as you go, trying to make a personal connection in your mind to the material you have just recited. Focus particularly on material near which you've placed a check mark.

7.4 Dealing with Special Subjects: Math, Science, Languages, & Other

Question: How do I cope with difficult subjects, and what special tools can help me?

The Big Picture

The main methods for coping with difficult subjects are (1) reduce your anxiety by using positive self-talk and reducing stress; (2) devote enough time to the material by keeping up with the assignments; and (3) use special study tools, such as flash cards, diagrams, and charts.

Some students, even though they may be smart in many ways, go into a panic when confronted with a particular subject—technical subjects such as math and chemistry or detail-oriented subjects such as foreign languages, history, and literature. The specific advice for coping here is . . .

- **Reduce your anxiety.** Take steps to reduce your anxiety.
- **Take extra time.** Devote more time and practice to your assignments—and don't fall behind.
- **Use special study tools.** Use special tools for information organization and study.

Let's consider this advice.

1. Reduce Your Anxiety

"Math anxiety" is very real for a number of people, as is anxiety about the other subjects mentioned. Students may believe that math requires a logical ability or special knack that they don't think they have. With science, they may think there is only one way to solve problems. With history, literature, or foreign languages, they may think they don't have a good enough memory for details.

Here's what to do:

- **Hear your inner voice.** The first step is to learn what your inner voice is saying, to pinpoint those inhibiting pronouncements from within. This inner voice is often the Voice of Judgment (VOJ), the internal broadcast that goes on within all of us.

  As we described in Chapter 3, the VOJ "condemns, criticizes, attaches blame, makes fun of, puts down, assigns guilt, passes sentence on, punishes, and buries anything that's the least bit unlike a mythical norm."

- **Pinpoint your negative thoughts.** Once you've identified the negative thoughts ("I don't think I'm smart enough to get this stuff"), speak them aloud or write them down. Usually, such thoughts come down to two matters:

  "I don't understand it now, so I never will"

  and

  "Everybody else is better at this subject than I am."

  If you think about this, however, you'll realize that there have been many times in the past when you haven't understood something at first but eventually did. After all, there was a time when you couldn't read, ride a bicycle, drive a car, or whatever.

  If you do a reality check—by asking your classmates—you'll find that many others have trouble with the subject as well. Probably a number of people will, if they're honest, say they aren't confident about this subject.

- **Replace your negative thoughts with positive self-talk.** Now try to replace the VOJ and use your inner voice as a force for success. You do this by using positive self-talk, which can help you control your moods, turn back fear messages, and give you confidence. ***Positive self-talk consists of giving yourself positive messages.***

  The messages of positive self-talk are not mindless self-delusions. Rather, they are messages such as "You can do it. You've done it well

before" that correct errors and distortions in your thinking and help you develop a more accurate internal dialog.

- **Deal with stress.** The sense of unpleasantness that the anxiety-provoking subject evokes may be felt in a physical way—as clammy hands, constricted breathing, headache, or other kinds of panicky reactions. Elsewhere in the book (Chapter 12) we describe ways to deal with stress, such as techniques of relaxation and visualization.

  For now, however, just try this: Every time you have to deal with a troublesome subject, take a slow, deep breath and slowly exhale; then repeat. Then tell yourself, "Now I'm ready to deal with this subject calmly and methodically, taking however long it takes." If the anxiety begins to resurface, repeat the slow, deep breathing twice.

2. Devote Enough Time

Once you've dealt with the emotional barriers, be prepared to spend more time on the subject. It doesn't matter that it takes you longer to learn math, physics, French, or whatever than it will some other students; you're doing this for yourself. (The chances are, however, that a difficult subject for you is also a difficult subject for many others.)

Spending more time on the subject involves these steps:

- **Keep up with the assignments.** Don't fall behind. Subjects such as math and foreign languages are *cumulative or sequential* kinds of knowledge: It's difficult to understand the later material if you don't understand the earlier material.

  Thus, if you feel yourself slipping, *get help right away*. Seek assistance from a classmate, the instructor, or a tutor in Support Services. If you're worried about confiding your anxieties to someone involved with the subject, see your academic advisor. Or go to the campus counseling center and seek the advice of a counselor.

- **Review the previous assignment before starting the present one.** Precisely because later skills depend on having mastered earlier skills, it's a good idea to review the previous assignment. Being confident you understand yesterday's material will give you the confidence to move on to today's assignment.
- **Apply the SQ3R or S-RUN-R reading strategy.** Difficult subjects are precisely the kinds of subjects in which you need to go over things several times, constantly asking questions, marking up the text, and taking notes. The reading methods we described in the previous section will help here.
- **Work practice problems.** Math and foreign languages require that you learn specific skills as well as information. Accordingly, you should work all practice problems that are assigned, whether math problems or language exercises. For example, you should work practice problems at the end of every section within the book and also those at the end of every chapter.
- **Take frequent breaks—and remind yourself of why you're doing this.** Needless to say, studying difficult material is a frustrating business. Go easy on yourself. If you feel you're beating your head against the wall, take frequent breaks. Study some other material for a while.

  When you come back to your original work, remind yourself why you're studying it—for example, "I need to study chemistry because it's important to my medical career."
- **Do lab assignments.** Some subjects require use of a laboratory. For biology or chemistry, for example, there is often a lecture portion, in which you take notes about concepts from a lecturer, and a lab portion, in which you do experiments or other hands-on tasks. *The two kinds of classes are not independent of each other*: What's learned in the lab reinforces what's learned in the lecture.

Some suggestions for dealing with math are shown in the box below.

Ticket to Success

Tips for Dealing with Math

When people say they hate math or have never been good at math, they are expressing a belief that, once accepted, only makes it more difficult to do well at it. However, though you may never be a math genius, you can learn to get through—even prevail in—a mathematics course.[21]

- **Don't skip class, take good notes, and ask questions.** Math is one of those subjects in which every class counts. Even if the course is given at 7:00 a.m. in the wintertime, you need to make every class. Listen carefully, take good notes, and whenever you don't understand something, ask questions—lots of questions.
- **Review the text before class and take notes on concepts, procedures, and examples.** Because math instructors don't usually do formal lectures (as history professors do) but instead work through procedures and problems, it's tempting to take minimal notes and fall back on the text. A better strategy is to read the text before class, which the instructor may follow closely, but then to concentrate on understanding the concepts and procedures and to take close notes of these and any examples.
- **Make friends with other students in the class.** If you're absent from a class, you'll need to contact someone to find out what you missed. Try to determine who the other serious students are in the course and get to know those who could fill you in. You may also get their help (or help them) in getting over rough spots.

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- **Study daily, do all the assignments, and plan to spend more time studying.** Math is one of those subjects that you can't let slide and then try to catch up on later. It's best if you study daily. And never postpone or skip assignments, which are apt to be assigned on a weekly or even daily basis. Finally, be prepared to spend more time on the subject than you would in other courses.
- **If you're rusty, begin where you need to begin.** *Never get rid of a math text.* You'll be far ahead of the game if you've kept all your math texts so that you can refer to them again, if necessary. Thus, if you're starting a trigonometry class but the last time you had college algebra was 3 or 6 months ago, realize that you may have to pull out your old notes and text and refresh your memory.
- **Become adept at understanding mathematical language and at working problems.** Mathematical formulas can contain a lot of information. Become skillful at understanding what they mean. Terms are usually defined early in the relevant chapters in the textbook. Learn to underline the directions that are relevant. Learn to be able to state in your own words what a math problem is saying. Sometimes you can solve a problem by looking for similarities with sample problems or with other problems you've studied.
- **Attack each difficulty as it arises.** When you encounter problems, don't quit in frustration. (Staying power, or perseverance, is *really* important in math.) Go back and review your old math texts or get some review books from the library. Get together with a fellow student in the course or form a study group with other students that meets regularly. Go see the instructor. Check the learning center for computer-assisted programs.

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- **Check your work and arrange it neatly.** Accuracy and precision are important. Before you hand in an assignment (or a quiz), check your work to avoid having points taken off for simple arithmetic errors. Show all the steps in your work and arrange it neatly so the instructor can read it and so that you can understand it when you refer to it later during test preparation.

3. Use Special Tools for Studying

A whole bag of tools is available to help you organize information, make special study guides, and learn difficult subjects. Some of these tools, such as diagrams and charts, may be especially helpful if your learning style tends to be more visual than verbal.

Here are some tools:

- **Flash cards.** As mentioned in Chapter 4, a flash card is a card bearing words, numbers, or pictures that is briefly displayed as a learning aid. (Flash cards are available in digital form using apps like Quizlet, StudyBlue, and Flashcard Machine.)

  Flash cards can be used for all kinds of subjects. For math or engineering, you can write a term or formula on one side and its definition, meaning, and/or calculations on the other. In science, you can state the theory or scientist on the front and the important, associated principles or hypotheses on the back. For literature classes, you can write the name of a short story or poem on one side and its meaning on the other.

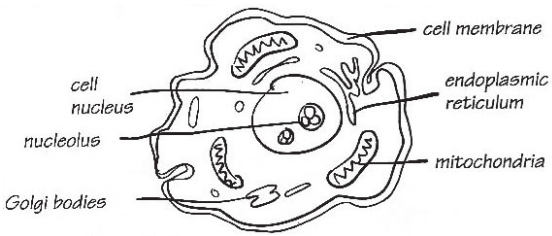
  When you use flash cards, you can sort them into three piles according to how well you've memorized them: (1) cards you know well; (2) cards you know but respond slowly to or are vague about; (3) cards you don't know. You'll find it's pleasing to watch the "I know" pile grow. (And if you must cram for an exam, the second and third piles are the ones to concentrate on.)

Carry a few flash cards with you wherever you go. Then, when you find yourself with a few minutes to spare, you can take them out and practice answering the questions on them.

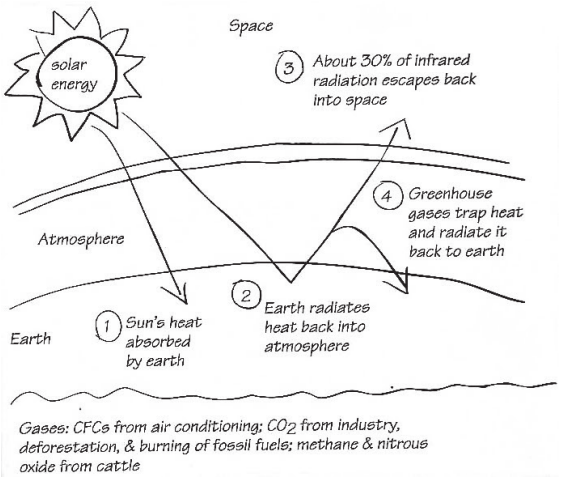
- **Recordings.** Elsewhere we mentioned that recording lectures can provide a kind of reinforcement, particularly if the lecturer is hard to follow. Listening to recordings is also critical for certain subjects, such as language study. Since the heart of learning a foreign language is repetition and practice, during spare moments in your day you can use your smartphone or tablet, for example, to listen to recordings featuring new vocabulary terms, verb forms, and idioms.
- **Diagrams, charts, and maps.** Drawing diagrams of concepts helps to reinforce learning in two ways: (1) It helps your visual sense, because you can see the ideas. (2) It helps your kinesthetic sense, or sense of touch, because you are actually creating something with your hand.

  There are all kinds of ways to sketch out concepts and information. What follows are only a few ideas.

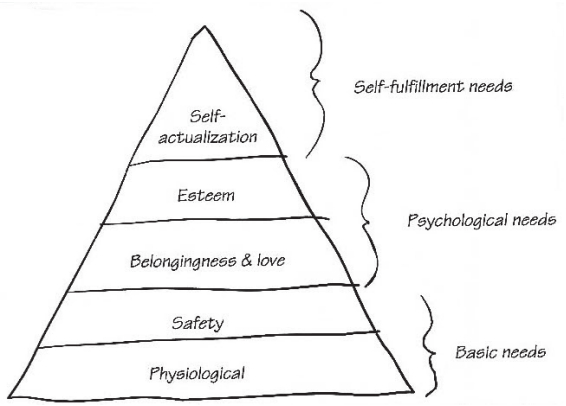
  — ***Study diagrams*** **are literal representations of things from real life** that you have rendered in your own hand. This type of artwork is especially useful in the biological and health sciences: You can draw and label the parts of a cell, the bones in the head, the arteries and veins of the circulatory system, and the like.



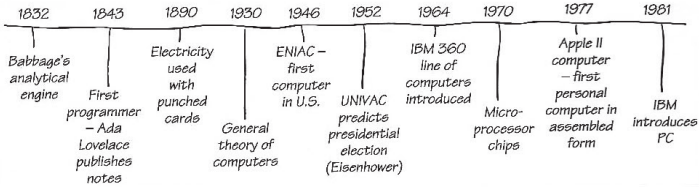
— ***Process diagrams*** **are useful for representing the steps in a process** and thus are useful in such subjects as biology, geology, or environmental science. For example, you might sketch the process of photosynthesis, the process of global warming, or the geological formation of an ancient lake.



— ***Concept maps*** **are visual diagrams of concepts.** For example, you can make a drawing of psychologist Abraham Maslow's famous hierarchy of needs, the parts of a symphony, or the five departments of a typical business organization.



— ***Timelines*** **are sketches representing a particular historical development.** They are useful in memorizing historical processes, such as the buildup to the Civil War or the growth of computer technology. A timeline consists of simply a horizontal line with "tick marks" and labels, each indicating the year and its important event.



— ***Comparison charts*** **are useful for studying several concepts and the relationships among them.** Headings are listed across the top of the page and down the left side of the page; the concepts are then briefly described in a grid in the middle of the page. For example, you might compare various religions by listing their names across the top (such as *Hinduism*, *Judaism*, *Christianity*, *Islam*), the principal categories of comparison down the side (*principal geographic locations*, *number of gods*, *holy book*), and then the specifics within the grid.

	Hinduism	Judaism	Christianity	Islam
Principal geographic locations	India	Israel, Europe, Americas	Especially Europe & Americas; adherents worldwide	Asia, North Africa, Central Africa
Type (number of gods)	Polytheistic	Monotheistic	Monotheistic	Monotheistic
Holy book(s)	Mahabharata, Ramayana	Torah	Bible	Koran