Incorporating Study Skills into Developmental Math Classes – AMATYC 2010

George Woodbury
College of the Sequoias

If you have any questions or feedback, here is my contact information.

Email: georgew@cos.edu

Web Site: georgewoodbury.com

Blog (George Woodbury's Blogarithm): georgewoodbury.wordpress.com

Follow Me on Twitter: @georgewoodbury

Why teach study skills?
Are developmental math students struggling solely because of poor math skills? Although poor math skills could be part of the problem, I don't think that's the only reason they are struggling. Could part of the problem be that they do not know how to learn mathematics? I think that this is the key. If a student is lacking the necessary math study skills, then success is a long shot at best.

Should we teach study skills?
There are many instructors who would answer "No" to this question. I think the reasoning is that we are teaching at a college, and if a student doesn't have the survival skills needed in college they have two choices – develop them on their own or disappear.

I think that this approach is unfair, and perhaps slightly elitist. If a student wasn't taught in K-12 how to succeed in a mathematics class, or how to succeed in school in general, then we cannot continue to penalize them for this. It's not their fault. The same holds true for the re-entry student who has been away from school for 10+ years.

Another thing to keep in mind is that even though we are teaching at a college, many of the students are enrolled in a class considered to be a pre-collegiate course such as Prealgebra or Elementary Algebra. One of the many reasons I love teaching at a community college is because we are in a position where we can help students to start anew, to give them the tools that will change their path in life. Helping a student understand how to learn is a great first step in this journey.

General Study Skills Courses and Their Shortcomings for Math Students
At our college, many (first year) students take a general study skills course. These "Student Success" courses focus on the college's resources and programs designed to help students. The courses also offer general guidelines as to how to be a successful student. The courses are typically taught by the Counseling division. These courses can be quite helpful to students in general, but in many ways fall short in helping students to be successful in mathematics.

The set of study skills required to be successful in a math class are in many ways different than the skills needed in a history class, an English class, or an art class. Of course, being an active listener is important to success in all of those classes, but I feel it is crucial in mathematics.

Another problem for me with the general study skills class is that many of the study skills are taught out of context. When the instructor says note cards are a great aid for memorizing facts, the students will most likely forget about this skill by the time they will be able to apply it in my class. However, when I reach the first specific instance that I feel the use of note cards would be helpful I can briefly stop the class, explain the power of using note cards, exactly what to write

on the card, how to make use of the cards, and so on. This is a skill that my students will now understand and incorporate them into their general strategy. Later in the semester all I have to say is “This is a note card moment” and my students know what to do.

Teaching the study skills within the framework of a math class helps students to understand the current material while also adding to their study skill toolbox.

Study Skills That I Cover

I have a list of 12 study skills that I cover in my developmental math classes.

- Note Taking
- Doing Homework Effectively
- Reading a Math Text
- Creating Note Cards
- Test Preparation
- Practice Quizzes
- Test Taking
- Test Analysis
- Time Management
- Study Groups
- Math Anxiety
- Learning Styles

Three Essential Elements for Every Study Skill

Every study skill that I teach must address the following three elements.

- How do we do it?
  Obviously I have to show them how to apply or incorporate each study skill. I also have to discuss when to apply the skill and under which circumstances to apply the skill.
- Why do we do it?
  Students need to know why each skill is important, and what benefits come from applying the skill. If they don’t know why each skill is important, they won’t see why they need to incorporate that skill into their routine. If you don’t explain the benefits associated with a particular study skill, they will assume there are none.
- Encourage them to do it.
  To get students started, you must encourage them to use the study skills. That includes suggesting when to use a particular study skill – read through the next section of the textbook before tomorrow’s class, create a set of note cards for problems that you find to be difficult, create a practice quiz that coves today’s material, … You also have to remind them of the benefits – by going over your mistakes on last night’s homework you’ll increase your chances of getting a similar problem correct on the exam.

How do I cover study skills and still cover all of the material in the course outline?

It’s possible! I incorporate study skills into my mathematics lectures. My preference is to talk about study skills within the flow of the daily lectures. I have designed short in-class activities that I can use. I try to keep the time commitment to 10 or less minutes. I have also developed a series of assignments that can be completed outside of class.

What follows are a series of discussions, activities, and assignments that I use.

Note Taking

I start with note taking because I believe that a high percentage of the learning that occurs takes place inside the classroom. Note taking is the one activity that is essentially included in each day's session.

On the first day of class I tell my students what type of binder they need to have, and how the notebook should be structured.

(A description of how I want the notebook to be structured follows on the next page.)

On the first day that I lecture I explain the Cornell note taking system, and why it's helpful.

(A brief visual explanation follows the page explaining the notebook structure.)

I also explain why we take notes in class, and how we use them afterward.

After I cover enough material for roughly one page of notes, I stop and talk to my students about their notes.

Are they neat? Are they easy to follow?
What questions or comments could have been written in the left-hand column?
How would you summarize the first page of notes at the bottom of the page?

This takes a total of 5 minutes of class time on top of the math lecture.

That's it. On day 2, I walk into class and see my students preparing their pages.

I start each class by asking students to read me their summaries from the previous day.

Essentially, this is my "What did we cover yesterday?" moment.

Your Math Binder

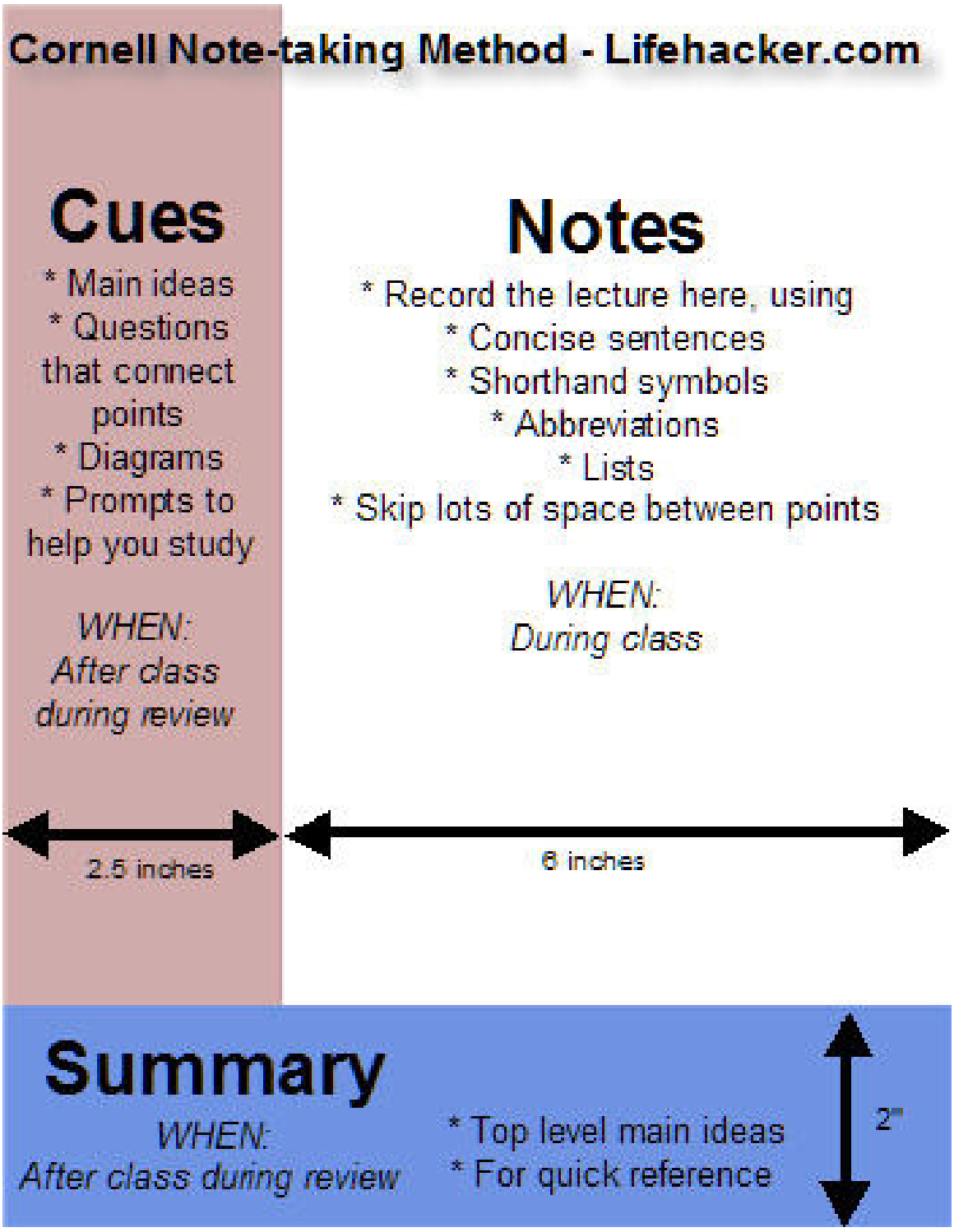
Many say that organization is one of the keys to success. It is definitely true in a math class. You can take the greatest notes, but if you can't find them it won't help you at all. You should have one notebook that is for your math class only. You should use a three-ring binder, which is easier for creating quality notes than a spiral notebook. A binder that is 1 ½" or 2" thick would be a good choice.

Put your copy of the class syllabus at the very beginning of the binder. The syllabus contains all of the important information for the course, including my office location and the schedule for office hours. After the syllabus, break the binder into several sections using section dividers. Here are the sections I want you to use.

- **Section 1 -** Notes: This section will contain your classroom notes.
- **Section 2 –** Homework: In addition to your homework (odd textbook exercises), you can keep class work in this section.
- **Section 3 -** Exams and Quizzes: Keep your old exams and quizzes in this section. Many students fail to keep their old exams and quizzes handy, but reviewing old quizzes is a great way to prepare for an exam. Reviewing old exams is a great way to prepare for a final cumulative exam.
- **Section 4 –** Key Problems: For each section you will be assigned a set of key problems that you will turn in. Once they are returned to you, store them here. This is also the place to keep your homework diary of problems you have struggled with.
- **Section 5 –** Handouts: In this section you can keep any handouts that I give you. This should include any handouts I give you throughout the semester.
- **Section 6 –** Glossary: Each section in the textbook has a set of key vocabulary terms. You will keep the definitions of these terms in this section of your notebook

Cornell Notes Overview

This overview comes from LifeHacker.com .



Doing Homework #1 – Coping Strategies

- **Form groups of 2-4 students.**
- **Have each group of students make a list of 5 coping strategies when stuck on a homework exercise. (5 minutes should be plenty of time.)**
- **Collect the strategies on the board, 1 from a group at a time until all strategies are exhausted.**
- **Comment/discuss the effectiveness/practicality of each.**
- **Add any other strategies you can think of.**

Doing Homework #2 - Note Cards

- **Assign homework near the end of the class period. Instruct students to check their answers after completing each of the exercises.**

- **For any problem missed, the student should**
  -Write the problem, and what went wrong, on the front of the card.
  -Work out the problem correctly on the back.

- **Collect the note cards at the beginning of the next class to look them over. This will give you a snapshot of where your students are having trouble.**

- **Briefly discuss how to use these note cards as part of an overall test preparation strategy, as well as the potential benefits of using these cards.**

Reading the Textbook #1 – Main Features

- **Have students flip through 1 chapter in the textbook and make a listing of the different features in the book. This can be done individually, or in groups.**

- **For each feature, discuss how it can be used to help the student learn and understand mathematics.**

Memorization - Note Cards

- **Note cards are an effective tool for memorization. Here is a list of possible topics for which note cards would help students to memorize.**

- **Sign rules for integers**
- **Rules for arithmetic with fractions**
- **Formulas for factoring**
- **Set up for word problems**
- **First step for solving absolute value equations and inequalities**
- **Steps for graphing different types of functions/equations**

- **Choose one topic early in the course, and make a set of note cards on the board. For example, in a prealgebra class covering multiplication and division of integers, the following would work.**

Front	Back
Positive × Positive Positive ÷ Positive	Positive
Positive × Negative Positive ÷ Negative	Negative
Negative × Positive Negative ÷ Positive	Negative
Negative × Negative Negative ÷ Negative	Positive

- **As the course progresses, you can point out opportunities to create note cards.**

Test Preparation

Many developmental math students do not know how (or what) to study for an exam.

- **Two or three days before the first exam, go over the different topics that could be on the exam.**
- **Talk to your students about your recommended preparation.**
  - **Look over your homework diary.**
  - **Start with the chapter test at the end of the chapter in the textbook.**
  - **For problems on the chapter test that you struggled with, find similar problems in the chapter review.**
  - **If there are problems that you struggled with on the chapter review, you can:**
    - **Look over your homework from that section.**
    - **Ask your instructor for help.**
    - **Visit the tutorial center.**
    - **Ask a classmate for help.**

Practice Quizzes

As we all learned in grad school, being able to anticipate what you'll be asked is half the battle to be successful on an exam.

- **Assign your students to create a practice quiz (for a section or an entire chapter) for homework.**
- **Give them an idea about the types of problems, as well as how many, to include.**
- **You can:**
  - **Collect the quizzes and give your feedback.**
  - **Have students swap quizzes and analyze the other student's test. (Too hard, too easy, missing this type of problem, …)**
  - **Have students swap quizzes and take each other's practice quiz. Ask the student who wrote the practice quiz to grade it.**

Practice Quizzes - MyMathLab Style

- **Print out the online exercise listing for a certain chapter for your text from MyMathLab.**

- **Form groups of 4 students, and instruct them to make a 20 question practice test from this list.**

- **Tell them that the problems should be varied in level of difficulty and represent the entire chapter.**

- **Quickly create their practice tests on MyMathLab, and post them so they can take it.**

- **Sometimes I have students take the practice quiz that another group wrote and analyze how well they did in creating their practice quiz.**

Test Taking - Half Test

- **Write a varied practice test that will take half of a class period.**

- **After the students have finished, give out a sheet with solutions.**

- **Have students determine whether they are working quickly enough.**

- **Have students determine which subjects/problems will require further study and spend the remainder of the time answering questions.**

- **The main idea is to put students in a test-like situation prior to the test. This can be done before the first exam, and students can do this on their own prior to all subsequent exams.**

Test Analysis

- **When you turn back a test, assign your students a "Test Analysis" assignment.**
- **For any problem they lost points on, have them**
  - **Explain the error in their own words**
  - **Rework the problem correctly**
  - **Cite a page number and example number where this type of problem can be found in the book**
  - **Make up a similar problem of their own and solve it.**

Time Management – Weekly Calendar

- **Give a 1-week calendar and have students fill out commitments (classes, work, ...), travel time, sleep, meals, ...**

- **Then have students pencil in time for studying and homework for each class.**

- **Open discussion on whether this is enough time devoted to the course, is the plan realistic, etcetera.**

- **A couple of weeks later have students keep track of the time they spend working on your class. Have them compare their budgeted study time with their actual study time.**

Study Groups

If you want to encourage your students to form groups outside of class, consider incorporating collaborative activities into your class.

For example, reserve the last 5-10 minutes for students to work on problems in groups. If the experience goes well, your students are more likely to work together outside of class.

Extend this idea to assignments for groups to complete outside of class.

Some fun assignments I have tried include:

- **Mathematicians in History – Create a poster documenting the life of a prominent mathematician.**

- **Newsletter Assignment – Create a newsletter explaining how to solve a certain type of problem.**

(If you would like sample assignments, email me at georgew@cos.edu .)

Math Anxiety – Math Autobiography

As a homework assignment, ask students to prepare a brief "Math Autobiography". This should include items such as

- **Classes taken**
- **Positive experiences**
- **Negative experiences**
- **Overall attitude about math**
- **Strengths and weaknesses**

Just getting these ideas on paper helps students to realize their situation, and gives you a quick snapshot into the mathematical background/baggage of your students.

Commonalities can be discussed in class, showing students that they are not the "only one".

Math Anxiety –
Assessment of Strengths and Weaknesses

- **During the last 5 minutes of class, have students list 3 reasons why they will pass the class, as well as completing the sentence "If I fail the class, it will most likely be because ..."**

- **Collect all of the responses from students on their way out.**

- **Prepare a summary list from both categories before the next class.**

- **Begin the next day with a discussion that will celebrate those strengths, and focus on how to overcome those potential shortcomings. Include your suggestions for overcoming math anxiety.**

Learning Styles #1 - Pass the Pen

- **Instructor puts a problem on the board. This works best at the end of class, when you have time to sneak in that one extra example to make sure students truly understand before they leave.**

- **A volunteer comes up to do 1 step, then passes the pen to another volunteer who does the next step, and so on.**

Note Taking Activity –

“Building the Perfect Notes"

- **Give a carefully scripted 20-minute lecture. Include definitions, examples, and commentary.**

- **After the 20 minutes, pair students together and have them compare their notes for 5 minutes. Give each pair 10 minutes to rewrite their notes based on their discussions.**

- **Combine two pairs together and have each group of 4 compare their notes for 5 minutes. Give each group 10 minutes to rewrite their notes based on their discussions.**

- **For homework, have each student supplement their notes with materials from the textbook.**

- **On the next day of class, go over a list of things that students added to their notes.**

Reading the Textbook #2 – Think/Pair/Share

- **For homework have students read through several objectives or an entire section in the book. The earlier in the semester the better, while the material is on the "easier" side.**

- **Students should summarize the main ideas and describe the types of examples covered.**

- **At the beginning of class, put students in groups of 2-4 students. The students should compare what they have written with the rest of their group, looking for items or ideas they are missing.**

- **Give the students a brief assignment, allowing them to use what they have written. This will allow the students to determine whether they got enough out of the reading.**

Learning Styles #2 –
Brief Group Presentations

- **At the end of class, assign a particular problem to one group, based on the material covered that day. This can be selected from the homework exercises, or a problem of your own.**

- **At the beginning of the next class they make a 5-minute presentation of their solution.**

- **The presentation should include auditory/visual components.**

- **Encourage them to use as much of the board as they can to present their work, and to make their explanations as clear and thorough as possible.**