Suggestions On How To Study[1]

Each year after the first summative test a student will come in for help. They are distressed since they have always gotten good grades on tests, they studied, but they did not do so well on the summative. They come for answers to why they did not do well. They want to know how I can fix this for them, or what they can do so it does not happen again.

The idea of "studying" is concept that kids think they understand. But when they are asked the following questions, they are surprised to find that what they call "studying" may not be all that effective in learning and remembering.

Pretend for a moment you are in this situation and I ask you these questions. How would you answer?

- Did you make a list of key concepts from the learning materials to test yourself?
- Did you take the main concepts, define them and use them in a paragraph?
- While you were reading, looking through notes, or watching videos, did you convert the main ideas into questions and quiz yourself later?
- Did you take the main learning concepts and rewrite them in your own words and check them against your learning materials?
- Did you relate the new material to things you already had studied in the past?
- Did you relate the topics in the new material to each other using a concept map?
- Did you look for clear examples of the learning concepts and write why these are examples?

In order to properly study, you have to be active with the learning material. You cannot simply read, take notes and reread. You cannot cram one night before a test. You cannot just prepare if there is a test coming up. Being proficient in biology (or any subject) takes work and this work must be smart, consistent, and organized. Studying does not just happen to get ready for a test.

Students often think that by paying attention in class or taking notes that they understand the concepts, only to be let down when they have to show proficiency on a summative test. There can be a sense of overconfidence.

The three biggest mistakes kids make when studying are:

1. A failure to know the areas in which your learning is weak.
2. A choice of study techniques that leave them with a false sense of mastery.
3. Only studying when they have a quiz or test. You study to learn. This should happen each night if possible, even for 10 minutes.

Effective Study Strategies

Retrieving Things From Memory

- Instead of rereading, use self-quizzes or flashcards.
- As you work with your Home Learning materials, pause periodically and ask (without looking): What are the main ideas? What information or terms are new to me? How does this stuff relate to what i already know?
- Use end of chapter questions, Quizlet, or generate your own quizzes (exchange them with a friend).
- When you quiz, go back and see if you are correct and if not, why?
- Identify weak areas and focus on how you can get stronger in those areas.
- If using flash cards, use a multi-deck system (see below).

[1] Many of these strategies are adapted from *Making It Stick: The Science of Successful Learning* http://makeitstick.net/

Spacing Out Studying

Cramming might help you pass the test in the short-term, but as many discover, you quickly forget anything you learn this way. If you have four hours to study, then you're much better spending an hour every single day for four days than spending four hours on one day. Even breaking a single hour into four well spaced fifteen-minute study sessions can be beneficial.

Interleaving

Science tells us that chunking the learning of one new thing at a time is less effective than studying a variety of things at a time. For example if you just learned about photosynthesis and you want to study that, the old way would be just to sit down and try to study that topic. A better way would be to start with a different topic to review, then study photosynthesis, and then another review topic from last week. If the topics relate in some way, that's even better.

Relate To What You Already Know

- Write out how a concept you are studying relates or connects to other concepts.
- Explain what you know to another person in your class and have them do the same. Have a conversation about similarities/differences in your explanations.
- Use analogies, drawing models or concept maps to connect learning to other learning.

Generate Answers

- You will get your Home Learning in advance of classroom instruction. Before doing any learning on your own, work through the study questions. Then go and read or interact with the Home Learning resources to see how you did and what you left out.

Reflection

- At some point during the day after you learn something new, use your notebook or a Google Doc to review what you learned. Ask: What went well? What have you learned before that this relates to? What else do you need to know?

Below are some tips on how to interact with the learning at home. Try different things and see how they work for you. The main idea is to engage with the learning and not just read over and over again. Also, make sure you write down questions and ask them in class.

Suggested Reading on Learning Better

Spaced Practice by The Learning Scientists

Retrieval by The Learning Scientists

Strengthening The Student Toolbox by John Dunlosky

Test-enhanced learning: Using retrieval practice to help students learn by Cynthia Brame

Make It Stick by Peter Brown

Suggested Ways to Study

Below is a list of suggested study methods and others that should be done less frequently.

Use These More Often	Use These Less Often
● Conceptual Flash Cards ● Quizlets ● Self-quizzes with 5 old and 5 new items ● Group study with friends ● After getting a quiz or test back, determine why you missed what you did and write out the correct answers for future studying. ● Card sequences ● Concept maps ● Relate new items to other items you already know. Explain in paragraphs. ● Read from book and then write out your own summary. ● Explain a complex process in your own words after studying, and then compare your work with that of the book or information piece. ● Note exchange with another student to see how they compare. Discuss and revise. ● Make your own quiz for a friend and them, you. Take the quiz and correct your mistakes. ● Short videos or animations and then writing the concepts out in your own words. Watch the video again for clarification. ● Textbook workbook page completion after learning	● Rereading the book ● Writing notes from the book over and over ● Rereading your notes from class ● Rereading or memorizing a study guide ● Memorization without knowing underlying principles ● Cramming ● Not reviewing missed test items ● Memory Flash Cards ● Highlighting notes

Lesser Known Strategies

Below are summaries from some of the strategies listed in the table above. If you have questions about others, feel free to come in and we can discuss.

Flash Card Piles

Make flashcards each week. As you learn the material and feel you have mastered it, make a “weekly pile” for those cards. The other, unmastered cards stay in your “working” pile. Weekly (maybe on Thursday), go over your working pile and your weekly pile. New mastered cards add to your weekly pile, while cards you still know well in you weekly pile get transferred into a new pile called your “bi-weekly” pile or your “monthly” pile depending you your choice. As you master cards, they move from pile to pile. New cards will be added each week to your working pile.

Concept Flash Cards

Typical 3x5 note cards, but they contain conceptual prompts instead of vocabulary words. Students look at each prompt and then remember or vocalize the concept in its entirely. Can be used alone or with friends.

Self-Quizzes and Self-Quizzes 5 and 5

Self quizzes require the student to write their own quiz and answer it. They can make them for each other as well. The 5 and 5 option is to include 5 new concepts and 5 old ones from previous units of study.

Card Sequences

These can be done with note cards. Here a specific concept is broken into smaller ideas and written on each card. The cards are shuffled and the student places them in the correct order. With friends, students can explain why they think that order is correct and discuss validity.

Concept Maps

Concept maps are geometrically shaped areas connected by lines. They typically start with broader topics and get more specific. Lines in different directions may be used with more shapes to make topics more and more specific. As a student follows each path, the linear concept idea should emerge. As a map, students can see how all of the concepts fit together.