Penn State students typically earn an impressive mix of As and Bs in high school, but then struggle in a some of their courses during their college careers. Instructors will often tell their students that their study strategies from high school won’t work well in college anymore, but then don’t offer any specific details or suggestions about exactly what students should do.

The steps listed below are part of an approach you can use in any class. People who are able to teach themselves complex things almost always do these things, but they are not always aware that they are doing each step.

Read over the steps below. We have included examples and questions to help you understand what it is you should be doing or thinking about. You and your course instructors may have additional ideas, but this should be a good first step in helping students answer the question: **How should I study for the next exam?**

**The Learning Scientists have many great resources for students:
Videos:** [**http://www.learningscientists.org/videos/**](http://www.learningscientists.org/videos/)

**Downloadable Posters:** [**http://www.learningscientists.org/downloadable-materials/**](http://www.learningscientists.org/downloadable-materials/)

1. **What do you need to learn?**
	1. Review the learning objectives listed for that material.
	2. Review any powerpoint slides or other material your instructor posts.
	3. Listen to what your teacher says are the goals for the topic.
	4. Advice from previous students.
	5. If there are sample questions provided by your instructor, textbook, or other resource, attempt to answer those questions and then use your score to help evaluate your strengths and weaknesses (see below).
	6. Are textbook or other readings important? Is the text hard to read?
	7. Are there processes, equations or relationships between ideas to learn?
	8. If you are not sure what you need to learn, ask your instructor!
2. **Do you have any prior knowledge or experiences that could help you learn this?**(Write out your answers to each question below on a separate piece of paper.)
	1. Have you ever seen any of this material or something similar in another class? Do you think you still know this material or do you need to review it?
	2. Do you understand what your instructor is asking you to do? Is it ok to just memorize and recite facts, or do you need to demonstrate a more complex understanding, like analyzing something or solving problems? Are you comfortable doing this?
	3. Do you have any issues or concerns with any of this material or with the format of the exam you will take or other work you are required to complete?
	4. Have you ever used a study strategy in the past that helped you learn things like this, or do you need to develop one or more new study strategies?
	5. Create a diagram or a pair of columns and write down the things you already understand, and the things that you do not understand, then concentrate on what you do not understand yet. (You may want a to do this on a separate sheet of paper to track your progress and to keep track of your study progress)
3. **Plan your approach**
	1. Create a schedule for studying and then budget your time to get everything done.
		1. For a 3 credit class, you will likely need to study about 6 hours outside of class every single week.
			1. If you have three exams spaced five weeks apart, you can get in 30 hours of studying for each exam in the course this way.
			2. If you have four exams spaced three to four weeks apart, you can get in about 22 hours of studying for each exam in the course.
			3. If you have five exams spaced three weeks apart, you can get in about 18 hours of studying for each exam in the course.
		2. Consider using a planner to set time aside for each task that needs to be completed.
		3. Be sure to factor in tests, homework, study time, and assignments from your other classes.
		4. Don’t forget work schedules, personal plans, family obligations, and the time you need to stay healthy (research clearly demonstrates that lack of sleep, exercise, time to relax, and poor nutrition all interfere with learning!)
	2. Plan for any supplies you need (pencils, pens, extra paper, note cards, post its, etc.)
	3. Stock up on any food or beverages you need.
	4. Avoid music or other distractions. Your brain constantly listens for words that are important to you, so if you must have music playing, choose instrumental music (no words or lyrics!), or listen to music in a language you do not speak.
	5. Choose a study strategy that is well matched to what you need to learn (see below).
	6. **Remember that the strategy or strategies you choose should integrate all of the things you have learned about each topic**.
4. **Use the strategies you chose to create a new set of notes** that combine all of the information you have from class.
5. Be sure to go back to the original information (the top row of boxes) and make sure that you did not leave anything out of your new set of combined notes.

**Think about everything you need to learn and then choose *some combination* of the strategies listed below.**

Take notes

Take notes

Take notes

Study all the information you have from other sources (Office Hours, homework, YouTube, Wikipeda, Khan Academy, anything at all)

Study all the information in readings or anything else your instructor assigned.

Study all the information in your instructor’s Powerpoints, lectures, tutorials, or anything else your instructor provided.

*This takes weeks, not days. You need to study every week, about 2 hours outside of class for every hour you are in class.*

1. **Choose a study strategy and monitor your progress**
Try to match your strategy to what you need to accomplish. If you just need to spit back a few facts, then rote memorization may be a good strategy. If you need to memorize many facts, or if you need to understand more complex relationships, solve problems, or analyze new information, then you should consider other strategies. DO NOT try to use every strategy listed below for every single thing you study. Instead, consider each of these strategies as a tool, and then choose the tool that will work best for what you need to learn. If you have many study tools in your “toolbox”, then you will be able to choose the right tool for whatever you need to learn.

It may take some time to become comfortable with a new study strategy, and at first it may seem that a new study strategy slows down your progress. Don’t be frustrated by this. Give yourself a chance to become comfortable with a new approach. As you become proficient with multiple study strategies, and learn to choose the correct strategy for the specific learning task, you will likely spend less time studying but still start earning higher grades.

The following strategies can be used while you are studying your class notes, reading a text book, and reviewing models or other classroom resources.

	1. Rote memorization is probably the most straightforward study strategy, but it takes a lot of time. It works very well if you only need to memorize a few things that are not very complex. The key to rote memorization is repetition.
		1. Repeat the items to yourself again and again until you do not need to refer to your notes, text, or other resource.
		2. Write out the items you want to memorize over and over again until you do not need to refer to your notes, text, or other resource. This is a good way to practice spelling too.
		3. Create flashcards and then drill yourself by reviewing your flashcards as often as possible.
		4. *Monitoring*. Compare the information you have memorized to the information listed in your notes or textbook. Is anything missing? If so, keep repeating one or more of the steps above.

Besides taking a lot of time, a drawback with rote memorization is that you do not learn the relationships between ideas, or how to solve problems or analyze new situations. If your instructor expects you to be able to do these things, then consider one or more of the strategies listed below.

* 1. Explain what you are studying/Teach someone else
		1. As you study, pause frequently (after every paragraph, every figure, or every structure or region) and explain what you just learned to yourself, then go back and study the next paragraph, figure, etc. Keep pausing and giving a self-explanation again and again.
		2. Alternatively, if you are studying with a partner, try explaining concepts to your study partner. Ideally, you should close or cover your notes or texts so that you are explaining from memory. Your partner can keep his/her notes or texts open and check your explanation. Trade roles frequently.
		3. *Monitoring*. Compare your explanation to your notes, the text, or other resources. Make a note of anything you leave out or that does not make sense to you, and then study that again. If you continue having trouble, make a note of that concept and then talk with a TA or your instructor in class or during office hours. If you are feeling that you are not getting anywhere, then you may need to choose another strategy.
	2. Integrate information presented in text with information presented in figures and diagrams.
		1. Important information is presented in both text and diagrams, but students often pay the most attention to the text. Since scientists often use figures and diagrams to communicate ideas, students will often miss important information if they mostly study the text.
		2. **If the text is hard to read, try studying the figures and diagrams first**, and then scan the text for ideas you missed or don’t understand.
			1. What ideas are presented in both the text and the diagram? These ideas may be very important.
			2. What ideas are in the diagram, but not in the text? How do these details help things make more sense?
		3. What ideas are in the text, but not in the diagram? How do these details help things make more sense?
		4. Combine this strategy with any other strategy where both text and diagrams are part of what you need to learn. Try combining this strategy with the explanation strategy described earlier.
		5. *Monitoring*. Compare the notes you make while studying to the notes you took in class, the text you are reading, or other resources. Make a list of anything you leave out or that does not make sense to you, and then study that again. If you continue having trouble, make a note of that concept and then talk with a TA or your instructor in class or during office hours. If you are feeling that you are not getting anywhere, then you may need to choose another strategy.
	3. Draw out pictures of what you are studying on a large piece of paper or even a chalkboard in an empty classroom. Label the main structures as well as nearby structures. Try drawing both macroscopic and microscopic views. If applicable, draw things from different views (from a top view, side and bottom views, or transverse, sagittal, and coronal section views). Label everything in the drawing. Don’t forget to explain the function of each structure (What does it do? Why is it important?)
		1. This can also be done while you are studying alone or studying with a partner. Either way, be sure that you can explain everything you draw (i.e. combine it with the explanation strategy discussed earlier).
		2. *Monitoring*. Compare your drawing and explanations to your class notes, the text, or other resources. Make a note of anything you leave out or that does not make sense to you, and then study that again. If you continue having trouble, make a note of that concept and then talk with a TA or your instructor in class or during office hours. If you are feeling that you are not getting anywhere, then you may need to choose another strategy.
	4. Draw flowcharts / concept maps when you need to learn processes. Use nouns for the main ideas, and then connect the main ideas with arrows. Use verbs next to each arrow to explain what happens from one step to the next step.

		1. Examples

trigger

 Ventricular
Systole

* + - 1.

becomes

composed of

entombs

deposit

Bone
matrix

Osteoblasts

 Osteoblast

Osteocyte

 25% water
25% protein
50% mineral salts

QRS
Complex

Action
Potentials

Rt. & Lft.
Ventricle

depolarize

trigger

* + - 1.
		1. This can also be done while you are studying alone or studying with a partner. Either way, be sure that you can explain everything in your flowchart.
		2. *Monitoring*. Compare your flowchart and explanations to your class notes, the text, or other resources. Make a note of anything you leave out or that does not make sense to you, and then study that again. If you continue having trouble, make a note of that concept and then talk with a TA o r your instructor in class or during office hours. If you are feeling that you are not getting anywhere, then you may need to choose another strategy.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Direction of solute movement | Membrane Transport Protein Required? | Energy InputRequired? | Type of Reaction | Example |
| Simple Diffusion | high concentration to low | No | No | Exergonic | hydrophobic hormone entering cell |
| Facilitated Diffusion | high concentration to low | Yes | No | Exergonic | Na+ passing through v-gated Na+ channel |
| Active Transport | low concentration to high | Yes | Yes | Endergonic | Na+/K+ pump |

* 1. Use tables to organize information

**Second**, list the things you know about each idea along the top

**First**, Llst big ideas along the left

* + 1. You can use tables while you are studying alone or studying with a partner. Either way, be sure that you can explain your table.
		2. *Monitoring*. Compare your table and explanations to your class notes, the text, or other resources. Make a note of anything you leave out or that does not make sense to you, and then study that again. If you continue having trouble, make a note of that concept and then talk with a TA or your instructor in class or during office hours. If you are feeling that you are not getting anywhere, then you may need to choose another strategy.
1. **Is everything working out ok? If not, then adjust your strategy!**
	1. Look back at how you assessed the task, is everything complete or did you discover holes and/or new questions?
	2. Review your homework, returned quizzes, exams, writing assignments, etc. and ask the following questions.
		1. Are you happy with your performance?
			1. If yes, then keep up the good work!
			2. If no, then ask yourself the questions below.
				1. Did you understand what you needed to do? If not, how can make sure that you accurately assess what you need to learn in the future?
				2. Do you understand your strengths and weaknesses? Look for patterns in where you are earning points and where you are losing points. If you do not see any patterns, speak with your TA or instructor.
				3. How much time did you spend studying (be honest with yourself!)? Was it enough? If not, then what will you do differently next time? Remember that **if you keep studying the same way, you will probably keep earning the same grades**. Think about what you can change about your approach to be successful.
				4. Did you use the best study strategies? If not, what will you do differently in the future? How will you know if a strategy is working for you or not?
		2. **Remember that you can speak with your TAs and instructors about any of the things discussed here.**