

AP Biology Learning Plan

As you transition to college-level courses, arguably the biggest adjustment that you are going to have to make is determining a process that you can use to do the work that you need to do on your own. Hopefully, many of the most important in-class structures that you have been exposed to in the pre-college-level experience of school are still going to be in place, but many of the more guided structures are going to disappear. In order to be successful, you're going to need to develop a **Learning Plan** that you can use to make up for what is being removed from your scholastic experience. This document endeavors to help you do just that. What follows are a series of *best practices for learning* that are based on the research that has been done on the topic of how people learn. This is not intended to serve as a comprehensive, one-size-fits-all, approach, but rather to serve as a foundation from which you might build the learning plan that works best for you.

In-class learning

In order to do as well as you can, it's important to use in-class time well. Fundamentally, this means that you are an active, engaged, and interested learner when you are in class. Assuming that this is the operational foundation for what happens in class, we can extrapolate this to a series of practices that you should try to follow when you are a student in a classroom. Here is a (non-exhaustive) list:

- You arrive to class having completed whatever out-of-class work was required of you.
- You don't come to class late (if you're not in the room, you'll miss what happens).
- You take out whatever you need to have to participate in class prior to the beginning of class (so that you don't have to spend time finding materials later, when the class is happening).
- When you do arrive, you begin work on anything that might be indicated on the board, and submit anything that has been requested.
- You silence your phone, and put it somewhere you will not be tempted to use it when your attention should be directed elsewhere (if this seems to be a problem for you, I encourage you to reexamine your relationship with technology, and see if it's as healthy as it could be).
- You don't complain about whatever it is that is being done in class on any particular day.
- You pay attention to announcements from the teacher as to assignment due dates, upcoming assessments, etc.
- You employ a system of information capture that does not require your teacher or your peers to have to repeat themselves.
- In-class notes are taken in such a way that they make sense upon review, and demonstrate a structural relationship among the topics that are discussed, while not being a verbatim, word-for-word recording of the material as presented by the teacher.
- You follow a series of constructive "norms" when you work with your peers:
 - You don't insult them, or their ideas.
 - You communicate with them as to your experience of working with them and your expectations for their behavior.
 - You contribute to your group with an equal effort of everyone else in your group.

At-home learning

Learning at home is a crucial part of your overall learning strategy. But many kids and parents are not sure what should be done at home to increase learning. What follows is another series of best practices, with a focus on home.

Time management analysis

Generally, home learning depends on how much time is available to the student each week for the learning process. There is also a balance between maintaining what you already know, learning new material and preparing for upcoming assessments. When you have 6 classes, it is easy to lose track of what time you actually have.

Calendar

My first suggestion is to use some sort of calendar. It could be a large desk calendar on a wall, a calendar on your phone, calendar apps, or an agenda given to you by the school. Some students sync a mobile calendar on their phone, with a home calendar as well. Maintaining (and using) a calendar of your work and due dates is critical.

Time inventory

The next phase is to take an inventory of what available time you have during the week to work on school related material. This has to be an honest assessment of a normal week.

Fill in the following grid with the activities you do each day after school. Pick a reasonable bedtime of no later than 11 pm. For weekend days, be conservative. Don't assume you will have all day to study on an average week.

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Extra-Curricular Activities and Family Responsibilities							
Homework Time							

Now that you have an idea how much time you actually have, you should add onto your calendar any upcoming projects, quizzes or tests.

In terms of at-home study, it's important to understand that there has to be a balance between interacting with new material and reviewing old material.

Independent learning of course material

One of the major differences between college-level and prior-level courses is the amount of material that you have to learn on your own. Fortunately, we know a good bit about how different people learn different things. This section will describe some of the major understandings about how different people learn.

Recall

Recall is your major goal when you learn. You probably have no major issues getting material into your head. The difficulties arise when you are asked to apply and re-express that material in the future (on things like assessments). This is why you need to be able to recall material. Think of your brain as a forest, and all of the different things you have learned as trees in that forest. In order to recall a particular thing that you have learned, you'll need to be able to get to that particular tree whenever it's requested of you. This will only happen if you practice finding your way back to that piece of knowledge over and over and over again. By far the most effective

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technique to help you recall information is “self-quizzing”. As you work through material stop periodically and ask/answer the following questions:

- Can you make a list of the main concepts from each section of new material?
- Can you define/explain those concepts and use them in paragraphs?
- Can you convert the main points of the material into questions, and then answer those questions?
- Can you rephrase the content in your own words?
- Can you relate the content to what you already know?
- Can you find additional examples of the material outside of what you already know?
- What did I just read? What is this about?
- I believe it happens this way: <state your thinking> check to see, revise as needed.

As far as AP Biology goes, the structure of the course material/reading guide is designed to help you with recall (as long as you use them correctly). When dealing with new material, you should work through it initially, taking notes and self-quizzing as needed. Then, after your pass through the material, you should look at the questions and major understandings on the reading guide and make sure you are comfortable with them to the point that you can answer them without having to refer to your notes. If you aren't, that's the signal that more work is needed to learn the material (either by reading the textbook, watching one of the supplementary podcasts/videos, or bringing the questions with you to class).

Spacing

Spacing refers to returning to material that you are learning after a period of time. The idea here is that by waiting a period of time, you will begin to forget material, and returning to material once you start forgetting it makes your recall and retention better every time you come back to it. The only thing that you have to figure out in order to space your learning effectively is how long that interval should be. Try fooling around with different intervals to figure out what works best.

- Develop a **spacing schedule**. Try a pattern like covering material within a day of learning, then again in ~3 days, and then maybe weekly, and then every month. Adjust as necessary, depending on your results.
- To help you space, make a series of flashcards for every part of the course, and sort them into piles that you review according to your spacing schedule. Don't remove flashcards you “know”, just put them in a pile to be revisited less often in your spacing schedule. Move them back into more frequent rotation if/when you forget them again.

Interleaving

Interleaving refers to mixing up the material that you are learning so that you are not spending too much time learning any one skill or topic in a mass. It's important to interleave, because if you spend too much time learning just one thing, you won't engage in the process of moving material from short-term to long-term memory AND you'll fool yourself into thinking that you know material much better than you actually do. The main strategy for interleaving is probably obvious: Once you've done one thing for a while, stop doing it and do something else.

Here are some other interleaving strategies:

- Vary problem types, frequently. Don't chunk them.
- Study more than one formula type at a time in mathematics. Alternate frequently.
- Study more than one subject at a time, spend enough time to feel just comfortable then move on, then come back later.

What's going to become obvious if you interleave your studying is that it seems like you are doing something much harder than the typical way that you have “chunked” or “crammed” in the past. This is absolutely correct. And that's why interleaving works better than what you have typically done.

Learning types

There has been some consideration of different **learning types** in the literature. This is different from the old notion of “learning styles” (ie. auditory learners, visual learners, etc), which is outdated and not broadly supported by the literature. Here is a brief review of two major learner type comparisons. As you read what follows, remember that your learning type is not fixed, and it will change from subject to subject, or even topic to topic.

Low structure vs. High structure learners-

Low structure learners have a hard time integrating new information into existing mental models. They can't easily discriminate between relevant and irrelevant details. **High structure** learners are able to determine the important themes and principles in new information, and not pay attention to irrelevant details. You definitely want to focus on high structure elements instead of low structure ones. If you do find yourself unable to work new material into your existing thoughts about a course, you are in trouble. In order to deal with this problem when it emerges (and it always emerges at some point for all of us), you should continually self-quiz as you learn new information. Pick a convenient interval (every 5 minutes, every sub-heading, etc.), and quiz yourself about what you are reading (what is similar? what is different? why this material now?)

Example learners vs. Rule learners-

Rule learners tend to be able to determine the underlying rules in examples and apply them to new situations. **Example learners** tend to memorize the examples that are used, without noting the underlying principles. If you are finding it difficult to determine the underlying rules in the examples that are used during a particular subject, gather all of the examples into one place (ex. make a list) and compare them to look for underlying similarities. Those similarities are the important things, the other details are less so.

Final thoughts on independent learning: Not all practice is equal

When you are learning a subject, you are practicing it, just like an instrument or any other skill. To improve at a subject you need sustained, deliberate, practice which is goal-oriented toward reaching beyond your current level of performance. Doing familiar things is not going to help you improve (though it does help you do what you already know better/faster/etc.). Deliberate practice is typically NOT enjoyable, because it is difficult. Here's a list of practices you should try to use when learning material:

- Blocked practice and massed practice are not all that useful for learning new things. They are also deceptive, leading the learner to think they are doing useful work when they are not.
- Don't record when you encode. Take material and turn it into your own phraseology, representations.
- Try to solve new problems prior to seeing the solutions to those problems (“generation”).
- The best learning is going to feel slow, and somewhat uneasy. That's a sign that you are doing the right kind of things. Feeling like it's coming fast and easy is a good sign that you are probably not doing the best kind of learning.
- Rereading notes is **NOT VERY USEFUL AT ALL.**
- Practice retrieving learning from new memory
- Space out retrieval practice.
- Interleave study of different problem types.
- Practice elaboration, generation, and reflection. Ask yourself:
 - What went well?
 - What could have gone better?
 - What does current learning remind you of?
 - What might you need to learn for better mastery?
 - What strategies might get you better results?

Reviewing for Exams, Quizzes, and other Assessments

Most teachers tell their students in advance when they will have assessments. Now that you have these marked on your calendar and you know your time inventory, studying for a test gets easier.

Step 1: Make a new time inventory for the days leading up to the test. You will have an honest idea of how many days you have for studying when you are finished. If you have a study guide with a list of items to learn from your teacher or if you make a list yourself, simply divide the number of items to learn by the number of days you have study time. For example, if you have a test in 9 days then you have a maximum of 8 days to prepare. If your inventory only shows 6 days free to study and you have 12 objectives to review, then you would be studying 2 items a day.

Step 2: Organize your list of objectives from least understood to most understood. you will tackle the least understood first and finish with things you understand the most.

Step 3: Follow the progression below showing study time and review time. Studying means learning the material and reviewing means reinforcing learning you have already done.

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Monday	Tuesday
Study 2	Study 2 New	Study 2 New	Can't Study	Study 2 New	Can't Study	Study 2 New	Study 2 New	Test
No Review	Review 2 from Mon	Review 4 from Mon-Tu	X	Review 6 from Mon-Wed	X	Review 8 from Mon-Fri	Review 10 from Mon-Sat	
Hardest Topics -----> Easiest Topics								

As you can see in the plan above, you start out with the most unclear items and progressively your studying gets easier. You also progress to where you are studying less and reviewing more.

Suggested ways to study

First, make sure to do all of the review material that your teacher gives you. Additionally, you may find the following list of suggested study methods useful:

Do This

- Concept Flash Cards
- HeadBands game with friends
- Self-Quizzes
- Self Quizzes with 5 and 5
- Group Study
- Identification of objectives not understood and relearning them
- Card sequences
- Concept maps
- Rewrite and summarize information from the book reading, in class presentations or handouts in your

Don't Do This

- Rereading the book
- Writing notes from the book over and over
- Rereading your notes from class
- Highlighting notes
- Rereading or memorizing a study guide
- Memorization without knowing underlying principles
- Cramming
- Not reviewing missed test items
- Memory Flash Cards

- own words.
- 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 then, you. Take the quiz and correct your mistakes.
- Watch short videos or animations and then writing the concepts out in your own words. Watch the video again for clarification.
- The “Intelligent 12-year-old” Test.

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.

Concept flash cards

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

HeadBands with friends

Take a concept flash card and place it on your forehead (others do the same). Each person in the study group has to explain the concept until the person holding the card gets it correct.

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 \(http://bit.ly/1LWerQk\)](http://bit.ly/1LWerQk) are geometrically shaped areas connected by lines that use linking phrases to explain the relationships. 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.

The “Intelligent 12-year-old test”

Can you explain a topic, define a term, or answer a question in such a way that it would make sense to a reasonably intelligent 12-year-old? If not, that’s a signal that you need to revise your understanding of that piece of the course.

In Closing: The Picture of a Successful Student

In looking at what successful students do, several themes emerge. Here are some of the best practices that successful students use when learning a subject:

- She/he always covers the material prior to a lecture (e.g., podcasts, reading...)
- She/he anticipates test questions and their answers as that material is being covered.
- She/he answers self-quizzing questions as she/he works
- She/he makes, uses, and reviews study guides for material she doesn't know. She/he then relearns that material.
- She/he copies bolded terms and defines them in her own words/makes sure she/he understands them.
- She/he does all practice review exams/etc. during review.
- She/he writes out important/detailed concepts and puts them someplace she/he sees them all the time (in bedroom, bathroom mirror, etc.).
- She/he spaces review and practice, and interleaves her/his study of the material of a course.