

# STUDY STRATEGY

Principles of Biology  
BIO 100

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## Introduction

As you know from experience, you must plan to be successful. This “Study Strategy” is intended to give you the necessary ingredients to plan your personal study strategy based upon what has worked for you in other courses. It includes some built-in incentives that have immediate grade implications (e.g. quizzes, exams); but, it also has much flexibility to fit your learning style. This “Strategy” has the following four parts: *Commitment, Consistency, Conceptualization, and Cooperation.*

## COMMITMENT

Success in any endeavor requires commitment. To become committed to this *course of study*, you must acquire a firm inner conviction that biology is relevant to your vocational development, and that this course is a trustworthy means of becoming more literate in biology. Having enrolled and paid your tuition for BIO 100, gaining all you can from this course becomes your responsibility to GOD, to those (or yourself) who assist you financially, to your professor, and to your peers in this class.

**CHALLENGE:** Devote some time alone with God and His Word. Read Col. 3:23-24, Phil. 2:3-4, and other passages that speak of commitment and responsibility. A FRUIT of this commitment is a willingness to share in valuing the course objectives to the point of accepting a personal responsibility to achieve them. This FRUIT becomes evident to peers and professor through CONSISTENCY in your efforts to learn.

## CONSISTENCY

There are four settings in which you will have opportunity to demonstrate a CONSISTENT effort. These are discussed in your Syllabus, page 2; they are Out-of-Class Study, Laboratory, Lecture-Discussion, and Office Hours. Each of these settings will complement the others – e.g. completion of reading-study assignments prepare you to gain more from the lecture-discussions; and, immediate review of study notes from lecture reinforces your insights from lecture. It is essential that you establish a pattern of regular attendance in lecture and laboratory, promptness to class, and attentiveness and participation.

Several specific assumptions that I am making as your professor for the lecture-discussion:

1. You will spend time on a regular basis to read and study your text, answer questions, and review lecture and study notes in order to reach the desired level of learning proficiency. To accomplish this, you will regularly commit at least two (2) hours of quality out-of-class time for each hour of lecture/discussion.
2. Major differences in pre-college science preparation exist among students. You may need to devote additional time and effort, and seek assistance where necessary, to compensate for deficiencies in your academic preparation.

- If you are failing early-on to establish consistency, consult either myself or your laboratory professor, and we will meet with you to discuss the issue of commitment (#1 above) and suggest ways of implementing a consistent study effort. Take advantage of Office Hours.

## CONCEPT-LEARNING

My responsibility as your “professor of biology” is to guide you in the learning process rather than being just a disseminator of information in a note-take → memorize → “regurgitate” experience. We all know that memorizing and correctly “regurgitating” information is a quick way to generate good grades, but there are no lasting benefits, and you may even feel cheated when you look back. Yet, we can’t throw memorization out the window altogether. Instead, we harness memorization into a more meaningful learning process which emphasizes conceptualization; let’s call it **CONCEPT-LEARNING**. Concept-learning involves associating words (vocabulary) with abstract ideas through acquiring and memorizing clear definitions. Then, one goes further by fleshing out the meaning of that definition by learning to associate the word with other vocabulary and their meanings—*i.e.* developing a conceptual framework.

One learning model suggests that mastery of biological concepts requires that you advance “upward” through a series of levels of biological literacy as defined below. Study questions and problem-solving draw us “upward” but we may find it necessary to move “downward” to memorize and define before we can construct meaning and apply the knowledge. Study the four literacy levels in Table 1 below, and notice how the word “Zygote” takes on meaning as the conceptual framework is formed to include concepts of “sexuality”, “sperm”, and “generation.”

**BIOLOGICAL LITERACY:** The quality of being able to understand biological concepts, make moral and ethical judgements about biological issues, and solve real-world problems that involve biological issues.

Table 1. Biological Literacy Begins with Nominal Literacy and Works ‘Upward.’

LITERACY LEVEL	DESCRIPTION	DEMONSTRATED BEHAVIOR
MULTIDIMENSIONAL LITERACY ↑	Applies knowledge to solve real-world problems ↑	How should my wife and I deal with our apparent infertility? ↑
STRUCTURAL LITERACY ↑	Constructs appropriate meaning of concept based upon his/he own understanding/experiences ↑	"ZYGOTE" is the beginning of a new generation of life in sexually reproducing species. ↑
FUNCTIONAL LITERACY ↑	<i>Defines or describes</i> a term from memory ↑	"ZYGOTE" = cell formed by union of sperm and egg ↑
NOMINAL LITERACY	<i>Recognizes</i> a term as "biological"	Associates "ZYGOTE" with BIOLOGY

As you begin your study of biology, aim for concept-learning. This “literacy ladder” can be a useful model and a goal in which you constantly seek to move biology vocabulary “up the ladder” into a meaningful conceptual framework. Indeed, the analogy of “framework” suggests that we are building out of “vocabulary words” (*i.e.* boards and nails) a framework (building). Your BIO 100 *Study Guide* will serve as the blueprint to guide you as you assemble the “boards and nails” into a meaningful framework.

How does one accomplish this mental "building"? I suggest that you purchase a loose-leaf notebook and use a "Split Notebook Approach." As the notebook lays open, use the right side for lecture-discussion notes and pages of your Study Guide. The left side (back of each page) can be used for related reading-study notes.

The following plan is suggested to assist you in maximizing use of study time and retention of information from your reading. This reading-study approach will be called the "S-I-R D-E-C-A Approach."

SURVEY-> INQUIRE-> READ-> DEFINE-> EXAMPLE-> CONCEPTUALIZE-> APPLY

"SIR-DECA" is a modification of the SQ3R method (Robinson, F. P. 1961. Effective Study. Harper and Row) which has proven effectiveness in maximizing study efficiency and retention. SIR DECA can be used in conjunction with your *Study Guide*. It emphasizes active questioning (inquiry) and writing as you perform each reading assignment. To use this approach, keep in mind our analogies of the “Literacy Ladder” (Table 1) or "Learning as Building" and proceed as follows:

1. SURVEY -- Consult your “Course Schedule” at the BIO 100 web page to be sure of the scope of the assignment. Print out the *Study Guide* for the day’s assignment. Each *Study Guide* page has an OVERVIEW and BLUEPRINT sections to introduce the topic. Then, survey (glance thoughtfully over) the assigned pages in your text, noting major headings, illustrations, and diagrams. This survey will make your mind more receptive to the information you will be reading.
2. INQUIRY -- Return to the first page of the assignment read the captions in the left margins of each assigned page. Also, read the section headings as you come to them, and formulate questions to arouse curiosity and focus your attention in preparation for later reading. You may wish to write your questions on the reading-study side of your notebook.
3. READING – You are now ready to read with the purpose of answering the questions you formulated. Rather than passively plodding, you are an active searcher. Pray for an alert, inquiring mind.
4. DEFINITION -- Biology has an extensive vocabulary which must be mastered as prerequisite to moving beyond nominal literacy. Having read the assignment, turn to the *Study Guide* section, VOCABULARY, and define them in meaningful terms in your reading-study notes section.  
[Note: Your text, Chapter 3, Section 3-I, explains how to perform Steps 4 through 7.]
5. EXAMPLES -- From the context of the reading, list one or more examples to assist in relating the definition to your experience.
6. CONCEPTUALIZE -- Having defined VOCABULARY in your own words, and illustrated by examples, turn to LEARNING GOALS in your *Study Guide*. These are the goals which your learning must reach on a regular basis as you complete assignments. If you can write answers and/or discuss them freely from memory, your biological literacy is functioning at the “structural literacy” level (Table 1), and you are likely to perform above average on an exam.. However, by the time of each exam, your faithful effort will also have prepared you to revisit the LEARNING GOALS you encountered earlier in the unit, and you will be able to make applications, and demonstrate “multidimensional literacy.” Read on.

7. APPLY -- Some of the LEARNING GOALS require more applied thinking, and these will help you apply your understanding to the broader context of your learning and vocation.. Write out answers as best you can and leave space so that you can add or modify answers as you return later with better understanding. Also, try to think creatively and pose original questions from your own personal reflections on the material. This is your opportunity to pursue "multidimensional literacy" in biology. Don't get bogged down here; give it your best try and return later. Remember, development of biological literacy requires an on-going effort, so make careful responses/notes, review them repeatedly, look for "structural relationships" among concepts, and write down new insights. The box below provides some additional suggestions particular to learning biology.

### VISUALIZING STRUCTURES AND PROCESSES

Biology is a highly visual oriented science. Use your text diagrams and illustrations, and visual resources that are becoming available on the internet. Some internet addresses will be provided in the *Study Guide*. As you visit these sites, retain the addresses as an Explorer "Favorites" for easy access, or otherwise note the location for later use. Locate other Internet sources and share them with your professors and peers via e-mail.

### NOTE-TAKING SUGGESTIONS

Good lecture notes provide an important bridge between the lecture and your individual study. Concepts discussed in lecture are usually very likely to be encountered on examinations. The following tips may be helpful as you continue to revise your note-taking strategies:

1. Organize your notebook or "Biology Journal" using the "split notebook" approach described above. Use a looseleaf notebook, number each page for use in cross-referencing, and date each day's lecture notes. Each lecture assignment can be printed from the BIO 100 home page, three-hole punched, and inserted into the notebook. Many assignments include a LECTURE OUTLINE or STUDY OUTLINE which will be helpful in note taking during lecture.
2. Discipline yourself for consistent lecture attendance. Complete the reading/study assignment before coming to lecture. Familiarize yourself with the LECTURE-STUDY OUTLINE, if present.
3. Sit in a room location and with peers that will optimize your attentiveness and participation.
4. Listen and observe attentively and write notes in sufficient detail to support/focus/clarify your out-of-class study. Use cross-referencing to pages in the textbook, or to other locations in your notes. The "split notebook" approach allows you to expand brief notes or ideas or reminders in the "left side" (back of pages) of the notebook" in the adjacent "study notes side".
5. Strive for neatness and order; highlight sparingly.
6. Review notes *soon* after class, fill in gaps with the aid of the text or discussion with professor or peers. Address VOCABULARY and LEARNING GOALS which were difficult to address before lecture. Seek assistance where you just cannot seem to understand a point.
7. Develop a schedule of review of notes and LEARNING GOALS from previous days to keep your recollection sharp.

## COOPERATION – COOPERATIVE LEARNING GROUPS

**Background:** During the past few years, several factors have begun to influence our approach to teaching:

1. The growth of information technology has given students (and faculty) greater access to information, causing us to see our role more as facilitators of learning, not simply a disseminator of information. Our role is not only to determine content/emphasis of the course, but also to assist you in developing biological literacy as defined above.
2. The educational literature is providing abundant evidence that at least some students learn better in a setting wherein cooperative learning is used – *i.e.* “the instructional use of small groups so that students work together to maximize their own and each other’s learning (Johnson, 1993. *Cooperative Learning and College Teaching Newsletter* 3(2): 6-9).”
3. Cooperative learning has been used in BIO 100 for years, and with positive results.

**Group Formation:** During the first meeting of your laboratory section, you will become a member of a Cooperative Learning Group. This will be done at random but with an effort to include representatives of more than one gender and graduating class in each group.

**Your Responsibility** as a student will be to exercise commitment to God, to professor, and to your peers in BIO 100 as outlined on page 2 of your syllabus. Commitment to peers will include the class as a whole, and your group in particular. Although you may not have chosen to be in the group with your three partners, you will allow God to use you to be an effective member of that team, and in so doing, gain valuable experience in group work which will prepare you for most vocations where team efforts are so vital to success.

**Group Activities:** Cooperative learning will be used in BIO 100 in the following ways:

1. Biological Issues and Our Society (BIOS) have been a part of BIO 100 for many years. Your group will choose a topic, decide upon your strategy, then proceed to gather information and prepare your written and oral report as outlined in a future handout.
2. Cooperation in Laboratory Learning: In some weekly laboratory investigations, division of responsibilities within the group will be encouraged wherein, each member shows/explains/teaches other group members what he/she has learned.
3. Cooperative Learning in Lecture and in Completing Assignments: Optionally, you may want to arrange to sit with your cooperative learning group in lecture and to plan study sessions outside of class. Please be flexible to allow members the option of studying independently. Ultimately, each of you will need to individually read and study.

**Quality Factors:** You will be encouraged to develop skills in the following elements of cooperative learning:

1. Positive Interdependence: Our responsibility is to give your group a clear task or group goal which demands cooperation to complete a task that is too complex for one person. Your success as a group will grow as you learn to cooperate and draw upon the strengths of each member. EVALUATION: Group is asked to turn in written work.
2. Individual Accountability: Each member is responsible to make efforts to contribute. Commit yourself to making your group successful. EVALUATION: Individuals or cooperative learning group turns in a quiz, summary, or an oral response.
3. Teamwork Skills: Leadership, decision-making, trust-building, communication, conflict-management—these skills must be learned just as science content is learned. Each member should be godly and gracious to accept and encourage others. EVALUATION: Be honest and talk to each other about strengths, weaknesses, etc. We will be glad to meet with your group to help resolve concerns in a biblical manner. You may be asked as a group to report on “how ‘group dynamics’ are going.”  
OBSERVED BEHAVIOR – active participation, encouraging, elaborating by all members.