

How to Succeed in the Study of Biology

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The "success suggestions" of this article were prepared for the beginning biology student. Their purpose is to aid him to accomplish more easily his objectives of study. They are an over-all pattern of thinking-acting-accomplishing for biology students. The list includes those points which are different from the other subjects he may have at this time. It does not include general aids to study, these may be obtained from any good book on the subject.

ADOPT THE BIOLOGY ATTITUDE. Biology is a study of living things, concentration of information on life and living. Many of its facts and principles are obvious, others are technical. It is your business during your biology study to make a personal issue of each of the problems with which you are confronted and ask the question, "How does this apply to me?" See for yourself how you can benefit by the study of the biological situation with which you are dealing.

LEARN THE LANGUAGE OF BIOLOGY. The study of biology might be likened to the study of a new language. There are many new words and phrases to master. Some ordinary words take on new meanings; become familiar with these. You should not only be able to understand them but you should also be able to use them to your advantage. Most textbooks have a glossary of words and biological phrases; find its location in the book and refer to it often. Some books have word lists at the end of each chapter or problem. Make the words on the list your own.

* "The Old Fossil" of *Biology Laboratories* received several requests to expound on the theme of this article, the title of which was mentioned in the issue of April 1950. This is in response to these requests.

MAKE PLANIMAL OBSERVATIONS. Seek out the location of the nearest conservatories, parks, zoos, and museums, and visit them often. Observe the plant or animal specimen and associate its name with it. On your next visit try to recall this name if possible without benefit of the name plate. For each specimen try to amass a reserve supply of knowledge.

TAKE FREQUENT HIKES after school hours and on week ends. Study the living things when you visit: wooded areas, lakes, streams, rivers, and open fields. Observe the types of life found in each area. Find the answer to the problem of why certain living things are found in a particular area and not in another. Take notes, sketches, draw, and record important data when specimens are encountered. If you do not care to do this type of thing, at least bask in the beauties of nature and enjoy yourself in the meanderings of your field-trip.

PURCHASE IDENTIFICATION GUIDES. These are often reasonably priced in variety-dime stores, hobby shops, and bookstalls. The identification guides may be in book form, large printed charts, loose-leaves, and card sets. They cover various topics: birds, trees, mammals, insects, and others. These are economically priced so you should purchase as many different kinds as possible. They do not become outmoded nor obsolete and can be shared with friends or members of the family. They are compact for the pocket on a field trip, or duffel while in camp and may be used for special reports or as reference if the information desired is not too technical.

MAINTAIN A NATURE SCRAPBOOK. Include in this any current literature available on the subject of plants and animals. These are found in newspapers, Sunday supplements (some with excellent life like coloration pictures), magazines, and circulars. A loose-

leaf scrapbook is best because after a few articles have been collected they may be shifted and grouped according to subject matter. (It should be noted that the cutting up of magazines devoted entirely to biology should be discouraged; such form the basis of a comprehensive biology library.) All special reports and extra-credit work should find a permanent place in your scrapbook, after they have been used for class purposes.

ASSUME A QUESTIONING ATTITUDE regarding all phases of biology. Those points which bother you should be formulated into one or more well worded questions. Keep these in mind and ask someone in authority to explain them. The questioning attitude should always be maintained throughout life. It is one of the most valuable assets to your learning technique. Even those in authority use it periodically to check their thinking.

COLLECT SPECIMENS—leaves, insects, seeds, fruits, bark, buds, twigs, shells, and fossils. Any biology materials of a hard texture make excellent collector items. Biologicals of a soft texture must be preserved in fluids such as alcohol, formaldehyde, or AFA. Fluid preservation is not difficult, provided a few simple rules are followed in the process. It is well within the realm of any interested secondary school student's ability to collect and preserve specimens.

REAR PETS AND PLANTS. Both of these provide an interesting avocation. Pets may be any of a varied type of animal life from fish to mammals. A great deal may be learned through feeding, rearing, and breeding of these pets. The growing of plants from seeds and from cuttings is also educational. Soil-less culture may be tried on a small scale (just as it is done commercially in greenhouses) with excellent results. There are kits and books on the market to aid you in the work.

JOIN ORGANIZATIONS, such as Boy and Girl Scouts, nature study clubs, and others which bring together people of a like interest. If you join one or more of these you not only will learn a great deal about biology but also the people you meet may become lifelong friends through the contacts.

WRITE FOR LITERATURE. The advertising departments of many commercial houses distribute literature on different phases of nature and living things. Ask for these materials, they are generally free. Such may include: bird pictures, extinct animals, and even different phases of health, food, and vitamins. This is in addition to the materials obtained from seed houses and manufacturers of garden products, equipment, and insecticides. The State Conservation Department will have many publications; the Agriculture School of your state university publishes much material on crops, and care and feeding of animals; the federal government printing office has several catalogues each of which contains thousands of pamphlets, many no doubt in your field of interest. *The Naturalists' Directory* contains thousands of names and addresses of people throughout the world, with their particular fields of interest listed. Contact your County Agent for local or regional know-how.

BECOME A VORACIOUS READER. The field of literature for biology extends from deeply engrossing adventure stories with a nature setting and biological background to technical literature. The field is so broad you can find many things of interest to you: be sure to read your fill of these. Do not confine your concurrent learning enterprises to the subject matter being taught in your biology classroom for a particular period of time. You should be interested in whatever phase of biology may come to your attention. In this connection biology is a lifelong study, either vocationally or avocationally, according to choice.

ADOPT A BIOLOGICAL HOBBY. Photography of plant and animal life can develop one's knowledge of biology very rapidly. Other hobbies might include the field of conservation of wild flowers, birds, mammals; extinct animals and plants, and those which are becoming exceedingly rare.

PLANT A GARDEN. The most dominant biological pastime down through civilizations has been the activity of gardening. Everyone benefits from it. If it is vegetable gardening it furnishes food. Other gardens are recommended for their aesthetic qualities,

and are lauded for their healthful activity possibilities. Knowledge of gardening grows rapidly with the years. The production of one crop of radishes makes one feel, the next year, like a veteran gardener with a storehouse full of know-how.

START A LIBRARY. The formation of a library does not need to be a lavish outlay of money at one time. It does mean the gathering together of textbooks, magazines with a biological theme, pamphlets of a similar nature, and other biologicals of a related character in one accessible area. You will be surprised with the speed with which your library will grow in size when you formulate a plan for its improvement and development.

IS SUCCESS IN BIOLOGY IMPORTANT? The people of biology believe that it is. In our

opening paragraph we stated "biology is life and living." It always will be. In this regard everyone respects LIFE and holds it in high esteem. They also enjoy LIVING and want to continue to do so. For a good life one must learn living as an art.

WHAT YOU CAN DO ABOUT IT. The success suggestions mentioned are approaches you may make to the subject. There are no short-cuts to success but there are aids. These should not be considered as goals, but as methods for easier learning. These are not to take the place of ordinary correct study habits. They do not in any way relieve scholastic application. They are to serve as a compliment and supplement to regular laboratory and classroom work.

Trivia for Teaching

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Every teacher eventually finds a few simple methods for successfully teaching certain parts of the work, judged on the percentage of students who remember. Whether the items mentioned in this article are important in teaching high school biology you are as able to judge as I.

When the class is studying circulation in the human body, connect the a of the words anterior and auricle with the a-shaped cavities of the heart, and the v of ventricle with the v-shaped cavities. Also, associate the a of arteries with the a in away from. When I discovered the V-A-V-A-c-plan I felt pleased with myself. Perhaps others have thought of it long ago. The first V is for Vein. In no two places in the circulation do two V's or two A's come together. Always it is Vein-Auricle-Ventricle-Artery-capillary-Vein, etc. Charts with their blue and red coloring plan are apt to be mislead-

ing. But the V-A-V-A-plan always works in the systemic circulation.

You may not consider it important to remember average lung capacity. It interests students and helps to develop better posture, I feel. We use a wide-mouthed glass jar of a gallon or gallon-and-a-half capacity. There should be several glass tubes which can be sterilized, to slip into the long rubber tube for mouth-pieces. The jar is marked conspicuously with adhesive tape to show every 100 cu. in. when inverted. Assuming the biology laboratory has at least one sink, proceed by the water-displacement method, having a student inhale all the air he can then exhale into the tube to see how much water can be displaced from the jar. A few students will be able to empty the 231 cu. in. and they will remain proud and extra-chesty for a week following. When computing