Biology Department

Purpose Statement:

The Biology program provides biology students a fundamental knowledge of biology along with introducing students to the major areas in biology and opportunities to explore these areas. In this endeavor, the biology department provides students the ability to critically apply biological concepts to the understanding of natural phenomena and to dealing with biology related health, societal and conservation issues. In addition, the biology program prepares students for: advanced study and research in the biological and related sciences, healthcare professional programs, wildlife and forestry professional programs, veterinary professional programs, careers in education and biology related industry and governmental service. The biology program also provides courses for general education in the natural sciences to introduce students to science, biology, biological concepts and how these affect society. Finally, the biology program provides courses to support other university programs such as Agriculture, Education, Physical Education, Chemistry and Engineering.

Learning Outcomes

Through the biology department curriculum, students should...

Attitudes

1. appreciate science and especially biology. This appreciation should include how science and biology permeates our society and many other aspects of our lives.

2. develop a curiosity for the world around them. This curiosity should include not only “how does that work?” or “what is that bug” or “how are genes expressed”, but also “how do we know that?” or “how can we figure this out?”.

3. develop respect for equipment and specimens or materials. Biologists depend on these things and the proper care and want to care for them is critical.

4. develop an enthusiasm and motivation for biology and the sciences.

5. further develop integrity. This development would include integrity in scientific endeavors and communication such as the issues of plagiarism and “fudging data” in research.

Skills

1. be able to understand and apply the scientific method. Students need to understand what the process of science is and what it is not. In this light, students should understand its limitations.
2. develop and apply communication skills.
   a. These communication skills include being able to present in a logical, understandable
      fashion, ideas or information in written, oral and visual formats.
   b. These skills also include “people” or inter-personal skills. Our students should be able to
      present themselves in a positive and professional way when interacting with others.

3. develop and apply critical thinking skills. Students should then be able to apply these skills to
   problems and/or issues in science, nature and society. This would include critical analysis and
   synthesis associated with the examination of literature and other informational resources.

4. develop resourcefulness and inventiveness. Students should develop the means to be able to
   identify and utilize available, pertinent resources (including those within his/her own person)
   in the solving of problems, the scientific process and in dealing with societal issues.

5. develop creativity. This would include developing novel ideas and approaches to solving
   problems, dealing with issues and experimental approaches.

6. be able to integrate multiple disciplines in the practice of science. For example, biology
   depends on the fundamental understanding of many other disciplines including physics,
   chemistry, astronomy, geology and geography.

7. develop and apply skills for the proper use and care of equipment.

Knowledge

1. **Hierarchy of Biological Structure** – Students should be able to describe the hierarchy and
   illustrate how the hierarchical context relates to different organisms. Students should also be
   able to explain the relationships among the different levels of the hierarchy and how those
   interactions influence organisms. Lastly, students should be able to distinguish biological
   systems within the context of the hierarchy.

2. **Evolution** – Students should be able to summarize the concept of evolution and assess the role
   of evolution in biology. Students also should be able to integrate the concepts of natural
   selection and evolution. Lastly, students should be able to relate the diversity of life to evolution
   and natural selection.

3. **Diversity of Life** – Students should be able to differentiate various organisms according to
   their evolutionary relationships. Students should also be able to explain how and why systematic
   approaches are used to organize and understand the diversity of organisms. Lastly, students
   should be able to describe how the concept of species fits within the context of biology.

4. **Ecology** – Students should be able to illustrate the interrelationships among organisms and the
   interrelationships between organisms and the environment. Students should also be able to
   describe energy and nutrient cycles and infer how those cycles influence organisms and the
environment. Lastly, students should be able to relate ecological concepts to various disciplines within biology.

5. **Genetics** – Students should be able to describe the structure and expression of genes. Students should also be able to demonstrate the role of inheritance in determining differences among individual organisms, populations, and species. Lastly, students should be able to summarize the relationships among DNA, RNA, and protein synthesis.

6. **Cells** – Students should be able to compare and contrast the structures and functions of various cell types. Students should also be able to illustrate the processes of mitosis and meiosis, as well as describe the roles these processes have in a biological context. Lastly, students should be able to explain and relate the concepts of cellular respiration and photosynthesis.

7. **Properties of Life** – Students should be able to summarize the properties that are expressed by all living things. Consequently, students should also be able to discriminate living entities from non-living entities. Lastly, students should be able to describe the theory of chemical evolution (i.e. the biological explanation of how life began on earth).

8. **Energy** – Students should be able to explain what energy is and the different forms of energy. Students should also be able to apply the 1st and 2nd Laws of Thermodynamics to the form and function of biological systems. Lastly, students should be able to relate the concepts of entropy and homeostasis.

9. **Process of Science** – Students should be able to collect, analyze, interpret, summarize, and present biological data within the context of the scientific method. Students should also be able to distinguish between experimental and observational approaches and assess how each might be used to answer scientific questions. Students should also be able to integrate previous findings from scientific literature into both approaches. Lastly, students should be able to formulate testable hypotheses and assess the appropriate methods to test those hypotheses.

10. **History of Science** – Students should be able to relate historical contributions to science with the current approaches and knowledge base within biology. Students should also be able to describe the contributions of various individuals to the science of biology. Lastly,

11. **Science and Society** – Students should be able to illustrate how biology relates to society. As citizens, students should also be able to make informed decisions about biological issues and policies. Lastly, students should be able to differentiate the means by which biology is communicated to society and assess the advantages and disadvantages of each.

12. **Bioethics** – Students should be able to identify and assess different positions associated with ethical issues in biology. Students should also be able to describe the role of ethics in their present and future biological careers. Lastly, students should be able to explain the impact and importance of ethics on science and biology.