

Course of Study

Biology

Warren County Career Center

**3525 North State Route 48
Lebanon, Ohio 45036**

Adopted 6-15-06

*This document is for the use of the staff at Warren County Career Center.
Credit is given the designer of the template, Upper Valley JVS, Piqua, Ohio.*

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Acknowledgements

Biology Warren County Career Center

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Warren County Career Center Administrative Team
Warren County Educational Service Center
Mr. Karl Flem
Mr. Jeff Little
Mrs. Adrienne Schmidt
Ms. Toni Welles
Mrs. Charla Cornwell
Mrs. Sandra Monti

***Warren County Career Center
Resolution Of School Board Approval***

WHEREAS, representatives of the Science Department of the Warren County Career Center have reviewed the Course of Study; and

WHEREAS, this Course of Study is based upon Academic Content Standards adopted by the State of Ohio for the Biology program; and

WHEREAS, the Science Department have reviewed and added competencies as needed to address local labor market needs and trends in the industry;

NOW, THEREFORE, BE IT RESOLVED, in accordance with the Superintendent's recommendation, that the Warren County Career Center adopt the Biology Course of Study.

District Superintendent

Date

President, Board of Education

Date

Statement of Recommendation

The Science Department at Warren County Career Center has reviewed this course of study and recommends it for use as the foundation for instruction in the Biology class.

The developers of this course of study have considered local labor market needs and the school's ability to offer specialized programs. The competencies have been reviewed and accepted as being congruent with our school's vision, mission, and strategic goals. When appropriate, additional competencies related to the program area have been incorporated into this course of study.

Achievement of technical competencies, utilizing proper attitudes, and demonstrating appropriate values are critical for successful employment and for furthering educational opportunities within a student's chosen field. We believe that this course of study adequately and correctly focuses upon student development.

This course of study is recommended on: 6-15-06

Warren County Career Center Vision Statement

WCCC is the valued partner of choice within the educational and economic systems of our communities, by providing quality academic and career technical education.

We pave the way for a future of opportunities unique to each of our learners.

Warren County Career Center Mission Statement

To prepare youths and adults to make informed career choices and to successfully enter, compete, and advance in a changing work world.

Warren County Career Values

- Communicating openly and honestly
- Taking ownership of personal actions and being held accountable for results
- Upholding and demonstrating high ethical, educational and fiscal standards
- Exhibiting high levels of professionalism
- Providing high quality instruction and highly qualified staff to ensure success for all learners
- Making quality customer service a high priority
- Promoting partnerships and a team environment
- Celebrating team and individual achievements
- Using data to drive planning, decision making and actions

Course Design

Courses are designed to reflect career-focused education, which combines high-level academics with real-life technical skills. The intent is to maximize a student's present and future academic and career success.

Career-focused education enhances the integration of academic and technical skills, designs programs that prepare students with transferable skills and promotes each student's career opportunities.

Course Philosophy

We believe that the philosophy for our science courses to be:

- Prepare students to use appropriate scientific processes and principles to make personal decisions;
- Enable students to engage in intelligent public discourse about matters of scientific and technological concern;
- Help students develop an understanding of themselves and the world in which they live;
- Foster an understanding of the nature of science, the development of science processes, the principles of science, and the connections between all the sciences;
- Increase their future economic productivity through the use of scientific knowledge, understanding, and skills in their careers.

Course Goals

The course goals for Biology are to:

- Set high expectations and provide support for achievement by all students
- Provide balance among conceptual understanding, procedural knowledge and skills, and application and problem-solving
- Provide skills to allow them to be able to apply scientific knowledge and processes to individual and societal issues
- Incorporate the use of technology by all students and the interconnected nature of science and technology
- Understand biological concepts and how they are applied in General science

Course Description

This course expands and reviews general biological concepts and their application in the study of General Biology.

The topics covered will include cell structure and function, heredity, plants, animals, the human body and the environment.

Biology is designed to give the student a comprehensive study of biology and an understanding of how biological science is applicable to the real world.

Academic and Technical Integration

Expectations of curriculum must be aligned with what is written, taught, assessed, and reported. Student expectations focus on active, project-centered learning—an approach to learning that emphasizes a connection between ideas in a discipline and the outside world. Educational programming and course content will clearly connect career and post-secondary opportunities. At the Warren County Career Center, the main goal is to design courses and projects that use strategies for authentic instruction. These characteristics of instruction focus on deep understanding, established opportunities for concept connections, provide anticipatory and abstract thinking, and emphasize genuine application.

The academic courses at the WCCC follow the state model curricula. They are designed to meet both associate school and state requirements. These standards respond to the need to improve student achievement, quality of curriculum and instruction, and strengthen school and community relationships.

Technology

The Warren County Career Center board and staff believe that technology skills are essential for all students to achieve in the 21st century. It is the goal of this district to infuse technology into all facets of education:

- Instruction
- Assessment
- Administration
- Career planning
- Course design
- Professional development

Strategies to incorporate technology into all facets of education are a priority of the district and there is commitment to a continual process to provide updated hardware, software, and professional development for staff members for the purpose of providing a high quality education, with the integration of technology, for all students.

Students Served

The population served by this program are juniors and seniors at the Warren County Career Center.

Scope and Sequence

Biology

Competency 1 The Nature of Science and Analysis of a Experimental scenario

- 1.1 Demonstrate knowledge and application of experimental design
- 1.2 Recognize the difference between science and pseudoscience
- 1.3 Use mathematical principles of dimensional analysis, graphic, substitution, percents, and equations to interpret information gained in a problem solving investigation
- 1.4 Determine the proper use of equipment in a laboratory setting
- 1.5 Demonstrate safety rules and procedures in the laboratory
- 1.6 Demonstrate the collection of information in a experimental scenario and how to interpret the information
- 1.7 Use critical analysis skills to evaluate various experimental experimental scenarios, such as forgeries and other evidence left at the experimental scenario

Competency 2 Cellular Structure and Function

- 2.1 Describe the historical development of cell theory
- 2.2 Explain the structure, function, and interrelationships of each part of a eukaryotic cell
- 2.3 Compare the structures of eukaryotic and prokaryotic cells
- 2.4 Describe multicellular organization

Competency 3 Chromosomes and Cellular Reproduction

- 3.1 Differentiate between a gene, a DNA molecule, a chromosome and a chromatid
- 3.2 Compare haploid and diploid cells
- 3.3 Differentiate between homologous chromosomes, autosomes, and sex chromosomes
- 3.4 Identify the major events and characterize each of the five phases of the cell cycle
- 3.5 Summarize the events of the four states of mitosis
- 3.6 Summarize the events that occur during meiosis I and meiosis II
- 3.7 Relate to how crossing over, independent assortment and random fertilization contribute to genetic diversity
- 3.8 Distinguish the difference between mitosis and meiosis
- 3.9 Identify three types of asexual reproduction
- 3.10 Evaluate the advantages and disadvantages of asexual and sexual reproduction

Competency 4 Genetics

- 4.1 Identify studies that formed the basis of modern genetics
- 4.2 Relate the ratios that Mendel observed in his crosses
- 4.3 Relate to the terms homozygous, heterozygous, genotype, and phenotype
- 4.4 Compare Mendel's two laws of heredity

- 4.5 Predict the results of monohybrid crosses by using Punnett squares
- 4.6 Apply a test cross to determine the genotype of an organism with a dominant phenotype
- 4.7 Analyze a simple pedigree
- 4.8 Identify the five factors that influence patterns of heredity
- 4.9 Describe how mutations can cause genetic disorders
- 4.10 Analyze a karyotype and describe genetic disorders and describe their causes and symptoms

Competency 5 DNA and Protein Synthesis

- 5.1 Describe the three components of a nucleotide
- 5.2 Develop a model of the structure of a DNA molecule
- 5.3 Relate the role of the base pairing rules to the structure of DNA
- 5.4 Summarize the process of DNA replication
- 5.5 Describe how errors are corrected during DNA replication
- 5.6 Compare the structure of RNA with that of DNA
- 5.7 Summarize the process of transcription
- 5.8 Relate the role of codons to the sequence of amino acids that results after translation
- 5.9 Outline the major steps of translation
- 5.10 Relate how the *lac operon* is turned on or off
- 5.11 Summarize the role of transcription factors in regulating eukaryotic gene expression
- 5.12 Evaluate three ways that point mutations can alter genetic material

Competency 6 Gene Technology

- 6.1 Describe four basic steps commonly used in genetic engineering experiments
- 6.2 Evaluate how restriction enzymes are used in genetic engineering
- 6.3 Relate the role of electrophoresis and probes in identifying a specific gene
- 6.4 Identify different uses for DNA fingerprints
- 6.5 Demonstrate the use of gel electrophoresis equipment using DNA fingerprinting techniques and Generals

Competency 7 Human Body Structure

- 7.1 Identify the different types of systems in the human body
- 7.2 Distinguish between the axial skeleton and the appendicular skeleton
- 7.3 Analyze the structure of bone
- 7.4 Identify the three main classes of joints
- 7.5 Identify the structure and function of teeth
- 7.6 Demonstrate how teeth marks from bites can be used in General applications
- 7.7 Analyze the structure and function of the epidermis
- 7.8 Demonstrate the use of human fingerprints to identify individuals using General applications
- 7.9 Summarize how hair and nails are formed
- 7.10 Demonstrate identification of different types of human and animal hair samples

Competency 8 Circulatory and Respiratory Systems

- 8.1 Differentiate between arteries, capillaries, and veins

- 8.2 Relate each component of blood to function
- 8.3 Summarize how a person's blood type is determined
- 8.4 Demonstrate the analysis of blood type using simulated blood typing methodology
- 8.5 Differentiate the pulmonary circulation loop from the systemic circulation loop
- 8.6 Summarize the path that blood follows through the heart

Competency 9 Digestive and Excretory Systems

- 9.1 Relate the four major functions of the digestive system to the processing of food
- 9.2 Summarize the path of food through the digestive system and the major digestive processes that occur in the mouth, stomach, small intestine, and large intestine
- 9.3 Describe how nutrients are absorbed from the digestive system into the bloodstream
- 9.4 Identify the role of the pancreas and liver in digestion
- 9.5 Identify the major wastes produced by humans and the organ or tissues where they are eliminated from the body
- 9.6 Evaluate General applications in which time of death may be determined from evaluation of food within the digestive system

Topics which may be addressed if time

Competency 10 Sensory Systems

- 10.1 List five types of sensory receptors and the stimuli to which they respond
- 10.2 Identify sites of sensory processing in the brain
- 10.3 Analyze the structure of the eye and its role in the visual system
- 10.4 Describe how the ear detects sound and helps maintain balance
- 10.5 Compare the sense of taste and smell
- 10.6 Compare the sense of smell between animals and humans and how animals are used in General applications
- 10.7 Analyze the structure and function of neurons
- 10.8 Distinguish between the central and peripheral nervous systems
- 10.9 Identify the major parts of the brain and their functions
- 10.10 Compare the somatic nervous system with the autonomic nervous system
- 10.11 Demonstrate the use of toxicology in General applications and drug identification using excretory wastes from the human body

Competency 11 Insects

- 11.1 Describe the characteristics of insects
- 11.2 Compare complete and incomplete metamorphosis
- 11.3 Identify the external and internal structures of an insect
- 11.4 Evaluate time of death using the life cycles of insects in General applications

Competency 12 Soil and Water Analysis

- 12.1 List the characteristics of protists
- 12.2 Identify the unifying features of protists
- 12.3 Analyze pond water for pH, ammonia, and other environmental conditions, and identify protists within the water system
- 12.4 Describe the layers of the soil

- 12.5 Identify the composition of soils
- 12.6 Demonstrate soil testing methods for General applications

Source Documents for Scope and Sequence

- * National Science Education Standards
- * Ohio Draft Science Content Standards

TECHNOLOGY STANDARDS

Standard 1: Nature of Technology

Students develop an understanding of technology, its characteristics, scope, core concepts* and relationships between technologies and other fields.

Benchmark A: Synthesize information, evaluate and make decisions about technologies.

Benchmark B: Apply technological knowledge in decision-making.

Benchmark C: Examine the synergy between and among technologies and other fields of study when solving technological problems.

Standard 2: Technology and Society Interaction

Students recognize interactions among society, the environment and technology, and understand technology's relationship with history. Consideration of these concepts forms a foundation for engaging in responsible and ethical use of technology.

Benchmark A: Interpret and practice responsible citizenship relative to technology.

Benchmark B: Demonstrate the relationship among people, technology and the environment.

Benchmark C: Interpret and evaluate the influence of technology throughout history, and predict its impact on the future.

Benchmark D: Analyze ethical and legal technology issues and formulate solutions and strategies that foster responsible technology usage.

Benchmark E: Forecast the impact of technological products and systems.

Standard 3: Technology for Productivity Applications

Students learn the operations of technology through the usage of technology and productivity tools.

Benchmark A: Integrate conceptual knowledge of technology systems in determining practical applications for learning and technical problem-solving.

Benchmark B: Identify, select and apply appropriate technology tools and resources to produce creative works and to construct technology-enhanced models.

Standard 4: Technology and Communication Applications

Students use an array of technologies and apply design concepts to communicate with multiple audiences, acquire and disseminate information and enhance learning.

Benchmark A: Apply appropriate communication design principles in published and presented projects.

Benchmark B: Create, publish and present information, utilizing formats appropriate to the content and audience.

Benchmark C: Identify communication needs, select appropriate communication tools and design collaborative interactive projects and activities to communicate with others, incorporating emerging technologies.

Standard 5: Technology and Information Literacy

Students engage in information literacy strategies, use the Internet, technology tools and resources, and apply information-management skills to answer questions and expand knowledge.

Benchmark A: Determine and apply an evaluative process to all information sources chosen for a project.

Benchmark B: Apply a research process model to conduct research and meet information needs.

Benchmark C: Formulate advanced search strategies, demonstrating an understanding of the strengths and limitations of the Internet, and evaluate the quality and appropriate use of Internet resources.

Benchmark D: Evaluate choices of electronic resources and determine their strengths and limitations.

Standard 6: Design

Students apply a number of problem-solving strategies demonstrating the nature of design, the role of engineering and the role of assessment.

Benchmark A: Identify and produce a product or system using a design process, evaluate the final solution and communicate the findings.

Benchmark B: Recognize the role of teamwork in engineering design and of prototyping in the design process.

Benchmark C: Understand and apply research, development and experimentation to problem-solving.

Standard 7: Designed World

Students understand how the physical, informational and bio-related technological systems of the designed world are brought about by the design process. Critical to this will be students' understanding of their role in the designed world: its processes, products, standards, services, history, future, issues and career connections.

Benchmark A: Classify, demonstrate, examine, and appraise energy and power technologies.

Benchmark B: Classify, demonstrate, examine and appraise transportation technologies.

Benchmark C: Classify, demonstrate, examine and appraise manufacturing technologies.

Benchmark D: Classify, demonstrate, examine and appraise construction technologies.

Benchmark E: Classify, demonstrate, examine and appraise information and communication technologies

Benchmark F: Classify, demonstrate, examine and appraise medical technologies.

Benchmark G: Classify, demonstrate, examine and appraise agricultural and related biotechnologies.

Performance Measures/Student Assessment/Instructional Strategies

Assessments/Evaluations

- Observations
- Demonstrations
- Portfolios
- Standardized Tests
- Class Assignment
- Quizzes/Tests/Exams

Instructional Strategies

- Teacher-Directed & Student-Centered Activities
- Case Study Problem Solving
- Cooperative Learning
- Project-Based Learning
- Career-Based Learning (Internships/Shadowing/Placement)
- Community-Based Learning (CTSOs and Other)
- Exploratory Learning
- Independent Research
- Team Teaching

Content Specific Strategies