

**Southeast Missouri State's Title III Strengthening Institutions Project
PR Award # P031A090131, U.S. Department of Education**

Summary Table of Title III Project Course Redesign Modules

Faculty Implementer & Biology Course	Module Topic & Inquiry Activity	Technology Utilized
Ms. Shannon McNew BS 113 Anatomy and Physiology I	Muscle Metabolism Data collection and analysis	Students use a <i>Vernier</i> hand dynamometer and computer interface software to collect data to obtain graphical representation of the force of hand gripping during different types of gripping (e.g., continuous or repetitive) and use data to investigate mechanisms of muscle metabolism.
	Homeostasis: Skin Temperature Recovery Data collection and analysis	Students use a <i>Vernier</i> surface temperature sensor and computer interface software to collect data on the rate of recovery from cold in two different skin regions and then correlate the rate of recovery with vascularity.
Dr. Diane Wood BS 114 Anatomy and Physiology II	Respiration: O² Extraction by the Lungs Date collection and analysis	Students use a Vernier O ² gas sensor and computer interface software to collect data on O ² concentrations during inhalation and exhalation and chart mean O ² concentrations after each exhalation to investigate effect of O ² extraction by the lungs with successive breaths.
	Renal Physiology: Kidney Function Observation, identifying structures & mechanisms	Students use a computer simulation program to increase understanding of the concept of glomerular filtration and urine formation and then explore ways the kidney adjusts hydrostatic pressure to maintain filtration rates.
Dr. Michael Taylor BI 438 Biogeography	Regional Similarity Prediction and explorations	Students use computers/wireless Internet to get data sets, calculate similarity indices and use cluster analysis to plot dendrograms that visually display regional similarity.
	Range Size Prediction and explorations	Students use laptop computers/wireless Internet to analyze range size data sets of aquatic organisms, graph results and compare these graphs with range size graphs of terrestrial animals and birds.
Dr. Christina Frazier BI 443 Epidemiology	Investigating an Epidemic Online individual study followed by group exercise	Students use laptop computers/wireless Internet to individually work through the same CDC online case and then do a computer-based group exercise to apply what's been learned to a different epidemic.

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Dr. Christina Frazier BI 443 Epidemiology	Epidemiological Calculations Retrieving/ analyzing data	Students select a disease which they wish to follow throughout the semester and use laptop computers/wireless Internet to collect data on this disease and then use the data to conduct epidemiological calculations such as relative risk.
Dr. Lucinda Swatzell BS 103 Human Biology	The Human Niche Information location and gathering	Students use tablet computers/wireless Internet to locate and gather information which they will use to write an essay which supports the claim that he or she is human.
	In Human Skin Information location and gathering	Students follow an information gathering model that utilizes the Web and broad introductory articles to build an information base which they will use to support an opinion on skin cell research and tissue regeneration.
Dr. Stephen Overmann BS 105 Environmental Biology	Presenting Research on Selected Environmental Topics Through student-produced digital videos	Students use software for digital video production to present research on a selected environmental topic. Students learn about environmental topics from each other through group viewing, critiquing of the videos produced.
	Researching a Selected Environmental Topic Critical evaluation of Internet information resources	Students use computers/wireless Internet to locate information sources for their research papers and evaluate the quality of these information sources utilizing criteria given by university librarians.
Dr. Timothy Judd ZO 200 Animal Biology	Comparing Free Living and Parasitic Forms Observation and identifying differences	Students study two images projected simultaneously through a new dual projection system. Through active engagement in a compare and contrast process, students will learn how morphology relates to life history.
	Vertebrate Phylogeny Observation, identifying structures and comparing anatomy	Students study projected images of actual specimens through a new overhead camera system. Using observational skills, students will construct a phylogeny based on the morphology of the specimens.

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<p>Dr. Margaret Waterman BS 218 Biological Science: A Process Approach</p>	<p>Ecology: Effects of Competition on Interacting Populations Propose hypotheses then test using simulations</p>	<p>Students use laptop computers/wireless Internet to run two Java-based online ecology simulations to conduct investigations which involve proposing hypotheses, modifying variables, collecting data and interpreting graphs related to their investigations.</p>
	<p>Natural Selection: The Role of Predators Propose hypotheses then test using simulations</p>	<p>Students use laptop computers/wireless Internet to run an online natural selection simulation to manipulate variables to see the effect of environment on different genotypes and to investigate the role that predators play in natural selection.</p>
<p>Dr. Lucinda Swatzell BO 200 Plant Biology</p>	<p>Photosynthetic Rates and Environmental Conditions Experimentally manipulate variables and make predictions</p>	<p>Students use tablet computers/wireless Internet to run two online photosynthesis simulations (one focused on <i>Elodea</i> photosynthesis and the other on molecular photosystem) which allow students to adjust environmental conditions and make predictions regarding photosynthetic rates in land plants.</p>
	<p>Monocot Versus Dicot Plant Anatomy Observation/identifying differences and similarities</p>	<p>Students use a Nikon fluorescence microscope to observe and identify the structures of live plants and then use tablet computers/wireless Internet to access the online <i>JStorePlants</i> database to obtain information on a plant's habitat, distribution and taxonomy.</p>
<p>Dr. Michael Taylor ZO 478 Ichthyology</p>	<p>Biogeography of Missouri Fishes Data exploration and discovery</p>	<p>Students use laptop computers/wireless Internet to download large data sets and, using a powerful open source statistical program, conduct cluster analysis and non-metric dimensional scaling to discover how Missouri is divided into distinct biogeographic regions by looking at the presence and absence of fishes in watersheds.</p>
	<p>Diversity Comparison of Missouri Rivers Data analysis and interpretation</p>	<p>Students use laptop computers/wireless Internet to download data sets and look up different indices which they will calculate using EXCEL and then interpret the results for making diversity comparisons of Missouri rivers.</p>

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<p>Dr. Allan Bornstein BO 361 Systematic Botany</p>	<p>Plant Collection and Documentation Hands-on collecting, observation and identification</p>	<p>Students use computers/wireless Internet to access online keys, databases and images to aid in the identification (including keying out the unknowns) of plant specimens which the students had observed and hand-collected in the field.</p>
	<p>Constructing a Plant Key Locating and gathering data & making observation-based decisions.</p>	<p>Students use computers/wireless Internet to locate appropriate information (e.g., online databases and images, plus online keys) to aid in their construction of a plant key. Students identify which online resources were most valuable in helping them to construct their plant key.</p>
<p>Dr. John Kraemer BO 200 Plant Biology</p>	<p>Respiratory Exposures and Diagnostics Retrieving/analyzing data & observation/identifying differences</p>	<p>Students use tablet computers /wireless Internet to research occupational chemical exposure scenarios. Students use dual projection system to compare x-ray film, MRI or other diagnostic imagery to determine techniques for identifying occupational exposure to chemicals.</p>
	<p>Liver Exposures and Diagnostics Retrieving/analyzing data & observation/identifying differences</p>	<p>Students use tablet computers /wireless Internet to research occupational chemical exposure epidemiology, diagnostic outcomes and diagnostic imagery related to hepatotoxic exposures. Students use dual projection system to compare images and diagnostic outcome to work through occupational exposure scenarios.</p>
<p>Dr. Walt Lilly BI 404 Cell Biology</p>	<p>Fluorescence Microscopy Hypothesis testing through the localization of specific proteins</p>	<p>Students use a Nikon fluorescence microscope to learn to use Differential Interference Contrast Microscopy to obtain images of living tissue and to detect the “reporter” Green Fluorescent Protein (GFP) as part of a larger investigation of an actively growing strain of the fungus <i>Neurospora crassa</i> in which students run SDS-PAGE gels followed by western blot analysis of the GFP-tagged protein.</p>
	<p>Bioinformatics: Membrane Protein Properties Exploration and discovery</p>	<p>Students use laptop computers/wireless Internet to run an amino acid sequence of a plasma membrane protein through an online bioinformatics software program that finds transmembrane domains. Students’ analyses of these transmembrane domains are displayed for annotation using tablet computers and a SmartBoard.</p>

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Dr. Rebecca Kurzhals BI 381 Molecular Genetics	Restriction Digestion and Gel Electrophoresis Using Molecular Techniques to Generate and Analyze Data	Students set up restriction digests of different DNA samples using heating blocks, gel electrophoresis apparatuses, rocking platform and micropipets to generate DNA fingerprinting data which they analyze as part of a larger investigation of how molecular techniques may be used to answer questions in biology.
	Differences in Expression Patterns of Genes Comparing, contrasting and drawing inferences	Students use a Nikon fluorescence microscope to make critical observations about differences in expression patterns of genes in <i>Drosophila</i> through direct visualization of the Green Fluorescent Protein (GFP) "reporter gene" as it is placed next to different promoters.

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