

Bemidji Area Schools

Grades 10-12 Forensics Science Outcomes

Strand	Substrand	Standard "Understand that ...	Benchmark "The student will ...	Activity
1. The Nature of Science and Engineering	1. The Practice of Science	1. Science is a way of knowing about the natural world and is characterized by empirical criteria, logical argument and skeptical review.	9.1.1.1.6 Describe how changes in scientific knowledge generally occur in incremental steps that include and build on earlier knowledge.	Discussion of the science behind forensic techniques and how they are used to solve crimes. Discussion of how the techniques in forensic science have changed with the advancement of science.
		2. Scientific inquiry uses multiple interrelated processes to pose and investigate questions about the natural world.	9.1.1.2.1 Formulate a testable hypothesis, design and conduct an experiment to test the hypothesis, analyze the data, consider alternative explanations, and draw conclusions supported by evidence from the investigation.	Several lab activities including: Evidence Lab, Hair Lab, Glass Lab, Fingerprint Lab, Unknown Substances Lab, Bug Lab, Blood Spatter Lab, Blood Type Lab, Ballistics Lab, and Stride Lab.
			9.1.1.2.2 Evaluate the explanations proposed by others by examining and comparing evidence, identifying faulty reasoning, pointing out statements that go beyond the scientifically acceptable evidence, and suggesting alternative scientific explanations.	Several lab activities, especially: Ballistics Lab and Blood Types Lab.
			9.1.1.2.3 Identify the critical assumptions and logic used in a line of reasoning to judge the validity of a claim.	Several lab activities, especially: Stride Lab, Blood Spatter Lab, and Glass Lab.
			9.1.1.2.4 Use primary sources or scientific writings to identify and explain how different types of questions and their associated methodologies are used by scientists for investigations in different disciplines.	Reading and research assignments about: Hair, Glass, and DNA.
	1. Engineering is a way of addressing human needs by applying science concepts and mathematical techniques to develop new products, tools, processes and systems.	9.1.2.1.1 Understand that engineering designs and products are often continually checked and critiqued for alternatives, risks, costs and benefits, so that subsequent designs are refined and improved. <i>For example:</i> If the price of an essential raw material changes, the product design may need to be changed.	Compare techniques used to test DNA. Discuss when certain forensic tests are appropriate, especially with DNA and blood.	

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1. The Nature of Science and Engineering	2. The Practice of Engineering	1. Engineering is a way of addressing human needs by applying science concepts and mathematical techniques to develop new products, tools, processes and systems.	9.1.2.1.2 Recognize that risk analysis is used to determine the potential positive and negative consequences of using a new technology or design, including the evaluation of causes and effects of failures. <i>For example:</i> Risks and benefits associated with using lithium batteries.	Discussion behind the ethics of DNA banks.
		3. Interactions Among Science, Technology, Engineering, Mathematics, and Society	2. Men and women throughout the history of all cultures, including Minnesota American Indian tribes and communities, have been involved in engineering design and scientific inquiry.	9.1.3.2.2 Analyze possible careers in science and engineering in terms of education requirements, working practices and rewards.
	3. Science and engineering operate in the context of society and both influence and are influenced by this context.	9.1.3.3.2 Communicate, justify, and defend the procedures and results of a scientific inquiry or engineering design project using verbal, graphic, quantitative, virtual, or written means.	Several lab activities, especially: Stride Lab, Blood Spatter Lab, and Ballistics Lab.	
	4. Science, technology, engineering, and mathematics rely on each other to enhance knowledge and understanding.	9.1.3.4.2 Determine and use appropriate safety procedures, tools, computers and measurement instruments in science and engineering contexts. <i>For example:</i> Consideration of chemical and biological hazards in the lab.	Several lab activities, including: Evidence Lab, Hair Lab, Glass Lab, Fingerprint Lab, Unknown Substances Lab, Bug Lab, Blood Spatter Lab, Blood Type Lab, Ballistics Lab, and Stride Lab.	
		9.1.3.4.3 Select and use appropriate numeric, symbolic, pictorial, or graphical representation to communicate scientific ideas, procedures and experimental results.	Stride Length Lab.	
		9.1.3.4.4 Relate the reliability of data to consistency of results, identify sources of error, and suggest ways to improve the data collection and analysis. <i>For example:</i> Use statistical analysis or error analysis to make judgments about the validity of results		

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4. Life Science	1. Structure and Function of Living Systems	2. Cells and cell structures have specific functions that allow an organism to grow, survive and reproduce.	9.4.1.2.2 Recognize that the work of the cell is carried out primarily by proteins, most of which are enzymes, and that protein function depends on the amino acid sequence and the shape it takes as a consequence of the interactions between those amino acids.	
			3. Evolution in Living Systems	1. Genetic information found in the cell provides information for assembling proteins which dictate expression of traits in an individual.
	9.4.3.1.2 In the context of a monohybrid cross, apply the terms phenotype, genotype, allele, homozygous and heterozygous.			
	9.4.3.1.3 Describe the process of DNA replication and the role of DNA and RNA in assembling protein molecules.			