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Integration of Science, Math, Writing and Technology in Forensics*

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This information directly relates to activities described in *Forensic Science: Fundamentals & Investigations*, Cengage Learning Publishing or to activities on our web site, www.BertinoForensics.com.

Topic	Science	Math	Writing	Technology
1. Hair Analysis	<p>Skin and hair structure and growth</p> <p>Wet mount slide preparation Teach microscope use by comparison of different hair types (human, dog, cat, etc.)</p> <p>Hair and toxins analysis</p>	<p>Measure hair width under microscope</p> <p>Animal or human? Calculate medullary index of hair.</p>	<p>Hair analysis is often used to determine drug use of people who have died years earlier. Research a famous case of hair analysis being used to determine if someone was under the influence of drugs or toxins during their lifetime.</p>	<p>Use digital microscope for measurement of hair.</p> <p>Use a digital camera and film canister to create a digital microscope to photograph & measure hair width.</p>
2. Fiber Analysis	<p>Chemical analysis of fiber Solubility, burn tests Teach microscope use by comparison of different fibers, weave patterns</p>	<p>Measurement of fibers</p> <p>Thread count</p>	<p>Investigate the Atlanta serial killer Wayne Williams. Explain how orange threads lead to linking him to the crime scene.</p>	<p>Use stereomicroscope to analyze weave patterns</p>
3. Pollen and spore examination	<p>Structure, function, and reproduction of angiosperms, gymnosperms and fungi</p> <p>Preparing permanent mount slides Focusing a microscope</p>	<p>Calculate the diameter of various pollen grains under the microscope</p>	<p>Expert witness testimony to jury on pollen analysis comparing pollen at crime scene with pollen found on suspect</p>	<p>Use digital microscope to photograph & measure pollen grains. Computer: copying images, preparation of power point presentation</p>

4. Fingerprinting	Structure, function and growth of skin Role of sweat glands in fingerprinting	Calculate ridge count	Research the history of fingerprinting. Prepare a time line indicating when it began and how it has progressed.	Match transparency of fingerprints to latent prints from a surface Photograph enlarged fingerprints for comparison.
5. DNA analysis	Structure, function of DNA Gel electrophoresis Role of restriction enzymes Principles of electrophoresis	Graphing skills: comparison of distance traveled to band size Use 'binning techniques' to determine the probability of a genotypic match within a population.	Research Project Innocence. When did it begin, by whom, its purpose and its status as of today.	Measurement with pipettes and use of gel electrophoresis apparatus, PCR and sequencing.
6. Blood typing and Saliva analysis	Structure, function of blood cells Antigen-antibody reactions of immune system	Determining the probability of various blood types within populations	Write an essay explaining how a simple blood typing test mimics the reactions of the human immune system.	Computer skills: using tutorial programs on blood typing from Internet or CDs
7. Blood Spatter	Is it human blood? Lines of convergence, area of origin, Angle of impact, Determine height of source of blood Properties of blood: Adhesion/cohesion of blood Surface tension Effects of velocity, size of drop	Measurement skills using metric and English system Use of protractor Use of sine function to determine angle of impact Use of tangent function to determine height of source of blood	One of the errors made during the investigation of O.J. Simpson and the murder of his wife Nicole Brown involved problems with the collection of the blood spatter evidence. Research this controversy and explain the errors made by the CSI during evidence collection.	Use of calculators to determine sine and tangent values of blood Computer skills using tutorial on CD or Internet Use of digital camera to photograph crime scene Microscopic blood photos
8. Drugs	Nerve and brain physiology Role of neurotransmitters, protein receptors, enzymes Simulated drug testing using	Calculate the impact of a DWI traffic ticket on car insurance	Drug Research Jig Saw (Capstone materials) Debate: Are random drug searches a violation of our	Create a poster, pamphlet or Power Point of the effects of a drug.

	indicators, solubility and precipitation tests		rights?	
9. Handwriting	Observational skills Chromatography of ink' Solvents,	Measurements using calipers: distance between words, difference between capitol and small case letters, angle of slant Calculation of R _f values	Expert witness testimony to the jury (Capstone materials)	Examine currency for the modern methods used to discourage counterfeiting Investigate newest methods of handwriting analysis
10. Rigor Mortis	Muscle physiology Sliding filament theory Aerobic and anaerobic respiration, ATP, muscle fatigue, role of Calcium	Calculation of time of death	Prepare a coroner's report that uses rigor and livor mortis as the basis for an estimated time of death	Examine Internet tutorials on muscle contraction.
11. Livor Mortis	Circulatory system, decomposition, gravity	Calculation of time of death Onset 2 hours, permanent after 8	Write a story from the point of view of a blood cell within the body of a deceased, decomposing body describing livor mortis and other changes taking place.	
12. Death and Decomposition	Role of bacteria Anaerobic fermentation Chemistry of saponification	Calculation of time of death based on stage of decomposition	Prepare a chart describing the stages of decomposition	Take digital photos of an animal documenting stages of decomposition
13. Entomology	Insects: characteristics, structure, development, role in ecosystem. Drug testing of larvae. Classification of larval stages based on size and spiracle slits Insect succession on dead bodies	Calculation of time of death based on insect development and ambient conditions Accumulated Degree Hours to determine time of death	Diary entries of a Blowfly on a dead, decomposing body. Insect scrapbook or baby book describing major events in the development of an insect Forensic Insect Research	Stereomicroscope and calipers to view and measure larva Digital photography
14. Forensic anthropology	Structure, function, growth, disease of bones	Determine age, sex and race based on measurements of bones:	Read William Maples book Dead Men Do Tell Tales. Using a case described in the	Research facial reconstruction techniques.

	Male versus female bones Racial differences in bones	Sub pubic angle, nasal index using a protractor Estimate body size based on a single bone	text, explain how bones helped to identify a person.	View an episode of Bones that shows facial reconstruction.
15. Soil	Classification of soil Column separation of soil Density, identification of organic and inorganic matter,	Estimate percentages of soil contents by column separation, % of water and chemical and physical composition of soil, pH	Investigate a crime scene where the soil contents helped to solve the case	Digital comparison photos of suspects' & crime scene soil samples
16. Dental Impressions	Structure of teeth and gums Growth and development of teeth	Using calipers, determine jaw dimensions and attempt to match bite marks to a particular jaw Use protractors to determine angles between teeth	Investigate how dental records helped to identify the members of the Romanov family; the assassinated royal family in Russia Research how Ted Bundy's bite pattern helped to convict him	Use dental x-rays to compare victim for identification. Compare bite patterns from suspects.
17. Glass Analysis	Measure density of glass, Measure refractive index of glass	Calculation of density Calculation of refractive index of different types of glass	Interview a crime scene investigator. What type of information might be gained from a crime scene by examination of glass evidence?	Take digital photos of glass fracture patterns. Determine direction and force of impact.
18. Foot, tire and tool impressions	Plaster Casts of foot prints, tire prints Physics of skid marks.	Measurement of wheel base, skid marks speed of vehicle. Use calipers to measure foot and tool impressions	Visit a tire store. Describe the variations found in tires. Explain how these variations can be detected in a tire impression.	Photograph skid marks using a digital camera, measure skid marks using laser rule to help analyze a crime scene.
19. Ballistics	Aerodynamics of bullet design Trajectory patterns Compare the energy of one bullet of a particular weight to the energy of another bullet at different weight or gun velocity	Calculate energy of bullet given speed and velocity of gun. Calculate the trajectory of a bullet	Describe the role of ballistics in the investigations of John F. Kennedy.	Determine the path of projectiles using the wind speed, distance, time of day and type of weaponry used.

20. Crime Scene	Observational skills Data collection measurement	Measure size of crime scene and all important items in the crime scene. Draw a sketch to scale	Preparation of written report of the crime scene including eyewitness interviews. Interview a policeman and ask him what types of reports are required for any investigation	Computer skill to draw a crime scene using computer software
21. general			Describe an actual court case where a particular type of evidence was used to help solve the crime expert witness testimony (Capstone) write a fictitious crime short story using scientific description of possible evidence	