

Professional Education Program Evaluation Report (PEPER II)	MATRIX Form I-C							
8710.4750 Teachers of Science: General Science Grades 5-8	K = Knowledge; A = Assessment							
	BIO 1211	BIO 1212	Chem 1111	Chem 1112	Phys. 1111	Geol. 1111 or Geol 1112	SCI 3100	SCI 3450
(b) interpret a given text, physical or computer model, demonstration, diagram, flow chart, set of numbers, table, graph, and appropriate mathematical relationships;				K	K		A	
(c) use computer software or graphing calculators to display and analyze data and to model solutions to a prediction or design problem;					K		A	A
(d) explain how mathematics influenced the development of scientific knowledge in a given contemporary or historical context, and how the development of new scientific knowledge led to new mathematics in a given contemporary or historical context; and						K	A	A
(e) describe the impact on society and culture of a given historical development of scientific ideas.							A	
C. A teacher of science understands how knowledge of concepts and principles of science and technology and knowledge of factors influencing personal and community health, population growth, natural resources, environmental quality, and natural and human-induced hazards influence decisions about personal and societal issues. The teacher of science must:								
(1) predict the scientific, economic, political, and ethical factors that could influence a course of action to address a given personal issue or local, national, or global challenge;							A	
(2) design, using the systematic approaches of science and scientific knowledge, a course of action to address a personal issue or a given local, national, or global challenge; and							A	
(3) justify and defend a given design for a course of action in terms of an assessment of alternatives, risks, costs, and benefits, and consideration of who benefits and who suffers, who pays and gains, and what the risks are and who bears them.							A	
D. A teacher of science must be able to understand and apply fundamental principles, laws, and concepts of earth and space science, life science, and physical science. The teacher of science must:								
(1) know and apply the fundamental principles, laws, and concepts of earth and space science including understanding:								
(a) the components and evolution of the Earth system as evidenced by the ability to:								
i. describe, using words, diagrams, pictures, and graphs, the physical properties of a given Earth material;						A		
ii. explain, from observation of its composition, texture, and physical state using physical, geological, or biological processes, a plausible way in which a given rock formed through time;						A		

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i. describe, using words, diagrams, pictures, graphs, historic records, and physical models, the scientific basis for predicting the occurrence of a given environmental hazard on a human time frame;						A	A	
ii. describe, using words, diagrams, pictures, maps, and physical or computer models, the observed changes in a given Earth system that are due directly or indirectly to human activity; and						A		
iii. predict, using words, diagrams, pictures, maps, and physical or computer models, the probable movement of pollutants in a given Earth system;						A	A	
(2) know and apply the fundamental principles, laws, and concepts of life science including understanding:								
(a) structural and functional relationships in living systems and environments as evidenced by the ability to:								
i. perform observations to describe the macroscopic structures of a given common organism;		A						
ii. describe, using words, pictures, and diagrams, the conditions required to sustain life for a given common organism;	A							
iii. describe, using words and diagrams, the characteristics of what determines life in a given common organism;	A							
iv. design a system to support, sustain, and continue the life of a given set of common organisms;		A						
v. describe, using words, pictures, dioramas, and physical or computer models, the structure and function of the components of a given living system in relation to its overall function;	A							
vi. explain, in terms of the function of the organs of that system, the structure of a given plant and animal system;	A							
vii. explain, using structure-function relationships, how and why the structures for a given function are different in different given species;		A						
viii. describe the origins, transmission, prevention, management, or cure of a given disease; and		A						
ix. explain and predict, in terms of the defense mechanism and the method by which the immunity is established, how a given active or passive immunity functions in a human;		A						
(b) molecular and cellular life processes as evidenced by the ability to:								
i. perform observations to describe cellular structures and physiological processes;	A							
ii. describe, using words, pictures, and models, the components of a given cell;	A							
iii. explain, in terms of the structure and function of the cell components, the differences between prokaryotic and eukaryotic cells and between given eukaryotic cells;	A							

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iv. describe, using words, pictures, and diagrams, the cellular processes of a given plant or animal cell;	A							
v. explain, using the process of photosynthesis, how plants transform solar energy into cellular energy;	A							
vi. explain, using the process of cellular respiration, how energy stored in food molecules is released;	A							
vii. explain, using the process of DNA replication, how proteins are synthesized in a cell;	A							
viii. explain, using the structure-function relationships between cells, tissues, organs, and systems, how cells function as primary building blocks of an organism;	A							
ix. describe, using words, pictures, and models, the physical changes at each given stage of cellular asexual reproduction;	A							
x. describe, using words, diagrams, and charts, how traits are inherited and sex is determined in a given animal; and	A							
xi. explain, using the relationships between genetic change and expression, how a mutation occurs and predict the effect an environmental change will have on the expression of a trait;	A							
(c) diversity and biological evolution as evidenced by the ability to:								
i. describe, using words, pictures, and diagrams, the range of physical and behavioral adaptations that can occur in response to environmental stresses for a given species;		A						
ii. describe, using words, diagrams, charts, and graphs, the range of observable characteristics of a given species in a given environment;		A						
iii. explain the speciation process in a given fossil record; and		A						
iv. design, based only on observable structure, a classification key for a given set of organisms; and		A						
(d) the interdependence among living things as evidenced by the ability to:								
i. collect and analyze data to describe the diversity and number of species in a given ecosystem;		A						
ii. describe, using words, pictures, and diagrams, the biotic and abiotic components of a given niche, habitat, ecosystem, or biome;		A						
iii. explain, in terms of environmental adaptations and development, the diversity of a given species;		A						
iv. describe, using words and diagrams, the cycling of matter and the flow of energy within a given system;		A						
v. explain and predict the behavioral responses of an animal to a given set of environmental changes; and		A						

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iii. describe, using words and ray diagrams, the reflection, refraction, transmission, and absorption of light when it encounters an ordinary object, a plain or curved mirror, a prism, and thin concave or convex lenses; and							A	
iv. explain qualitatively, using ray diagrams and the laws of reflection and refraction of light, the observed location and magnification of the real or virtual images for a given pinhole system, simple system of mirrors, or simple system of thin lenses;							A	
(d) electricity and magnetism as evidenced by the ability to:								
i. perform measurements to determine the type of charge of a given charged object, and the north and south poles of an unmarked magnet;							A	
ii. explain qualitatively, in terms of the movement of electrons, observed changes in the charge of an object in a given system of interacting charged and uncharged objects;							A	
iii. describe, using words and diagrams, the magnetic field around a straight current carrying wire and a current-carrying solenoid; and							A	
iv. design a circuit using batteries, bulbs, and switches to meet given criteria for the brightness and control of the bulbs;							A	
(e) the properties and structure of matter as evidenced by the ability to:								
i. perform measurements and calculations to describe the mass, volume, density, concentration, melting and boiling temperatures, and solubility limits of a given substance;			A	K			K	
ii. describe, using words and diagrams, common substances as pure elements or compounds, solutions, suspensions, or colloids;			A	K				
iii. perform procedures of distillation, precipitation, extraction, or chromatography to separate the substances in a given mixture;				A				
iv. describe, using words and diagrams, the basic atomic and subatomic constituents of matter;			A					
v. describe, using the kinetic-molecular theory or intermolecular forces, or both, the arrangement and motion of the atoms, ions, or molecules in a given gas, liquid, or solid substance, and explain the characteristic properties of the substance;			A	A				
vi. explain and predict, using the principles for filling the electron orbital of atoms and the Periodic Table, the periodic trends in electrical conductivity, ionization, and metallic character of a given set of elements;			A					
vii. predict, using the Periodic Table, whether the bonding in a given substance is primarily covalent, metallic, or ionic;			A					
viii. describe, with words and diagrams, the electrical conductivity of a given conductor, insulator, or semiconductor using periodic trends;			A					

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ix. describe, in words and diagrams using conservation of mass and energy, the changes in matter and energy that occur in the nuclear processes of radioactive decay, fission, and fusion; and				A			K	
x. describe, with words, structural and chemical diagrams and formulas, and physical and computer models, the unique structure of carbon, and explain how that structure results in the large variety of organic molecules;			A					
(f) chemical reactions as evidenced by the ability to:								
i. describe, using words, diagrams, physical or computer models, and a balanced chemical equation, changes in the energy and arrangement of atoms for a given chemical reaction;			A	K				
ii. describe, using words, diagrams, and chemical symbols, a given chemical reaction as oxidation-reduction, acid-base, free radical, precipitation, metathesis, or a combination of these; and			A	K				
iii. explain and predict qualitatively, using solubility rules, the common oxidation states of elements, the activity series of metals and nonmetals, the stability of radicals, and the properties of acids and bases, the most likely type of reaction for a given set of given reactants;			A	K				
(g) thermodynamics as evidenced by the ability to:								
i. describe, using words and pictures or diagrams, the characteristics of an ideal gas;			A	A				
ii. describe and predict, using words, graphs, and mathematical relationships, changes in pressure, volume, or temperature of a given ideal gas;			A					
iii. describe, using words, diagrams, and energy graphs, the changes in the enthalpy and entropy during a given chemical reaction; and			A	A				
iv. explain qualitatively, using the First and Second Laws of Thermodynamics energy, changes in a given spontaneous or nonspontaneous reaction; and				A				
(h) chemical kinetics and equilibrium as evidenced by the ability to:								
i. explain, using the requirements for effective particle collisions and activation energy, why a given spontaneous reaction is fast or slow, and predict the conditions necessary to make the reaction occur more rapidly;				A				
ii. explain, using the concept of activation energy and the requirements for effective particle collisions, how a given catalyst increases the rate of a given reaction;				A				
iii. explain, using the kinetic-molecular model, how a given change in temperature, concentration, or particle surface area changes the rate of a given chemical reaction;				A				
iv. describe, using words, diagrams, chemical equations, and concentration graphs, the equilibrium of a given reaction;				A				

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(3) how to apply educational principles relevant to the physical, social, emotional, moral, and cognitive development of preadolescents and adolescents;								A ED 3110 ED 3350
(4) how to apply the research base for and the best practices of middle level and high school education;								A ED 3350
(5) how to develop curriculum goals and purposes based on the central concepts of science and how to apply instructional strategies and materials for achieving student understanding of the discipline;								A
(6) the role and alignment of district, school, and department mission and goals in program planning;								A ED 4830
(7) the need for and how to connect students' schooling experiences with everyday life, the workplace, and further educational opportunities;								A ED 4830
(8) how to involve representatives of business, industry, and community organizations as active partners in creating educational opportunities;								A ED 4830
(9) the role and purpose of cocurricular and extracurricular activities in the teaching and learning process;								A ED 4830
(10) the impact of reading ability on student achievement in science, recognize the varying reading comprehension and fluency levels represented by students, and possess the strategies to assist students to read science content more effectively; and								A ED 3780 ED 3350 ED 4830

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(11) how to apply the standards of effective practice in teaching through a variety of early and ongoing clinical experiences with middle level and high school students within a range of educational programming models.								A ED 3100 ED 4830