National Science Education Standards, Content Standard 5-8, Correlation with IPS and FM&E

Standard	Fundamental Concepts	Scientific Principles	IPS Ch. 1	IPS Ch. 2	IPS Ch. 3	IPS Ch. 4	IPS Ch. 5	IPS Ch. 6	IPS Ch. 7	IPS Ch. 8	IPS Ch. 9	IPS Ch. 10	IPS Ch. 11	IPS Ch. 12	FM&E Ch. 1	FM&E Ch. 2	FM&E Ch. 3	FM&E Ch. 4	FM&E Ch. 5	FM&E Ch. 6	FM&E Ch. 7
Science as Inquiry	Abilities necessary to do scientific inquiry	Identify questions that can be answered through scientific investigations	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		Design and conduct scientific investigation	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		Use appropriate tools and techniques to gather, analyze, and interpret data	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		Develop descriptions, explanations, predictions, and models using evidence	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		Think critically and logically to make the relationships between evidence and explanations	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		Recognize and analyze alternative explanations and predictions	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		Communicate scientific procedures and explanations	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		Use mathematics in all aspects of scientific inquiry	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Understandings about Scientific Inquiry	Different kinds of questions suggest different kinds of scientific investigations. Some investigations involve observing and describing objects, organisms, or events; some involve collecting specimens; some involve experiments; some involve seeking more information; some involve discovery of new objects and phenomena; and some involve making models.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		Current scientific knowledge and understanding guide scientific investigations. Different scientific domains employ different methods, core theories, and standards to advance scientific knowledge and understanding.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		Mathematics is important in all aspects of scientific inquiry.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

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Science as Inquiry	Understandings about Scientific Inquiry	Technology used to gather data enhances accuracy and allows scientists to analyze and quantify results of investigations.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		Scientific explanations emphasize evidence, have logically consistent arguments, and use scientific principles, models, and theories. The scientific community accepts and uses such explanations until displaced by better scientific ones. When such displacement occurs, science advances.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		Science advances through legitimate skepticism. Asking questions and querying other scientists' explanations is part of scientific inquiry. Scientists evaluate the explanations proposed by other scientists by examining evidence, comparing evidence, identifying faulty reasoning, pointing out statements that go beyond the evidence, and suggesting alternative explanations for the same observations.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		Scientific investigations sometimes result in new ideas and phenomena for study, generate new methods or procedures for an investigation, or develop new technologies to improve the collection of data. All of these results can lead to new investigations.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Physical Science	Properties and changes of properties in matter	A substance has characteristic properties, such as density, a boiling point, and solubility, all of which are independent of the amount of the sample. A mixture of substances often can be separated into the original substances using one or more of the characteristic properties.			X	X	X														

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Physical Science	Properties and changes of properties in matter	Substances react chemically in characteristic ways with other substances to form new substances (compounds) with different characteristic properties. In chemical reactions, the total mass is conserved. Substances often are placed in categories or groups if they react in similar ways; metals is an example of such a group.		X				X													
		Chemical elements do not break down during normal laboratory reactions involving such treatments as heating, exposure to electric current, or reaction with acids. There are more than 100 known elements that combine in a multitude of ways to produce compounds, which account for the living and nonliving substances that we encounter.						X													
	Motions and Forces	The motion of an object can be described by its position, direction of motion, and speed. That motion can be measured and represented on a graph.															X				
		An object that is not being subjected to a force will continue to move at a constant speed and in a straight line.															X				
		If more than one force acts on an object along a straight line, then the forces will reinforce or cancel one another, depending on their direction and magnitude. Unbalanced forces will cause changes in the speed or direction of an object's motion.													X		X				
	Transfer of Energy	Energy is a property of many substances and is associated with heat, light, electricity, mechanical motion, sound, nuclei, and the nature of a chemical. Energy is transferred in many ways.																			X

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		Heat moves in predictable ways, flowing from warmer objects to cooler ones, until both reach the same temperature.																		X	
		Light interacts with matter by transmission (including refraction), absorption, or scattering (including reflection). To see an object, light from that object—emitted by or scattered from it—must enter the eye.																			
		Electrical circuits provide a means of transferring electrical energy when heat, light, sound, and chemical changes are produced.										X	X	X							
		In most chemical and nuclear reactions, energy is transferred into or out of a system. Heat, light, mechanical motion, or electricity might all be involved in such transfers.										X	X	X							
		The sun is a major source of energy for changes on the earth's surface. The sun loses energy by emitting light. A tiny fraction of that light reaches the earth, transferring energy from the sun to the earth. The sun's energy arrives as light with a range of wavelengths, consisting of visible light, infrared, and ultraviolet radiation.																			
Earth and Space Science	Structure of the Earth System	Water is a solvent. As it passes through the water cycle it dissolves minerals and gases and carries them to the oceans				X															
	Earth in the Solar System	Gravity is the force that keeps planets in orbit around the sun and governs the rest of the motion in the solar system. Gravity alone holds us to the earth's surface and explains the phenomena of the tides.													X						X

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Science and Technology	Abilities of Technological Design	**Identify appropriate problems for technological design.** Students should develop their abilities by identifying a specified need, considering its various aspects, and talking to different potential users or beneficiaries. They should appreciate that for some needs, the cultural backgrounds and beliefs of different groups can affect the criteria for a suitable product.																			
		Design a solution or product. Students should make and compare different proposals in light of the criteria they have selected. They must consider constraints—such as cost, time, trade-offs, and materials needed—and communicate ideas with drawings and simple models.																			
		Implement a proposed design. Students should organize materials and other resources, plan their work, make good use of group collaboration where appropriate, choose suitable tools and techniques, And work with appropriate measurement methods to ensure adequate accuracy.																			
		Evaluate completed technological designs or products. Students should use criteria relevant to the original purpose or need, consider a variety of factors that might affect acceptability and suitability For intended users or beneficiaries, and develop measures of quality with respect to such criteria and factors. They should also suggest improvements and, for their own products, try proposed modifications.																			
		Communicate the process of technological design. Students should review and describe any completed piece of work and identify the stages of problem identification, solution design, implementation, and evaluation.																			

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	Understandings About Science and Technology	Scientific inquiry and technological design have similarities and differences. Scientists propose explanations for questions about the natural world, and engineers propose solutions relating to human problems, needs, and aspirations. Technological solutions are temporary; technologies exist within nature and so they cannot contravene physical or biological principles; technological solutions have side effects; and technologies cost, carry risks, and provide benefits.																			
		Many different people in different cultures have made and continue to make contributions to science and technology.																			
		Science and technology are reciprocal. Science helps drive technology as it addresses questions that demand more sophisticated instruments and provides principles for better instrumentation and technique. Technology is essential to science because it provides instruments and techniques that enable observations of objects and phenomena that are otherwise unobservable due to factors such as quantity, distance, location, size, and speed. Technology also provides tools for investigations, inquiry, and analysis.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		Perfectly designed solutions do not exist. All technological solutions have trade-offs, such as safety, cost, efficiency, and appearance. Engineers often build in back-up systems to provide safety. Risk is part of living in a highly technological world. Reducing risk often results in new technology.																			

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		Technological designs have constraints. Some constraints are unavoidable, for example, properties of materials, or effects of weather and friction; other constraints limit choices in the design, for example, environmental protection, human safety, and aesthetics.																			
		Technological solutions have intended benefits and unintended consequences. Some consequences can be predicted, others cannot.																			
History and Nature of Science	Science as a human endeavor	Women and men of various social and ethnic backgrounds – and with diverse interests, talents, qualities, and motivators – engage in the activities of science, engineering, and related fields such as the health professions. Some scientists work in teams, and some work alone, but all communicate extensively with others.																			
		Science requires different abilities, depending on such factors as the field of study and type of inquiry. Science is very much a human endeavor, and the work of science relies on basic human qualities, such as reasoning, insight, energy, skill, and creativity—as well as on scientific habits of mind, such as intellectual honesty, tolerance of ambiguity, skepticism, and openness to new ideas.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

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History and Nature of Science	Nature of Science	Scientists formulate and test their explanations of nature using observation, experiments, and theoretical and mathematical models. Although all scientific ideas are tentative and subject to change and improvement in principle, for most major ideas in science, there is much experimental and observational confirmation. Those ideas are not likely to change greatly in the future. Scientists do and have changed their ideas about nature when they encounter new experimental evidence that does not match their existing explanations.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		In areas where active research is being pursued and in which there is not a great deal of experimental or observational evidence and understanding, it is normal for scientists to differ with one another about the interpretation of the evidence or theory being considered. Different scientists might publish conflicting experimental results or might draw different conclusions from the same data. Ideally, scientists acknowledge such conflict and work towards finding evidence that will resolve their disagreement.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

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History and Nature of Science	Nature of Science	It is part of scientific inquiry to evaluate the results of scientific investigations, experiments, observations, theoretical models, and the explanations proposed by other scientists. Evaluation includes reviewing the experimental procedures, examining the evidence, identifying faulty reasoning, pointing out statements that go beyond the evidence, and suggesting alternative explanations for the same observations. Although scientists may disagree about explanations of phenomena, about interpretations of data, or about the value of rival theories, they do agree that questioning, response to criticism, and open communication are integral to the process of science. As scientific knowledge evolves, major disagreements are eventually resolved through such interactions between scientists.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	History of Science	Many individuals have contributed to the traditions of science. Studying some of these individuals provides further understanding of scientific inquiry, science as a human endeavor, the nature of science, and the relationships between science and society.																			
		In historical perspective, science has been practiced by different individuals in different cultures. In looking at the history of many peoples, one finds that scientists and engineers of high achievement are considered to be among the most valued contributors to their culture.																			
		Tracing the history of science can show how difficult it was for scientific innovators to break through the accepted ideas of their time to reach the conclusions that we currently take for granted.						X							X		X				