Alignment to Texas Essential Knowledge and Skills

Working with Wind Energy

Lesson focuses on how wind energy can be generated on both a large and small scale. Student teams design and build a working windmill out of everyday products and learn about anemometer and site testing. Student windmills must be able to sustain the wind generated by a fan or hairdryer at medium speed at 2 feet and rotate, lifting a small object upward. Students evaluate the effectiveness of their windmill and those of other teams, and present their findings to the class.

Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	IPC	Earth & Space Science
Strand: Scientific Investigation and Reasoning							
1.A Demonstrate safe practices as described in the Texas Safety Standards during classroom and outdoor investigations including observing a schoolyard habitat.	1.A Demonstrate safe practices and the use of safety equipment as described in the Texas Safety Standards during classroom and outdoor investigations.	1.A Demonstrate safe practices and the use of safety equipment as described in the Texas Safety Standards during classroom and outdoor investigations.	1.A Demonstrate safe practices during laboratory and field investigations as outlined in the Texas Safety Standards.	1.A Demonstrate safe practices during laboratory and field investigations as outlined in the Texas Safety Standards.	1.A Demonstrate safe practices during laboratory and field investigations as outlined in the Texas Safety Standards.	1.A Demonstrates safe practices during laboratory and field investigations.	1.A Demonstrate safe practices during laboratory and field investigations.
1.B Make informed choices in the use and conservation of natural resources by recycling or reusing materials such as paper, aluminum cans, and plastics.	1.B Make informed choices in the use and conservation of natural resources and reusing and recycling of materials such as paper, aluminum, glass, cans and plastic.	1.B Make informed choices in the conservation, disposal, and recycling of materials.	1.B Practice appropriate use and conservation of resources including disposal, reuse, or recycling of materials.	1.B Practice appropriate use and conservation of resources including disposal, reuse, or recycling of materials.	1.B Practice appropriate use and conservation of resources including disposal, reuse, or recycling of materials.	1.B Demonstrate an understanding of the use and conservation of resources and the proper disposal or recycling of materials.	1.B Demonstrate an understanding of the use and conservation of resources and the proper disposal or recycling of materials.
							1.C Use the school's technology and information systems in a wise and ethical manner.
2.A Plan and implement descriptive investigations including asking and answering questions, making inferences, and selecting and using equipment or technology needed to solve a specific problem in the natural world.	2.A Plan and implement descriptive investigations, including asking well-defined questions, making inferences, and selecting and using appropriate equipment or technology to answer his/her questions.	2.A Describe, plan and implement simple experimental investigations testing one variable.	2.A Plan and implement comparative and descriptive investigations by making observations, asking well- defined questions, and using appropriate equipment and technology.	2.A Plan and implement comparative and descriptive investigations by making observations, asking well- defined questions and using appropriate equipment and technology.	2.A Plan and implement comparative and descriptive investigations by making observations, asking well- defined questions, and selecting and using appropriate equipment and technology.	2.B Plan and implement investigate procedures including asking questions, formulating testable hypotheses, and selecting equipment and technology.	

Alignment to Texas Essential Knowledge and Skills

Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	IPC	Earth & Space Science
		2.B Ask well-defined questions, formulate testable hypotheses, and select and use appropriate equipment and technology.	2.B Design and implement experimental investigations by making observations, asking well-defined questions, formulating testable hypotheses, and using appropriate equipment and technology.	2.B Design and implement experimental investigations by making observations, asking well-defined questions, formulating testable hypotheses, and using appropriate equipment and technology.	2.B Design and implement comparative and experimental investigations by making observations, asking well- defined questions, formulating testable hypotheses and selecting and using appropriate equipment and technology.		
2.B Collect data by observing and measuring using the metric system and recognize differences between observed and measured data.	2.B Collect and record data by observing and measuring, using the metric system, and using descriptive words and numerals, such as labeled drawings, writing, and concept maps.	2.C Collect information by detailed observations and accurate measuring.	2.C Collect and record data using the International System of Units (SI) and qualitative means such as labeled drawings, writing, and graphic organizers.	2.C Collect and record data using the International System of Units (SI) and qualitative means such as labeled drawings, writing, and graphic organizers.	2.C Collect and record data using the International System of Units (SI) and qualitative means such as labeled drawings, writing, and graphic organizers.	2.C Collect data and make measurements with precision.	2.E Demonstrate the use of course equipment, techniques, and procedures, including computers and web-based computer applications.
2.C Construct maps, graphic organizers, simple tables, charts, and bar graphs using tools and current technology to organize, examine, and evaluate measured data.	2.C Construct simple tables, charts, bar graphs, and maps using tools and current technology to organize, examine, and evaluate data.	2.G Construct appropriate simple graphs, tables, maps, and charts using technology including computers to organize, examine, and evaluate information.	2.D Construct tables, using repeated trials and means to organize data and identify patterns.	2.D Construct tables and graphs, using repeated trials and means to organize data and identify patterns.	2.D Construct tables and graphs, using repeated trials and means, to organize data and identify patterns.		
2.D Analyze and interpret patterns in data to construct reasonable explanations based on evidence from investigations.	2.D Analyze data and interpret patterns to construct reasonable explanations from data that can be observed and measured.	2.D Analyze and interpret information to construct reasonable explanations from direct (observable) and indirect (inferred) evidence.					
2.E Demonstrate that repeated investigations may	2.E Perform repeated investigations to	2.E Demonstrate that repeated investigations may	2.E Analyze data to formulate reasonable explanations,	2.E Analyze data to formulate reasonable explanations,	2.E Analyze data to formulate reasonable explanations,	2.D Organize, analyze, evaluate, make inferences,	2.G Organize, analyze, evaluate, make inferences,

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Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	IPC	Earth & Space Science
increase the reliability of results.	increase the reliability of results.	increase the reliability of results.	communicate valid conclusions supported by the data, and predict trends.	communicate valid conclusions supported by the data, and predict trends.	communicate valid conclusions supported by the data, and predict trends.	and predict trends from data.	and predict trends from data.
2.F Communicate valid conclusions supported by data in writing, by drawing pictures, and through verbal discussion.	2.F Communicate valid, oral and written results supported by data.	2.F Communicate valid conclusions in both written and verbal forms.				2.E Communicate valid conclusions.	2.I Communicate valid conclusions supported by data using several formats such as technical reports, lab reports, labeled drawings, graphic organizers, journals, presentations, and technical posters.
3.C Represent the natural world using models such as volcanoes or Sun, Earth, and Moon system, and identify their limitations including size, properties, and materials.	3.C Represent the natural world using models such as rivers, stream tables or fossils and identify their limitations, including accuracy and size.	3.C Draw or develop a model that represents how something works or looks that cannot be seen such as how a soda dispensing machine works.	3.B Use models to represent aspects of the natural world such as a model of Earth's layers.	3.B Use models to represent aspects of the natural world such as human body systems, and plant and animal cells.	3.B Use models to represent aspects of the natural world such as an atom, a molecule, space or a geologic feature.		
						3.B Communicate and apply scientific information extracted from various sources such as current events, news reports, published journal articles and marketing materials.	3.B Communicate and apply scientific information extracted from various sources such as current events, news reports, published journal articles, and marketing materials.
3.D Connect grade level appropriate science concepts with the history of science, science careers and contributions of scientists.	3.D Connect grade-level appropriate science concepts with the history of science, science careers, and contributions of scientists.	3.D Connect grade-level appropriate science concepts with the history of science, science careers, and contributions of scientists.	3.D Relate the impact of research on scientific thought and society including the history of science and contributions of scientists as related to the content.	3.D Relate the impact of research on scientific thought and society, including history of science and contributions of scientists as related to the content.	3.D Relate the impact of research on scientific thought and society including the history of science and contributions of scientists as related to the content.	3.D Evaluate the impact of research on scientific thought, society, and the environment.	3.D Evaluate the impact of research on scientific thought, society, and public policy.

Alignment to Texas Essential Knowledge and Skills

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						3.E Describe connections between physics and chemistry and future careers.	3.E Explore careers and collaboration among scientists in Earth and space sciences.
						3.F Research describes the history of physics, chemistry and contributions of scientists.	3.F Learn and understand the contributions of scientists to the historical development of Earth and space sciences.
4.A Collect, record, and analyze information using tools, including microscopes, cameras, computers, hand lenses, metric rulers, Celsius thermometers, wind vanes, rain gauges, pan balances, graduated cylinders, beakers, spring scales, hot plates, meter sticks, compasses, magnets, collecting nets, notebooks, sound recorders, Sun, Earth, and Moon system models; timing devices, including clocks and stopwatches; and materials to support observation of habitats of organisms such as terrariums and aquariums.	4.A Collect, record, and analyze information using tools, including calculators, microscopes, cameras, computers, hand lenses, metric rulers, Celsius thermometers, mirrors, spring scales, pan balances, triple beam balances, graduated cylinders, beakers, hotplates, meter sticks, compasses, magnets, collecting nets, and notebooks; timing devices, including clocks and stopwatches; and materials to support observation of habitats of organisms such as terrariums and aquariums.	4.A Collect and analyze information using tools including calculators, microscopes, cameras, computers, hand lenses, metric rulers, Celsius thermometers, prisms, mirrors, pan balances, triple beam balances, spring scales, graduated cylinders, beakers, hot plates, meter sticks, timing devices including clocks and stopwatches, magnets, collecting nets, notebooks and materials to support observations of habitats or organisms such as terrariums and aquariums.	4.A Use appropriate tools to collect, record, and analyze information including: journals/ notebooks, beakers, Petri dishes, meter sticks, graduated cylinders, hot plates, test tubes, triple beam balances, microscopes, thermometers, calculators, computers, timing devices, and other equipment as needed to teach the curriculum.	4.A Use appropriate tools to collect, record, and analyze information including: life science models, hand lens, stereoscopes, microscopes, beakers, Petri dishes, microscope slides, graduated cylinders, test tubes, meter sticks, metric rulers, metric tape measures, timing devices, hot plates, balances, thermometers, calculators, water test kits, computers, temperature and pH probes, collecting nets, insect traps, globes, digital cameras and journals/notebooks and other equipment as needed to teach the curriculum.	4.A Use appropriate tools to collect, record, and analyze information including: lab journals/notebooks, beakers, meter sticks, graduated cylinders, anemometers, psychrometers, hot plates, test tubes, spring scales, balances, microscopes, thermometers, calculators, computers, spectroscopes, timing devices, and other equipment as needed to teach the curriculum.		2.F Use a wide variety of additional course apparatuses, equipment, techniques, and procedures as appropriate such as satellite imagery and other remote sensing data, Geographic Information Systems (GIS), Global Positioning System (GPS), scientific probes, microscopes, telescopes, modern video and image libraries, weather stations, fossil and rock kits, bar magnets, coiled springs, wave simulators, tectonic plate models, and planetary globes.
Strand: Matter and Energy							

Alignment to Texas Essential Knowledge and Skills

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			7.A Research and debate the advantages and disadvantages of using coal, oil, natural gas, nuclear power, biomass, wind, hydropower, geothermal, and solar resources.				
Strand: Force Motion and Energy							
6.A Explore different forms of energy including mechanical, light, sound, and heat/thermal in everyday life.	6.A Differentiate among forms of energy including mechanical, sound, electrical, light, and heat/thermal.	6.A Explore the uses of energy including mechanical, light, thermal, electrical, and sound energy.	8.A Compare and contrast potential and kinetic energy.	7.C Demonstrate and illustrate forces that affect motion in everyday life, such as emergence of seedlings, turgor pressure, and geotropism.	6.A Demonstrate and calculate how unbalanced forces change the speed or direction of an object's motion.	4.A Describe and calculate an object's motion in terms of position, displacement, speed and acceleration.	
6.B Demonstrate and observe how position and motion can be changed by pushing and pulling objects to show work being done such as swings, balls, pulleys, and wagons.		6.D Design an experiment that tests the effect of force on an object.	8.B Identify and describe the changes in position, direction, and speed of an object when acted upon by unbalanced forces.			4.C Investigate how an object's motion changes only when a net force is applied, including activities and equipment such as toy cars, vehicle restraints, sports activities and classroom objects.	
6.C Observe forces such as magnetism and gravity acting on objects.						5.A Recognize and demonstrate that objects and substances in motion have kinetic energy such as vibration of atoms, water flowing down a stream moving pebbles, and bowling balls knocking down pins.	
						5.B Demonstrate common forms of potential energy including	

Alignment to Texas Essential Knowledge and Skills

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						gravitational, elastic, and chemical, such as a ball on an inclined plane, springs and batteries.	
						5.E Investigate and demonstrate the movement of thermal energy through solids, liquids, and gases by convection, conduction and radiation, such as in weather, living and mechanical systems.	
						5.H Analyze energy conversions such as those from radiant, nuclear, and geothermal sources, fossil fuels such as coal, gas, oil, and the movement of water or wind.	
						5.I Critique the advantages and disadvantages of various energy sources and their impact on society and the environment.	
Strand: Earth and Space							
		7.C Identify alternative energy resources such as wind, solar, hydroelectric, geothermal, and biofuels.	7.A Research and debate the advantages and disadvantages of using coal, oil, natural gas, nuclear power, biomass, wind, hydropower, geothermal, and solar resources.		10.A Recognize that the Sun provides the energy that drives convection within the atmosphere and oceans, producing winds and ocean currents.		14.A Analyze the uneven distribution of solar energy on Earth's surface, including differences in atmospheric transparency, surface albedo, Earth's tilt, duration of insolation, and differences in

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							atmospheric and surface absorption of energy.
							14.B Investigate how the atmosphere is heated from Earth's surface due to absorption of solar energy, which is re-radiated as thermal energy and trapped by selective absorbers.