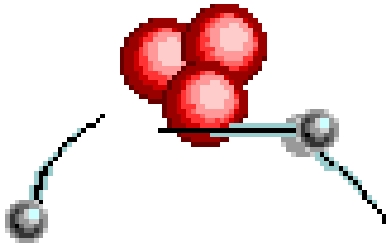
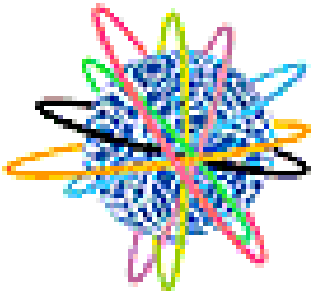
Franklin County Schools

Our Future, Our Commitment, Our Students

GRADE 6 SCIENCE CURRICULUM GUIDE





INCLUDES

Franklin County Schools

Our Future, Our Commitment, Our Students

PACING GUIDE TABLE OF CONTENTS

Franklin County Schools

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RATIONALE

This CURRICULUM guide is designed to ensure that each 6th-grader in Franklin County is getting a quality education in Science in accordance with the North Carolina Standard Course of Study and Franklin County Board of Education policies. It is intended that each teacher in the three Franklin County middle schools will teach each goal and objective at the specified time and in the specified order; by doing this, a 6th-grader is not placed at an educational disadvantage if he/she transfers from one middle school to another during the school year. However, in no way is this pacing guide intended to be a daily lesson plan for each teacher; teacher flexibility and ingenuity within the NCSCOS is vital and essential for the proper academic, intellectual, and emotional growth of the students educators are responsible for.

Every 6th-grade Science teacher is encouraged to send in ideas and lesson plans for continual improvement of this pacing guide. In no way is this pacing guide to be considered a "finished" product. It will NEVER be finished; new and better ways of instruction will continually be discovered and implemented, the Standard Course of Study will be revised from time to time, Board policies will be revised. As changes from Raleigh and the Central Office come, this pacing guide will be revised. As 6th-grade science teachers share their ideas and better ways of doing things, this pacing guide will be revised. As technological advances give educators and student's new and faster and better ways of doing things, this pacing guide will be revised. And since each child is unique, the necessity of educating the child of the future to what he/she may need will necessitate revisions of this pacing guide.

Much credit and thanks goes to the following personnel who helped ensure that this pacing guide was prepared in time for the 2009-20010 school year:

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LAST REVISED: 6/16/09

SIXTH GRADE SCIENCE
Year At A Glance

It is important that the nature of the adolescent be at the core of all curricula. Middle school students are undergoing extensive psychological, physiological, and social changes, which make them curious, energetic, and egocentric. Middle school science provides opportunities to channel the interests and concerns of adolescents, provided it maximizes their exposure to high interest topics. Investigations designed to help students learn about themselves and their world motivate them. .Designing technological solutions and pondering benefits and risks should be an integral part of the middle school science experience. As students take the initiative to learn science and technology, they will learn about themselves, their community and potential career paths. The confidence to pursue such personal goals can be instilled through successful science experience.

GOALS 1 AND 2 SHOULD BE REINFORCED IN ALL UNITS

GOAL 1: The learner will design and conduct investigations to demonstrate an understanding of scientific inquiry.

1.01 Identify and create questions and hypotheses that can be answered through scientific investigations.

1.02 Develop appropriate experimental procedures for

- Given questions.
- Student generated questions.

1.03 Apply safety procedures in the laboratory and in field studies:

- Recognize potential hazards.
- Manipulate materials and equipment.
- Conduct appropriate procedures.

1.04 Analyze variables in scientific investigations:

- Identify dependent and independent.
- Use of a control.
- Manipulate.
- Describe relationships between.
- Define operationally.

1.05 Analyze evidence to:

- Explain observations.
- Make inferences and predictions.
- Develop the relationship between evidence and explanation.

1.06 Use mathematics to gather, organize, and present quantitative data resulting from scientific investigations:

- Measurement.
- Analysis of data.
- Graphing.
- Prediction models.

1.07 Prepare models and/or computer simulations to:

- Test hypotheses.
- Evaluate how data fit.

1.08 Use oral and written language to:

- Communicate findings.
- Defend conclusions of scientific investigations.

1.09 Use technologies and information systems to:

- Research.
- Gather and analyze data.
- Visualize data.
- Disseminate findings to others.

1.10 Analyze and evaluate information from a scientifically literate viewpoint by reading, hearing, and/or viewing:

- Scientific text.
- Articles.
- Events in the popular press

GOAL 2: The learner will demonstrate an understanding of technological design.

2.01 Explore evidence that "technology" has many definitions.

- Artifact or hardware.
- Methodology or technique.
- System of production.
- Social-technical system.

2.02 Use information systems to:

- Identify scientific needs, human needs, or problems that are subject to technological solution.
- Locate resources to obtain and test ideas.

2.03 Evaluate technological designs for:

- Application of scientific principles.
- Risks and benefits.
- Constraints of design.
- Consistent testing protocols.

2.04 Apply tenets of technological design to make informed consumer decisions about:
Products. processes, systems.

SIXTH GRADE SCIENCE
Year At A Glance

Quarter 1 (continued straight down page 4-6)	Quarter 2 (continued straight down page 4-6)	Quarter 3 (continued straight down page 4-6)	Quarter 4 (continued straight down page 4-6)

UNIT 1:
BECOMING A SCIENTIST
TIME SPENT: 15 DAYS
GOAL 1: The learner will design and conduct investigations to demonstrate an understanding of scientific inquiry.
GOAL 2: The learner will demonstrate an understanding of technological design
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This unit lays the foundation for all other units. Please focus on …
- science process skills
  - observing
  - measuring
  - predicting/inferring
  - classifying
- Apply scientific method
  - hypothesis
  - variables
- science safety
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Essential Nature of Science Documents
Comprehensive Science I
Comprehensive Science II
Comprehensive Science III
Lab Group Roles
Writing Lab Reports
	UNIT 2 :
	JOURNEY TO THE CENTER OF THE EARTH
	(continued)
	TIME SPENT: 40 DAYS
	GOAL 3: The learner will build an understanding of the geological cycles, forces, processes, and agents which shape the lithosphere
	3.01 Evaluate the forces that shape the lithosphere including:
	- Crustal plate movement.
	- Folding and faulting.
	- Deposition.
	- Volcanic Activity.
	- Earthquakes.
	3.02 Examine earthquake and volcano patterns.
	3.03 Explain the model for the interior of the earth.
	.Review and maintain competency in Goals 1 and 2
		UNIT 4 :
		THE CIRCLE OF LIFE
		TIME SPENT: 40 DAYS
		GOAL 7: The learner will conduct investigations and use technologies and information systems to build an understanding of population dynamics.
		7.01 Describe ways in which organisms interact with each other and with nonliving parts of the environment:
		- Coexistence/Cooperation/Competition.
		- Symbiosis.
		- Mutual dependence.
		7.02 Investigate factors that determine the growth and survival of organisms including:
		- Light.
		- Temperature range.
		- Mineral availability.
		- Soil/rock type.
		- Water.
		- Energy.
		7.03 Explain how changes in habitat may affect organisms.
		Review and maintain competency in Goals 1 and 2
			UNIT 4 :
			THE CIRCLE OF LIFE
			(continued)
			TIME SPENT: 40 DAYS
			7.04 Evaluate data related to human population growth, along with problems and solutions:
			- Waste disposal.
			- Food supplies.
			- Resource availability.
			- Transportation.
			- Socio-economic patterns.
			7.05 Examine evidence that overpopulation by any species impacts the environment.
			7.06 Investigate processes which, operating over long periods of time, have resulted in the diversity of plant and animal life present today:
			- Natural selection.
			- Adaptation.
			Review and maintain competency in Goals 1 and 2

SIXTH GRADE SCIENCE
Year At A Glance

Quarter 1 (continued)	Quarter 2 (continued)	Quarter 3 (continued)	Quarter 4 (continued)
UNIT 2 : **BLAST OFF TO OUTERSPACE** **TIME SPENT: 35 DAYS** **GOAL 5: The learner will build understanding of the Solar System.** 5.01 Analyze the components and cycles of the solar system including: □ Sun. □ Planets and moons. □ Asteroids and meteors. □ Comets. □ Phases. □ Seasons. □ Day/year. □ Eclipses. 5.02 Compare and contrast the Earth to other planets in terms of: □ Size. □ Composition. □ Relative distance from the sun. □ Ability to support life. 5.03 Relate the influence of the sun and the moon's orbit to the gravitational effects produced on Earth. □ Solar storms. □ Tides. **Review and maintain competency in Goals 1 and 2**	**UNIT 3 :** **JOURNEY TO THE CENTER OF THE EARTH** **TIME SPENT: 40 DAYS** . 3.07 Assess the use of technology and information systems in monitoring lithospheric phenomenon. . 3.04 Describe the processes which form and the uses of earth materials. □ Rock cycle. □ Minerals. □ Characteristics of rocks. □ Economic use of rocks and minerals. □ Value of gems and precious metals. □ Common gems, minerals, precious metals and rocks found in N.C. 3.08 Conclude that the good health of environments and organisms requires: □ Monitoring of the pedosphere. □ Taking steps to maintain soil quality. □ Stewardship **Review and maintain competency in Goals 1 and 2**	**UNIT 4 :** **THE CIRCLE OF LIFE** ***(continued)*** **TIME SPENT: 40 DAYS** **GOAL 4: The learner will investigate the cycling of matter.** 4.03 Examine evidence that green plants make food. □ Photosynthesis is a process carried on by green plants and other organisms containing chlorophyll. □ During photosynthesis, light energy is converted into stored energy which the plant, in turn, uses to carry out its life processes. 4.04 Evaluate the significance of photosynthesis to other organisms: □ The major source of atmospheric oxygen is photosynthesis. □ Carbon dioxide is removed from the atmosphere and oxygen is released during photosynthesis. □ Green plants are the producers of food that is used directly or indirectly by consumers. 4.05 Evaluate designed systems for ability to enable growth of certain plants and animals. **Review and maintain competency in Goals 1 and 2**	**UNIT 5 :** **ENERGYzer:** **IT KEEPS GOING & GOING** **TIME SPENT: 30 DAYS** **GOAL 6: The learner will conduct investigations and examine models and devices to build an understanding of the characteristics of energy transfer and/or transformation.** 6.01 Determine how convection and radiation transfer energy. 6.02 Analyze heat flow through materials or across space from warm objects to cooler objects until both objects are at equilibrium. 6.03 Analyze sound as an example that vibrating materials generate waves that transfer energy. □ Frequency. □ Amplitude. □ Loudness. □ How sound travels through different material. □ Form and function of the human ear. 6.04 Evaluate data for qualitative and quantitative relationships associated with energy transfer and/or transformation. **Review and maintain competency in Goals 1 and 2**

SIXTH GRADE SCIENCE
Year At A Glance

Quarter 1 (continued)	Quarter 2 (continued)	Quarter 3 (continued)	Quarter 4 (continued)
UNIT 3 : **BLAST OFF TO OUTERSPACE** ***(continued)*** **TIME SPENT: 35 DAYS** 5.04 Describe space explorations and the understandings gained from them including: □ N.A.S.A. □ Technologies used to explore space. □ Historic timeline. □ Apollo mission to the moon. □ Space Shuttle. □ International Space Station. □ Future goals. 5.05 Describe the setting of the solar system in the universe including: □ Galaxy. □ Size. □ The uniqueness of Earth. 5.06 Analyze the spin-off benefits generated by space exploration technology including: □ Medical. □ Materials. □ Transportation. □ Processes. □ Future research. **Review and maintain competency in Goals 1 and 2**	**UNIT 2 :** **JOURNEY TO THE CENTER OF THE EARTH** ***(continued)*** **TIME SPENT: 40 DAYS** 3.05 Analyze soil properties that can be observed and measured to predict soil quality including: □ Color. □ Horizon profile. □ Infiltration. □ Soil temperature. □ Structure. □ Consistency. □ Texture. □ Particle size. □ pH. □ Fertility. □ Soil moisture. □ Nutrient balance. □ Soil as a vector. 3.06 Evaluate ways in which human activities have affected Earth's pedosphereand the measures taken to control the impact: □ Vegetative cover. □ Agriculture. □ Land use. □ Nutrient balance **Review and maintain competency in Goals 1 and 2**	**UNIT 4 :** **THE CIRCLE OF LIFE** ***(continued)*** **TIME SPENT: 40 DAYS** 4.01 Describe the flow of energy and matter in natural systems: □ Energy flows through ecosystems in one direction, from the sun through producers to consumers to decomposers. □ Matter is transferred from one organism to another and between organisms and their environments. □ Water, nitrogen, carbon dioxide, and oxygen are substances cycled between the living and non-living environments. 4.02 Evaluate the significant role of decomposers. **Review and maintain competency in Goals 1 and 2**	**UNIT 5 :** **ENERGYzer:** **IT KEEPS GOING & GOING** ***(continued)*** **TIME SPENT: 30 DAYS** 6.05 Analyze the physical interactions of light and matter: □ Absorption. □ Scattering. □ Color perception. □ Form and function of the human eye. 6.06 Analyze response to heat to determine the suitability of materials for use in technological design: □ Conduction. □ Expansion. □ Contraction. 6.07 Analyze the Law of Conservation of Energy: □ Conclude that energy cannot be created or destroyed, but only changed from one form into another. □ Conclude that the amount of energy stays the same, although within the process some energy is always converted to heat. □ Some systems transform energy with less loss of heat than others. **Review and maintain competency in Goals 1 and 2**

SIXTH GRADE SCIENCE 2008-2009 PACING GUIDE

1. Moore County Schools Curriculum Matrix
2. Learn NC (must see)
3. ScienceSpot
4. Middle School Science
5. Science-Class.net
6. Marcia's Science Teaching Ideas
7. Annenberg Media
8. McGraw—Hill Free BrainPop(must see)
9. McGraw-Hill Active Learning
10. Science Education Place
11. Effectively Teaching Science (must read)
12. Science Literature in the Classroom
13. *BrainPop (free trial)
14. Mr& Mrs Smith Science
15. Newton's Apple (must see)
16. Online Stopwatch
17. PowerPoint Games
18. Science NetLinks
19. Science Visualizations (must see)
20. Teacher Tube (must join)
21. NC DPI Support Documents (must see)
22. Learning Science.org
23. UEN Science Lessons
24. SEGway science
25. Teacher's Domain
26. The Biology Corner
27. The ScienceClass.net
28. United Streaming (must see)
29. Yahoo! Group: MSS (must join)
30. World Book Online
31. Science Graphic Organizers
32. Interactive Student Tutor
33. Science Resource Guide (must use)
34. Exploratorium Science Snacks
35. ExploreLearning Science Gizmos (free trial)
36. Essential Labs Gizmos (use with above)

Here is the ultimate list of general website to help make your year teaching science EASIER, ENGAGING, AND LESS TIME CONSUMING. This should be your first stop to help with lesson plans/lab, educational videos, visualizations and classroom management and more!!. **Asterisk(*) requires paid subscription**

COMPENTENCY GOAL 1 & 2	*The learner will design and conduct investigations to demonstrate an understanding of scientific inquiry.* *The learner will demonstrate an understanding of technological design.*

Period of Days	**SCOS Goals and Unit Theme**	**SCOS and Objectives**	**Student Edition**	**Elaboration and Connection**	**Correlation to Science Support Document**	**Resources General Websites:**
15	**Goal 1 and 2** **Unit 1: Become A Scientist** **Topics:** The Nature of Science Process Skills *(not covered in book)* Science Safety	**1.01-1.10**	**Prentice Hall Science Explorer Chapter 1**	This unit lays the foundation for building students' science skills, lab safety, and communicating lab results though lab reports. The final connection should be made is how science leads to technology to fit our needs. In order to prepare students to be sound scientist, it is essential that unit will be INCORPORATED in all units!		Scientific Method Activities Science-Class: Nature of Science ScienceSpot: Nature of Science Science Process Skills Science Safety Technology and Design Activities

Sample Lesson Plans

Intro to Scientific Method
Density Fun (major concept)
Nature of Science
Safety
Variables
A Tale of Two Kittens
Observation & Inference
Data Collection & Analysis; Graphing

Metric Measurement
Biology Corner: Scientific Method
Prentice Hall Inquiry Skills Activity
Measurement Lab,

Graphic Organizers
Scientific Method Graphic Organizer
Concept Web: Scientific Methods

Interactives
Practice the Scientific Method with an interactive, online lab
The Blackout Syndrome
Triple Beam Balance
Hot Air Balloons: Density
Pumpkin vs Boat: Density??

Unit 1 Key Vocabulary 8	Scientific Method Hypothesis Experiment Data	Evidence Observation Conclusion Constant	Control Qualitative Variables: Independent Variable	Manipulative Variable Dependent Variable Responding Variable Scientific Law Scientific theory	Meter Liter Mass Volume	Density Technology Qualitative Quantitative

COMPENTENCY GOAL 5	The learner will build understanding of the Solar System.					
Period of Days	**SCOS Goals and Unit Theme**	**SCOS Objectives**	**Student Edition**	**Elaboration and Connection**	**Correlation to Science Support Document**	**Resources** **Websites:**
35	**Goal 5:** **----------** **Unit 2 : Journey to Outer Space** **Topics:** Earth, Moon, & Sun Exploring Space The Solar System Stars, Galaxies, & the Universe	**5.01-5.06**	**Prentice Hall Science Explorer 7-10**	This unit takes students on an exploration of the solar system. Students should leave this unit understanding the components and cycles of the solar system. Students will then use this knowledge to compare and contrast Earth to other planets and lastly describe space exploration and understanding gained		Science- Class: Space Activities Middle School Science: Space Science Activities Science Spot: Astronomy Lesson Plans Earth Moon Sun - Seasons Phases Eclipses Tides AstroBiology Lesson Plans SpacePlace SpaceWeather

Lesson Plans	**Interactives**		**Graphic Organizers**
Seasons Day & Night Moon Phases Solar System Objects in the Universe Space Exploration AstroAdventure Space Lesson Plans Life in the Int'l Space Station Design a Space Station Collection of NASA lessons Debbie's Space Unit Factory	Seasons Interactive Earth-Sun Relations Earth, Sun & Moon Take the Moon Challenge! Moon Shadow - Solar Eclipse Moonlight Madness Phases of the Moon Cartoon Harcourt: Phases of the Moon Interactive Reason for the Seasons	Black Holes Amazing Space - SeveralActivities Interactive Space Map Scholastic Science Interactives Comet tour Astroventure Solar System Interactive Spin Around the Solar System	Causes of Seasons Graphic Organizer Earth's Movement Vocabulary Moon Phases Sequence Diagram Reason for the Seasons

Unit 3 Key Vocabulary						
	Astronomy Atmosphere Axis Asteroid Asteroid belt Big Bang Black hole Comet Coma Constellation	Chromospheres Convection zone Corona Crater Eclipse Equinox Force Gas giants Galaxy Gravity	Greenhouse Effect Inertia Law of Universal gravitation Lunar Eclipse Oort cloud Orbit Photosphere Prominence Penumbra	Planet Protostar Milky Way Meteor Meteoroid Meteorite Moon phases Neap tide Newton's' 1st law of motion	Radiation zone Revolution Rotation Solar eclipse solstice Star Satellite Solar flare Solar System Solar wind	Spring tide Super nova Terrestrial planets Tide Umbra **Waning** **Waxing** **White Dwarf**

COMPENTENCY GOAL 3	The learner will build an understanding of the geological cycles, forces, processes, and agents which shape the lithosphere .					
Period of Days	**SCOS Goals and Unit Theme**	**SCOS and Objectives**	**Student Edition**	**Elaboration and Connections**	**Correlation to Science Support Document**	**Resources Websites:**
40	**Goal 3** --- **Unit 3: Journey to the Center of the Earth** **Topics:** Plate Tectonics Earthquakes & Volcanoes Minerals Rocks Weathering & Soil Formation	**3.01-3.08**	**Prentice Hall Science Explorer Chapters 5, 6, 2, 3, 4** ***IMPORTANT!!!*** *This order was chosen because students are already exposed to Earth having layers through planet research.*	Students finally journey deep inside earth and discover it has layers. . Finally students are introduced to the theory of plate tectonics. Students see that the Earth is like a cracked egg and movements along the cracks lead to volcanoes and earthquakes. Students will erupt back onto the earth's surface and explore minerals, the building blocks of rocks & use different tests to identify minerals. Students will see how rocks change form through the rock cycle. Students then see how weathering connects rocks and soil and leads to soil formation. This will lead into the Circle of Life unit.		Science-Class: Geology Activities Science Spot: Earth Science Activities Middle School Science: Earth Science Activities

Lesson Plans	**Graphic Organizers**	**Interactives**	
Minerals, Rocks & Rock Cycle Plate Tectonics Weathering & Erosion AstroAdventure Geology Lesson Plans **Plate Tectonic Lesson Plan** **Earthquake Lesson Plan** **Volcano Lesson Plan I** **Volcano Lesson Plan II**	Characteristics of Minerals Organizers 3 Types of Rocks: Compare & Contrast	Mohs' Castle of Doom Pangaea Map Game Earth Structure Layers of the Earth Volcano Interactive Plates on the Move Interactive Plate Tectonics Rocks and Minerals: We are Family	Plate Tectonic animations Volcanoes & Tectonic Activity Animation Dynamic Earth Interactives Volcano Lab Mountain Maker, Earth Shaker Volcano Extinction Simulation Earthquake Simulation

Unit3: Key Vocabulary						
Asthenosphere Bedrock Chemical Weathering Cleavage Convergent Boundary Continental drift Compression Core Crust Crystal Deposition Divergent boundary Focus Dormant	Earthquake Epicenter Extrusive rock Erosion Fault Glacier Gravity Fertile Humus Ice Wedging Inorganic Inner core Intrusive rock Igneous rock	Lava Lava flow Liquid Lithosphere Litter Loam Luster Magma Mantle Mass Movement Mechanical weathering Metamorphic rock Mid ocean ridge Mineral	Mohs Hardness scale Natural resource Normal fault Ore Outer Core Pangaea Pipe Plate Tectonics Primary wave Reverse fault Richter scale Secondary wave Sediment Sedimentary rock	Seismic Waves Shearing Soil Conservation Soil Horizon Solution Subsoil Strike slip fault Streak Sunspot Supernova Tension Topsoil Transform Uniformitariansim	Volcano Weathering

COMPENTENCY GOAL 4 & 7	The learner will investigate the cycling of matter The learner will conduct investigations and use technologies and information systems to build an understanding of population dynamics					
Period of Days	**SCOS Goals & Unit Theme**	**SCOS Objetives**	**Student Edition**	**Elaboration and Compaction**	**Correlation to Science Support Document**	**Resources Websites:**
40	**Goal 4 & 7** **----------** **Unit 4: The Circle of the Life** **Topics:** Populations & Communities Ecosystems and Biomes Living Resources **CULMINATION PROJECT:** **Land, Water & Air Resources**	**4.01-4.05** **7.01-7.06**	**Prentice Hall Science Explorer 11-14**	This unit focuses on the interconnectedness of all animals, including humans, to our nearest star, the sun. Students learn that light from the sun provides plants with energy to carry out photosynthesis, a process that makes food and oxygen for all animals on Earth. This unit is also a great way to connect human technology and pollution.		Science-Class: Ecology activities Science Spot: Ecosystem Activities Weathering Erosion Deposition Ecosystems: Components **Biomes, Adaptations, Energy**

Lesson Plans	**Graphic Organizers**	**Interactives**
Ecology / Ecosystems / Biomes Energy Transfer / Food Chains / Food Webs Relationships: Predation, Competition, and Symbiosis Human Impact Primary & Secondary succession Earth's Resources Biology Corner: Ecology **Biodiversity Lesson Plan** Ecosystem Thematic Unit Lesson Various Ecosystem Lesson Plans Nature Next Door: Ecosystem lesson	Symbiosis Graphic Organizer Symbiosis: Helped, Harmed or Neither Organizer Key Ecology Vocabulary Key Ecosystem Vocabulary Biomes Graphic Organizer Transfer of Energy Organizer Food Chains Organizer Exploring Biomes Organizer	Biodiversity: Everything Counts Mission: Biomes Land Biomes Interactive World Land Biome Interactive Interactiongs among Living Things Flamingo: Food Chain

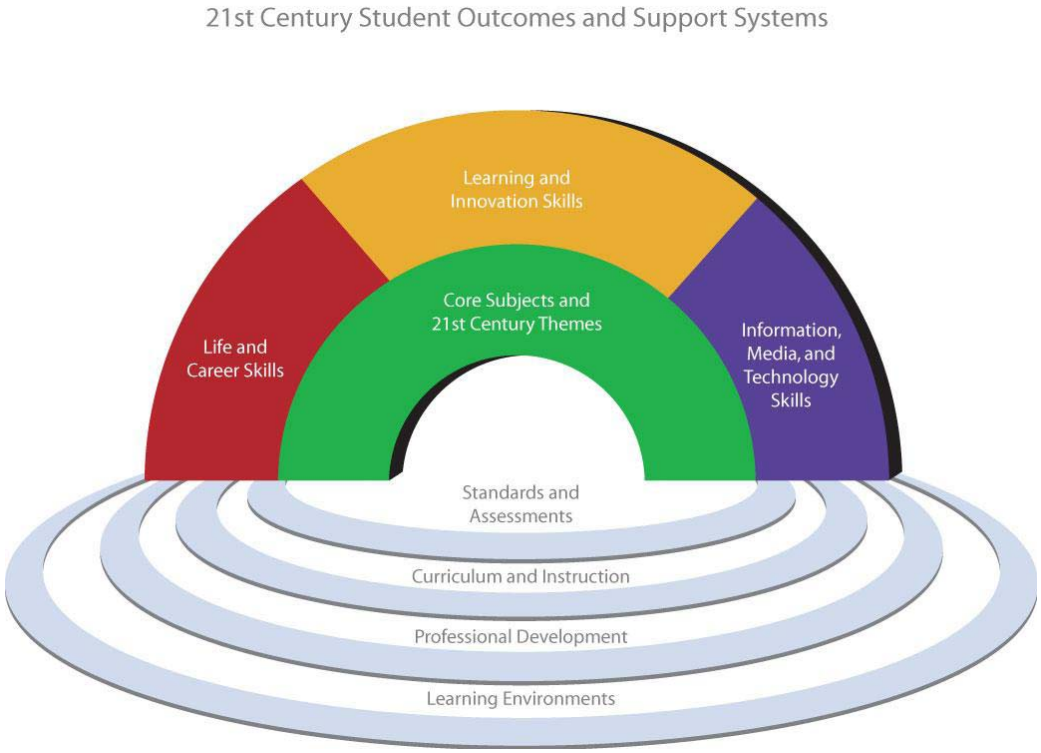
Unit 4: Key Vocabulary						
	Abiotic Adaptation Biodiversity Biome Biotic Factor Carbon Cycle Camouflage Carrying Capacity Carnivore Coniferous forest	Climate Chlorophyll Commensalism Community Competition Consumer Decomposer Deciduous Trees Ecology Ecosystem Emigration	Environment Endangered species Energy Pyramid Evaporate Environment Extinct Fertility Food chain Food web Energy Pyramid	Global Warming Habitat Herbivore Immigration Keystone species Mutualism Natural selection Niche Nitrogen cycle Omnivore	Photosynthesis Precipitation Predator Predation Prey **Producer** Parasitism Population Primary succession Renewable	Scavenger Secondary Succession Species Symbiosis Water Cycle

COMPENTENCY GOAL 6	The learner will conduct investigations and examine models and devices to build an understanding of the characteristics of energy transfer and/or transformation.					
Period of Days	**SCOS Goals & Unit Theme**	**SCOS Objectives**	**Student Edition**	**Elaboration and Compaction**	**Correlation to Science Support Document**	**Resources Websites:**
30	**Unit 5: ENERGYzer It Keeps on Going** **Topics:** Energy Thermal Energy and Heat Energy Resources Sound Light	**6.01-6.07**	**Prentice Hall Science Explorer 16, 17,15, 18, 19**	This final unit introduces students to different forms of energy (light, heat, sound). Students learn how energy moves from one substance to another. Students learn what sound is and how they hear. This unit also cover how light travels and how humans are able to see. Students will learn that energy is never lost only changed in the Law of Conservation of Energy.		Middle School Science: Energy Activities Science-Class: Energy Activities Force-Motion Newton 1st Potential-Kinetic Potential & Kinetic Energy Energy and Simple Machines

Lesson Plans	**Graphic Organizers**	**Interactives**
Speed, Force, Motion, Newton's Laws Energy Waves Sound Multiple Lessons Simple Sound Activities Light Lesson Plans Heat and Temp Lessons Food: Temp and Heat Activity Concave & Convex lens lesson	What is Energy Energy Transfer: 3 Types Energy Discover Simulations: Energy Phases of Matter & Phase Changes Energy Introduction	Forces in Motion Heat Transfer by Conduction Light: Operations Optics Electromagnet Activity Changing Electric Circuits Design Your Own Roller Coaster Projectile Motion Galileo Drops the Ball Lunar Lander Roller Coaster: Energy

Unit 5: Key Vocabulary					
Boiling Calorie Change of state Chemical energy Circuit Complementary color Concave mirror Conduction Conductor	Convex mirror Decibel Doppler effect Energy transformation Evaporation Freezing Gas	Force Heat Insulator Kinetic energy Liquid Fossil Fossil Fuel	Law of the Conservation of Energy Loudness Pitch Potential energy Matter Mechanical energy Melting	Radiation Secondary color Sound Temperature Transparent Translucent Vibration

21ST CENTURY EXAMPLES
IN
A SIXTH GRADE SCIENCE CLASSROOM



21st Century Student Outcome :____Learning and Innovation Skills____
21st Century Skill:_____Creativity and Innovation_____

TOPIC	DEFINITION	EXAMPLE(S)
Think Creatively	Use wide range of idea creation techniques	Analyze data from websites, magazines and newspapers that are related to science topic. Students can use ideas generated to create a concept map using Kidspiration or Wordle
Think Creatively	Create new and worthwhile ideas	Do observation labs to record movements and actions of different organisms in different real-world situations. Students can create an outside science observation book that shows the process of scientific thinking-observation, hypothesis, testing, analysis, and conclusions.
Think Creatively	Elaborate, refine, analyze and evaluate their own ideas in order to improve and maximize creative efforts	Examine outcomes from real life experiences/labs and find ways that outcomes can be changed to fit a situation. Students can use online references to explorer current understanding WikipediaWor or ldBookOnline
Work Creatively with Others	Develop, implement and communicate new ideas to others effectively	Student can create PowerPoint slides, videos using Windows Movie Maker, or do Podcast instead of written lab reports
Work Creatively with Others	Be open and responsive to new and diverse perspectives	Have debate topics for classes with set rules in order for all opinions to be heard. Students can use Skype to connect and discuss science topics with other classroom in across the state, nation and world.
Work Creatively with Others	Demonstrate originality and inventiveness in work and understand the real world limits to adopting new ideas	Pick a new idea from current television and tell how that idea can work in the real world and what could make it not work. Students can Twitter with real scientists to discuss how theory differs from application or can use email to directly discuss with a scientist
Work Creatively with Others	View failure as an opportunity to learn	For each idea or assignment that is failed, pick a new way to show that the idea has been learned. Students can use VoiceThread to communicate

		what they learned and how they would do it differently.
Implement Innovations	Act on creative ideas to make a tangible and useful contribution to the field in which the innovation will occur	Pick an invention and show how it has transformed the field that had it invented. This would be perfect for an Invention Convention where students research

21st Century Student Outcome :____Learning and Innovation Skills____
21st Century Skill:__Critical Thinking and Problem Solving_____________

TOPIC	DEFINITION	EXAMPLE(S)
Reason Effectively	Use various types of reasoning as appropriate to the situation	For a lab, use deductive reasoning to prove your evidence, then find your answer.
Use Systems Thinking	Analyze how parts of a whole interact with each other to produce overall outcomes in complex systems	Show how each food source in a food web is important by having students act out parts of each organism. Students can also analyze a pen to understand how all systems work together. This is a great lesson for technological design
Make Judgments and Decisions	Effectively analyze and evaluate evidence, arguments, claims and beliefs	For a rubric, instead of number or letter grades, give answers such as strongly agree, agree, neutral, disagree, strongly disagree.
Make Judgments and Decisions	Analyze and evaluate major alternative points of view	Have students write their point of view about a subject and pass it in. Give each student the opposite point of view and have their assignment be to list 3 reasons why someone would have that point of view about a topic
Make Judgments and Decisions	Synthesize and make connections between information and arguments	In groups, have students analyze journal articles with facts and arguments of each side. Have students debate pros and cons.
Make Judgments and Decisions	Interpret information and draw conclusions based on the best analysis	Have students do the same start up lab at beginning of class everyday for a week and use all the results to draw conclusions.
Make Judgments and Decisions	Reflect critically on learning	Have each student answer: “How is the scientific

	experiences and processes	method used in real life?" Students can subscribe to RSS feeds to ScienceNewsForKids in order to understand
Solve Problems	Solve different kinds of non-familiar problems in both conventional and innovative ways	Ask question such as: "Should the United States go only to renewable resources?" Have students get in groups of Yes and No to explain their side and the way they would handle that idea in the real world. Jigsawing is also an effective method where students must become experts in their subject and teach their home group
Solve Problems	Identify and ask significant questions that clarify various points of view and lead to better solutions	In pairs, have students create test questions for an upcoming test. This will allow students to gain deeper understanding of the testing material

21st Century Student Outcome: _Learning and Innovation Skills_____
21st Century Skill: _Communication and Collaboration_____

TOPIC	DEFINITION	EXAMPLE(S)
Communicate Clearly	Articulate thoughts and ideas effectively using oral, written and nonverbal communication skills in a variety of forms and contexts	For definitions, have students write definition, give oral sentence using word, and draw picture to express the definition. Students can use Wordle, Powerpoint, Windows Movie Maker, Podcast
Communicate Clearly	Listen effectively to decipher meaning, including knowledge, values, attitudes, and intentions	Group students. Give each student a different idea. Have each group act out their idea for other students to decipher. Another opportunity is to have students make a simple design using toothpicks and marshmallows. Students will then have to use their memory to write down the steps that they used and switch with another group. This lesson effectively shows students the importance of providing detailed directions
Communicate Clearly	Use communication for a range of purposes	Show how we communicate in different ways.

		Examples email, oral, writing, Powerpoint presentations, and letter form
Communicate Clearly	Utilize multiple media and technologies, and know how to judge their effectiveness as a priority as well as assess their impact	For an assignment, have each student answer in paper/pencil, email, Microsoft Word, PowerPoint, and Poster/Group Project. Have other students' rate which assignment was more effective.
Communicate Clearly	Communicate effectively in diverse environments	Instead of giving only oral instructions, have written instructions for those students that learn better from listening or have modifications. Have students choose different assessments. Test taking, projects, labs, creative writing. This will meet the modalities of different learners
Collaborate with Others	Demonstrate ability to work effectively and respectfully with diverse terms	Put students in groups for a lab with partners that they would not pick for themselves (Ex. Count off). Teachers need to analyze student personalities and academic qualities to ensure effective pairing. It is also essential to give student roles within the group such as team leader, materials manager, recorder, etc
Collaborate with Others	Exercise flexibility and willingness to be helpful in making necessary compromises to accomplish a common goal	Have different assignments for each level of student in your classroom so that they each can be taught effectively. It is important that students reflect on working within a group. Students need to assess the positives and negatives and come to a consensus that to work effectively in a group they must learn how to work cooperatively together.
Collaborate with Others	Assume shared responsibility for collaborative work, and value the individual contributions made by each team member	Have student rubrics for each project and have each team member grade each other.

21st Century Student Outcome: __Learning and Innovation Skills__
21st Century Skill:__Information, Media and Technology Skills_____

TOPIC	DEFINITION	EXAMPLE(S)
Access and Evaluate Information	Access information efficiently and effectively	Have specific list of questions for students to answer and have them timed in order to not have time wasted. Students can use Wikipedia or Worldbook Online
Access and Evaluate Information	Evaluate information critically and competently	Examine other students work (essays) for true information and explanation. Using a data projector, it would be great way to analyze student work to show them mastery work, intermediate work, or work that needs improvement. A good idea is to use students in other classes. Another good opportunity is to analyze case studies and have students investigate and apply knowledge
Use and Manage Information	Use information accurately and creatively for the issue or problem at hand	Find a real world problem that our government is trying to solve. Have students investigate and research the problem on-line. Have students find the creative way that they would use to solve the problem. This would be a great opportunity for students to take on soil and water conservation issues. Students will be able to interact with local leaders at the soil and conservation and present their findings. Students can show the real world process through a video
Use and Manage Information	Manage the flow of information from a wide variety of sources	For a specific topic, such as planets, let students pick their favorite planet and using different sources (computer, encyclopedia, magazines, etc), students can do presentations. Students would then be instructed to create a bibliography.
Use and Manage Information	Apply a fundamental understanding of the ethical/legal issues surrounding the access and use of information	Have students research ethical issues that surround using the computer. This would be a great opportunity to go over the plagiarism in the 21st century. Check out Read Write Think lesson
Analyze Media	Understand both how and why media messages are constructed, and for what	Show students a short snippet of a media message. Have students brainstorm about the purpose for that

	purposes	message. This would be a great opportunity to analyze comic strips, commercials, and billboards.
Analyze Media	Examine how individuals interpret messages differently, how values and points of view are included or excluded, and how media can influence beliefs and behaviors	Play a media clip concerning a science topic. Have each student write a few sentences detailing what they feel the clip meant/said. Read findings aloud so that students can see how each person can find differences in the same information. Check out Cable In the Classroom http://www.ciconline.org/mediasmartteachers
Analyze Media	Apply a fundamental understanding of the ethical/legal issues surrounding the access and use of media	Media literacy has become critical as students spend more time reading print, watching online news, TVs and movies. Teachers can help students develop their media analysis skills. Students can read Fahrenheit 451 and then watch the movie Check out HotChalk's Analyze Media
Create Media Products	Understand and utilize the most appropriate media creation tools, characteristics and conventions	Have students create a Travel Brochure on a planet within the solar system and would be scored using a rubric. Students would have to incorporate their research in Powerpoint in an engaging and effective manner.
Create Media Products	Understand and effectively utilize the most appropriate expressions and interpretations in diverse, multi-cultural environments	Read articles that involve habitats and the environments that are different from the students. Have the student compare and contrast their environment and the other through Venn Diagrams. Check out this great source for Web 2.0 in the Classroom
Apply Technology Effectively	Use technology as a tool to research, organize, evaluate and communicate information	Do an all on-line lab where answers are found from reputable sources and lab reports are completed such as Gizmos
Apply Technology Effectively	Use digital technologies, communication/networking tools and social networks appropriately to access, manage, integrate, evaluate and create information to successfully function in a knowledge economy	When discussing habitats, have students take digital pictures of items in their habitat. Once the pictures are taken, download them on computer so students can put together their habitat, piece by piece. Students can create a VoiceThread where they talk about each picture
Apply Technology Effectively	Apply a fundamental understanding of the ethical/legal issues surrounding the access and use of information technologies	Have students analyze the following website for credibility http://www.dhmo.org/facts.html Check out this website for the lesson plan

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APPENDICES...20-46

6TH GRADE SCIENCE WRITING PROMPTS

UNIT 1: BECOMING A SCIENTIST

1. Suppose you are a curator of a history museum. You are organizing an exhibit featuring inventions that have had dramatic impacts on society. Choose one invention that changed people's lives after it was invented. Write a summary about the invention that will appear in the exhibit
2. **FLOATING LOGS**
   A log was cut from a tree and put in water. The log floated on its side so that half the log was above the water surface. Another log was cut from the same tree. This log was twice as long and twice as wide. How does the larger log float compared with the smaller log?
   A. More than half of the larger log floats above the water surface.
   B. Half of the larger log floats above the water surface.
   C. Less than half of the larger log floats above the water surface.

UNIT 2: BLAST OFF TO OUTER SPACE

Imagine you are on a mission to explore the solar system. Write a brief news report telling the story of your trip from Earth to another terrestrial planet and to a gas giant. Include a description of each planet.

GAZING AT THE MOON

Enrico and Leah live in opposite hemispheres. Enrico lives in Santiago, Chile, which is in the Southern Hemisphere. Leah lives in Boston, Massachusetts, which is in the Northern Hemisphere. They both gazed at the moon on the same evening. Enrico noticed there was a full moon when he looked up at the sky from his location (the Southern Hemisphere). What do you predict Leah saw when she looked up in the sky from her location (the Northern Hemisphere)?

A. New Moon (no part of the moon is visible)
B. Crescent Moon (a quarter of the face of the moon is visible)
C. Half Moon (half of the face of the moon is visible)
D. Gibbous Moon (three-quarters of the face of the moon is visible)
E. Full Moon (the entire face of the moon is visible

Provide an explanation for your answer. How did you decide what the moon would look like in the opposite hemisphere?

DARKNESS AT NIGHT.. Six friends were wondering why the sky is dark at night. This is what they said:

Jeb: "The clouds come in at night and cover the sun."
Talia: "The Earth spins completely around once a day."
Nick: "The sun moves around the Earth once a day."
Becca: "The Earth moves around the sun once a day."
Latisha: "The sun moves underneath the Earth at night."
Yolanda: "The sun stops shining."

Which friend do you think has the best reason for why the sky is dark at night? Describe your ideas about why the Earth is dark at night and light during the day.

OBJECTS IN THE SKY.... Different things can be seen in the sky.

Put a D next to the things that are seen only in the daylight.
Put an N next to the things that can be seen only at night.
Put a B next to the things that can be seen in both day and night.

___the sun
___the moon
___the next-nearest star to our sun
___constellations

Explain your thinking. How did you decide when you could see different things in the sky?

UNIT 3: JOURNEY TO CENTER OF THE EARTH

What habitat do you live in? Write a detailed description of your habitat. Describe how you obtain the food, water, and shelter you need from your habitat. How does this habitat meet your needs in ways that another would not?

IS IT A ROCK?

Which things on this list could be rocks? How do you decide if something is a rock? Put an X next to things you think could be a rock.

____jagged boulder	____smooth boulder
____small stone	____large stone
____pebble	____ piece of gravel
____piece of sand	____ dust from 2 stones rubbed together

What "rule" or reasoning did you use to decide if something is a rock?

MOUNTAIN AGE

Mountain A is 4,800 feet tall, looks smooth and rounded, and is located in North America. Mountain B is 19, 280 feet tall, looks sharp and jagged, and is located in South America. Both mountains were originally formed by the uplifting of the Earth's crust millions of years ago, are composed of similar material, and are found in similar climate conditions.

Put an X next to the statement that best describes your thinking about the age of the 2 different mountains based on their shape and height.

____Mountain A is probably younger than Mountain B.
____Mountain A is probably older than Mountain B.
____Mountains A and B are the same age.

Describe your thinking, Provide an explanation for your answer.

Chapter 5- MOUNTAINTOP FOSSIL

The Esposito family went hiking on a tall mountain. Mrs. Esposito picked up a shell fossil on the top of the mountain. The fossil was once a shelled organism that lived in the ocean. The family had different ideas about how the fossil ended up there. This is what they thought:

Mrs. Esposito: A bird picked up the organism and dropped the shell as it flew over the mountain.
Mr. **Esposito:**Water, ice, or wind eventually carried the fossil to the top of the mountain.
Rosa: A mountain formed in an area that was once covered by ocean.
Sofia: The fossil flowed out of a volcano that rose up from the ocean floor.

What idea do you most agree with and why?

Write a description for one of the renewable energy sources. Be sure to mention how its advantages make it superior to the other energy sources. Also mention how scientist might be able to overcome its disadvantages.

Chapter 11-FUNCTIONS OF LIVING THINGS

The functions listed below are performed by living organisms. Which functions are performed by plants, animals, or both? Mark each example with a P, A, or B.

Put a P in front of the functions performed only by plants.
Put an A in front of the functions performed only by animals.
Put a B in front of the functions performed by both plant and animals.

___Photosynthesis	____Acquire and take in food from environment
___ Storage of energy	___Respiration (Release energy from food)
___Cell division	___Transport of materials within the organism
___Reproduction	___Maintain a stable, internal environment
___Growth	___Response to stimuli
___Elimination of waste products	___Repair of damaged structures

Explain your thinking. What helped you decide whether a function is performed by a plant, animal or both?

HABITAT CHANGE

A small, short-furred gray animal called a divo lives on an island. This island is the only place on earth where divos live. The island habitat is warm and provides plenty of the divos' only food – tree ants. The divos live high in the treetops, hidden from predators. One year the habitat experienced a drastic change that lasted for most of the year. It became very cold and even snowed. All of the ants died. The trees lost their leaves, but plenty of seeds and dried leaves were on the ground.

Circle any of the things you think happened to most of the divos living on the island after their habitat changed.

A. The divos' fur grew longer and thicker.
B. The divos switched to eating seeds.
C. The divos dug holes to live under the leaves or beneath rocks.
D. The divos hibernated through the cold period until habitat was warm again.
E. The divos died.

Explain your thinking. How did you decide what effect the change in habitat would have on most of the divos?

IS IT A PLANT?
Put an X next to the things that you consider to be plant.

___fern	___grass	___moss	___vine
___grasshopper	___tomato	___mold	___flower
___tree	___onion	___weed	___bush
___cactus	___bacteria	___mushroom	___carrot
___cabbage	___dandelion		

Explain your thinking. Describe the "rule" or reasoning you used to decide if something is a plant.

AIR POLLUTION
List all of the substances that you can think of that cause air pollution. For each one, find a way that we could eliminate it from our environment.

This is a beautiful planet and not at all fragile. Earth can withstand significant volcanic eruptions, tectonic cataclysms, and ice ages. But this canny, intelligent, prolific, and extremely self-centered human creature has proven himself capable of more destruction of life than Mother Nature herself.... We've got to be stopped. ~Michael L. Fischer, *Harper's*, July 1990

UNIT 5: ENERGYzer..IT KEEPS GOING AND GOING

Chapter 15- ICE CUBES IN A BAG

You are having an argument with your friend about what happens to the mass when matter changes from one form to another. To prove your idea, you put three ice cubes in a sealed bag and record the mass of the ice in the bag. You let the ice cubes melt completely. Ten minutes later you record the mass of the water in the bag. Which of the following best describes the result? Circle your prediction.

A. The mass of the water in the bag will be less than the mass of the ice in the bag.
B. The mass of the water in the bag will be more than the mass of the ice in the bag.
C. The mass of the water in the bag will be the same as the mass of the ice cubes in the bag.

Describe your thinking. Provide an explanation for you answer.

Chapter 16- BOILING TIME AND TEMPERATURE

Ernesto is heating a pure liquid on a stove. He records the temperature a minute after the liquid starts to boil. After 20 minutes of boiling, he records the temperature again. When Ernesto compares the first temperature with the second, what do you think he will find? Circle your prediction.

A. The boiling temperature did not change.
B. The boiling temperature decreased.
C. The boiling temperature increased.

Explain your thinking. Describe the "rule" or reasoning you used to make your prediction.

Chapter 17- ICE-COLD LEMONADE

It was a hot summer day. Mattie poured herself a glass of lemonade. The lemonade was warm, so Mattie put some ice in the glass. After 10 minutes, Mattie noticed that the ice was melting and the lemonade was cold. Mattie wondered what made the lemonade get cold. She had tree different ideas. Which idea do you think best explains why the lemonade got cold? Circle your answer.

A. The coldness from the ice moved into the lemonade.
B. The heat from the lemonade moved into the ice.
C. The coldness and the heat moved back and forth until the lemonade cooled off.

Explain your thinking. Describe the "rule" or reasoning you used for your answer.

Chapter 18- MAKING SOUND
All of the objects listed below make sounds. Put an X next to the objects you think involve vibrations in producing sound.

___guitar strings ___drum ___dripping faucet ___piano
___barking dog ___wind ___ brakes ___radio speaker
___crumpled paper ___car engine ___chirping cricket __singer
___popped balloon ___wood saw ___clapped hands __bubbling water
___rustling leaves ___hammer ___flute ___thunderstorm

Explain your thinking. What "rule" or reasoning did you use to decide which objects involve vibrations in producing sound?

Chapter 19- CAN IT REFLECT LIGHT?
What types of objects or materials can reflect light? Put an X next to the things you think can reflect light.

___water ___gray rock ___leaf ___mirror
___glass ___sand ___potato skin ___wax paper
___soil ___tomato soup ___crumpled paper ___shiny metal
___wood ___dull metal ___red apple ___rough cardboard
___the moon ___rusty nail ___clouds ___bedsheet
___milk ___brand new penny ___old penny ___smooth aluminum foil

Explain your thinking. Describe the "rule" or the reasoning you used to decide if something can reflect light.

SIXTH GRADE SCIENCE KEY VOCABULARY

Unit 1 Key Vocabulary
Scientific Method
Hypothesis
Experiment
Data Evidence
Observation
Conclusion
Constant
Control
Qualitative
Variables:
Independent Variable
Manipulative Variable
Dependent Variable
Responding Variable
Scientific Law
Scientific theory
Meter
Liter
Mass
Volume
Density
Technology
Qualitative
Quantitative

Unit 2 Key Vocabulary
Astronomy
Atmosphere
Axis
Asteroid
Asteroid belt
Big Bang
Black hole
Comet
Coma
Constellation
Chromosphere
Convection zone
Corona
Crater
Eclipse
Equinox
Force
Gas giants
Galaxy
Gravity
Greenhouse Effect
Inertia
Law of Universal gravitation
Lunar Eclipse
Oort cloud
Orbit
Photosphere
Prominence
Penumbra
Planet
Protostar
Milky Way
Meteor
Meteoroid
Meteorite

Unit 2 *continued*
Meteorite
Moon phases
Neap tide
Newton's' 1st law of motion
Radiation zone
Revolution
Rotation
Solar eclipse
solstice
Star
Satellite
Solar flare
Solar System
Solar wind
Spring tide
Super nova
Terrestrial planets
Tide
Umbra
Waning
Waxing
White Dwarf

Unit 3 Key Vocabulary
Asthenosphere
Bedrock
Chemical Weathering
Cleavage
Convergent Boundary
Continental drift
Compression
Core
Crust
Crystal
Deposition
Divergent boundary
Focus
Dormant
Earthquake
Epicenter
Extrusive rock
Erosion
Fault
Glacier
Gravity
Fertile
Humus
Ice Wedging
Inorganic
Inner core
Intrusive rock
Igneous rock
Lava
Lava flow
Liquid
Lithosphere
Litter
Loam
Luster
Magma
Mantle
Mass Movement

Unit 3 *continued*
Mechanical weathering
Metamorphic rock
Mid ocean ridge
Mineral
Mohs Hardness scale
Natural resource
Normal fault
Ore
Outer Core
Pangaea
Pipe
Plate Tectonics
Primary wave
Reverse fault
Richter scale
Secondary wave
Sediment
Sedimentary rock
Seismic Waves
Shearing
Soil Conservation
Soil Horizon
Solution
Subsoil
Strike slip fault
Streak
Sunspot
Supernova
Tension
Topsoil
Transform
Uniformitariansim
Volcano
Weathering

SIXTH GRADE SCIENCE KEY VOCABULARY

Unit 4: Key Vocabulary

Abiotic
Adaptation
Biodiversity
Biome
Biotic Factor
Carbon Cycle
Camouflage
Carrying Capacity
Carnivore
Climate
Chlorophyll
Commensalism
Community
Competition
Consumer
Decomposer
Ecology
Ecosystem
Emigration
Environment
Endangered species
Energy Pyramid
Evaporate
Environment
Extinct
Fertility
Food chain
Food Web
Energy Pyramid
Global Warming
Habitat
Herbivore

Unit 4 *continued*

Immigration
Keystone species
Mutualism
Natural selection
Niche
Nitrogen cycle
Omnivore
Photosynthesis
Precipitation
Predator
Predation
Prey
Producer
Parasitism
Population
Primary succession
Renewable
Scavenger
Secondary Succession
Species
Symbiosis
Water Cycle

Unit 5: Key Vocabulary

Boiling
Calorie
Change of state
Chemical energy
Circuit
Complementary color
Concave mirror
Conduction
Conductor
Convex mirror
Decibel
Doppler effect
Energy transformation
Evaporation
Freezing
Gas
Force
Heat
Insulator
Kinetic energy
Liquid
Fossil
Fossil Fuel
Law of the Conservation of Energy
Loudness
Pitch
Potential energy
Matter
Mechanical energy
Melting
Radiation
Secondary color
Sound
Temperature
Transparent
Translucent
Vibration

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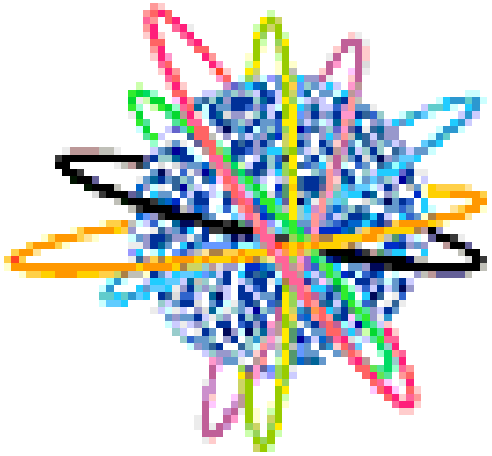
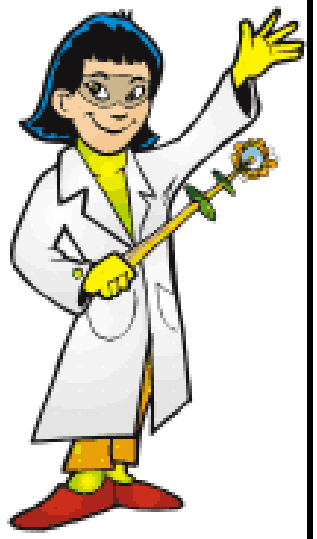
GRADE 6 SCIENCE
STANDARD COURSE OF STUDY





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SIXTH GRADE
STANDARD COURSE OF STUDY

Goal

Sixth grade science builds on the concepts and skills acquired in kindergarten through fifth grade. Instructional design should provide opportunities for understanding: the unifying concepts of science, the strands, conceptual goals and objectives. Connections to mathematics, technology, social science, and communication skills should be considered in instructional design. To assist teachers with instruction, materials explaining the Unifying Concepts, Strands, Goals, and Objectives with specific recommendations for classroom, laboratory, and/or field experiences are available through the Department of Public Instruction.

It is important to keep the nature of the adolescent at the core of all curricula. Middle school students are undergoing extensive psychological, physiological and social changes which make them curious, energetic, and egocentric. Middle school science provides opportunities to channel adolescent interests and concerns, provided it maximizes their exposure to high interest topics. Middle school learners need to see a direct relationship between science education and daily life.

Designing technological solutions and pondering benefits and risks should be an integral part of the middle school science experience. As students take initiative to learn science and technology, they will learn about themselves, their community and potential career paths. The confidence to pursue such personal goals can be instilled through a successful sixth grade science experience.

Nature of Science

Science is a human endeavor that relies on reasoning, insight, skill and creativity. A parallel reliance on scientific habits of mind such as intellectual honesty, tolerance of ambiguity, skepticism, and openness to new ideas is crucial to the advancement of science and technology. Science would be a stagnant body of knowledge if not for humans continually seeking to understand and explain the natural world and their role in it. Capitalizing on the continuous public review of science and technology, middle school students should understand that the very nature of science is for some ideas to be constant yet tentative, probabilistic, historic and replicable.

Many of science's universal laws are very old ideas that still apply today. In addition, using history to trace the technology evolution that led us from an agricultural to an industrial to an information and communication-based society exemplifies the nature of science. Public acceptance of modified or new ideas exemplifies the struggle of scientists who attempt to advance scientific knowledge or make breakthroughs. The learner should appreciate the efforts of past scientists whose efforts gave rise to modern science and technology.

A solid conceptual base of scientific principles, as well as knowledge of science safety, is necessary for inquiry. Teachers should foster a supportive learning environment based on how scientists and engineers work. Adherence to all science safety criteria and guidelines for classroom, field and laboratory experiences is imperative. Contact the Science Section at DPI for information and professional development opportunities regarding North Carolina specific Science Safety laws, codes and standards. See information on the statewide initiative entitled "NC – The Total Science Safety System."

Science as Inquiry

Traditional laboratory experiences provide opportunities to demonstrate how science is constant, probabilistic, historic and replicable. Although there are no fixed steps that all scientists follow, scientific investigations usually involve collections of relevant *evidence*, the use of *logical reasoning*, the application of *imagination* to devise hypotheses, and *explanations* to make sense of collected evidence. The science process skills necessary for inquiry are acquired through active experience. The process skills

support development of reasoning and problem-solving ability and are the core of scientific methodologies. Students should:

- Structure questions that can be answered through scientific investigations.
- Clarify ideas that guide and influence the inquiry.
- Design and conduct scientific investigations to test ideas.
- Apply safe and appropriate abilities to manipulate materials, equipment and technologies.
- Control and manipulate variables.
- Use appropriate tools to gather, analyze, interpret, and communicate data.
- Use mathematics to gather, organize and present data.
- Make inferences from data.
- Use evidence to offer descriptions, predictions and models.
- Think critically and logically to bridge the relationship between evidence and explanations.
- Recognize and evaluate alternative explanations.
- Review experimental procedures.
- Communicate scientific procedures, results and explanations.
- Formulate questions leading to further investigations.

Science and Technology

Science is the foundation of technology and new technology plays a key role in the advancement of science. Teachers should emphasize the reciprocity of science and technology with middle school learners. Current media topics, emerging technologies, and research issues provide a real world context for understanding and applying targeted grade-level skills and concepts.

A single problem often possesses scientific *and* technological aspects. For example, investigating the salinity of water in North Carolina's sounds is the pursuit of science, while creating a way to make the salt water drinkable is the pursuit if technology. In other words, while science tries to understand the natural world, technology tries to solve practical problems. Technology expands our ability to understand the world and to control the natural and human-made environment. Technology asks questions like "How does this work?" and "How can it be improved?"

The word technology has many definitions. Stephen Kiln, Professor of Mechanical Engineering at Stanford University, has four definitions of technology (Kiln, 1985):

- Artifact or hardware (e.g. an aspirin, computer)
- Methodology or technique (e.g. painting, using a microscope)
- System of production (e.g. automobile assembly line, an entire industry)
- Social-technical system (e.g. an airplane suggests a plethora of interrelated devices, human resources, and artifacts such as airports, passengers and pilots, fuel, regulations and ticketing).

Technology provides tools for understanding natural phenomena and often sparks scientific advances. It has always played a role in the growth of scientific knowledge. The techniques for shaping, producing or manufacturing tools, for example, are seen as the primary evidence of the beginning of human culture. Applying scientific knowledge of materials and processes to the benefit of people has been a determining factor in shaping our culture.

While understanding the connection of science and technology is critical, the ability to distinguish between the work of engineers and scientists should also be explored. Scientists propose explanations for questions about the natural world and engineers propose solutions relating to human problems, needs and aspirations. Technology design skills are parallel to inquiry skills in science. It is critical that students understand that technology enables us to design adaptations to the natural world but not without both positive and negative consequences. The middle school science teacher should stress the limits on science's ability to answer all questions and on technology's ability to design solutions for all adaptive problems. Design requires that technological solutions adhere to the universal laws of nature. Constraints such as gravity or the properties of materials used are critical to the success of a technological solution. Other constraints, including cost, time, politics, society, ethics and aesthetics, also define parameters and limit choices. Students should analyze benefits and costs of technological solutions. Fundamental abilities and technological design include the abilities to:

- Identify problems appropriate for technological design.
- Develop criteria for evaluating the product or solution.
- Identify constraints that must be taken into consideration.

- Design a product or solution.
- Apply safe and appropriate abilities to manipulate materials, equipment and technologies.
- Implement a proposed design.
- Evaluate completed design or product.
- Analyze the risks and benefits of the solution.
- Communicate the process of technological design.
- Review the process of technological design.

Science in Personal and Social Perspectives

The ultimate goal for a scientifically literate person is the ability to use appropriate scientific principles and processes in making personal decisions. Therefore, making personal and societal connections to scientific challenges is imperative to middle school learners. Concepts, skills, and theories for middle school science afford opportunities to develop scientific understanding for many aspects of personal and societal health. Opportunities that nurture students' abilities to think creatively and scientifically abound, as students connect science to personal decision making. Personal and societal connections can be made as sixth grade students conduct in-depth investigations which:

- Analyze the role of humans in the natural world using issues that concern the lithosphere.
- Interpret the interconnections of all organisms in an ecosystem and the effect of disturbing parts of a system.
- Evaluate the benefits and knowledge gained from space exploration.
- Investigate the importance of soil quality.

SCIENCE GRADE 6

Learners will study natural and technological systems.
All goals should focus on the unifying concepts of science defined by the National Science Education Standards:

- Systems, Order and Organization
- Evidence, Models and Explanations
- Constancy, Change and Measurement
- Evolution and Equilibrium
- Form and Function

The skills of technological design and inquiry are targeted for mastery. The concepts for which in-depth studies should be designed at sixth grade level include:

- Scientific Inquiry
- Technological Design
- Lithosphere
- Cycling of Matter
- Solar System
- Energy Transfer/Transformation
- Population Dynamics

Strands: The Nature of Science, Science as Inquiry, Science and Technology, Science in Personal and Social Perspectives

Competency Goal 1: The learner will design and conduct investigations to demonstrate an understanding of scientific inquiry.

Objectives

1.01 Identify and create questions and hypotheses that can be answered through scientific investigations.
1.02 Develop appropriate experimental procedures for:

- Given questions.
- Student generated questions.

1.03 Apply safety procedures in the laboratory and in field studies:

- Recognize potential hazards.
- Manipulate materials and equipment.
- Conduct appropriate procedures.

1.04 Analyze variables in scientific investigations:

- Identify dependent and independent.
- Use of a control.
- Manipulate.
- Describe relationships between.
- Define operationally.

1.05 Analyze evidence to:

- Explain observations.
- Make inferences and predictions.
- Develop the relationship between evidence and explanation.

1.06 Use mathematics to gather, organize, and present quantitative data resulting from scientific investigations:

- Measurement.
- Analysis of data.

- Graphing.
- Prediction models.

1.07 Prepare models and/or computer simulations to:
- Test hypotheses.
- Evaluate how data fit.

1.08 Use oral and written language to:
- Communicate findings.
- Defend conclusions of scientific investigations.

1.09 Use technologies and information systems to:
- Research.
- Gather and analyze data.
- Visualize data.
- Disseminate findings to others.

1.10 Analyze and evaluate information from a scientifically literate viewpoint by reading, hearing, and/or viewing:
- Scientific text.
- Articles.
- Events in the popular press.

Competency Goal 2: The learner will demonstrate an understanding of technological design.

Objectives

2.01 Explore evidence that "technology" has many definitions.
- Artifact or hardware.
- Methodology or technique.
- System of production.
- Social-technical system.

2.02 Use information systems to:
- Identify scientific needs, human needs, or problems that are subject to technological solution.
- Locate resources to obtain and test ideas.

2.03 Evaluate technological designs for:
- Application of scientific principles.
- Risks and benefits.
- Constraints of design.
- Consistent testing protocols.

2.04 Apply tenets of technological design to make informed consumer decisions about:
- Products.
- Processes.
- Systems.

Competency Goal 3: The learner will build an understanding of the geological cycles, forces, processes, and agents which shape the lithosphere.

Objectives

3.01 Evaluate the forces that shape the lithosphere including:
- Crustal plate movement.
- Folding and faulting.
- Deposition.
- Volcanic Activity.
- Earthquakes.

3.02 Examine earthquake and volcano patterns.

3.03 Explain the model for the interior of the earth.

3.04 Describe the processes which form and the uses of earth materials.
- Rock cycle.
- Minerals.
- Characteristics of rocks.
- Economic use of rocks and minerals.
- Value of gems and precious metals.
- Common gems, minerals, precious metals and rocks found in N.C.

3.05 Analyze soil properties that can be observed and measured to predict soil quality including:
- Color.
- Horizon profile.
- Infiltration.
- Soil temperature.
- Structure.
- Consistency.
- Texture.
- Particle size.
- pH.
- Fertility.
- Soil moisture.

3.06 Evaluate ways in which human activities have affected Earth's pedosphere and the measures taken to control the impact:
- Vegetative cover.
- Agriculture.
- Land use.

- Nutrient balance.
- Soil as a vector.

3.07 Assess the use of technology and information systems in monitoring lithospheric phenomenon.
3.08 Conclude that the good health of environments and organisms requires:

- Monitoring of the pedosphere.
- Taking steps to maintain soil quality.
- Stewardship.

Competency Goal 4: The learner will investigate the cycling of matter.

Objectives

4.01 Describe the flow of energy and matter in natural systems:

- Energy flows through ecosystems in one direction, from the sun through producers to consumers to decomposers.
- Matter is transferred from one organism to another and between organisms and their environments.
- Water, nitrogen, carbon dioxide, and oxygen are substances cycled between the living and non-living environments.

4.02 Evaluate the significant role of decomposers.
4.03 Examine evidence that green plants make food.

- Photosynthesis is a process carried on by green plants and other organisms containing chlorophyll.
- During photosynthesis, light energy is converted into stored energy which the plant, in turn, uses to carry out its life processes.

4.04 Evaluate the significance of photosynthesis to other organisms:

- The major source of atmospheric oxygen is photosynthesis.
- Carbon dioxide is removed from the atmosphere and oxygen is released during photosynthesis.
- Green plants are the producers of food that is used directly or indirectly by consumers.

4.05 Evaluate designed systems for ability to enable growth of certain plants and animals.

Competency Goal 5: The learner will build understanding of the Solar System.

Objectives

5.01 Analyze the components and cycles of the solar system including:

- Sun.
- Planets and moons.
- Asteroids and meteors.
- Comets.
- Phases.
- Seasons.
- Day/year.
- Eclipses.

5.02 Compare and contrast the Earth to other planets in terms of:

- Size.
- Composition.
- Relative distance from the sun.
- Ability to support life.

5.03 Relate the influence of the sun and the moon's orbit to the gravitational effects produced on Earth.

- Solar storms.
- Tides.

5.04 Describe space explorations and the understandings gained from them including:

- N.A.S.A.
- Technologies used to explore space.
- Historic timeline.
- Apollo mission to the moon.
- Space Shuttle.
- International Space Station.
- Future goals.

5.05 Describe the setting of the solar system in the universe including:

- Galaxy.
- Size.
- The uniqueness of Earth.

5.06 Analyze the spin-off benefits generated by space exploration technology including:

- Medical.
- Materials.
- Transportation.
- Processes.
- Future research.

Competency Goal 6: The learner will conduct investigations and examine models and devices to build an understanding of the characteristics of energy transfer and/or transformation.

Objectives

6.01 Determine how convection and radiation transfer energy.

6.02 Analyze heat flow through materials or across space from warm objects to cooler objects until both objects are at equilibrium.

6.03 Analyze sound as an example that vibrating materials generate waves that transfer energy.

- Frequency.
- Amplitude.
- Loudness.
- How sound travels through different material.
- Form and function of the human ear.

6.04 Evaluate data for qualitative and quantitative relationships associated with energy transfer and/or transformation.

6.05 Analyze the physical interactions of light and matter:

- Absorption.
- Scattering.
- Color perception.
- Form and function of the human eye.

6.06 Analyze response to heat to determine the suitability of materials for use in technological design:

- Conduction.
- Expansion.
- Contraction.

6.07 Analyze the Law of Conservation of Energy:

- Conclude that energy cannot be created or destroyed, but only changed from one form into another.
- Conclude that the amount of energy stays the same, although within the process some energy is always converted to heat.
- Some systems transform energy with less loss of heat than others.

Competency Goal 7: The learner will conduct investigations and use technologies and information systems to build an understanding of population dynamics.

Objectives

7.01 Describe ways in which organisms interact with each other and with non-living parts of the environment:

- Coexistence/Cooperation/Competition.
- Symbiosis.
- Mutual dependence.

7.02 Investigate factors that determine the growth and survival of organisms including:

- Light.
- Temperature range.
- Mineral availability.
- Soil/rock type.
- Water.
- Energy.

7.03 Explain how changes in habitat may affect organisms.

7.04 Evaluate data related to human population growth, along with problems and solutions:

- Waste disposal.
- Food supplies.
- Resource availability.
- Transportation.
- Socio-economic patterns.

7.05 Examine evidence that overpopulation by any species impacts the environment.

7.06 Investigate processes which, operating over long periods of time, have resulted in the diversity of plant and animal life present today:

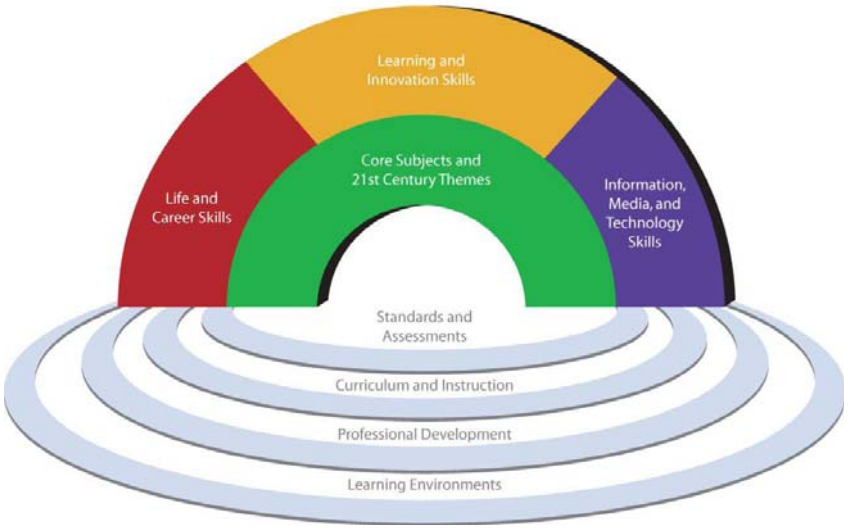
- Natural selection.
- Adaptation.

Franklin County Schools

Our Future, Our Commitment, Our Students

Building 21st Century Skills

21st Century Student Outcomes and Support Systems



PARTNERSHIP FOR 21ST CENTURY SKILLS

21ST CENTURY LEARNING

The Partnership for 21st Century Skills has developed a unified, collective vision for 21st century learning that can be used to strengthen American education. The key elements of 21st century learning are represented in the graphic and descriptions below. The graphic represents both 21st century skills student outcomes (as represented by the arches of the rainbow) and 21st century skills support systems (as represented by the pools at the bottom):

P21 Framework -
P21 Framework Definitions Document

This definitions document provides guidance to educators who are working to make sure the K-12 education system provides all students with rich core content and 21st century skills. The framework defined in this document presents a holistic view of 21st century teaching and learning. It presents a vision for 21st century student outcomes (a blending of content knowledge, specific skills, expertise and literacies) and the support systems that are needed to produce these outcomes. **While the graphic represents each element distinctly for descriptive purposes, the Partnership views all the components as fully interconnected in the process of 21st century teaching and learning.**

21ST CENTURY STUDENT OUTCOMES

The elements described in this section as "21st century student outcomes" (represented by the rainbow) are the knowledge, skills and expertise students should master to succeed in work and life in the 21st century.

CORE SUBJECTS AND 21st CENTURY THEMES

Mastery of **core subjects and 21st century themes** is essential for all students in the 21st century. Core subjects include:

- English, reading or language arts
- World languages
- Arts
- Mathematics
- Economics
- Science
- Geography
- History
- Government and Civics

In addition to these subjects, we believe schools must move to include not only a focus on mastery of core subjects, but also promote understanding of academic content at much higher levels by weaving **21st century interdisciplinary themes** into core subjects:

Global Awareness

- Using 21st century skills to understand and address global issues
- Learning from and working collaboratively with individuals representing diverse cultures, religions and lifestyles in a spirit of mutual respect and open dialogue in personal, work and community contexts
- Understanding other nations and cultures, including the use of non-English languages

Financial, Economic, Business and Entrepreneurial Literacy

- Knowing how to make appropriate personal economic choices
- Understanding the role of the economy in society
- Using entrepreneurial skills to enhance workplace productivity and career options

Civic Literacy

- Participating effectively in civic life through knowing how to stay informed and understanding governmental processes
- Exercising the rights and obligations of citizenship at local, state, national and global levels
- Understanding the local and global implications of civic decisions

Health Literacy

- Obtaining, interpreting and understanding basic health information and services and using such information and services in ways that enhance health
- Understanding preventive physical and mental health measures, including proper diet, nutrition, exercise, risk avoidance and stress reduction
- Using available information to make appropriate health-related decisions
- Establishing and monitoring personal and family health goals
- Understanding national and international public health and safety issues

LEARNING AND INNOVATION SKILLS

Learning and innovation skills increasingly are being recognized as those that separate students who are prepared for a more and more complex life and work environments in the 21st century, and those who are not. A focus on creativity, critical thinking, communication and collaboration is essential to prepare students for the future.

CREATIVITY AND INNOVATION

Think Creatively

Use a wide range of idea creation techniques (such as brainstorming)

Create new and worthwhile ideas (both incremental and radical concepts)

Elaborate, refine, analyze and evaluate their own ideas in order to improve and maximize creative efforts

Work Creatively with Others

• Develop, implement and communicate new ideas to others effectively

• Be open and responsive to new and diverse perspectives; incorporate group input and feedback into the work

• Demonstrate originality and inventiveness in work and understand the real world limits to adopting new ideas

View failure as an opportunity to learn; understand that creativity and innovation is a long-term, cyclical process of small successes and frequent mistakes

Implement Innovations

Act on creative ideas to make a tangible and useful contribution to the field in which the innovation will occur

CRITICAL THINKING AND PROBLEM SOLVING

Reason Effectively

Use various types of reasoning (inductive, deductive, etc.) as appropriate to the situation

Use Systems Thinking

Analyze how parts of a whole interact with each other to produce overall outcomes in complex systems

Make Judgments and Decisions

Effectively analyze and evaluate evidence, arguments, claims and beliefs

Analyze and evaluate major alternative points of view

Synthesize and make connections between information and arguments

Interpret information and draw conclusions based on the best analysis

Reflect critically on learning experiences and processes

Solve Problems

Solve different kinds of non-familiar problems in both conventional and innovative ways

Identify and ask significant questions that clarify various points of view and lead to better solutions

COMMUNICATION AND COLLABORATION

Communicate Clearly

Articulate thoughts and ideas effectively using oral, written and nonverbal communication skills in a variety of forms and contexts

Listen effectively to decipher meaning, including knowledge, values, attitudes and intentions

Use communication for a range of purposes (e.g. to inform, instruct, motivate and persuade)

Utilize multiple media and technologies, and know how to judge their effectiveness a priori as well as assess their impact

Communicate effectively in diverse environments (including multi-lingual)

Collaborate with Others

Demonstrate ability to work effectively and respectfully with diverse teams

Exercise flexibility and willingness to be helpful in making necessary compromises to accomplish a common goal

Assume shared responsibility for collaborative work, and value the individual contributions made by each team member

INFORMATION, MEDIA AND TECHNOLOGY SKILLS

People in the 21st century live in a technology and media-suffused environment, marked by various characteristics, including: 1) access to an abundance of information, 2) rapid changes in technology tools, and 3) the ability to collaborate and make individual contributions on an unprecedented scale. To be effective in the 21st century, citizens and workers must be able to exhibit a range of functional and critical thinking skills related to information, media and technology.

INFORMATION LITERACY

Access and Evaluate Information

Access information efficiently (time) and effectively (sources)

Evaluate information critically and competently

Use and Manage Information

Use information accurately and creatively for the issue or problem at hand

Manage the flow of information from a wide variety of sources

Apply a fundamental understanding of the ethical/legal issues surrounding the access and use of information

MEDIA LITERACY

Analyze Media

Understand both how and why media messages are constructed, and for what purposes

Examine how individuals interpret messages differently, how values and points of view are included or excluded, and how media can influence beliefs and behaviors

Apply a fundamental understanding of the ethical/legal issues surrounding the access and use of media

Create Media Products

Understand and utilize the most appropriate media creation tools, characteristics and conventions

Understand and effectively utilize the most appropriate expressions and interpretations in diverse, multi-cultural environments

ICT (Information, Communications and Technology)

LITERACY

Apply Technology Effectively

Use technology as a tool to research, organize, evaluate and communicate information

Use digital technologies (computers, PDAs, media players, GPS, etc.), communication/networking tools and social networks appropriately to access, manage, integrate, evaluate and create information to successfully function in a knowledge economy

Apply a fundamental understanding of the ethical/legal issues surrounding the access and use of information technologies

LIFE AND CAREER SKILLS Today's life and work environments require far more than thinking skills and content knowledge. The ability to navigate the complex life and work environments in the globally competitive information age requires students to pay rigorous attention to developing adequate life and career skills.

FLEXIBILITY AND ADAPTABILITY

Adapt to Change

Adapt to varied roles, jobs responsibilities, schedules and contexts

Work effectively in a climate of ambiguity and changing priorities

Be Flexible

Incorporate feedback effectively

Deal positively with praise, setbacks and criticism

Understand, negotiate and balance diverse views and beliefs to reach workable solutions, particularly in multi-cultural environments

INITIATIVE AND SELF-DIRECTION

Manage Goals and Time

Set goals with tangible and intangible success criteria

Balance tactical (short-term) and strategic (long-term) goals

Utilize time and manage workload efficiently

Work Independently

Monitor, define, prioritize and complete tasks without direct oversight

Be Self-directed Learners

Go beyond basic mastery of skills and/or curriculum to explore and expand one's own learning and opportunities to gain expertise

Demonstrate initiative to advance skill levels towards a professional level

Demonstrate commitment to learning as a lifelong process

Reflect critically on past experiences in order to inform future progress

SOCIAL AND CROSS-CULTURAL SKILLS

Interact Effectively with Others

Know when it is appropriate to listen and when to speak

Conduct themselves in a respectable, professional manner

Work Effectively in Diverse Teams

Respect cultural differences and work effectively with people from a range of social and cultural backgrounds

Respond open-mindedly to different ideas and values

Leverage social and cultural differences to create new ideas and increase both innovation and quality of work

PRODUCTIVITY AND ACCOUNTABILITY

Manage Projects

Set and meet goals, even in the face of obstacles and competing pressures

Prioritize, plan and manage work to achieve the intended result

Produce Results

Demonstrate additional attributes associated with producing high quality products including the abilities to:

- Work positively and ethically
- Manage time and projects effectively
- Multi-task
- Participate actively, as well as be reliable and punctual
- Present oneself professionally and with proper etiquette
- Collaborate and cooperate effectively with teams
- Respect and appreciate team diversity
- Be accountable for results

LEADERSHIP AND RESPONSIBILITY

Guide and Lead Others

Use interpersonal and problem-solving skills to influence and guide others toward a goal

Leverage strengths of others to accomplish a common goal

Inspire others to reach their very best via example and selflessness

Demonstrate integrity and ethical behavior in using influence and power

Be Responsible to Others

Act responsibly with the interests of the larger community in mind

21ST CENTURY SUPPORT SYSTEMS

The elements described below are the critical systems necessary to ensure student mastery of 21st century skills. 21st century standards, assessments, curriculum, instruction, professional development and learning environments must be aligned to produce a support system that produces 21st century outcomes for today's students.

21st Century Standards

Focus on 21st century skills, content knowledge and expertise

Build understanding across and among core subjects as well as 21st century interdisciplinary themes

Emphasize deep understanding rather than shallow knowledge

Engage students with the real world data, tools and experts they will encounter in college, on the job, and in life; students learn best when actively engaged in solving meaningful problems

Allow for multiple measures of mastery

Assessment of 21st Century Skills

Supports a balance of assessments, including high-quality standardized testing along with effective formative and summative classroom assessments

Emphasizes useful feedback on student performance that is embedded into everyday learning

Requires a balance of technology-enhanced, formative and summative assessments that measure student mastery of 21st century skills

Enables development of portfolios of student work that demonstrate mastery of 21st century skills to educators and prospective employers

Enables a balanced portfolio of measures to assess the educational system's effectiveness in reaching high levels of student competency in 21st century skills

21st Century Curriculum and Instruction

Teaches 21st century skills discretely in the context of core subjects and 21st century interdisciplinary themes

Focuses on providing opportunities for applying 21st century skills across content areas and for a competency-based approach to learning

Enables innovative learning methods that integrate the use of supportive technologies, inquiry- and problem-based approaches and higher order thinking skills

Encourages the integration of community resources beyond school walls

21st Century Professional Development

Highlights ways teachers can seize opportunities for integrating 21st century skills, tools and teaching strategies into their classroom practice — and help them identify what activities they can replace/de-emphasize

Balances direct instruction with project-oriented teaching methods

Illustrates how a deeper understanding of subject matter can actually enhance problem-solving, critical thinking, and other 21st century skills

Enables 21st century professional learning communities for teachers that model the kinds of classroom learning that best promotes 21st century skills for students

Cultivates teachers' ability to identify students' particular learning styles, intelligences, strengths and weaknesses

Helps teachers develop their abilities to use various strategies (such as formative assessments) to reach diverse students and create environments that support differentiated teaching and learning

Supports the continuous evaluation of students' 21st century skills development

Encourages knowledge sharing among communities of practitioners, using face-to-face, virtual and blended communications

Uses a scalable and sustainable model of professional development

21st Century Learning Environments

Create learning practices, human support and physical environments that will support the teaching and learning of 21st century skill outcomes

Support professional learning communities that enable educators to collaborate, share best practices and integrate 21st century skills into classroom practice

Enable students to learn in relevant, real world 21st century contexts (e.g., through project-based or other applied work)

Allow equitable access to quality learning tools, technologies and resources

Provide 21st century architectural and interior designs for group, team and individual learning

Support expanded community and international involvement in learning, both face-to-face and online

SIXTH GRADE: COMPUTER/ TECHNOLOGY SKILLS

Focus Areas

- Responsible and safe use of online resources
- Using Copyright and Fair Use Guidelines
- Refining application skills
- Using formulas in a spreadsheet
- Using search strategy with two or more criteria in a database
- Increasing productivity and accuracy in keyboarding
- Using word processing, spreadsheet, database, and multimedia for assignments in all subject areas
- Locating and retrieving information using telecommunications
- Evaluating resources and information for accuracy and usefulness
- Selecting and using a variety of technology tools

Competency Goal 1: The learner will understand important issues of a technology-based society and will exhibit ethical behavior in the use of computer and other technologies.

Objectives:

1.01 Recognize, discuss, and visually represent knowledge of changes in information technologies and the impact changes have on schools, workplaces and society. (1)

1.02 Recognize and discuss how Copyright Laws protect ownership of intellectual property and discuss consequences of misuse. (1)

1.03 Identify and discuss minor hardware and software issues/problems as a class/group. (1)

1.04 Identify and discuss technology skills needed in the workplace and how they impact school students today as a class/group.(1)

1.05 Recognize and discuss how and why databases are used to collect, organize, and analyze information in a variety of settings. (2)

1.06 Identify and use database terms/concepts (e.g., reports, layout, format) to describe and explain findings. (2)

1.07 Cite sources of information used in content area databases. (2)

1.08 Recognize and discuss use of spreadsheets to calculate, graph, and present data in a variety of settings (e.g., schools, government, business, industry, mathematics, science). (3)

1.09 Identify, discuss and use WP/DTP terms/concepts (e.g., minimize document, resize document, toggle between two open documents on the desktop). (4)

1.10 Demonstrate appropriate use of copyrighted materials in word processing documents used for content projects/assignments. (4)

1.11 Recognize, discuss, and establish ethical guidelines for use of personal and copyrighted media (e.g., images, music, video, content, language) in multimedia projects and presentations as a class/group. (5)

1.12 Recognize, discuss, and model correctly formatted

citations for copyrighted materials and adhere to Fair Use Guidelines. (5)

1.13 Identify and discuss terms/concepts associated with safe, effective, and efficient use of the telecommunications/Internet (e.g., password, firewalls, Spam, security, Fair Use, AUP/IUP's). (6)

1.14 Demonstrate knowledge of responsible, safe, and ethical use of networked digital information (e.g., Internet, mobile phone, wireless, LANs). (1)

1.15 Demonstrate knowledge of Copyright and Fair Use Guidelines by explaining selection and use of Internet resources in content projects/assignments. (6)

Competency Goal 2: The learner will demonstrate knowledge and skills in the use of computer and other technologies.

Objectives:

2.01 Recognize, discuss, and use multi-tasking concepts (e.g., windows, toggle between two windows on the desktop, copy and paste data between two windows on the desktop). (1)

2.02 Investigate, discuss, and explain why computers, networks, and information must be protected from viruses, vandalism and intrusion, both malicious and mischievous (AUP/IUP). (1)

2.03 Use spreadsheet terms/concepts and functions to calculate, represent, and explain content area findings. (3)

2.04 Use proper keyboarding techniques to improve accuracy, speed and general efficiency in computer operation. (4)

2.05 Use WP/DTP menu/tool bar features to publish for a specific audience and purpose. (4)

2.06 Demonstrate knowledge of the advantages/disadvantages of using multimedia to develop, publish, and present information to a variety of audiences. (5)

2.07 Identify, discuss, and use multimedia terms/concepts (e.g., multimedia authoring, web tools) to develop content projects as a class/group. (5)

2.08 Use menu/tool bar features to edit/modify/revise multimedia projects to present content information for a different audience and purpose. (5)

2.09 Select and justify the use of appropriate online collaborative tools (e.g., surveys, email, discussion forums, webpages) to develop content area presentations for the intended audience and purpose. (6)

Competency Goal 3: The learner will use a variety of technologies to access, analyze, interpret, synthesize, apply, and communicate information.

Objectives:

3.01 Select and use responsibly a variety of computing devices (e.g., probeware, handhelds, digital cameras, scanners) to collect, analyze and present content area information. (1)

3.02 Plan and develop database reports to organize, explain, and display findings in content areas as class/group. (2)

3.03 Develop and use search strategies with two or more criteria to solve problems and make decisions in content areas. (2)

3.04 Use database sort and search/filter strategies to organize, analyze, interpret, and evaluate findings in content areas and cite sources. (2)

3.05 Enter/edit data and use spreadsheet features and functions to project outcomes and test simple "what if..." statements in content assignments. (3)

3.06 Select and use chart/graph functions to analyze and display findings in content projects, citing data sources. (3)

3.07 Modify/create spreadsheets to calculate and graph data to incorporate into content area projects (e.g., word processing, multimedia, webpages). (3)

3.08 Modify/create and use spreadsheets to solve problems, make decisions, support, and display findings in content areas projects. (3)

3.09 Demonstrate knowledge of the advantages/disadvantages of using word processing to develop, publish, and present information to a variety of audiences. (4)

3.10 Select and use WP/DTP features/functions to design, format, and publish assignments/products. (4)

3.11 Use rubrics to evaluate multimedia presentations for elements (e.g., content, organization, accuracy, design, purpose). (5)

3.12 Plan, collect, evaluate, interpret, and use information from a variety of resources to develop assignments about the Eastern Hemisphere, Europe, and Former Soviet Republics. (6)

3.13 Use evaluation tools to select Internet resources and information for content and usefulness in content area assignments. (6)