NORTHERN ILLINOIS UNIVERSITY

The Development of an Appraisal Instrument and Subsequent Evaluation of Middle School Science Curricula

A Thesis Submitted to the

University Honors Program

In Partial Fulfillment of the

Requirements of the Baccalaureate Degree

With Upper Division Honors

Department of Curriculum and Instruction

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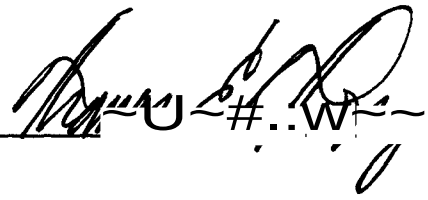
Approved by: 

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HONORS THESIS ABSTRACT
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ABSTRACT (100-200 WORDS):

Within the last few years, standards of education have become an influence on the construction and assessment of school curricula. In order to evaluate middle school science programs, a rubric was developed based on the National Science Education Standards and the Illinois Learning Standards for Science. Middle school science curricula were acquired from three different districts: Community Unit District U-46, Naperville School District 203, and DeKalb Community Unit District #428. Each curriculum was perused and evaluated using the rubric.

Because a rubric is subjective in its nature, additional comments were made in regards to each district's curriculum. There was variance in what each district included in the science programs. When a district lacked in a given topic, it usually covered another topic in much more depth than the rubric was evaluating.

As society has become more and more concerned with consumerism, everything that costs money has become an interest. One area in which consumer interest has emerged recently is in public education. Parents and the public in general want to know exactly what students are learning at school. For this reason, many districts have been making the curriculum available to the public.

Because each district has its own guidelines for formulating curricula each district can vary greatly in terms of what content is being covered, and to what extent. Many schools have "taught by the test," meaning that students are taught the breadth of concepts that are included in standardized tests, in order to increase student scoring. Unfortunately, this tactic has made learning a monotonous task that lacks in supporting the development of lifelong learners.

To counteract this approach, state boards of education, and national organizations across the country have been developing standards of education that can be used by educators to construct and evaluate the curriculum being taught. Most education standards encourage active student involvement in the learning process. The National Science Education Standards (1998) emphasizes that students need to be "engaged" in the sciences. The term "engaged" is used to describe the critical, or formal, thinking that is necessary when approaching scientific literacy.

It is assumed that scientific literacy stems from an exposure to a breadth of scientific information, but true literacy goes beyond this. In order for a student to be literate, scientifically, he/she must be able to use information to understand

how technology and science are related, to evaluate scientific information, to work with mathematical models, graphs, and charts that depict a scientific idea, and to think about the implications of the sciences on societal issues.

In order for a student to be able to use scientific information in these ways, the curriculum in which he/she is taught must be student-centered. In other words, students must be an active, productive participant in the Processes that science is based on.

While state and national standards encourage student involvement in learning, many schools have failed to respond in full, Perhaps, the fear of not covering everything on standardized tests overrides the importance of providing students with in-depth experiences that will be remembered for a lifetime. Fortunately, some schools have responded to the proposed standards and now include the processes of scientific inquiry, student-designed experiments, and problem-solving within the science curriculum. Hopefully, as these educational pioneers observe an increase in student scoring on standardized tests, and more importantly, an increase in scientifically competent girls and boys that want to continue to learn within the field of science, more schools will proceed in making necessary curricular changes.

While the affects of using the standards in formulating science curricula for a middle school can not yet be determined (due to needing more years of such use in order to make a reasonable measurement), individual curricula can be evaluated in terms of how well the standards are being incorporated into the science program. The rubric used for this study was developed in order to

measure the application of the National Science Education Standards, and Illinois Learning Standards, for science within a given middle school science curriculum.

The rubric was designed after reading the state and national standards, for science, The rubric questions the curricular content in the topics of: scientific inquiry, physical science, life science, ecology, earth science, the solar system,, technology, the history of science, and science in society. It should be understood that a rubric is a subjective instrument of measurement, as it reflects the values of its creator. Due to this fact, the creator of the rubric attempted to adhere, as closely as possible, to the guidelines set forth in the state and national standards.

Many districts in the greater Chicago area were contacted in pursuit of middle school science curricula. Of the districts contacted,, only five had currierla that were available to the public. Out of the five curricula, the three that were most thorough, Community Unit District U-46, DeKalb Connnunity Unit School District #428, and Naperville School District 203, were chosen for the evaluation process. Because the National Science Education Standards, were written with the middle school as grades five through eight, some adaptations were made in what grades were evaluated for earn district. DeKalb Community Unit School District #428 has a middle school for grades five and six and a middle school for grades seven and eight. The curriculum for all four grade levels was included in the assessment. Connnunity Unit District U-46, however; has a middle school for grades seven and eight only. In order to make the evaluation of this district more objective, the science curriculum for grades five and six, from the district's elementary schools, was also considered. Naperville School District

203 has a sixth through eighth grade middle school. Bemuse the fifth grade curriculum was not available, only the sixth, seventh, and eighth grade science curriculum were evaluated.

Community Unit District U-46 scored 66 out of 75 possible points. Five of the points missing may have been a part of the curriculmn,, but were not mentioned in detail.. The only area in which the curriculum did not cover topics that the standards emphasized was that of evolution. Because the theory of evolution is a debatable issue, it does not reflect poorly on the district's curriculum that it is not included. All other content areas were covered significantly.

DeKalb Community District #428 scored 58 points. The areas lacking in the curriculum were earth science, including the solar system,, and science history. The Dekalb science curriculum focused a great deal on physical science. Each grade level spent a portion of the year on various aspects of physical science that went far beyond the general topics discussed within the standards.

Naperville School District 203 scored 61 points. Of the three curricula evaluated,, Naperville's was the most detailed and thorough. It may be that some of the missing topics, (i.e. hurnanbody systems) were not accounted for because the fifth grade curriculum was not included in the evaluation. Some of the lacking areas, however, should be included at all grade levels, and were not discussed in the curriculum for grades sixth through eighth. While there was some indication of discussing technology and science history, more criteria in those areas can be added to improve the curriculum.

Overall, each curriculum had its own strengths and weaknesses. In all

cases, the middle school science programs covered a wide range of content areas from basic biology to physical science. Community Unit District U-46 and Naperville School District 203 seemed to have more student involvement written into the curriculum. Both districts emphasized higher levels of thinking (application, analysis, synthesis, evaluation, construction/design), whereas, DeKalb Community Unit School District #428 seemed to centralize the curriculum on student comprehension of the materials only. The district's curriculum did, however, involve students in the inquiry process and scientific investigations at all grade levels.

The two areas that take traditional middle school science curriculwn beyond the general topics, inquiry and technology, were included in all three district's curricula. It seems as though these districts have indeed responded to what the standards recommend in terms of increasing scientific literacy. Hopefully, as the success of the students from these schools is acknowledged, more schools will follow suit.

Only when it becomes public knowledge that students who have been active participants in their learning of science perform better on standardized tests, and go on to achieve more in the field of science, will more schools begin to incorporate the standards into the development of science curricula. Until then, the battle between educational breadth versus depth will continue. In the meantime, the few risk-taking administrations that venture out to new educational grounds will have to serve as leaders. Hopefully, as these leaders experience success, they will become catalyst to change and improvement in science education nationwide.

SCIENCE CURRICUWME VAWATION

Name of School or District _____ Grade Levels Taught at School _____

Does the middle school science curriculum:

Engage students in the process of scientific inquiry?

Are students asked to:
Form a hypothesis? ___ (1)

Design an experiment? ____ (1)

Keep track of data, using mathematics? ____ (1)

Communicate the results and fonn a conclusion to the experiment? ___ (1)

Subtotal _ (4)

Expose students to a wide variety 01 scientific research that includes:

Observations, lab experiments, field experiments? ____ (1)

Mathematical models, tables, and computer graphics that depict the results of an experiment? ____ (1)

The use of currently accepted scientific principles, theories, laws? ____ (1)

New research based on the experiments of someone else? _ (1)

Subtotal _ (4)

Assist students in mastering the basic concepts in physical science?

Show how substances have properties that do not change based on the amount of the substance? ____ (1)

Give examples of chemical reactions, in which a substance with new characteristics is fonned? ____ (1)

Convince students that chemical elements remain intact during heating, electric currents, or acid reactions? ___ (1)

Subtotal ___ (3)

Suggest principles for motion and force?

Define the ways in which motion can be measured? _ (1)

Demonstrate that an object will continue at the same speed, in a straight line, unless it is subjected to a force? _ (1)

Prove that when more than one force acts on an object that the forces will either reinforce or cancel out each other? _ (1)

Subtotal _ (3)

Describe energy and how it is transferred?

Generalize that energy is a characteristic associated with light, heat, sound, motion, etc.? ___ (1)

Show how heat transfers from wanner matter to cooler matter? ____ (1)

Provide the opportunity to observe the various ways that light interacts with matter? ____ (1)

SpecifYthat for an object to be seen, light that interacts with the object must enter the eye? ____ (1)

Suggest that electrical circuits are a means to transferring energy? ___ (1)

Point out that energy flows through a system? ___ (1)

Mention that the sun is a major source of energy and list the types 01 light (due to wavelength) that the earth receives from the sun? ___ (1)

Subtotal ___ (7)

Broaden student understanding of organisms by:

Explaining how living systems are organized from cell to ecosystem? ___ (1)

Comparing unicellular organisms to multicellular organisms? ___ (1)

Discussing how cells function including an emphasis on cell division? ___ (1)

Allowstudents to use microscopes to viewcells and microorganisms? ___ (1)

Classitying the types of specialized cells. and illustrating how organs are composed of tissues, which are groups of specialized cells? ___ (1)

Identitying the components ofthe organ systems in the human body? ____ (1)

Giving examples of diseases that demonstrate a breakdown of functioning in a given organism? ____ (1)

Subtotal ___ (7)

Present the concepts of reproduction through:

Reasoning that all organisms must reproduce for species to continue? ___ (1)

Contrasting sexual and asexual reproduction? ____ (1)

Descnbing the process of sexual reproduction in plants? ____ (1)

Mentioning that some traits are inherited and providing information about genes and chromosomes? ___ (1)

Subtotal ___ (4)

Develop student understanding of how organisms behave by:

Citing evidence that all organisms use resources to survive, grow and reproduce? _ (1)

Supporting comprehension of the necessity for homeostasis within an organism? _ (1)

Providing examples of how and why it is assumed that the behavior of a given organism may have been caused by evolutionary history? __ (1)

Subtotal __ (3)

Identify the role of populations within an ecosystem through:

Defining a population and generalizing the impact of biotic and abiotic factors on populations? __ (1)

Categorizing populations by trophic function? ____ (1)

Ranking the sun as the most common source of energy fur an organism? ____ (1)

Analyzing population growth in terms of resources available? __ (1)

Subtotal __ (4)

Ask students to survey the diversity of organisms that are present throughout the world via:

Presenting a variety of organisms including microorganisms, plants, and animals? ____ (1)

Demonstrating the various ways in which evolution may have contributed to the millions of species that exist? ____ (1)

Discussing the significance that extinction of a species may have on organismal diversity and how extinction can impact the world? ____ (1)

Subtotal _ (3)

Provide specifics about the earth and its relationship to the solar system by:

Constructing understanding of the earth's layers? ____ (1)

Providing evidence and explanation regarding plate tectonics? ____ (1)

Describing how Iandforms are created? __ (1)

Distinguishing the differences between different types of rocks, different kinds of soils, and the components of each? __ (1)

Demonstrating the water cycle and the unique properties of water? ____ (1)

IdentifYingthe components of earth's atmosphere? ____ (1)

Relating ocean currents and cloud formations to climate and weather? __ (l)

Implying how organisms can earth and its atmosphere? ____ (1)

Subtotal ____ (8)

Outline the changes that have occurred to the structure of earth via:

Proposing changes in environmental conditions based on evidence provided by fossils? __ (1)

Drawing conclusions about the impact of erosion, natural disturbances,, and plate movement on the structure of earth? __ (1)

Subtotal __ (2)

Construct concepts of the earth and its location in the solar system?

Account for the major components of the solar system, emphasizing the sun as the center? __ (1)

Introduce the concept that most objects in the solar system are moving predictably, which enables humans to measure time? __ (1)

Relay the effect that gravity has on the solar system, and apply that to life on earth? ____ (1)

Show how the earth's tilt and rotation around the sun affects climate, and causes seasonal changes? ____ (1)

Subtotal __ (4)

Create an environment in which technology is a focus?

Discuss how products are made to meet the needs of various cultures, beliefs, and needs? __ (1)

Ask students to design a product while considering time, cost and availability of materials? _ (1)

Utilize practice in using resources and tools to implement construction of a product? ____ (1)

Build skills of evaluation and appreciation in regards to various technologies? ____ (1)

Discuss the reciprocal nature between science and technology? __(1)

Argue that technological constraints exist, and some may have consequences that cannot be predicted? _ (1)

Subtotal _ (6)

Apply the sciences to personal and social issues?

Recommend exercise as a way to maintain, and improve human fitness? _ (1)

Stress the importance of safety and hazard prevention? __(1)

Discuss the adverse biological effects tobacco, drugs, and alcohol?	__	(1)
Develop values, based on science, in terms of lifestyle choices such as: nutrition, sleep habits, sexual activity and emphasize that precautions can be taken to prevent disease?	__	(1)
Apply concepts of health issues to environmental conditions?	__	(1)
Identify the effects of population size on the environment and availability of resources?	____	(1)
Show the relationships between humans, natural disturbances, and changes in the environment?	____	(1)
Utilize technology and models to measure risks, benefits, and teach decision-making?	__	(1)
Give examples of ethical codes that scientists and engineers fullowin research and design?	____	(1)
Subtotal	____	(9)
Build an appreciation for the men and women who have contributed to advances in science?	__	(1)
Address the various skills, or intelligences, that can be used in different science fields?	__	(1)
Illustrate that in areas of scientific evidence is not plentiful, disagreements may occur, and that the disagreements can be used to further scientific inquiries?	__	(1)
Recognizethe contribution of various cultures to the sciences?	__	(1)
Subtotal	_	(4)
TOTAL	__	(75)

COMMENTS:

Outcome 7, Standard 1

4-6 PHYSICAL SCIENCE

	Fourth Grade	Fifth Grade	Sixth Grade
A. Properties of Objects and Materials	drull Y measurement and observation skills in IU2] investigations of properties of objects [m] IIA2b Observe and Investigate changing states of [U3] mailer 12C2b		
A. Properties and Changes of Properties in Maller		Explore and Investigate concepts of density. IU3] physical and chemical changes. and [U2[elements and compounds	- test food for chemical contents IIA2b - develop a nutritial wellness plan IIB2b
B. Position and Motion of Objects	Investigate properties of sound (pitch. volume) IU2] 12C2a		
B. Motions and Foret'S		Explore concepts of inertia and momentum IU2] IU4] 12D2b Investigate and Design simple and compound 1115] machines lUI] II B2a.2h.2c.2d,2e,2f I3B2h	
C. Light, IIeat, Electricity arid Maegetisrn			
C. Transfer of Energy			

Unifying Concepts and Processes:
Ul • systems, order and organizalion
U2 • evidence, models and explanation
U3· constancy, change and measurement
U4 • evolution and equilibrium
US • form and function

Science as Inquiry: (Should be a part of every lesson)
11 • abilities necessary to do scientific inquiry
12 • understandings about scientific inquiry

State Goals are identified in each cell, (e.g. llAta, t2Ftb)
State Goals 1382a, 1382c, 13A2a,2b,2c for all 5th grade units

Outcome 7, Standard 1

4-6 EARTH AND SPACE SCIENCE

	Fourth Grade	Fifth Grade	Sixth Grade
A. Changes in the Earth and Sky	Investigate and Measure properties of weather [UI] [U2] [U3] 12E2a	~ the structure of the layers of the earth [U2] and how they arc formed .:xplore how constructive and destructive forces [U3] result. in changes in land forms (earthquakes, volcanoes. erosion. weathering. deposition of sediments) Illescrihe the rock cycle [UII Uescrihe how living organisms affect the [lJ3) weathering of rocks II A2a.2h.k2d.2c 12E2a.2b.2c	
1\. Structure ur the Earth System	Investigate (he water cycle as it reiales to lUll weather Explure douds and how they affect weather [U2) and climate Investigate the rclauonship of air pressure to [UI) weather [U21 IU3) 12E2		
C.. Earth in the Solar System			Uescrihe stars and their properties apparent. sun 12e2a movement. and passive solar energy Ueserih.. the relationship of the sun to the [III) seasons 11I31 12F2a

Unifying Concepts.. and Processes:
lJ 1 - systems, order and organization
U2 - evidence, models and explanation
U3 - constancy, change and measurement
U4 - evolution and equilibrium
US - form and function

Science as Inquiry: (Should be a part of every lesson)
11 - abilities necessary to do scientific inquiry
12 - understandings about scientific inquiry

State Goals are identified in each cell, (e.g, llAla, 12Flb) B82c, 1382a, 13A2a,2b,2c for all 5th grade units

Outcome 7, Standard 1

4-6 LIFE SCIENCE

	Fourth Grade	Fifth Grade	Sixth Grade
A. Structu re and Function in Living Systems	Explore (UI) (US] structure and function of cells. tissues. organs and human body systems Explore (UI] (US] 12Ala interaction of human body systems	Explore (UI) (U5] structure and function of cells. tissues. organs and human body systems Explore (UI] (U5] 12A2a.2h interaction of human body systems	Explore (U5) 12B2a.2b breakdown in structures and function (diseases. infections. damage)
B. Reproduction and Heredity		Describe (VI] 12A2a.2b asexual and sexual reproduction of cells and organisms	~ (V4] 12A2a.2b 12B2b s.!.!!al reproduction of plants and animals melated to heredity and genetics Ilescribe (V4) 12B2a.2b differences between inherited an, acquired traits
C. Regulation and Behavior			Investigate [V4j how an organism's behavior adapts to its environment
D. Populations and Ecosystems			Investigate (VI) 12B2a investigate terrestrial and aquatic systems to develop the concepts of environmental .. l factor. tolerance. environmental preference and environmental ranae.

Unifying Concepts and Processes:
UI - systems, order and organization
U2 - evidence, models and explanation
U3 - constancy, change and measurement
U4 - evolution and equilibrium
US - form and function

Science as Inquiry: (Should be a part of every lesson)
11 - abilities necessary to do scientific inquiry
12 - understandings about scientific inquiry

State Goals are identified in each cell, (e.g. llAla, 12Flb)

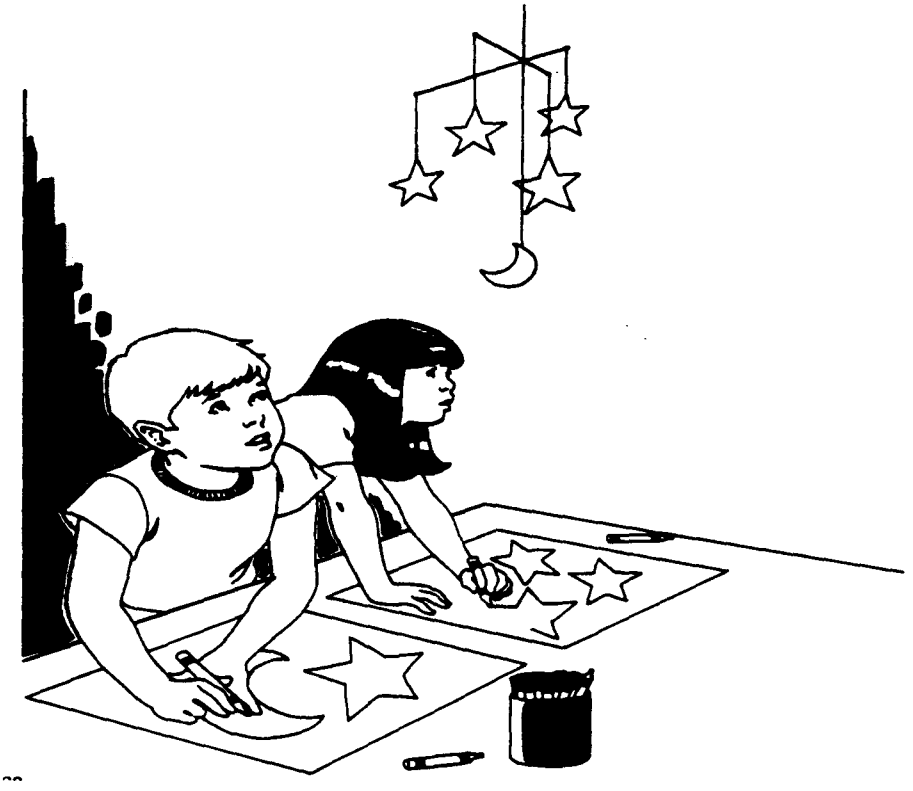
Tracing the history of science can show how difficult it was for scientific innovators to break through the accepted ideas of their time to reach the conclusions that we currently take for granted.

Fourth Grade	Fifth Grade	Sixth Grade
[illegible]	[illegible]	[illegible]

DeKalb Community Unit School District #428

SCIENCE CURRICULUM AND UNITS OF STUDY

Grades K-8



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September 14, 1995

Approved by the Board of Education
October 2, 1995

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Science Curriculum

Grade Level 5-6

State Goal for Learning #1: As a result of their schooling. all students will have a working knowledge of the concepts and basic vocabulary of biological physical and environmental sciences and their application to life and work in contemoorarv technolozical societv.	Local Outcome Level (Grade Level 5–6): By the end of this level,, students will have a working knowledge of the concepts and basic vocabulary of science and its application to life.

Grade Level Objectives:

-Fifth GrBae	Sixth Grade
Uk • Classify the four basic types of tissues • Describe the features and functions of the skeletal. muscular. digestive. circulatory. respiratory. excretory. nervous. integumentary. reproductive and endocrine systems • Identify the immune system and its function Pbysical • Describe the forces between electric charges and the atomic basis of electric charges • Identify the effects of static electricity • Define voltage. current, and resistance and apply these concepts to circuit situations **Eaab** • Describe the basic interactions and relationships among living things • Describe the effects of rhythms on organisms • Explain the role of chemical cycles in nature • Describe the process of ecological succession • Identify the characteristics of the six land biomes and the two water biomes • Demonstrate an awareness for the reasons of extinction of organisms and human responsibilities	**Lik** • I4etify parts of representative members of the following groups: viruses. monerans, protists fung~ algae. and non-vascular and vascular plants • Identify the parts of a simple complete flower • Describe the role of green plants in the transfer of energy • Explain/demonstrate the roll of seeds in the life cycle of higher plants and relate to human use • Reproduce a Alaltt and describe its life cycle • Select a plant type and explain how huriians use it in a non-food way • Describe several ways that viruses and bacteria are harmful and several ways that they can be used beneficially Physical • Define and use appropriate vocabulary needed to describe motion. force and energy • Explain work and power and demonstrate how they are affected by simple machines to include calculation of appropriate units • Give everyday examples of the laws of motion or identify which laws apply to a situation • Demonstrate the principles of force and motion in fluids and relate them to the guiding principles of classic science • Explain. or demonstrate the transfer and conservation of energy **Sk,ill1** • Explain and/or describe bow to conduct a simple science investigation

Science Curriculum

Grade Level 5-6

State Goal for Learning #2: As a result of their schooling, students will have a working knowledge of the social and environmental implications and limitations of technological development.	Local Outcome Level (Grade Level 5-6): By the end of this level. students will have a working knowledge of the social and environmental implications and limitations of technological development in science.

Grade Level Objectives:

Fifth Grade	Sixth Grade
Lim • Show an awareness of what a healthy environment can do to maintain a healthy functional body Physical • Identify the effects of static electricity • Show an awareness of a safe electrical environment in their home ~ • Explain the role of chemical cycles in nature. • Demonstrate awareness for the reasons of extinction of organisms and human responsibilities.	Lim • Select a plant or a plant group and explain how humans have come to control and use it. • Explain Idemonstrate the roll of seeds in the life cycle of higher plants and relate to human use: ;t[eseli@nhe .. grass family and describe how your world would change if it did not exist. • Select a plant type and explain how humans use it in a non-food way. • Describe ways in which viruses are harmful and several ways in which they can be used beneficially. Physical • Give everyday examples of the laws of motion or identify which laws apply to an everyday situation. Skilli • Communicate how science skills and investigation apply to consumer decisions or to environmental issues.

Science Curriculum

Grade Level 5-6

State Goal for Learning #3: As a result of their schooling. students will have a working knowledge of the principles of scientific research and their application in simple research projects.	Local Outcome Level (Grade Level 5-6): By the end of this level. students will have a working knowledge of the principles of scientific research and their application in simple science research projects.

Grade Level Objectives:

Fifth Grade	Sixth Grade
~ Physical • Demonstrate their ability to use process skills of science in problemsolving through a real world experience fm:Jh • Demonstrate their ability to use process skills of science in problem solving through a real world experience	Lik • ~ a plant or protist exprRtnent that could be con ucted in one school year. • Reproduce a plant and describe its life cycle. • Research the grass family and describe how your world would change if it did not exist. Pbysical • Demonstrate the principals of the force of motion in fluids and relate them to the guiding principals of classic science. • Construct a project/demonstration to illustrate the transfer of energy and the principles of force and motion. Skill1 • Recognize and respond appropriately to safety issues in a laboratory enviranment. . • Design a simple investigation.

Science Curriculum

Grade Level 5-6

State Goal for Learning #4: As a result of their schooling, students will have a working knowledge of the processes, techniques, methods, equipment, and available technology of science	Local Outcome Level (Grade Level 5-6): By the end of this level, students will have a working knowledge of the processes, techniques, methods, equipment, and available technology of science.

Grade Level Objectives:

Fifth Grade	Sixth Grade
~ • Demonstrate their ability to use process skills of science in problem solving through a real world experience. Physical • Demonstrate their ability to use process skills of science in problem solving through a real world experience. Ed • Demonstrate their ability to use process skills of science in problem solving through a real world experience.	~ • Reproduce a plant and describe its life cycle. • Research the grass family and describe how your world would change if it did not exist. Physical • Demonstrate the principles of force and motion in fluids and relate them to the guiding principles of classic science. .wJ.li • Identify, compare, and use appropriate metric units for measuring length, mass, force, and energy levels. • Identify and use appropriate tools for observation and measurement.

Science Units of Study

Grade Level 5-6

Fifth Grade	Sixth Grade
Ecology • Energy roles • Food chain and food web • Ecosystems • Interaction and adaptation • Cycles in nature • Biomes • Conservation • Ecological succession Human Body • Digestive system • Skeletal system • Muscular system • Respiratory system • Endocrine system • Reproduction system • Circulatory system • Nervous system • Excretory system • Integumantary system • Relationships of systems Electricity and Magnets • Electromagnets • Magnetic fields • Conductors and insulators • Electric circuits • Positive and negative charges • Static electricity • Current electricity • Electronics	~ • Classification- • Viruses and Monerans • Protists • Fungi • Nonseed plants • Seed plants Observation Skills • Direct • Indirect Measurement in Metric Units • Length • Mass • Energy level • Force Data "processing" • Collection • Displaying (graphs, tables, other graphics) • Classification (use of a key, creation of a system) Scientific Investigation • Use a microscope • Use a balance Force and Motion • What is motion • Nature of forces • Fluids and forces (work, power, and machines) • Energy (forms and changes)

Science Curriculum

Grade Level 7-8

State Goal for Learning #1: As a result of their schooling. all students will have a working knowledge of the concepts and basic vocabulary of biological physical and environmental sciences and their application to life and work in contemporary technological society.	Local Outcome Level (Grade Level 7-8): By the end of this level. students will have a working knowledge of the concepts and basic vocabulary of science and its application to life.

Grade Level Objectives:

Seventh Grade	Eie:hth Grade
• Identify examples of the major groups of vertebrates and invertebrates • Identify the characteristics of fishes. amphibians reptiles. birds. and mammals • Identify types of fossilization • Demonstrate a knowledge of the c~tion and the e'tideAce that supports it • Identify donunant recessive. codominant, , and sex-linked traits • Solve simple Menedlian crosses • Explain the relationship of chromosomes to heredity • Demonstrate a basic knowledge of DNA structure and genetic coding • Identify the differences between living and non-living things • Demonstrate a knowledge of the structures and funtions of ~and their J2arts • Compare and C.QD1Wpl~ls with ~ells • Demonstrate an understanding Jf~tl ~ary~ • Compare and contrast respiration ~~toSyntheSiS • Identify structures and functions o . Ys~steiiifl	• Describe the general properties of matter • Explain and give examples of chemical and physical properties and chemical and physical changes • Describe the structure of an atom • Describe the properties and characteristics of sound waves • Describe the properties and characteristics of electromagnetic waves • Identify and compare the types of chemical bonding • Identify the various types of chemical reactions • Demonstrate an understanding of the factors that affect reaction rates • Describe the properties of acids bases and saltS • Identify renewable and non-renewable non living natural resources • Demonstrate the ability to balance simple chemical equations • Demonstrate the ability to write formulas for simple chemical compounds

Science Curriculum

Grade Level 7-8

State Goal for Learning #2: As a result of their schooling, students will have a working knowledge of the social and environmental implications and limitations of technological development.	Local Outcome Level (Grade Level 7-8); By the end of this level. students will have a working knowledge of the social and environmental implications and limitations of technological development in science.

Grade Level Objectives:

Seventh Grade	Eighth Grade
• Describe some examples and applications of genetic engineering • Describe the relationship of antibiotic use and resistant bacterial strains • Describe the effect of pesticide use on pest evolution and resistance • Describe possible positive and negative applications of human genome mapping	• Identify some technological applications of light • Identify technical applications of petrochemical products • Identify the different types of nuclear reactions and their social and environmental implications • Identify fossil fuels and their relationships to the environment • Identify alternate sources of energy and their implications • Describe methods for managing land resources • Identify sources of air. water. and land pollution • Identify ways of preventing pollution • Recognize the need for recycling and conservation of resources

Science Curriculum

Grade Level 7-8

State Goal for Learning #3: As a result of their schooling. students will have a working knowledge of the principles of scientific research and their application in simple research projects.	Local Outcome Level (Grade Level 7-8): By the end of this level. students will have a working knowledge of the principles of scientific research and their application in simple science research projects.

Grade Level Objectives:

Seventh Grade	Eighth Grade
• State a problem in a scientific setting • Formulate a hypothesis based on a problem • Describe or use an experiment to test a hypothesis • Demonstrate a knowledge of controlling variables in an experiment • Demonstrate the ability to collect. organize. and/or graph experimental data. • Demonstrate the ability to draw conclusions based on experimental data.	• Identify a problem in a scientific setting. • Formulate a hypothesis based on a problem. • Develop an experiment to test a hypothesis. • Demonstrate the knowledge controlling variables in an experiment. • Demonstrate the ability to collect. organize. and graph experimental data. • Demonstrate the ability to draw conclusions from observations.

Science Curriculum

Grade Level 7-8

State Goal for Learning #4: As a result of their schooling, students will have a working knowledge of the processes, techniques, methods, equipment, and available technology of science	Local Outcome Level (Grade Level 7-8): By the end of this level, students will have a working knowledge of the processes, techniques, methods, equipment, and available technology of science.

Grade Level Objectives:

Seventh Grade	Eighth Grade
• Identify laboratory equipment • Demonstrate the ability to measure length, mass, volume, and temperature with appropriate equipment • Demonstrate a knowledge of labroratory safety procedures • Write a knowledge of laboratory safety procedures • Use a computer to gather information • Demonstrate proper handling and use of a compound microscope	• Classify matter as elements, compounds, solutions, or mixtures • Classify types of solutions • Classify types of solutions • Classify different carbon compounds and draw structural formulas for them • Demonstrate the ability to use measurement instrument • Demonstrate a knowledge of laboratory safety procedures • Demonstrate the ability to predict outcomes from observable data

Science Units of Study

Grade Level 7-8

~eventh Grade	Eighth Grade
Ev2i!.lli2D. • Fossils • I;i1slory, in rocks an.9...fussils • ~OUih geologic time • Evolution: change over time • Charles Darwin and natural selection. • Development of a new spec~s • Punctuated equilibrium • Search for human ancestors • Human ancestors and relatives ADimalli. • Five kingdoms • Introduction to the animal kingdom • Sponges • Cnidarians • Wonns • Mollusks • Arthropods • Echinoderms • Vertebrates • Fishes • Amphibians • Reptiles • Birds • Mammals Heredin: • History of genetics • Principles of genetics • Genetics and probability • Chromosome theory • Mutations • DNA molecule • Chromosome produce proteins • Inheritance in humans • Sex-linked traits • Human genetic disorders • Plant and animal breeding • Genetic engineering	Maner: • Matter • Mass and weight • Volume and density • Phases of matter • Phase changes • Chemical properties and changes • Classes of matter • Mixtures • Elements • Compounds • Atomic model of matter • Structure of the atom • Forces within the atom • Arranging the elements • Design of the Periodic Table C~milin gf Ma~[• Chemical bonding • Ionic bonds • Covalent bonds • Metallic bonds • Predicting types of bonds • Nature of chemical reactions • Chemical equations • Types of chemical reactions • Energy of chemical reactions • Solution chemistry • Acids and bases • Acids and bases in solution: salts • Carbon and its compounds • Hydrocarbons • Substituted hydrocarbons • What is petroleum • Petrochemical products • Radioactivity • Nuclear reactions • Harnessing the nucleus • Detecting and using radioactivity

Science Units of Study

Grade Level 7-8

Seventh Grade	Eighth Grade
!&lli • Origin of life • Characteristics of living things • Needs of living things • Chemistry of living things • Cell theory • S~re and function of the cells • Moving of materials in and out of the cell • Cell g~!.h and d~n • Photosynthesis • Respiration'. Methods of Science • Scientific methods • Safety in the lab • SI measurements • Scientific process skill	Sound and Liiht • Nature of waves • Characteristics of waves • Types of waves • Speed of waves • Interactions of waves • What is sound? • Properties of sound • Interaction of sound waves • Quality and sound • Applications of sound • How you hear • Electromagnetic waves • Electromagnetic spectrum • Wave or particle? • Ray model of light • Reflection of light • Refraction of light • Color • How you see • Optical instruments • Lasers Ecolo&y • What are fossil fuels • Energy from the sun • Wind and water • Nuclear energy • Alternative ener~es • Land and soil re~ • Water resources • Mineral resources • Air pollution • Water pollution • What can be done about pollution? • Fossil fuels and minerals • Protecting the environment Methods of Science • Safety in the lab] • SI measurements • Scientific process skill

NAPERVILLE SCnOOL DISTRICT 203
SCIENCE CORE CURRICULUM
GRADE 6

UNIT 1

Main Concepts	Processes	Explorations	Notes
Scienco encompasses the knowledge we have of the universe and also the ways in which this knowledge is acquired.	Students will keep a complete and well organized Science Journal all year.	For Your Journal mobius strip	
Models are representations of the real thing which are useful because they help us to understand and investigate the real thing.	Construct a model.	Airplane or Gremlin model	Vocab Scientific Method experiment hypothesis model prediction observation qualitative quantitative control
Science is a human activity.	Distinguish between a quantitative and qualitative description.	Exploration 1	inference conclusion properties technology
We learn about the world around us through observations.	Be able to distinguish objects by their ~roperties.	Exploration 2	
Making inferences is a way of making sense of what we observe.	Describe a short activity and make appropriate inference.	Exploration 4	
Scientists use the scientific method to study a problem.	W~sis that can be investigated.	pg.30-31 pg.33 Hypothesis-A Link between Cause and Effect	

UNIT 1- continued

Main Concepts	Processes	Explorations	Notes
Technology is the use of knowledge and innovation to solve practical problems.	Identify the variables that must be controlled in order to conduct a fair test. (controlled exp)	Exploration 5	
There are many careers in the area of science and technology.	Design an experiment to test a hypothesis. Perform an experiment according to a suggested format. Collect observations and data Summarize findings by drawing a conclusion.	Exploration 6	

NAPERVILLE SCNOOL DISTRICT 203
SCIENCE CORE CURRICULUM
GRADE 8

UNIT 2- Pattems ofL"lYing ThlOgs

Main Concepts	Processes	Explorations	Notes
Tiny units making up living things are called cells.	Illustrate by drawing an idea	pg. 102	Vocab microscope base eyepiece stage objective lens coarse adjustment fine adjustment light source cells wet mount
Plant and animal cells are made up of smaller structures.	Use a microscope properly to observe tiny objects, cells, and single-celled organisms.	pg. 104	
Plant and animals cells have similarities and differences.	Prepare wet mounts of several kinds of cells.	Exploration 9	Sourcebook 521-540

NAPERVILLE SCHOOL DISTRICT 203
SCIENCE CORE CURRICULUM
GRADE 6

UNIT 3 - It's a Small World

Main Concepts	Processes	Explorations	Notes
Knowledge about microorganisms is necessary in order to provide safe food.	Describe how a microscope works and how to use one.	pg.104-108 (2.2 cell structure)	Vocab microorganism microbiology protists
Simple microscopes have been used for hundreds of years to observe microorganisms.	Culture microorganisms for observation.	Exploration 2	culture kingdom algae bacteria
The ability of microorganisms to survive and reproduce can be affected by the conditions in their environment.	Use microscope to examine microorganisms.	Exploration 1	Monera Protista Fungi
Microorganisms are intimately involved in the lives of people.	Make a drawing of what is observed in a microscope.	Exploration 3	pasteurization yeast mold antibiotic
Antibiotics are important substances produced by microorganisms.	Read a graph and data chart.	Exploration 5	yogurt yeast lab pond water
If left alone, microorganisms establish a balance environment of their own.		Exploration 8	
(-;';;;ymethodS of food ; \ preservation have been ~ : developed with the advancement of technoloGy.			

UNIT 3 - It's A Small World - continued

Main Concepts	Processes	Explorations	Notes
Microorganisms travel through the air. Simple personal habits can help protect people against the harmful effects of microorganisms. There are government agencies that are responsible for overseeing the safety of food prepared in public eating facilities. Some fields a microbiologist would find a job in are science, medicine, and food service.		Exploration 9	

NAPERVILLE SCnOOL DISTRICT 203
SCIENCE CORE CURRICULUM
GRADE 6

UNIT 4

Main Concepts	Processes	Explorations	Notes
Matter is all around us. Matter can be described by properties. Properties can be classified as chemical, phYSical, or biological. The metric system Is based on multiples of ten. Volume is the amount of space occupied by matter. Mass is measured by using balance. Density = Mass / Volume Matter is classified in three states: solid, liquid, and gas. Melting pOint, freezing poi~ and boiling point are physical characteristic, properties. The properties of solids, liquids and gases can be explained by using the particle model of matter.	Convert from one metric unit to another. Measure volume using a graduated cylinder. To find mass using a balance. To find density of various objects. To find the freezing point of a substance. To design a simple experiment to test a hypothesis.	For your Journal Exploration 1 Exploration 2 pt. 2 Exploration 3 Exploration 5 Exploration 6 Exploration 8	Vocab matter physical prop chemical prop Siunits volume meniscus displacement mass freezing point melting point dew point particle model

NAPERVILLE SCnOOL DISTRICT 203
SaENCECORECURR~ULUM
GRADES

UNIT 5

Main Concepts	Processes	Explorations	Notes
Chemicals play an important role in the activities of daily living. Each chemical has certain chemical and physical properties that distinguish it from other chemicals. When dealing with chemicals safety is essential in the laboratory, the home, and the classroom. Changes are a natural part of our lives. Changes can be classified as either chemical or physical. A knowledge of chemical changes is an important part of many careers. Reactants are the starting materials in a chemical change: products are the materials formed as a result of the chemical change.	Test a chemical for solubility in water. Test a chemical with a weak acid (vinegar). Test a chemical for flammability. Complete lab activities using safe practices. ~ther dat~in an organized lable. Distinguish between a chemical change and a physical change. Perform and describe a chemical reaction in terms of reactants and products.	Exploration 1 Exploration 2 Exploration 4	Vocab chemical solubility acid flammability chemical change physical change preCipitate products reactants properties alloys word equation elements compounds periodic table acid base indicator neutralization combustion corrosion atom molecule

UNIT 5- continued

Main Concepts	Processes	Explorations	Notes
All chemicals can be classified as either elements or compounds.	Draw Bohr model		
The periodic table arranges elements with similar chemicals properties into chemical families.	Interpret periodic table		
Acids react with bases in a neutralization reaction to form water and a class of compounds called salts.	Test and identify a substance as an acid or a base by using an indicator.	Exploration 5	
Burning (combustion) is a chemical change that involves a rapid reaction with oxygen.		Exploration 7 or 8	
Corrosion is a chemical change that involves a slow reaction with oxygen.			

UNIT6 - Energy

Main Concepts	Processes	EXDlorations	Notes
The term energy is used in many different ways. Energy is stored in many forms. Electricity is a form of energy. Energy use has increased in the last 100 years. Some other forms of energy are light, sound, electrical, nuclear, chemical, mechanical, kinetic, and potential. Energy makes things happen when it is converted from one form to another. In an electrical generator, the wire coil moves within a magnetic field. Energy converters cannot be 100% efficient because they lose power to friction.	Construct a device to test for tile presence of electricity. Generate electricity. Read a pie chart and line graph. Identify forms of energy. Give examples of energy conversion.	I;xploration 2	Vocab energy electricity galvanometer kinetic energy potential energy efficiency non-renewable resources perpetual motion watt-hour insulator renewable resources work power recycle

UNIT 6 Energy - continued

Main Concepts	Processes	Explorations	Notes
Electrical appliances use different amounts of electricity, measured in watt-hours. An analysis of energy usage can aid in creating an energy ~gsPlan.	Calculate and compare the amount of energy used by different appliances in one month.	Exploration 5	
Insulation reduces heat loss from homes.	Design an experiment to determine Wfiich insulation materials lose heat the slowest. ~ collect and graph the ~from if thermometer.	Exploration 7	
Renewable energy sources can be replaced: nonrenewable sources cannot be replaced.	Compare energy consumption and production by analyzing a graph.		
Each energy source has advantages and disadvantages. Energy supplies in the future will have an impact on lifestyle.	AnalyZe articles about future sources of energy looking for: 1. Qualitative vrs Quantitative 2. Observations vrs Inferences 3. Author's bias Be able to Identify advantages and disadvantages of various energy sources.	Exploration 11	

UNIT 7

Main Concepts	Processes	Explorations	Notes
Thermometers measure temperature. Heat is a form of energy. Heat always flows from a hotter area to a cooler area by means of conduction, convection, or radiation.	Read a thermometer. Explain how a thermometer works. Describe difference between heat and temperature. Identify conduction, convection and radiation.	Exploration 1 Exploration 6	Vocab thermometer temperature conduction convection radiation insulator convection current reflection

Unit 8 - Our Changing Earth

Main Concepts	Processes	Explorations	Notes
The earth is constantly changing.			
Weathering is a process by which rocks are worn down and broken by water, ice, wind, pollutants and the activities of plants and animals.	Make careful observation and then record them in their well organized science journal.		
	Make predictions about weathering based on performing simulations to test the effects of: freezing, particle size, acid rain, landslides being carried in a stream.	Exploration 7 at home	Planet Earth Videos
The force of gravity underlies the erosion caused by water, ice, and wind.			
The rate at which water can pass through a porous material is a measure of the materials permeability.	Test the porosity and permeability of a soil sample.	Exploration 9	Optional per physical structures
The faster the water, the more power it has to erode the surface over which it travels.	Test by simulation the effect of changing slope on the water speed in a stream.	Exploration 10 and Exploration 11 -may be combined	

UNIT 8 - Our Changing Earth - continued

Main Concepts	Processes	Explorations	Notes
Geology helps explain how landforms came about.			Vocab geology continental drift crust geologic time scale plate
Geologist make inferences about the past based on observation of the present.	Distinguish between observation and inference.	Exploration 1	plate tectonics weathering simulation erosion
The theory of continental drift proposes that all the continents were once joined together and have since gradually drifted apart.		Geologic Time Scale pg.419	porous permeable runoff ground water deposits Pangaea
The theory of plate tectonics proposes that the earth's crust is made up of a number of large and small plates that are continually shifting.		Exploration 2	
Plate tectonics has been useful in explaining phenomena such as volcanoes, earthquakes, and mountain formation.			

UNITS - Our Changling Earth -continue d

Main Concepts	Processes	Explorations	Notes
The speed of a river determines the amount of deposited sediment.	Test by simulation the effect of changing the water volume on the water speed in a stream.		
The age of a river can be determined by the degree to which the land around it has been worn down.	Test by simulation the effect of bends in a river.		

NAPERVILLE SCHOOL DISTRICT 203
SCIENCE CORE CURRICULUM
GRADE 7

UNIT I-INTERACTIONS

Main Concepts	Processes	Explorations	Notes
All of the things in the environment, biotic and abiotic, interact with one another. An organism's niche is its way of life in its habitat, including its biotic and abiotic relationship. Commensalism, mutualism, and parasitism are examples of three kinds of biotic relationships.(Use of analogies to drill these concepts and vocabulary terms.	Keep a well organized science journal for the entire year. Classify parts of the environment as either biotic or abiotic. Record information on a data chart.		Field Trips: - Particles & Prairies - Morton Arboretum (Explor 5 & 6 apply here) Explor 4 - more of an assignment, but must be done Vocab biotic abiotic environment habitat niche commensalism mutualism parasitism photosynthesis producers consumers herbivores carnivores omnivores predator prey scavenger decomposer

NAPERVILLE SCHOOL DISTRICT 203
SCIENCE CORE CURRICULUM
GRADE 7

UNIT I-INTERACTIONS-continued

Main Concepts	Processes	Explorations	Notes
Organisms exist and interact in communities.	Identify example of commensalism, mutualism and parasitism.		
All living things depend on sunlight as their initial source of energy.			
There are producers, consumers, and decomposers in a community.			Vocab food chain food web succession decomposers community acid rain pH scale Project Wild - Oh Deer - Salmon Activity

NAPERVILLE SCHOOL DISTRICT 203
SCIENCE CORE CURRICULUM
GRADE 7

UNIT I-INTERACTIONS -continued

Main Concepts	Processes	Explorations	Notes
A food chain shows the flow of energy, in the form of food, from one organism to another.	Diagram food chains and food webs.	Explorations 2	
A f~b isa way of showing a complex system of food chains.			Concept mapping
	Provide examples of how plants and animals respond to changing abiotic factors.	Explorations 3	
Nature can restore itself to its original state through succession.	Take a percentage of a number.	Explorations 4	Not core, but good way to incorporate performance based assessment 5 & 6
Changes in the p.Qpulat!onof one organism are often reflected in the ~opulations of other organisms.	Describe the characteristics of a specific biological community.	Explorations 5 & 6 may be best done together on a field trip.	
,(N~w) ~cological Careers ~hould be discussed. ---	Check carefully - record data in a well organized science journal.		Video: Yellow Stone Videos "Beneath Ashes" AVID - Succession

NAPERVILLE SCHOOL DISTRICT 203
SCIENCE CORE CURRICULUM
GRADE 7

UNIT l-INTERACTIONS- continued

Main Concepts	Processes	Explorations	Notes
People have positive & negative influences on the environment.	Use a field guide Collect specimens for further testing and observation. Perform biotic tests in the field. Carefully record data in a well organized science journal.		Use LRC to obtain specific information on succession - 'assign a topic or a place - may use field guides May be explored at Fermi Labs

NAPERVILLE SCHOOL DISTRICT 203
SCIENCE CORE CURRICULUM
GRADE 7

UNIT 2-DIVERSITY OF LIVING THINGS

Main Concepts	Processes	Explorations	Notes
Living things exemplify diversity in their sizes, shapes; and physical structures. Adaptations enable organisms to survive their habitats. Natural selection explains how the different features of a species change over generations in response to changing environment. Extinction results from a number of natural and human-made causes. In an environment with little diversity, there is a greater chance of living things becoming extinct.	Observe and describe the diversity of living things including differences in size, shape, and structure. Record data in a well organized data chart. Infer how animal and plant adaptation help organisms to survive in their particular habits. Explain cause and effect relationships. Read and create an organizational flow chart.	Explorations 1	Vocab diversity organism adaptations camouflage mimicry natural selection endangered species kingdom classify vertebrates invertebrates genus species metamorphosis vascular nonvascular

NAPERVILLE SCHOOL DISTRICT 203
SCIENCE CORE CURRICULUM
GRADE 7

UNIT 2-DIVERSITY OF LIVING THINGS-continued

Main Concepts	Processes	Explorations	Notes
Most living things can be classified into two kingdoms-plant and animal.	Classify organisms into the plant or animal kingdom.	Exploration 1 "Looking for Diversity"	Shedd Aquarium outreach program on "Animal Diversity."
Plants can be classified as vascular or nonvascular.	Classify plants into two groups: vascular or nonvascular.		Bill Nye video Mimicry & Camouflage
The scientific name of a living thing is made up of two words. The first is the genus name. The second is the species name.			Play "Salmon Game" Play "Oh Deer!" Play "Cougar Game" Could have an animal diversity day.
There is diversity within a species.			
There is diversity within the different stages of an organism's life.	Sequence the stages in the life cycles of organisms undergoing complete and incomplete metamorphosis.	Exploration 4 "Tracing Similarities and Differences." Old Text. pg 118-120 "From Eggs to Adult Insects"	<u>Classifications:</u> Must use source book. May use shoe activity for classification. Dissection if you want.

NAPERVILLE SCHOOL DISTRICT 203
SCIENCE CORE CURRICULUM
GRADE 7

UNIT 3 -SOLUTIONS

Main Concepts	Processes	Explorations	Notes
Most solutions are liquid, transparent mixtures. The parts of a solution are spread uniformly throughout. Solutions can be made from different combinations of gases, liquids, and solids. In solutions, the substance that is in greater quantities the solvent and the substance that is in lesser quantity, is the solute. Hard water is a solution of compounds containing iron, calcium, and magnesium. Water is called the universal solvent because so many things dissolve in it.	Distinguish between mixtures that are solutions and those that are not. Recognize the Tyndall Effect and describe it in relation to solutions. Distinguish between solutes that are soluble, not very soluble, and insoluble.	Exploration 2 Exploration 3 (possible demo) Exploration 4 Exploration 5	AVID - Tyndall EtTect <u>Vocab</u> solution mixture solute solvent dissolving hard water soft water soluble insoluble variables evaporation boiling distilling desalination concentrated diluted saturated atmosphere

UNIT 3 -SOLUTIONS- continued

Main Concepts	Processes	Explorations	Notes
Substances vary in their capacity to dissolve in water.	Identify and test for variables that will increase the rate of dissolving.		
The rate of dissolving may be increased by grinding the solute, by stirring the mixture, and by increasing the temperature of the solvent.	Safely and accurately complete an experiment.	Exploration 6	Do not need to do all substances - choose several
	Completely and accurately record data.		
	Review and improve an example of poor lab technique.		
Two processes in which a liquid is turned to a gas are boiling and evaporation.	Work cooperatively in a team.	Exploration 7	(possible to design own or (10 paper Explor 7) (Demo distillation pg. IS7 text)
Boiling and evaporation can be used to separate a solute from a solvent.	Design an experiment.		

UNIT 6 - THE RESTLESS EARTH -continued

Main Concepts	Processes	Explorations	Notes
Sedimentary rocks often have layers.			
Rocks subjected to heat and pressure beneath the surface of the earth will change their original mineralogy, texture, and composition to become metamorphic rocks.	Observe the differences between metamorphosed rock and its original form.	Exploration 9	
The agents of metamorphism are heat, pressure and fluids.			
Fossils can provide information about ancient plants and animals.			
The events of earth's history have been placed in order on the geologic time scale.			
Gems are rare or unusual varieties of minerals that are valued for the their color, luster, transparency, and hardness.			Mention geological time periods, but don't need to identify.

NAPERVILLE SCHOOL DISTRICT 203
SCIENCE CORE CURRICULUM
GRADE 7

UNIT 7 -TOWARD THE STARS

Main Concepts	Processes	Explorations	Notes
The Sun appears at its highest and lowest points during the summer and winter solstices.	Explain why the length of daylight changes throughout the year.		Challenge pg. 405 Phases of the moon will require outside information.
During the vernal (spring) and autumnal equinoxes, the Sun is directly above the equator.	Describe how the tilt of the Earth on its axis creates seasons.	Exploration 4	Students need source book - idea if you wish to shorten this unit.
The planets revolve around the Sun in elliptical orbits.	Illustrate how a planet orbits the Sun by drawing an ellipse	Exploration 5 - Fun Lab	
Meteors are lumps of coal-like mixtures, rock, or iron that sometimes enter the Earth's atmosphere. If it hits the Earth, it's called a meteorite.	Identify the differences between a meteor, meteorite, asteroids, and a comet.		
While meteorites have formed craters on the Earth and on the Moon, much of the evidence on Earth has been destroyed by weathering.			
Comets are frozen masses of water, dust, gases and other materials.			

NAPERVILLE SCHOOL DISTRICT 103
SCIENCE CORE CURRICULUM
GRADE 7

UNIT 7 -TOWARD THE STARS

Main Concepts	Processes	Explorations	Notes
Technology has improved our knowledge of the unique characteristics of the planets. The color of a star provides information about its size, temperature, and evolution. Despite the huge number of objects of which its composed, the universe is mainly empty space. The vast distances of space are measured in astronomical units and light yean.	Identifyl some of the principal features that distinguish one planet from another. Describe the size of stan using comparison to Earth and the Sun. Explain the relationship between the color of a star and its temperature.		Read Magazine "Project Man" No Man on pg. 416

NAPERVILLE SCHOOL DISTRICT 203
SCIENCE CORE CURRICULUM
GRADE 7

UNIT 8 -GROWING PLANTS

Main Concepts	Processes	Explorations	Notes
All living things have basic needs that are necessary for their survival. In a given sample, it is unlikely that all seeds will geminate into plants. Soil is made up of rock and mineral particles and the decaying remains of living things. Factors affecting plant growth for example: soil type, temperature, nutrients, water and amount of light the plant receives.	Identify the basic needs necessary for the survival of living things. Describe how to conduct a test to compare seed germination rates. Describe the growth of a plant from a seed to maturity. Keep careful observation in a well organized science journal. Identify differences in soil types. Investigate the water holding capacity and percolation rate of soils.	Exploration 1- Testing for Germination Exploration 3, 4, S - may aU be done together	Source Book is a must. Vocab biosphere germinate humus nutrients loam percolation rate osmosis photosynthesis transpiration hydroponics pollination pistil stamen vegetative reproduction Builders Square for price, fertilizer & nitrogen content.

Resources 3, 9, 7

UNIT 8 -GROWING PLANTS - continued

Main Concepts	Processes	Explorations	Notes
Plants may develop deficiencies if a nutrient is lacking or if the pH is incorrect.	Identify the three main nutrients found in most fertilizers.		
	Evaluate a fertilizer based on its N-P-K rating		Discuss pesticides
	Explain what soil pH is and why it is important to plant growth.	Exploration 10	
	Explain how plants can be grown in nutrient solutions.		
The flowers of some kinds of plants are self-pollinating; those other kinds must be cross-pollinated.	Identify the parts of a flower.	Exploration 11	Magic School Bus video on Parts of Flower
	Explain the difference between self and cross pollination.	Exploration 12	
	Explain how cross-pollination is used as a plant-breeding technique.		

UNIT 8 -GROWING PLANTS-continued

Main Concepts	Processes	Explorations	Notes
Many plants are capable of reproducing vegetatively.	Describe vegetative techniques to grow plants. Observe a root tip under a microscope.		Discuss and observe.
The growth and use of plants to create, improve or change an environment requires careful planning. Agricultural Engineering and Botany are careers that will need people in the future.	Analyze an environment in order to determine the kinds of plants that grow best in it.	Exploration 19	

NAPERVILLE ~,-dOOL DISTRICT #203
SCIENCE CORE CURRICULUM
GRADER

UNIT 1

Main Concepts	Processes	Explorations	Supplemental Add. Resources
Write the equations for photosynthesis identifying the source/significance of each component.	Test for starch in a leaf.	Exploration I	
	Collect a gas by H2O displacement Test for CO2 Test gas for flammability.		C02 Uptake see attached
	Observe a stomata with a microscope.	Exploration 5	
Describe external/internal features of a leaf.	Prepare a wet mount.		

UNIT 1 -continued

Main Concepts	Processes	Explorations	Supplemental Add. Resources
Describe several characteristics of H20 that makes it valuable to living things. Describe how water is absorbed by the roots of a plant by osmosis. Explain how & why the process of diffusion takes place in a permeable and semi permeable membrane. Explain the theories of water movement (root pressure, capillary action, adhesion, cohesion, tension, transpiration).	Test for the presence of sugar & starch. Observe water movement.	Exploration 9 Exploration 10	

UNIT 1- continued

Main Concepts	Processes	Explorations	Supplemental Add. Resources
Write the equation for respiration identifying the source & significance of each component.	Test for presence of CO2.	Exploration 15	<u>Vocab</u> diffusion semipermeable impermeable permeable transpirtation water cycle chloroplasts chlorophyll pigment heat capacity

NAPERVILLE SLHOOL DISTRICT 103
SCIENCE CORE CURRICULUM
GRADE 8

UNIT 1

Main Concepts	Processes	Explorations	Supplemental Add. Resources
Work = force x distance	Perform work. Calculate work.	Exploration 1	Vocab potential energy kinetic energy chemical energy
Identify 1factors (speed & mass) that aITectkinetic energy.	Calculate kinetic energy & potential energy.	Exploration 3 (using ring stand to set at 5, 10, 15 cm)	Vocab heat energy electrical energy
Conservation of Energy: Energy is neither created nor destroyed, it's transferred from one form to another.			

UNIT 2 - continued

Main Concepts	Processes	Explorations	Supplemental Add. Resources
	Solve Tony's problem.		
	Construct a pulley system to solve problem.		
	Calculate mechanical advantage.		
	Calculate efficiency.		
Identify types of simple machine and where the force is directed or if the distance has been changed.	Calculate mechanical advantage/efficiency of a wheel & axle.	Exploration 5	
	Construct a mechanical system.	Exploration 10 or Rube Goldberg	

UNIT 3

Main Concepts	Processes	Explorations	Supplemental Add. Resources
Describe why earth's climate is unique as to allow life. Describe what factors contribute to temperature of earth. Describe the green house etTect. Name the sources of green house gases. Identify the possible consequences of global warmin2.	Read thermometer. Draw a graph.	Exploration 1 or Exploration 3 Exploration 2	

UNIT 3 - continued

Main Concepts	Processes	Explorations	Supplemental Add. Resources
Describe how water cHle transfers heat..	Construct a model of Marsili's puzzle.	Exploration 6	
Explain why some regions of the world are warmer or colder than others.	Calculate the density of solutions.	Exploration 7	
Describe the moisture in air via relative humidity.	Design an experiment to test densities of various objects.		
Describe how density currents in atmosphere affect climate.			
Identify causes of density variations in ocean.	Predict behavior of water using different temperatures and different densities.	Exploration 8	
Explain why pressure in atmosphere decreases with increasing altitudes.			
Explain why H20 pressure increases with depth.			

UNIT 4 -ENERGY
ELECTRICITY

Main Concepts	Processes	Explorations	Supplemental Add. Resources
Energy can neither be created nor destroyed; it can only be changed from one form into another.	Identify electrons as negative electrical charges and protons as positive electrical charges.		S 52-62
Much of modern technology depends upon electricity.	Construct a simple electric current.	Exploration 4-1	
Electrical energy can be changed into light and heat energy.			
Electricity flows through a circuit.			
An electric current produces a magnetic field.			
Like charges repel each other, unlike charges attract each other.			
An electric, current is created when electricity flows throu2h a conductor.			

UNIT 4, 5, 6-SCI PLUS

Main Concepts	Processes	Explorations	Supplemental Add. Resources
Batteries produce direct current.			
Generators produce alternating current.			
Electrical circuits can be illustrated by using diagrams and symbols.	Draw simple circuit diagrams using conventional symbols.	Pg.232	
	Determine how thickness, length, and material affect resistance.	Exploration 4-7	
When the flow of current meets resistance in a wire, electrical energy is changed into heat energy.	Construct and diagram simple parallel and series circuits.		
Series and parallel are the two main types of circuits.	Compare and contrast the amount of current in series and parallel circuits.		
	Explain the effect of increasing the number of cells connected in series.	Exploration 4-8	
Ohm's Law	Solve Ohm's Law prblems 2iven 2 variables.		S59

UNIT 5
SOUND

Main Concepts	Processes	Explorations	Supplemental Add. Resources
Both too much and too little sound can have harmful etTects on humans.			
Sounds are recognized by distinctive characteristics- pitch, loudness, duration, quality and purity.	Create a loud, soft, high and low sound.		
Sounds exist if there is a vibrating object, a medium to carry the sound waves, and receiver to hear the sound.	Read a logarithmic bar graph.		
Sound is a form of energy.			
Animals produce sounds in different ways and have different hearing ranges.			
A vibration consists of one complete back and forth motion; frequency is the number of times a body vibrates in one second.		Exploration 5-3	

UNIT 5
SOUND- continued

Main Concepts	Processes	Explorations	Supplemental Add. Resources
Sound waves reaching the ear set up vibrations of the eardrum, three bones of the middle ear, and the liquid and the hair cells of the inner ear. The vibrations are changed into electrical impulses which travel along the nerves from the inner ear to the brain.	Identify and label the structures of the human ear.	Pg.296	
Sound can't be transmitted in a vacuum.		Exploration 5-4	
Sound waves are alternate compressions and expansions caused by the vibration of particles of a medium.	Describe the relationship between wave length, frequency and speed of sound waves.		
Sound travels in air at a speed of slightly more than 330 m/sec. (at O°C).	Calculate the speed of sound given the distance it travels and the time it takes to travel that distance.		

UNIT 5
SOUND- Continued

Main Concepts	Processes	Explorations	Supplemental Add. Resources
Light travels much faster than sound.			
Sound waves reflect from obstacles located in their path and produce echoes.			
The loudness of sounds can be measured by a sound meter in units called decibels.			
Sound waves can be converted by an oscilloscope into transverse waves.		Exploration 5-8	
Transverse waves can be used to show frequency and amplitude.			Laser disk S 70 - S 77

UNIT 6
LIGHT

Main Concepts	Processes	Explorations	Supplemental Add. Resources
Like other kinds of energy, light has no mass and does not occupy space. As a solid object becomes hotter, the light it emits changes from red to yellow to white. White light is made up of all of the colors of the spectrum. The absence of light energy results in the color of black. Using a prism, white light can be separated into the colors of the spectrum: red, orange, yellow, green, blue, indigo, violet (ROY G BIV). When light passes through a filter, some of its energy is lost.	Explain how a spectrometer works and how it is used. List the colors of the spectrum in the order in which they occur. Use a prism to scatter light. Explain how a filter changes the color of light that passes through it.	Exploration 6-3	

UNIT 6
LIGHT-Continued

Main Concepts	Processes	Explorations	Supplemental Add. Resources
When light strikes an object, it may be transmitted, scattered, or absorbed. Objects can be seen clearly through transparent material but cannot be seen clearly through translucent material. Every visible object reflects light. The angle of incidence equals the angle of reflection. Light reflected from a smooth surface is directed in one direction while the light reflected from a rough surface is scattered in many directions.	Explain how a filter changes the color of light that passes through it.	pg.356-357	

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UNIT 6
LIGHT- Continued

Main Concepts	Processes	Explorations	Supplemental Add. Resources
The speed of light changes when it passes through different kinds of transparent materials.	Diagram the path of light as it passes from one material to another.	Exploration 6-10	
Lasers are coherent light.			S 101 - S 106
Light is part of the electromagnetic spectrum.			S 94 - S 100
Hertz is a measurement used in electricity, sound, and light.			
Electricity, sound and light are used for communications.			

NAPERVILLE SCHOOL DISTRICT 203
SCIENCE CORE CURRICULUM
GRADE 8

UNIT 7

Main Concepts	Processes	Explorations	Supplemental Add.. Resources
Identify sizes of various particles/objects.	Measure liquids & solids with graduate cylinders and balances.	Exploration 2	
Differentiate between observation & inference.	Estimate size of particles/objects.		Video "Powers of Ten"
Explain how we know matter is made of particles.	Put numbers in scientific notation.		
Explain why models are used as representations of objects or events to test hypotheses.			
	Calculate density using objects.	Exploration 5	

NAPERVILLE SCHOOL DISTRICT 203
SCIENCE CORE CURRICULUM
GRADE 8

Unit 7

Main Concepts	Processes	Explorations	Supplemental Add. Resources
Give evidence that molecules of different substances may be different sizes.			Distillation of wood
Explain behaviors of particles in 3 states of matter: solid, liquid, gas.	Observe 3 states of matter.	Exploration 7	Mixed solutions Conservation of mass
Explain the processes of diffusion, evaporation and condensation.			Decomposition of H_2O Mass of copper & sulfur
Describe what happens as a substance reaches its melting and freezing point.	Graph a MP/FP curve Identify variables and controls. Draw an inference Write a lab report using scientific method.	Exploration 9	All of these are IPS labs
Identify a science related career.			

UNIT 7 - continued

Main Concepts	Processes	Explorations	Supplemental Add. Resources
Describe the impact of scientific knowledge on society.			Vocab element compound atom molecule proton neutron electron density melting point freezing point plateau endothermic reaction exothermic reaction

NAPERVILLE SCHOOL DISTRICT 203
SCIENCE CORE CURRICULUM
GRADE 8

UNITS

Main Concepts	Processes	Explorations	Supplemental Add. Resources
Identify physical traits shared with non-related people. Identify physical and non-physical traits you share with family & explain impact of nature vs. nurture. Describe Redi's experiment that disproved spontaneous generation. Identify structure and function of cell & cell parts. Explain and differentiate between the processes of mitosis and meoisis. Identify the components of DNA and explain the function of DNA. Describe Mendel's experiment with pea plants and how he arrived at the concept of dominant and recessive traits. Examine the implications of bio technology Ibio engineering the future.	Create a wet mount. Observe a nucleus. Construct a Punnett square	Exploration 2 Exploration 3 or other lab	

SCIENCE CURRICUWM EVAWATION

Community Unit District U-46 — Name of School or District

1 c.v.1 g, 4d/4d1{f5N7 fra-le (d(JC"r" ; sa./U — Grade Levels Taught at School

Does the middle school science curriculum:

Engage students in the process of scientific inquiry?

Are students asked to: Form a hypothesis?	_,_	(1)
Design an experiment?	_,_	(1)
Keep track of data, using mathematics?	_1_	(1)
Communicate the results and form a conclusion to the experiment?	_1_	(1)
Subtotal	.-.t	(4)

Expose students to a wide variety 01 scientific research that includes:

Observations, lab experiments, field experiments?	_,	(1)
Mathematical models, tables. and computer graphics that depict the results of an experiment?	./:.	(1)
The use of currently accepted scientific principles, theories, laws?	L.:	(1)
New research based on the experiments of someone else?	..L	(1)
Subtotal	---:L	(4)

Assist students in mastering the basic concepts in physical science?

Show haw substances have properties that do not change based on the amount of the substance?	_,_	(1)
Give examples of chemical reactions, in which a substance with new characteristics is formed?	_,_	(1)
Convince students that chemical elements remain intact during heating, electric currents. or acid reactions?	./	(1)
Subtotal	-.:2	(3)

Suggest principles for motion and force?

Define the ways in which motion can be measured?	--L	(1)
Demonstrate that an object will continue at the same speed, in a straight line. unless it is subjected to a force?	./:.	(1)
Prove that when more than one force acts on an object that the forces will either reinforce or cancel out each other?	_1_	(1)
Subtotal	2(3)	

Descnbe energy and how it is transferred?

Generalize that energy is a characteristic associated with light, heat, sound, motion, etc.? _, (1)

Show how heat transfers from warmer matter to cooler matter? ~\~ (1)

Provide the opportunity to observe the various ways that light interacts with matter? ~ (1)

SpecifYthat for an object to be seen, light that interacts with the object must enter the eye? a (1)

Suggest that electrical circuits are a means to transferring energy? --L (1)

Point out that energy flows through a system? .-1 (1)

Mention that the sun is a major source of energy and list the types 01 light (due to wavelength) that the earth receives 1i"omthe sun? 1L (1)

Subtotal ~ (7)

Broaden student understanding of organisms by:

Explaining how living systems are organized from cell to ecosystem? L.: (1)

Comparing unicellular organisms to multicellular organisms? ~(1)

Discussing how cells function including an emphasis on cell division? _,_ (1)

AllOWstudents to use microscopes to view cells and microorganisms? .L (1)

ClassifYingthe types of specialized cells, and illustrating how organs are composed of tissues., which are groups of specialized cells? _,_ (1)

IdentifYingthe components of the organ systems in the human body? .L (1)

Giving examples of diseases that demonstrate a breakdown of functioning in a given organism? _1_ (1)

Subtotal ./s: (7)

Present the concepts of reproduction through:

Reasoning that all organisms must reproduce for species to continue? ~ (1)

Contrasting sexual and asexual reproduction? L (1)

Describing the process of sexual reproduction in plants? _,_ (1)

Mentioning that some traits are inherited and providing information about genes and chromosomes? .L, (1)

Subtotal I (4)

Develop student understanding of how organisms behave by:

Citing evidence that all organisms use resources to survive, grow and reproduce? 1 (1)

Supporting comprehension of the necessity for homeostasis within an organism? _ (1)

Providing examples of how and why it is assumed that the behavior of a given organism may have been caused by evolutionary history? _ (1)

Subtotal 2 (3)

Identify the role of populations within an ecosystem through:

Defining a population and generalizing the impact of biotic and abiotic factors on populations? _ (1)

Categorizing populations by trophic function? 1 (1)

Ranking the sun as the most common source of energy for an organism? _ (1)

Analyzing population growth in terms of resources available? _ (1)

Subtotal ~(4)

Ask students to survey the diversity of organisms that are present throughout the world via:

Presenting a variety of organisms including microorganisms, plants, and animals? _ (1)

Demonstrating the various ways in which evolution may have contributed to the millions of species that exist? ~ (1)

Discussing the significance that extinction of a species may have on organismal diversity and how extinction can impact the world? 0 (1)

Subtotal 1 (3)

Provide specifics about the earth and its relationship to the solar system by:

Constructing understanding of the earth's layers? 1 (1)

Providing evidence and explanation regarding plate tectonics? _ (1)

Describing how landforms are created? 1 (1)

Distinguishing the differences between different types of rocks, different kinds of soils, and the components of each? _ (1)

Demonstrating the water cycle and the unique properties of water? ~ (1)

Identifying the components of earth's atmosphere? 1 (1)

Relating ocean currents and cloud formations to climate and weather? 1 (1)

Implying how organisms can earth and its atmosphere? _, _ (1)

Subtotal ~(8)

Outline the changes that have occurred to the structure of earth via:

Proposing changes in environmental conditions based on evidence provided by fossils? L (1)

Drawing conclusions about the impact of erosion, natural disturbances, and plate movement on the structure of earth? _,_ (1)

Subtotal _1_ (2)

Construct concepts of the earth and its location in the solar system?

Account for the major components of the solar system, emphasizing the sun as the center? _,_ (1)

Introduce the concept that most objects in the solar system are moving predictably. which enables humans to measure time? L(1)

Relay the etrect that gravity has on the solar system, and apply that to life on earth? _,_ (1)

Show how the earth's tilt and rotation around the sun affects climate. and causes seasonal changes? _,_ (1)

Subtotal ~(4)

Create an environment in which technology is a focus?

Discuss how products are made to meet the needs of various cultures, beliefs, and needs? _,_ (1)

Ask students to design a product while considering time. cost and availability of materials? _,_ (1)

Utilize practice in using resources and tools to implement construction of a product? _1_ (1)

Build skills of evaluation and appreciation in regards to various technologies? _,_ (1)

Discuss the reciprocal nature between science and technology? -L (1)

Argue that technological constraints exist, and some may have consequences that cannot be predicted? _,_ (1)

Subtotal JL (6)

Apply the sciences to personal and social issues?

Recommend exercise as a way to maintain. and improve human fitness? -L (1)

Stress the importance of safety and hazard prevention? _, (1)

Discuss the adverse biological effects tobacco, drugs., and alcohol?	.L	(1)
Develop values, based on science, in terms of lifestyle choices such as: nutrition., sleep habits, sexual activity and emphasize that precautions can be taken to prevent disease?	_,	(1)
Apply concepts of health issues to environmental conditions?	_,	(1)
Identify the effects of population size on the environment and availability of resources?	-L	(1)
Show the relationships between humans, natural disturbances,, and changes in the environment?	- i .,	
UtiUzetechnology and models to measure risks, benefits, and teach decision-making?	_1_	(1)
Give examples of ethical codes that scientists and engineers fbllowin research and design?	J.-	(1)
Subtotal	~(9)	
Build an appreciation for the men and women who have contributed to advances in science?	_,	(1)
Address the various skills, or intelligences, that can be used in different science fields?	~(1)	
Illustrate that in areas of scientific evidence is not plentiful, disagreements may occur, and that the disagreements can be used to further scientific inquiries?	--.L	(1)
Recognize the contribution. of various cultures to the sciences?	_1_	(1)
Subtotal	A	(4)
TOTAL	66*	(75)

COMMENTS:

The curriculum for grades 7 and 8 has not been documented as thoroughly as District U-46's elementary school curriculum, for this reason, some of the criteria were marked with N/A rather than a 0. This is because the curriculum may actually include the topics, but they are not mentioned in the written curriculum. The only topic that District U-46 did not cover, in depth, is the concept of evolution and its impact on organismal diversity. While such a topic is encouraged in the National Standards, it is not necessarily a bad thing that it is not included in the middle school science curriculum.

* - The final score may be higher due to criteria marked with N/A.

SCIENCE CURRICUWM EVAWATION

P€KI7tD to.:JJIIJAIIr/ tJAld.xHOof.-. J:fs1il1cr ~f1.8
Name of School or District

5¾6 (ROSETTE) 7¾8 (HUNTLEY)
Grade Levels Taught at School

Does the middle school science curriculum:

Engage students in the process of scientific inquiry?

Are students asked to:
Form a hypothesis? _L (1)

Design an experiment? _L (1)

Keep track of data, using mathematics? _L (1)

Communicate the results and form a conclusion to the experiment? _L (1)

Subtotal _L (4)

Expose students to a wide variety 01scientific research that includes:

Observations, lab experiments, field experiments? _1_ (1)

Mathematical models, tables, and computer graphics that depict the results of an experiment? _,_ (1)

The use of currently accepted scientific principles, theories, laws? _I (1)

New research based on the experiments of someone else? _1_ (1)

Subtotal ~(4)

Assist students in mastering the basic concepts in physical science?

Show how substances have properties that do not change based on the amount of the substance? _,_ (1)

Give examples of chemical reactions, in which a substance with new characteristics is formed? ~ (1)

Convince students that chemical elements remain intact during heating, electric currents, or acid reactions? _/_ (1)

Subtotal I (3)

Suggest principles for motion and force?

Define the ways in which motion can be measured? _1_ (1)

Demonstrate that an object will continue at the same speed, in a straight line, unless it is SUbjectedto a force? _/_ (1)

Prove that when more than one force acts on an object that the forces will either reinforce or cancel out each other? _L (1)

Subtotal I (3)

Describe energy and how it is transferred?

Generalize that energy is a characteristic associated with light, heat, sound, motion, etc.?	1	(1)
Show how heat transfers from warmer matter to cooler matter?	~	(1)
Provide the opportunity to observe the various ways that light interacts with matter?	/	(1)
SpecifYthat for an object to be seen, light that interacts with the object must enter the eye?	1	(1)
Suggest that electrical circuits are a means to transferring energy?		(1)
Point out that energy flows through a system?	1	(1)
Mention that the sun is a major source of energy and list the types 01 light (due to wavelength) that the earth receives from the sun?	1	(1)
Subtotal		(7)

Broaden student understanding of organisms by:

Explaining how living systems are organized from cell to ecosystem?	12	(1)
Comparing unicellular organisms to multicellular organisms?	1	(1)
Discussing how cells function including an emphasis on cell division?	1	(1)
Allow students to use microscopes to view cells and microorganisms?	1	(1)
Classitying the types of specialized cells, and illustrating how organs are composed of tissues, which are groups of specialized cells?	1	(1)
IdentifYingthe components of the organ systems in the human body?	1	(1)
Giving examples of diseases that demonstrate a breakdown of functioning in a given organism?	1	(1)
Subtotal	1	(7)

Present the concepts of reproduction through:

Reasoning that all organisms must reproduce for species to continue?	1	(1)
Contrasting sexual and asexual reproduction?	1	(1)
Describing the process of sexual reproduction in plants?	1	(1)
Mentioning that some traits are inherited and providing information about genes and chromosomes?		(1)
Subtotal	1	(4)

Develop student understanding of how organisms behave by:

Citing evidence that all organisms use resources to survive, grow and reproduce? _,_ (1)

Supporting comprehension of the necessity for homeostasis within an organism? -L- (1)

Providing examples of how and why it is assumed that the behavior ofa given organism may have been caused by evolutionary history? _,_ (1)

Subtotal JL (3)

Identffy the role of populations within an ecosystem through:

Defining a population and generalizing the impact of biotic and abiotic factors on populations? _,_ (1)

Categorizing populations by trophic function? _,_ (1)

Ranking the sun as the most common source of energy fur an organism? .L (1)

Analyzing population growth in terms of resources available? _, (1)

Subtotal !L (4)

Ask students to survey the diversity of organisms that are present throughout the world via:

Presenting a variety of organisms including microorganisms, plants, and animals? L, (1)

Demonstrating the various ways in which evolution may have contributed to the millions of species that exist? _,_ (1)

Discussing the significance that extinction ofa species may have on organismal diversity and how extinction can impact the world? -.L (1)

Subtotal ~ (3)

Provide specifics about the earth and its relationship to the solar system by:

Constructing understanding of the earth's layers? JL (1)

Providing evidence and explanation regarding plate tectonics? ~ (1)

Describing how Iandforms are created? -'-- (1)

Distinguishing the differences between different types of rocks, different kinds of soils, and the components of each? ~ (1)

Demonstrating the water cycle and the unique properties of water? _,_ (1)

IdentifYing the components of earth's atmosphere? -L (1)

Relating ocean currents and cloud formations to climate and weather? L (1)

Implying how organisms and earth and its atmosphere? ___((1)

Subtotal ~ (8)

Outline the changes that have occurred to the structure of earth via:

Proposing changes in environmental conditions based on evidence provided by fossils? _1_ (1)

Drawing conclusions about the impact of erosion, natural disturbances, and plate movement on the structure of earth? .I: (1)

Subtotal -1- (2)

Construct concepts of the earth and its location in the solar system?

Account for the major components of the solar system, emphasizing the sun as the center? 0 (1)

Introduce the concept that most objects in the solar system are moving predictably. which enables humans to measure time? ~ (1)

Relay the etrect that gravity has on the solar system, and apply that to life on earth? ~ (1)

Show how the earth's tilt and rotation around the sun affects climate. and causes seasonal changes? .iL (1)

Subtotal JL (4)

Create an environment in which technology is a focus?

Discuss how products are made to meet the needs of various cultures, beliefs, and needs? ~ (1)

Ask students to design a product while considering time. cost and availability of materials? -L (1)

Utilize practice in using resources and tools to implement construction of a product? --L (1)

Build skills of evaluation and appreciation in regards to various technologies? _, (1)

Discuss the reciprocal nature between science and technology? -.L (1)

Argue that technological constraints exist, and some may have consequences that cannot be predicted? .I: (1)

Subtotal ~ (6)

Apply the sciences to personal and social issues?

Recommend exercise as a way to maintain. and improve human fitness? i(1)

Stress the importance of safety and hazard prevention? .L (1)

Discuss the adverse biological effects tobacco, drugs, and alcohol?	JL	(1)
Develop values, based on science, in terms oflifestyle choices such as: nutrition., sleep habits, sexual activity and emphasize that precautions can be taken to prevent disease?	_1_	(1)
Apply concepts of health issues to environmental conditions?	.L	(1)
Identify the effects of population size on the environment and availability of resources?	.-L	(1)
Show the relationships between humans, natural disturbances,, and changes in the environment?	_,_	(1)
Utilize technology and models to measure risks, benefits, and teach decision-making?	_1_	(1)
Give examples of ethical codes that scientists and engineers tbllow in research and design?	_,_	(1)
Subtotal	:1-	(9)
Build an appreciation for the men and women who have contributed to advances in science?	~(1)	
Address the various skills, or intelligences, that can be used in different science fields?	_()_	(1)
Illustrate that in areas of scientific evidence is not plentiful, disagreements may occur, and that the disagreements can be used to further scientific inquiries?	JL	(1)
Recognize the contribution of various cultures to the sciences?	_()_	(1)
Subtotal	JL	(4)
TOTAL	S~	(75)

COMMENTS:

4,(4 ~Juu~fy' (htJ./lk:Jt~U)~u;c/ ~9'Z9 /~ t/YLi ;d~~~~ ~ed,vtPlljE~ -cA~. A eLbV~H1J ~ #~~ eh;,,;....~~if ~c~ u/J.. .;a AJC~Tt<'J ~ueu:6uv\ ~/7't6/ ClfVVU ~ ~I>~u. ~d.t~ p.e.6~.1 ~(.U'J; ~1', ~~ th-i ·j}a/(,i·(c~ t th LJ~, ~~<tA (J./1,t? ;A /udait-~:r b ~ /J,4.v ,~yYV, {~ /1'b(f I.A~ ~ tk eur~ ~" , W..hlk th co//"Ueu&.#1 d,~./JuT ~/vu a.t,.! ~~~ ~ a~ v~/ J ~ ccvetJ a ~ hJ r:;/ ~/U:J.

SCIENCE CURRICUWM EVAWATION

NAPERVILLE SCHOOL DISTRICT 203 — Name of School or District

6, 7 and 8 — Grade Levels Taught at School

Does the middle school science curriculum:

Engage students in the process of scientific inquiry?

Are students asked to: Form a hypothesis?	1 (1)
Design an experiment?	1 (1)
Keep track of data, using mathematics?	1 (1)
Communicate the results and form a conclusion to the experiment?	1 (1)
Subtotal	4 (4)

Expose students to a wide variety 01 scientific research that includes:

Observations, lab experiments. field experiments?	1 (1)
Mathematical models. tables. and computer graphics that depict the results of an experiment?	(1)
The use of currently accepted scientific principles. theories, laws?	1 (1)
New research based on the experiments of someone else?	(1)
Subtotal	2 (4)

Assist students in mastering the basic concepts in physical science?

Show how substances have properties that do not change based on the amount of the substance?	1 (1)
Give examples of chemical reactions, in which a substance with new characteristics is formed?	1 (1)
Convince students that chemical elements remain intact during heating, electric currents. or acid reactions?	1 (1)
Subtotal	2 (3)

suggest principles for motion and force?

Define the ways in which motion can be measured?	1 (1)
Demonstrate that an object will continue at the same speed, in a straight line. unless it is subjected to a force?	1 (1)
Prove that when more than one force acts on an object that the forces will either reinforce or cancel out each other?	1 (1)
Subtotal	~ (3)

Describe energy and how it is transferred?

Generalize that energy is a characteristic associated with light, heat, sound, motion, etc.?	1	(1)
Show how heat transfers from warmer matter to cooler matter?	1	(1)
Provide the opportunity to observe the various ways that light interacts with matter?	1	(1)
Specny that for an object to be seen, light that interacts with the object must enter the eye?	1	(1)
Suggest that electrical circuits are a means to transferring energy?	1	(1)
Point out that energy flows through a system?	1	(1)
Mention that the sun is a major source of energy and list the types 01 lJght (due to wavelength) that the earth receives trom the sun?	1	(1)
Subtotal	7	(7)

Broaden student understanding of organisms by:

Explaining how living systems are organized from cell to ecosystem?		(1)
Comparing unicellular organisms to multicellular organisms?		(1)
Discussing how cells function including an emphasis on cell division?	1	(1)
Allow students to use microscopes to view cells and microorganisms?		(1)
Classitying the types of specialized cells, and illustrating how organs are composed of tissues, which are groups of specialized cells?		(1)
Identi1Y.ingthe components of the organ systems in the human body?		(1)
Giving examples of diseases that demonstrate a breakdown of functioning in a given organism?		(1)
Subtotal	11	(7)

Present the concepts of reproduction through:

Reasoning that all organisms must reproduce for species to continue?	1	(1)
Contrasting sexual and asexual reproduction?	1	(1)
Describing the process of sexual reproduction in plants?	1	(1)
Mentioning that some traits are inherited and providing information about genes and chromosomes?	1	(1)
Subtotal		~(4)

Develop student understanding of how organisms behave by:

Citing evidence that all organisms use resources to survive, grow and reproduce?	1	(1)
Supporting comprehension of the necessity for homeostasis within an organism?	1	(1)
Providing examples of how and why it is assumed that the behavior of a given organism may have been caused by evolutionary history?	1	(1)
Subtotal	~	(3)

Identify the role of populations within an ecosystem through:

Defining a population and generalizing the impact of biotic and abiotic factors on populations?	_,_	(1)
Categorizing populations by trophic function?	_,_	(1)
Ranking the sun as the most common source of energy for an organism?	1	(1)
Analyzing population growth in terms of resources available?	1	(1)
Subtotal	~	(4)

Ask students to survey the diversity of organisms that are present throughout the world via:

Presenting a variety of organisms including microorganisms, plants, and animals?	_,_	(1)
Demonstrating the various ways in which evolution may have contributed to the millions of species that exist?	_,_	(1)
Discussing the significance that extinction of a species may have on organismal diversity and how extinction can impact the world?	_,_	(1)
Subtotal	~	(3)

Provide specifics about the earth and its relationship to the solar system by:

Constructing understanding of the earth's layers?	11	(1)
Providing evidence and explanation regarding plate tectonics?	1	(1)
Describing how landforms are created?	~	(1)
Distinguishing the differences between different types of rocks, different kinds of soils, and the components of each?	_,_	(1)
Demonstrating the water cycle and the unique properties of water?	_,_	(1)
Identifying the components of earth's atmosphere?	1	(1)
Relating ocean currents and cloud formations to climate and weather?	_,_	(1)

A

Implying how organisms can earth and its atmosphere? J (1)

Subtotal L (8)

Outline the changes that have occurred to the structure of earth via:

Proposing changes in environmental conditions based on evidence provided by fossils? _'_ (1)

Drawing conclusions about the impact of erosion, natural disturbances, and plate movement on the structure of earth? .I: (1)

Subtotal L (2)

Construct concepts of the earth and its location in the solar system?

Account for the major components of the solar system, emphasizing the sun as the center? I (1)

Introduce the concept that most objects in the solar system are moving predictably, which enables humans to measure time? L (1)

Relay the etrect that gravity has on the solar system, and apply that to life on earth? ~ (1)

Show how the earth's tilt and rotation around the sun affects climate, and causes seasonal changes? _'_ (1)

Subtotal 1(4)

Create an environment in which technology is a focus?

Discuss how products are made to meet the needs of various cultures, beliefs, and needs? .L (1)

Ask students to design a product while considering time, cost and availability of materials? .JL (1)

Utilize practice in using resources and tools to implement construction of a product? .L (1)

Build skills of evaluation and appreciation in regards to various technologies? L (1)

Discuss the reciprocal nature between science and technology? _1_ (1)

Argue that technological constraints exist, and some may have consequences that cannot be predicted? -.L (1)

Subtotal JL (6)

Apply the sciences to personal and social issues?

Recommend exercise as a way to maintain and improve human fitness? -.fL (1)

Stress the importance of safety and hazard prevention? .L (1)

Discuss the adverse biological effects tobacco, drugs. and alcohol?	0	(1)
Develop values, based on science, in terms of lifestyle choices such as: nutrition., sleep habits. sexual activity and emphasize that precautions can be taken to prevent disease?	1	(1)
Apply concepts of health issues to environmental conditions?	1	(1)
Identify the effects of population size on the environment and availability of resources?	J2..	(1)
Show the relationships between humans. natural disturbances,, and changes in the environment?	-L	(1)
Utilize technology and models to measure risks, benefits, and teach decision-making?		~(1)
Give examples of ethical codes that scientists and engineers lbllow in research and design?	JL	(1)
Subtotal	.!L	(9)
Build an appreciation for the men and women who have contributed to advances in science?	-CL	(1)
Address the various skills. or intelligences, that can be used in different science fields?	_,_	(1)
Illustrate that in areas of scientific evidence is not plentiful, disagreements may occur. and that the disagreements can be used to further scientific inquiries?	~	(1)
Recognize the contribution, of various cultures to the sciences?	~	(1)
Subtotal	_~_	(4)
TOTAL	-.kL	(75)

COMMENTS:

SCIENCE

State Goals: 11-13

USINGTECHNOLOGY

Use appropriate instruments, electronic equipment, computers and networks to access information, process ideas and communicate results.

Technology is invented and improved by the use of scientific principles. In tum, scientists depend on technology in performing experiments, analyzing data and communicating the results. Science students learn to use a range oftechnologies: instruments, computer hardware and software, on-line services and equipment, primary source data and images, and communication networks. They learn how technology, in tum, is the result of a scientific design process that includes continual refinements and improvements.

WORKINGONTEAMS

Learn and contribute productively as Individuals and as members of groups.

The practical application of science requires both individual and group efforts. Individuals bring unique insight and focus to the work of inquiry and problem solving. Working in groups, scientists pose questions, share hypotheses, divide their experimental efforts, and share data and results. Science students have the opportunity to work both ways-as individuals and as members of teams organized to conduct complex investigations and solve problems.

MAKINGCONNECTIONS,

Recognize and apply connections of important Information and ideas within and among learning areas.

Science has many disciplines, all interrelated. Understanding the functioning of living things depends on knowing chemistry; understanding chemistry depends on knowing physics. In the same way, science itself is highly dependent on mathematics-and it also relates strongly to medicine, geography, physical development and health, social trends and issues, and many other topics. Science, at its best, provides knowledge and skills that improve the understanding of virtually all subjects.

WHY THIS GOAL IS IMPORTANT:

The inquiry process prepares learners to engage in science and apply methods of technological design. This understanding will enable students to pose questions, use models to enhance understanding, make predictions, gather and work with data, use appropriate measurement methods, analyze results, draw conclusions based on evidence, communicate their methods and results, and think about the implications of scientific research and technological problem solving.

MIDDLE/JUNIOR HIGH SCHOOL	EARLY HIGH SCHOOL	LATE HIGH SCHOOL
11.A.3a Formulate hnQ!heses that can be tested by collecting data. 11.A.3b Conduct scientifi~iments that control alllltit. one variable. 11.A.3c Collect and record data accurately using consistent measuring ana recoraing techniques and media. 11.A.3d Explain the existence of unexpected results in a data set. 11.A.38 Use data manipulation tools and quantitative (e.g., mean, mode, simple equations) and representational methods (e.g., simulations, image processing) to analyze measurements. 11.A.31 Interpret and represent results of analysis to produce findings. 11.A.3g Report and ~the process and results of a scientific Investigation.	11.A.4a Formulatehypothesesreferencingprior researchand knowledge. 11.A.4b Conduct controlled experiments or simulations to test hypotheses. 11.A.4c Collect, organize and analyze data accurately and precisely. 11.A.4d Apply statistical methods to the data to reach and support conclusions. 11.A.48 Formulate alternative hypotheses to explain unexpected results. 11.A.41 Using available technology, report, display and defend to an audience conclusions drawn from investigations.	11.A.5a Formulatehypothesesreferencingprior researchand knowledge. 11.A.5b Designprocedures to testthe selected hypotheses. 11.A.5c Conductsystematic controlled experiments to test the selected hypotheses. 11.A.5d Apply statistical methods to make predictions and to test the accuracy of results. 11.A.58 Report, display and defend the results of investigations to audiences that may include professionals and technical experts.
11.B.3a Identify an actual design problem and establish criteria for determining the success of a solution. 11.B.3b Sketch, propose and compare design solutions to the problem considering available materials, tools,so.~~~eness and safety. 11.B.3c Select the most appropriate design and build a prototype or simulation. 11.B.3d Test the prototype using available materials, instruments and technology and record the data. 11.B.38 Evaluate the test results based on established criteria, note sources of error and recommend improvements. 11. B.31 USingavailabletechnology, report the relative success of the design based on the test results and criteria.	11.B.4a Identifyatechnologicaldesignproblem inherent in a commonly used product. 11.B.4b Propose and compare different solution designs to the design problem based upon given constraints including availabletools, materials and time. 11. B.4c Developworking visualizations of the proposed solution designs (e.g., blueprints, schematics, flowcharts, cad-cam, animations). 11.B.4d Determine the criteria upon which the designs will bejudged, identify advantagesand disadvantagesof the designsandselectthe most promising design. 11.B.48 Develop and test a prototype or simulation of the solution design using available materials, instruments and technology. 11.B.41 Evaluate the test results based on established criteria, note sources of error and recommend improvements. 11.B.4g Using available technology, report to an audience the relative success of the design based on the test results and criteria.	11.B.5a Identify a design problem that has practical applications and propose possible solutions, considering such constraints as available tools, materials, time and costs. 11.B.5b Select criteria for a successful design solution to the identified problem. 11.B.5c Build and test different models or simulations of the design solution using suitable materials, tools and technology. 11.B.5d Choose a model and refine its design based on the test results. 11.B.58 Apply established criteria to evaluate the suitability, acceptability, benefits, drawbacks and consequences for the tested design solution and recommend modifications and refinements. 11. B.51 Using available technology, prepare and present findings of the tested design solution to an audience that may include professional and technical experts.

WHY THIS GOAL IS IMPORTANT:

This goal is comprised of key concepts and principles in the life, physical and earth/space sciences that have considerable explanatory and predictive power for scientists and non-scientists alike. These ideas have been thoroughly studied and have stood the test oftime. Knowing and being able to apply these concepts, principles and processes help students understand what they observe in nature and through scientific experimentation. A working knowledge of these concepts and principles allows students to relate new subject matter to material previously learned and to create deeper and more meaningful levels of understanding.

MIDDLE/JUNIOR HIGH SCHOOL	EARLY HIGH SCHOOL	LATE HIGH SCHOOL
12.A.38 Explain how cells function as "building blocks" of organisms and describe the requirements for cells to live. 12.A.3b Compare characteristics of organisms produced from a single parent with those of organisms produced by two parents. 12.A.3c Compare and contrast how different forms and structures reflect different functions (e.g., similarities and differences among animals that fly, walk or swim; structures of plant cells and animal cells).	12.A.4a Explain how genetiC combinations produce visible effects and variations among physical features and cellular functions of organisms. 12.A.4b Describe the structures and organization of cells and tissues that underlie basic life functions including nutrition, respiration, cellular transport. biosynthesis and reproduction. 12.A.4c Describe processes by which organisms change over time using evidence from comparative anatomy and physiology, embryology, the fossil record, genetics and biochemistry.	12.A.58 Explain changes within cells and organisms in response to stimuli and changing environmental conditions (e.g., homeostasis, dormancy). 12.A.5b Analyze the transmission of genetiC traits, diseases and defects.
12.B.38 Identify and classify biotic and abiotic factors in an environment that affect population density, habitat and placement of organisms in an energy pyramid. 12.B.3b Compare and assess features of organisms for their adaptive, competitive and survival potential (e.g., appendages, reproductive rates, camouflage, defensive structures).	12.B.4a Compare physica], ecological and behavioral factors that influence interactions and interdependence of organisms. 12.B.4b Simulate and analyze factors that influence the size and stability of populations within ecosystems (e.g., birth rate, death rate, predation, migration patterns).	12.B.58 Analyze and explain biodiversity issues and the causes and effects of extinction. 12.B.5b Compare and predict how life forms can adapt to changes in the environment by applying concepts of change and constancy (e.g., variations within a population increase the likelihood of survival under new conditions).
12.C.38 Explain interactions of energy with matter including changes of state and conservation of mass and energy. 12.C.3b Model and describe the chemical and physical characteristics of matter (e.g., atoms, molecules, elements, compounds, mixtures).	12.C.48 Use kinetic theory, wave theory, quantum theory and the laws of thermodynamics to explain energy transformations. 12.C.4b Analyze and explain the atomic and nuclear structure of matter.	12.C.58 Analyze reactions (e.g., nuclear reactions, burning of fuel, decomposition of waste) in natural and man-made energy systems. 12.C.5b Analyze the properties of materials (e.g., mass, boiling point, melting point, hardness) in relation to their physical and/or chemical structures.
12.0.38 Explain and demonstrate how forces affect motion (e.g., action/reaction, equilibrium conditions, free-falling objects). 12.0.3b Explain the factors that affect the gravitational forces on objects (e.g., changes in mass, distance).	12.0.48 Explain and predict motions in inertial and accelerated frames of reference. 12.0.4b Describe the effects of electromagnetic and nuclear forces including atomic and molecular bonding, capacitance and nuclear reactions.	12.0.58 Analyze factors that influence the relative motion of an object (e.g., friction, wind shear, cross currents, potential differences). 12.0.5b Analyze the effects of gravitational, electromagnetic and nuclear forces on a physical system.

MIDDLE/JUNIOR HIGH SCHOOL	EARLY HIGH SCHOOL	LATE HIGH SCHOOL
12.E.3a Analyze and explain large-scale dynamic forces, events and processes that affect the Earth's land, water and atmospheric systems (e.g., jetstream, hurricanes, plate tectonics). 12.E.3b Describe interactions between solid earth, oceans, atmosphere and organisms that have resulted in ongoing changes of Earth (e.g., erosion, El Nino). 12.E.3c Evaluate the biodegradability of renewable and nonrenewable natural resources.	12.E.4a Explain how external and internal energy sources drive Earth processes (e.g., solar energy drives weather patterns; internal heat drives plate tectonics). 12.E.4b Describe how rock sequences and fossil remains are used to interpret the age and changes in the Earth.	12.E.5 Analyze the processes involved in naturally occurring short-term and long-term Earth events (e.g., floods, ice ages, temperature, sea-level fluctuations).
12.F.3a Simulate, analyze and explain the effects of gravitational force in the solar system (e.g., orbital shape and speed, tides, spherical shape of the planets and moons). 12.F.3b Describe the organization and physical characteristics of the solar system (e.g., sun, planets, satellites, asteroids, comets). 12.F.3c Compare and contrast the sun as a star with other objects in the Milky Way Galaxy (e.g., nebulae, dust clouds, stars, black holes).	12. F.4a Explain theories, past and present, for changes observed in the universe. 12.F.4b Describe and compare the chemical and physical characteristics of galaxies and objects within galaxies (e.g., pulsars, nebulae, black holes, dark matter, stars).	12.F.5a Compare the processes involved in the life cycle of stars (e.g., gravitational collapse, thermonuclear fusion, nova) and evaluate the supporting evidence. 12.F.5b Describe the size and age of the universe and evaluate the supporting evidence (e.g., red-shift, Hubble's constant).

WHY THIS GOAL IS IMPORTANT:

Understanding the nature and practices of science such as ensuring the validity, and replicability, of results, building upon the work of others and recognizing risks involved in experimentation gives learners a useful sense of the scientific enterprise. In addition, the relationships among science, technology and society, give humans the ability, to change and improve their surroundings. Learners who understand this relationship will be able to appreciate the efforts and effects of scientific discovery and applications of technology on their own lives and on the society, in which we live.

MIDDLE/JUNIOR HIGH SCHOOL	EARLY HIGH SCHOOL	LATE HIGH SCHOOL
13.A.38 Identify and reduce potential hazards in science activities (e.g., ventilation, handling chemicals). 13.A.3b Analyze historical and contemporary cases in which the work of science has been affected by both valid and biased scientific practices. 13.A.3c Explain what is similar and different about observational and experimental investigations.	13.A.48 Estimate and suggest ways to reduce the degree of risk involved in science activities. 13.A.4b Assess the validity of scientific data by analyzing the results, sample set, sample size, similar previous experimentation, possible misrepresentation of data presented and potential sources of .error, 13.A.4c Describe how scientific knowledge, explanations and technological designs may change with new information over time (e.g., the understanding of DNA, the design of computers). 13.A.4d Explain how peer review helps to assure the accurate use of data and improves the scientific process.	13.A.58 Design procedures and pOlicies to eliminate or reduce risk in potentially hazardous science activities. 13.A.5b Explain criteria that scientists use to evaluate the validity of scientific claims and theories. 13.A.5c Explain the strengths, weaknesses and uses of research methodologies including observational studies, controlled laboratory experiments, computer modeling and statistical studies. 13.A.5d Explain, using a practical example (e.g., cold fusion), why experimental replication and peer review are essential to scientific claims.
13.B.38 Identify and explain ways that scientific knowledge and economics drive technological development 13.B.3b Identify important contributions to science and technology that have been made by individuals and groups from various cultures. 13.B.3c Describe how occupations use scientific and technological knowTeOge and sl<i1lS. 13.B.3d Analyze the interaction of resource acquisition, technological development and ecosystem impact (e.g., diamond, coal or gold mining; deforestation). 13. B.38 Identify advantages-nd disadvantages of natural resource conservation and management programs. 13.B.31 Apply classroom-developed criteria to determine the effects of poliCies on local science and technology issues (e.g., energy consumption, landfills, water quality).	13.B.48 Compare and contrast scientific inquiry and technological design as pure and applied sciences. 13.B.4b Analyze a particular occupation to identify decisions that may be influenced by a knowledge of science. 13.B.4c Analyze ways that resource management and technology can be used to accommodate population trends. 13.B.4d Analyze local examples of resource use, technology use or conservation programs; document findings; and make recommendations for improvements. 13.B.48 Evaluate claims derived from purported scientific studies used in advertising and marketing strategies.	13.B.58 Analyze challenges created by international competition for increases in scientific knowledge and technological capabilities (e.g., patent issues, industrial espionage, technology obsolescence). 13.B.5b Analyze and describe the processes and effects of scientific and technological breakthroughs. 13.B.5c Design and conduct an environmental impact study, analyze findings and justify, recommendations. 13.B.5d Analyze the costs, benefits and effects of SCientific and technological poricies at the local, state, national and global levels (e.g., genetic research, Internet access). 13.B.58 Assess how scientific and technological progress has affected other fields of study, careers and job markets and aspects of everyday life.

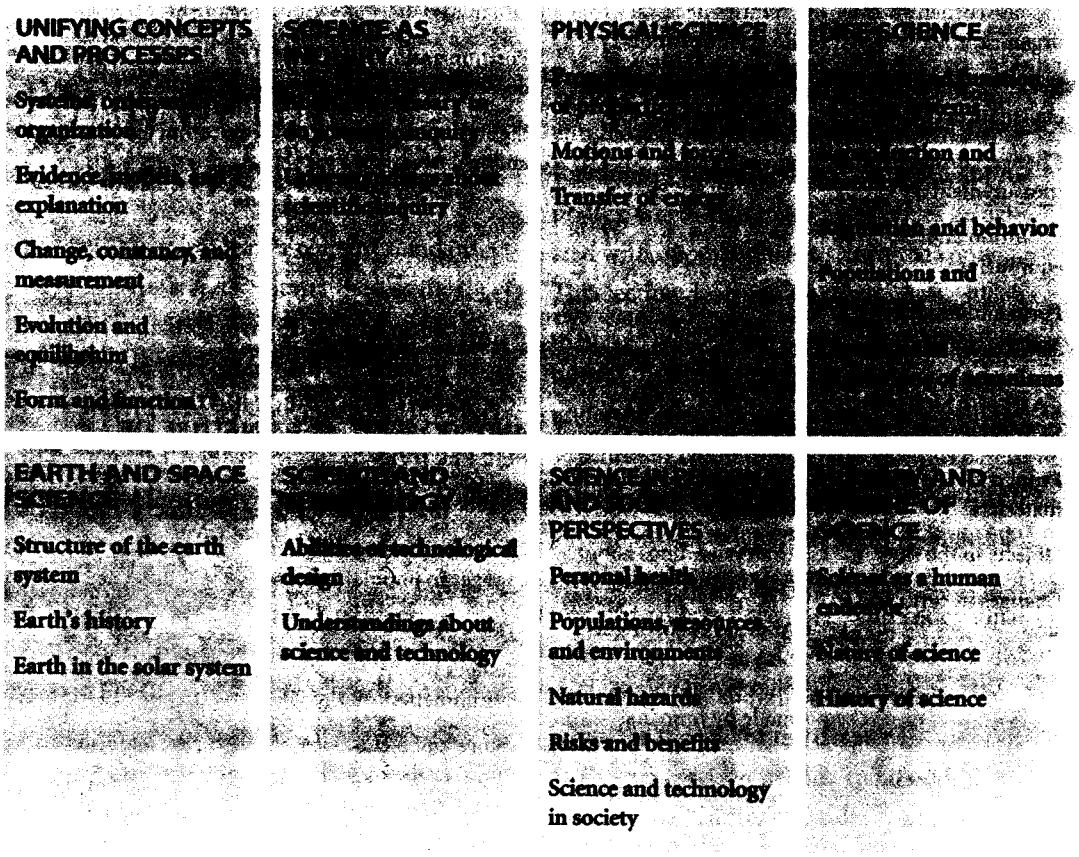
content accurately and appropriately at all grades, with increasing precision and more scientific nomenclature from kindergarten to grade 12.

The second criterion is an obligation to develop content standards that appropriately represent the developmental and learning abilities of students. Organizing principles were selected that express meaningful links to direct student observations of the natural world. The content is aligned with students' ages and stages of development. This criterion includes increasing emphasis on abstract and conceptual understandings as students progress from kindergarten to grade 12.

Tables 6.8, 6.9, and 6.10 display the standards grouped according to grade levels K-4, 5-8, and 9-12, respectively. These tables provide an overview of the standards for elementary-, middle-, and high-school science programs.

The third criterion is an obligation to present standards in a usable form for those who must implement the standards, e.g., curriculum developers, science supervisors, teachers, and other school personnel. The standards need to provide enough breadth of content to define the domains of science, and they need to provide enough depth of content to direct the design of science curricula. The descriptions also need to be understandable by school personnel and to accommodate the structures of elementary, middle, and high schools, as well as the grade levels used in national standards for other disciplines.

TABLE 6.9. CONTENT STANDARDS, GRADES 5-8



RESOURCES

Illinois State Board of Education. Illinois Learning Standards. Springfield, IL: Illinois State Board of Education,, 1997.

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