DOCUMENT RESUME

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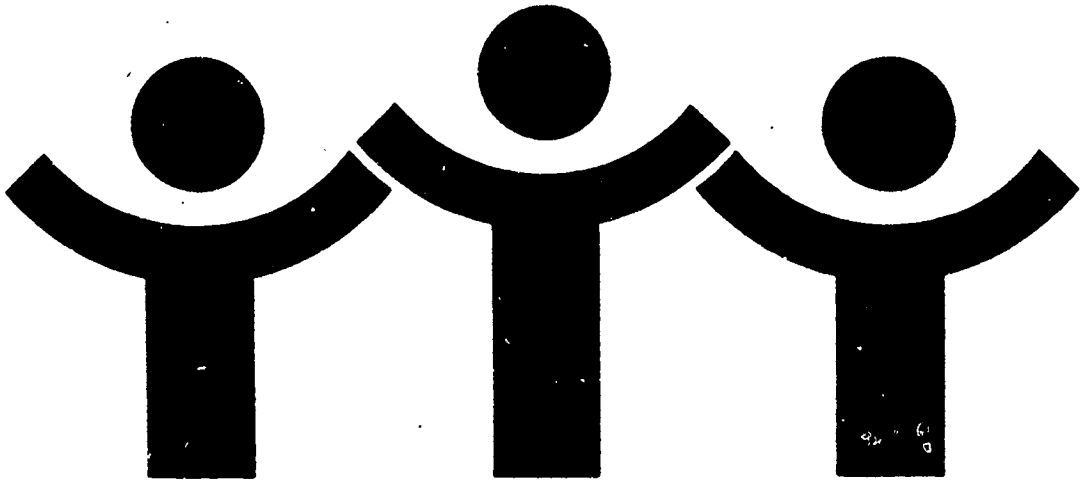
ABSTRACT

One major part of science education is the development and revision of science curriculum. This document presents South-Western City Schools' (Grove City, Ohio) science course of study for grades K-12. It was written and adopted in accordance with the new Ohio Science Model Course of Study. This document delineates the program's philosophy, goals, and objectives. The bulk of the document includes the program scope and sequence for grades K-12. It also contains program assessment policy and procedures, intervention services, learning skills lists, and science education resources. (ZWH)

SCIENCE

Course of Study

Grades K-12



South-Western City Schools
Department of
CURRICULUM and INSTRUCTION

SCIENCE

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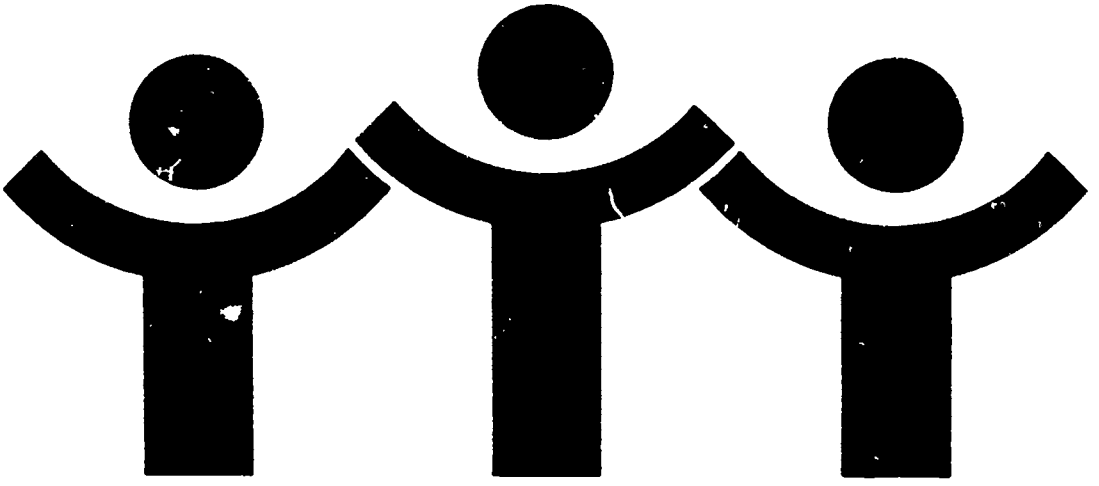

South-Western City Schools
Department of

CURRICULUM and INSTRUCTION

South-Western City Schools
Grove City, Ohio

Science
Course of Study

K - 12

1994

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South-Western City Schools
Grove City, Ohio

SCIENCE COURSE OF STUDY

TABLE OF CONTENTS
K - 12

SOUTH WESTERN CITY SCHOOLS

Curriculum Center
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STATEMENT OF APPROVAL
SOUTH-WESTERN CITY SCHOOLS
BOARD OF EDUCATION

Mrs. Stastyshyn moved the adoption of the following resolution:

WHEREAS, Section 3313.60, Ohio Revised Code, requires boards of education to prescribe a graded course of study for all schools under their control subject to the approval of the State Board of Education, and

WHEREAS, such a graded course of study is an official statement of what shall be taught in the schools of the district and it represents an educational commitment on the part of the Board of Education and the school personnel which approved it, and

BE IT RESOLVED, that this BOARD approve the following courses(s) of study:
SECONDED BY MR HUTCHISON.

SCIENCE, K-12

Roll Call:

Krista Stastyshyn, Aye
Beth Congrove, Aye
Mark Hutchison, Aye
Steven Keil, Aye
William G. McCarty, Aye

Motion Carried

This is to certify that the above information is an excerpt from the official minutes of the South-Western City Board of Education meeting, August 8, 1994

Alan Hutchinson, Treasurer

ACKNOWLEDGMENTS

The design and completion of the Science Course of Study involved a quality process from many teachers across all grade levels and buildings. We wish to acknowledge the dedicated teachers who have given generously of their time, expertise and commitment throughout the development of this document. Without their collective efforts, the task would not have been completed. We thank Mr. James McCormick, Curriculum Director, for empowering the members to become an action team with decision-making authority. We would especially like to recognize Michele Wells, Instructional Leader at Brookpark Middle School and Rob Hall, Science teacher at Grove City High School for their expert contributions as sub-team leaders. Without their help and leadership this document would not have been possible.We wish to thank the following team members for unwavering dedication and innovations during the process of curriculum revision:

Course of Study Team

Elementary Representatives:

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Writing Teams

Working with the Ohio's Model Competency-Based Science Program, American Association for the Advancement of Science (AAAS) Project 2061, National Science Teachers Association (NSTA), Scope, Sequence and Coordination and the South-Western City Schools Science Self-Assessment Report, the following teachers assumed the major writing and editing responsibilities. We wish to thank them for committing their time, talents and knowledge to this process.

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SCIENCE COURSE OF STUDY
K - 12

INTRODUCTION

It is the purpose of this document to compare favorably with the spirit and intent of the Ohio Science Model Course of Study which was adopted by the Ohio Department of Education in 1994. Further, this course of study prescribes the scope and sequence of what shall be taught in the Science curriculum in Kindergarten through twelfth grade throughout the South-Western City School District. The writers of this document spent over two years reviewing major trends and current research in science curriculum, analyzing the Science Self-Assessment Report conducted in 1991, and developing an activity-based program philosophy..

The driving principle in the facilitation and the development of this course of study is the Continuous Quality Improvement (CQI) team concept. This is truly a "quality" document where the stakeholders comprised the action teams and paradigms did not rule the day.

DESCRIPTION OF CONTENTS

The PROGRAM PHILOSOPHY is the driving force behind this document and it stems from the Ohio Science Model Course of Study basic principles of:

- Science is for all students;
- Science content must actively engage learners;
- Science programs that are articulated K - 12;
- Science content is grounded in and connect the three domains of science - life, earth and physical;
- Science programs adequately reflect all four strands of the Model - Scientific Inquiry, Scientific Knowledge, Conditions for Learning Science and Applications for Science Learning;
- Science instructional and performance objectives emphasize thinking and performance skills.

The PROGRAM GOALS and OBJECTIVES were derived from the Ohio Science Model and they adhere to the District Program Philosophy statement. Following this portion can be found the specific grade level or subject INSTRUCTIONAL OBJECTIVES and corresponding PERFORMANCE OBJECTIVES. This format provides the SCOPE AND SEQUENCE, Kindergarten through grade twelve, for the program. The scope and sequence are further reinforced through the PROGRAM THEMES which are major organizing concepts. Thematic organizing concepts are complex scientific ideas that can and should be reinforced at all ages across all science instruction.

A PERFORMANCE OBJECTIVE is designed to provide a benchmark of the student achievement along their progression toward meeting science program goals. Performance objectives are written for all levels in the science course of study. They help to determine the learning activities that will be conducted at each level. Additionally, they also guide the development of classroom-based and district-wide science assessment. Performance objectives are statements of what students know and can do as a result of the science instruction at that level.

Performance objectives all contain a specific description of how students can demonstrate what they know and can do and how a teacher may apply a level of success to their demonstration.

As the Ohio Department of Education progresses with the mandated ability/achievement testing program commencing in 1995, the performance objectives will be correlated with the fourth, sixth, ninth and twelfth grade proficiency tests.

SOUTH-WESTERN CITY SCHOOLS

MISSION STATEMENT

The mission of the South-Western City School District, directed by its commitment to excellence, and in partnership with the community, is to serve the needs of its diverse student population by providing

- ❑ Maximum learning opportunities
- ❑ Quality and visionary instruction
- ❑ A dedicated and knowledgeable staff
- ❑ Sound fiscal management and
- ❑ A safe orderly environment

which will develop citizens possessing useful social, thinking and communications skills, self-esteem, respect for others, and who can continue to learn and adapt to changes in a global society.

PHILOSOPHY OF THE SCIENCE PROGRAM

Using a cross-curricular integrated, sequential program based on hands-on inquiry and content activities, with the aid of up-to-date technology, the science program has a responsibility to develop the student's problem solving skills, content knowledge and the use of scientific processes, so that ALL students develop positive attitudes toward science and an understanding of the interrelationships among science, technology and society. These skills and knowledge will foster more productive citizenship while increasing the potential for life-long learning and responsible decision making.

PROGRAM GOALS

GOAL 1:

To enable students utilizing continual access to state of the art instrumentation, equipment and technology, to understand and engage in scientific inquiry; to develop positive attitudes toward the scientific enterprise; and to make decisions that are evidence-based and reflect a thorough understanding of the interrelationships among science, technology, and society.

OBJECTIVES:

The learner will:

- demonstrate curiosity, open-mindedness, skepticism, and ethical behavior while participating in scientific inquiry;
- develop and use scientific skills, instrumentation, technology, and concepts to explore how the natural world works; and to examine and propose solutions for its problems;
- choose and use developmentally appropriate means for making observations, gathering evidence, presenting the evidence in appropriate formats, performing analyses, drawing inferences, formulating conclusions, and using them to initiate additional investigations and applications;
- formulate questions, hypotheses and models drawing upon developmentally appropriate resources and means, including logic and imagination, and design investigations to test them when the nature of the phenomena permits;
- recognize that scientific knowledge is always open to refinement and can never be declared absolutely certain as demonstrated by the ability and willingness to modify personal insights and understandings in light of additional evidence; and

- engage in personal and group decision-making using risk-benefit analysis about the use of technology to solve problems.

GOAL 2:

To enable students to reflect upon and be able to apply the principles on which the physical universe seems to run; and to describe the relationship between the physical universe and the living environment.

OBJECTIVES:

The learner will:

- investigate and distinguish among the macro and micro components and systems of the universe and explain how they relate to one another;
- explore and explain the fundamental principles governing relationships between and among matter, energy, space, time and the living environment;
- construct and interpret conceptual, physical, and mathematical models to explain the systems and subsystems of the universe; and
- make and act upon evidence-based decisions to ensure a sustainable environment.

GOAL 3:

To enable students to describe the relationship between the earth system and its interacting subsystems which include water, land, air and life, and to make decisions that ensure a sustainable environment.

OBJECTIVES:

The learner will:

- recognize and explain the similarities and differences among organisms in terms of structure, function, and behavior;

- investigate and interpret the causes and the resulting effects of diversity and similarity among existent and extinct organisms through time;
- construct and interpret conceptual, physical, and mathematical models to explain how humans and other species are linked directly or indirectly with each other and in ecosystems;
- investigate and explain how the interaction between physical and biological forces of the Earth and universe affect their lives;
- evaluate how individual and societal decisions about science and technology may impact the environment and survival of all species;
- investigate and explore science careers related to the earth and its subsystems;
- investigate and explain how change through time has and may affect the Earth subsystems; and
- explore, reflect and interpret the Earth and universe as unique, a place of rare beauty and great value which is expressed through literature and the arts.

GOAL 4:

To enable students to analyze the interactions of science and technology in society, in the past, present and future.

OBJECTIVES:

The learner will:

- recognize and respect that scientific inquiry and knowledge represent the accumulated work, over many centuries, of men and women in every part of the world and elaborate how humans have developed their understanding of the universe;
- identify and explain the significance of milestones that define the advancement of scientific inquiry and knowledge;

- recognize and evaluate the impact of scientific inquiry and knowledge on human culture and how human culture impacts scientific inquiry and knowledge;
- investigate topics that relate to science and technology and their relationship to society;
- use current technology in the classroom to conduct scientific investigations; and
- investigate the impact of technology on career choices.

GOAL 5:

To enable students to explore phenomena, make informed decisions, resolve issues, solve problems, and explain how things work by using scientific ideas, themes and processes.

OBJECTIVES:

The learner will:

- identify systems by naming their components and describing their relationships, (e.g. solar systems, ecosystems, organisms, and chemical and physical systems);
- use the concept of systems to organize isolated facts and observations to explain how things work;
- use conceptual, physical, and mathematical models to help explain and explore how things work or might work;
- distinguish and apply the underlying principles and aspects of systems (e.g. stability, equilibrium, conservation, symmetry), to explore phenomena and make decisions; and
- apply patterns of change, (trends, cycles, evolution and chaos), to explore phenomena and make decisions.

PROGRAM THEMES

Patterns of Change

Change is an essential feature of the natural world. It can occur in regular patterns and cycles or it can be irregular. Analyzing changes helps us understand natural systems and, to some degree, respond to and predict changes.

Systems and Interactions

There are many kinds of natural systems - the solar system, an ecosystem, or an individual organism. Once the boundaries of a system have been defined, the system, its parts, and interactions within the system and outside of it can be studied. Because there are so many possible interactions within a system, focusing on one or two aspects of interactions at a time helps keep the information manageable.

Models

Models are often used to think about processes that happen too slowly, too quickly, or on too small a scale to observe directly, or that are too vast to be changed deliberately, or that are potentially dangerous. Different models can be used to represent the same thing. What kind of a model to use and how complex it should be depends on its purpose. The usefulness of a model may be limited if it is too simple or if it is needlessly complicated. Choosing a useful model is one of the instances in which intuition and creativity come into play in science.

Scale

Properties of systems that depend on volume, such as capacity and weight, change out of proportion to properties that depend on area, such as strength or surface processes. As the complexity of any system increases, gaining an understanding of it depends increasingly on summaries, such as averages and ranges, and on descriptions of typical examples of the system. Almost anything has limits on how big or small it can be.

Technology and Society

Technology extends the ability of people to change the world: to cut, shape, or put together materials; to move things from one place to another; and to reach farther with their hands, voices, senses, and minds. The changes may be for survival needs such as food, shelter, and defense, for communication and transportation, or to gain knowledge or express ideas.

Important contributions to the advancement of science, mathematics, and technology have been made by different cultures, genders and races at different times. All technologies have effects other than those intended by the design, some of which may have been predictable and some not. In either case, these side effects may turn out to be unacceptable to some of the population and therefore lead to conflict between groups.

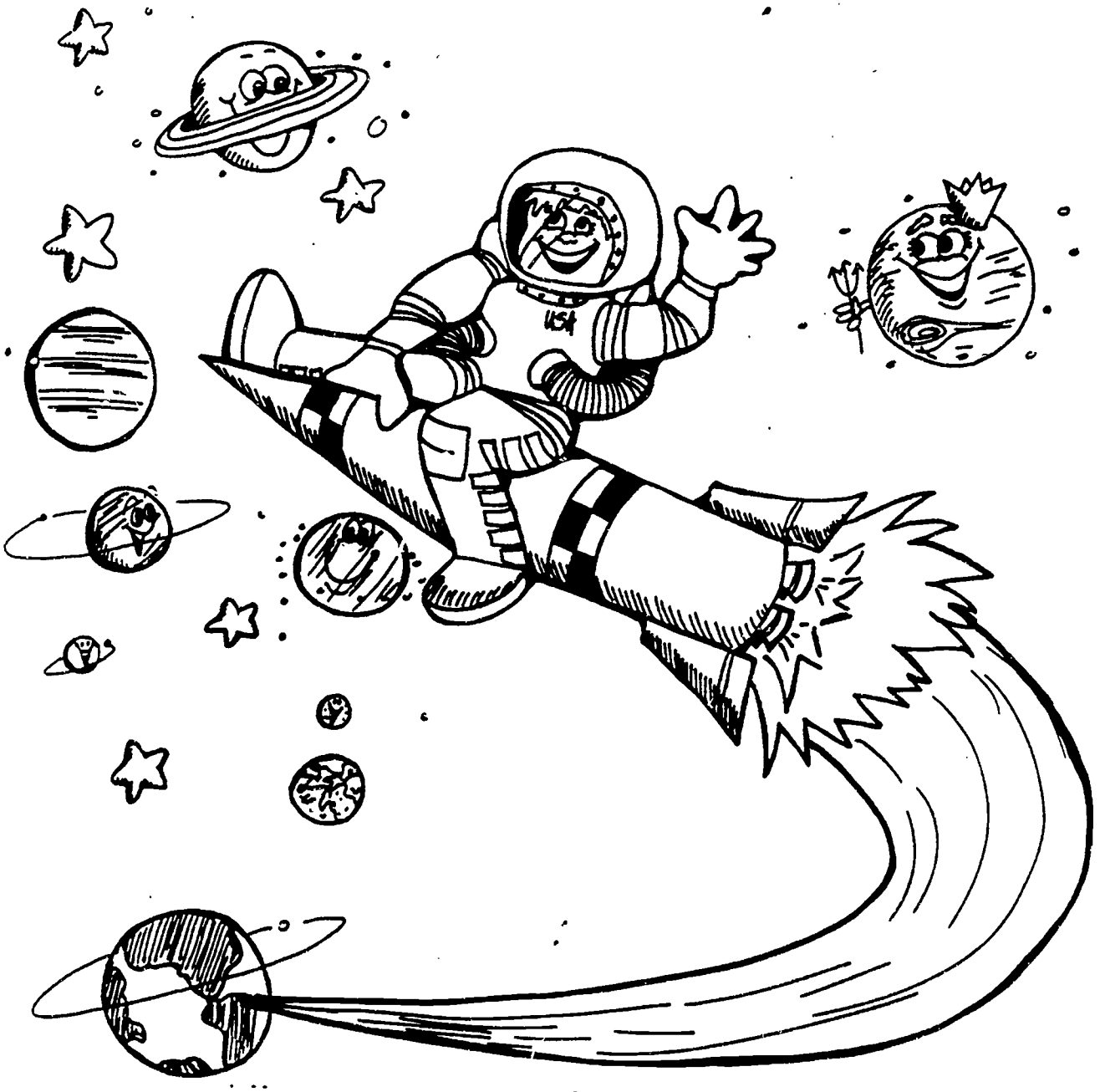
THE SKY'S THE LIMIT!

with SCIENCE

SCOPE AND SEQUENCE - GRADES K - 5

GRADE	INSTRUCTIONAL UNIT	LIFE SCIENCE	EARTH SCIENCE	PHYSICAL SCIENCE
KINDERGARTEN	Plants and Animals	√		
	Seasons		√	
	Environment		√	
	Senses	√		
ONE	Properties of Matter			√
	Wild Animals	√		
	Earth Systems		√	
TWO	Living patterns of Change	√		
	Weather		√	
	Land Changes		√	
THREE	Living Things	√		
	How Things Work			√
	Earth and Its Resources		√	
	Sound Around Us			√
FOUR	The Solar System		√	
	Magnets and Electricity			√
	Waste and Our World		√	
	Growing Up Green	√		
FIVE	What's the Matter			√
	Our Big Wet World		√	
	The Invention Connection			√

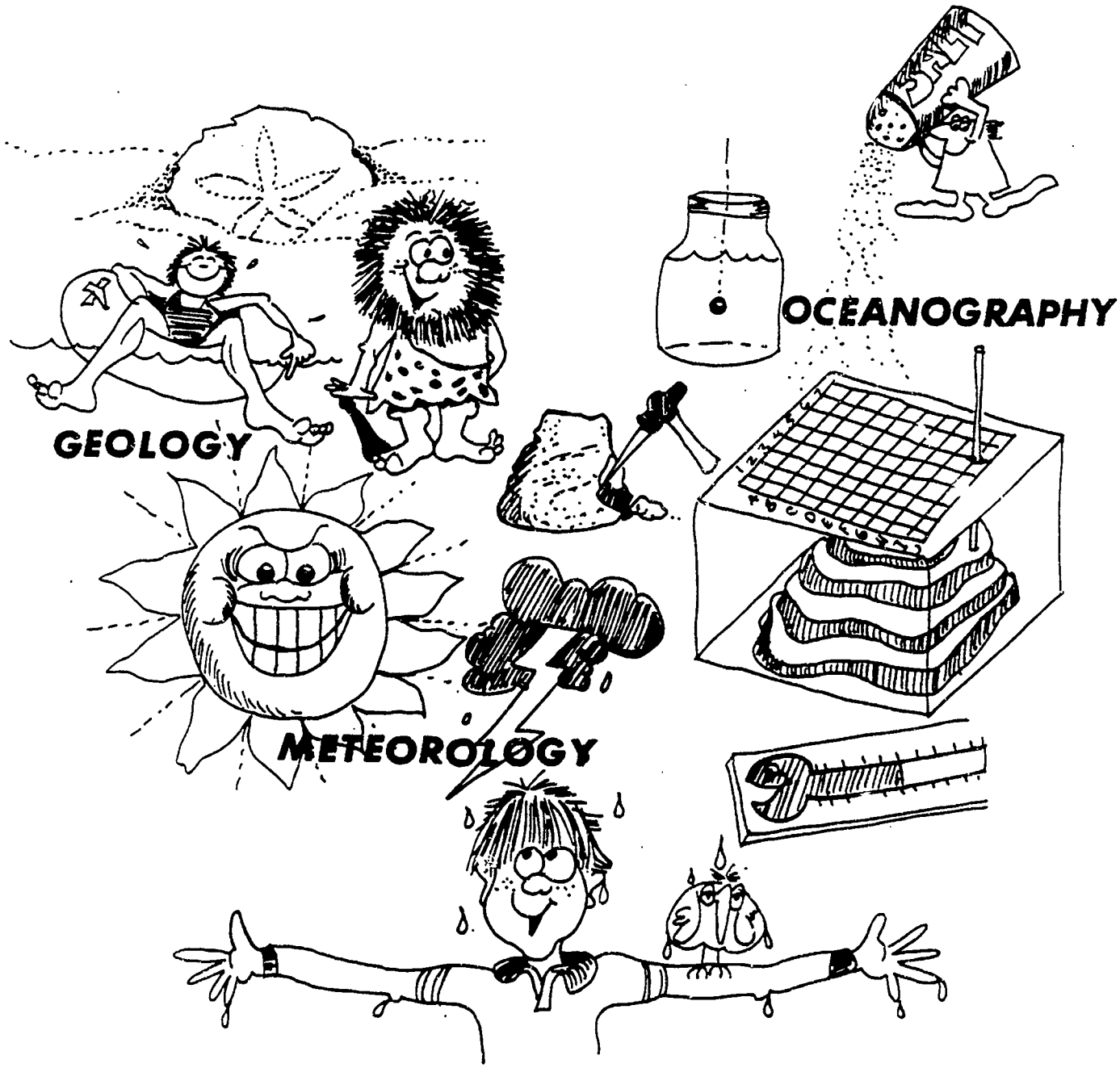
Out of This World



SCOPE AND SEQUENCE - GRADES 6 - 8

GRADE	INSTRUCTIONAL UNIT	LIFE SCIENCE	EARTH SCIENCE	PHYSICAL SCIENCE
SIX *	Space & Aerodynamics			√
	Weather, Climate & Global Climate Change		√	
	Local Organisms	√		
	Ecosystems & Biomes	√	√	
	The Physical World			√
	Science Careers	√	√	√
	Investigation Procedures	√	√	√
SEVEN **	Ecosystem & Biomes	√	√	
	Weather and Climate		√	
	Space & Aerodynamics			√
	The Physical World			√
	Larger Organisms	√		
	Science Careers	√	√	√
	Investigation Procedures	√	√	√
EIGHT ***	Ecosystems & Biomes	√	√	
	The Physical World			√
	Organisms	√		
	The Human Impact	√	√	
	Space & Aerodynamics			√
	Weather, Climate & Global Climate Change		√	
	Science Careers	√	√	√
	Investigation Procedures	√	√	√

* Units approached through a local prospective.
** Units approached through a regional prospective.
*** Units approached through a global prospective.


OCEANOGRAPHY
GEOLOGY
METEOROLOGY

SCOPE AND SEQUENCE - HIGH SCHOOL

COURSE	LIFE SCIENCE	EARTH SCIENCE	PHYSICAL SCIENCE
Integrated Science	√	√	√
Life Science	√		
Biology I	√		
Biology II	√		
Marine Biology	√		
Anatomy and Physiology	√		
Physiology of Sports Science	√		
Applied Biology/Chemistry	√		√
Chemistry I			√
Accelerated Chemistry I			√
Chemistry II			√
Advanced Placement Chemistry			√
Conceptual Physics			√
Physics I			√
Advanced Placement Physics			√
Earth Science		√	
Astronomy		√	

INSTRUCTIONAL OBJECTIVES	THEME
1.0 INSTRUCTIONAL UNIT: PLANTS AND ANIMALS	
1.1 Using a wide variety of plants/animals commonly found in Ohio, the learner will observe, compare and report their observations of the attributes, actions and changes in plants/animals in relationship to their world around them.	Patterns of Change
1.2 Working collaboratively, the learner will sort and classify common living organisms according to observed similarities and differences and describe these observations in relationship to their own self.	Scale
1.3 By observing a variety of common plants/animals over an extended period of time, the learner will explore observable patterns of size and height and report their observations using nonstandard units developed by the learner.	Scale
1.4 Using materials available in central Ohio, the learner will develop a societal responsibility in learning how to care for living plants in the classroom and at home through hands-on planting activities.	Systems & Interactions
1.5 Exploring a wide variety of domestic animals, the learner will discuss ways to take responsibility for the animals' care in the child's immediate and extended environment.	Systems & Interactions

INSTRUCTIONAL OBJECTIVES	THEME
2.0 INSTRUCTIONAL UNIT: SEASONS	
2.1 By repeating observations over extended periods of time, the learner will explore the passage of time by the sequencing of events in their daily lives.	Patterns of Change
2.2 Using a variety of groupings, the learner will explore observable day/night patterns in their daily lives by making multiple observations of the events and report these observations through discussions, or visual representations.	Patterns of Change
2.3 By making observations over an extended period of time, the learner will visually and orally describe seasonal patterns and changes in the environment by reflecting upon differences that have occurred in their daily lives.	Patterns of Change
2.4 Using information obtained through extended observations, the learner will investigate the relationship between seasonal changes and their effects on the learner or other organisr by performing various activities based on local environmental conditions.	Systems and Interactions

INSTRUCTIONAL OBJECTIVES	THEME
3.0 INSTRUCTIONAL UNIT: ENVIRONMENT	
3.1 Working in small and large groups, the learner will explore the natural resources in his/her environment by examining their existing knowledge by answering 'How do we know?' questions about basic environmental relationships.	Systems and Interactions
3.2 Sharing ideas and impressions while observing a variety of local resources, the learner will explore environmental resources by describing and grouping objects by similarity and difference patterns developed by the learner.	Scale
3.3 Using a variety of groupings, the learner will investigate ways to personally take responsibility for using resources efficiently through exploring the ideas of reducing, reusing and recycling trash found within the home, school and outdoor environments.	Technology and Society
4.0 INSTRUCTIONAL UNIT: SENSES	
4.1 Using their senses and related body parts, the learner will explore sensory-based descriptions of the world around them while making multiple observations using their five senses.	Systems and Interactions
4.2 Using information gathered from previous observations, the learner will discover how their senses help them make decisions and safe choices related to their well being.	Systems and Interactions

SCIENCE COURSE OF STUDY

GRADE: KINDERGARTEN

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
1. The learner will use his/her senses to collect information and describe several objects.	4.1, 4.2
2. The learner will observe and describe a familiar physical change.	1.1, 2.1, 2.2, 2.3
3. Given a set of familiar objects the learner will sort the objects into groups and describe what is similar and different in the groups.	1.2, 3.2
4. Given a set of pictures that tell a story, the learner will demonstrate understanding of observable patterns by explaining the meaning and sequence of the pictures.	1.3, 2.1
5. The learner will demonstrate an awareness of changes over time by describing an event or process that he/she has observed.	1.1, 1.3, 2.1, 2.3, 2.4
6. The learner will observe and describe familiar patterns and cycles.	1.1, 2.1, 2.2, 2.3
7. The learner will state/explain the seasonal differences and their effects on living organisms.	2.1, 2.2, 2.3, 2.4
8. The learner will observe a living organism and discuss what the organisms need to live.	1.4, 1.5
9. The learner will construct a recognizable simple model of a real object using familiar materials.	1.3, 2.2, 3.2
10. Given several similar items which vary in size, the learner will contrast the objects using the terms long/short, big/small and others.	1.2, 1.3

	PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
11.	Given a toy or model which represents a real object or organism, the learner will describe the differences between the toy or model and the real thing.	1.1, 1.2
12.	The learner will listen to a variety of literature relating to science topics and participate in story extensions.	All
13.	When presented with a new situation, the learner will ask "What if . . ." and "Why . . ." questions related to his or her understanding of the scientific concept in the situation.	All
14.	The learner will make accurate observations about familiar and/or unfamiliar objects or situations.	All
15.	The learner will participate in a project to help protect or preserve the environment.	3.1, 3.2, 3.3
16.	Using experiences gained through activities using the senses, the learner will participate in constructing a "Safety Sense" collage.	4.1, 4.2
17.	When presented with a variety of danger alerting warnings (e.g. sirens, traffic lights, signs), the learner will describe how their senses help them make decisions and safe choices.	4.1, 4.2

INSTRUCTIONAL OBJECTIVES	THEME
1.0 INSTRUCTIONAL UNIT: PROPERTIES OF MATTER	
1.1 **After observing a physical change (i.e. melting ice, steam), the learner will pose 'How do we know. . .' questions and propose explanations regarding their observations in relationship to their own experiences.**	Systems and Interactions
1.2 **After completing investigations involving a physical or chemical change (i.e. evaporation, static electricity), the learner will explore questions of 'Why?' and 'How do we know?' and 'What if . . .?' concerning the observed changes and relate this knowledge to their own experiences.**	Patterns of Change
1.3 **By gathering information from a variety of sources, the learners will explore by investigating and measuring the different factors (i.e. temperature, precipitation, wind chill) that affects the change in the attributes of matter over time through selected topics of the learner's personal interest.**	Patterns of Change

33

33

INSTRUCTIONAL OBJECTIVES	THEME
2.0 INSTRUCTIONAL UNIT: WILD ANIMALS	
2.1 Contributing in a variety of ways in small and large group activities, the learners will explore and make decisions concerning their own animal classification schemes based on observational comparisons and relate this scheme to the learner's personal experiences.	Models
2.2 Seeking information from a variety of multi-media sources, the learners will determine the validity of information contained in these materials (i.e. fact/fiction) based upon the learner's questions and personal observations of the similarities and differences of animals.	Models
2.3 Using resource persons, places, and a variety of materials, learners will investigate and analyze both the validity and appropriateness of animal classifications as related to past and present environmental conditions (i.e. endangered species) in relationship to the learner's personal experiences.	Systems and Interactions

INSTRUCTIONAL OBJECTIVES	THEME
3.0 INSTRUCTIONAL UNIT: EARTH SYSTEMS	
3.1 Utilizing their five senses to make multiple observations, the learner will explore and describe the physical properties of large and small objects in the environment and determine appropriate use practices.	Technology and Society
3.2 Using a variety of research groupings and a variety of related materials, the learner will collect and organize data concerning local natural phenomena and discuss with others its effects on the earth, including the learner's personal habitat, over a period of time.	Systems and Interactions
3.3 Given a variety of sources, the learners will explore different factors that affect changes on earth and the learner's world by testing, redesigning and repeating their ideas and investigations using physical materials and models.	Patterns of Change

SCIENCE COURSE OF STUDY

GRADE: ONE

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
1. Given a situation in which a physical change is evident, the learner will observe and describe the physical change.	1.1, 1.2
2. The learner will follow a simple set of instructions to construct a useful item.	3.3
3. Given a set of familiar objects, the learner will design and describe categories and use them to organize the set.	2.1, 2.2, 2.3, 3.1
4. Presented with unfamiliar situations or phenomena, the learner will ask questions related to cause and effect.	1.1, 1.2, 1.3, 3.2, 3.3
5. Given a familiar but unordered sequence of pictures that represent a physical change, the learner will describe the sequence using terms such as before, during, and after.	1.2, 3.2
6. The learner will use a classification system that he/she has previously developed to classify a new set of items, citing modifications of the systems as necessary.	2.1, 2.2, 2.3, 3.1
7. The learner will observe events in which the causes of the effects are not observable (e.g., wind), and ask questions about their effects.	1.1, 1.2, 1.3, 3.2
8. Given a simple question regarding natural phenomena, the learner will suggest several places to find information that may lead to answers to the questions.	1.1, 1.2, 1.3, 2.1, 2.2, 2.3, 3.2, 3.3
9. Provided with a familiar organism, the learner will describe or draw a picture of a simple home for the organism and describe its contributions to meeting the needs of the organism.	2.3, 3.1
10. Provided with a familiar object, the learner will describe the potential safe uses of the object.	2.3, 3.1

SCIENCE COURSE OF STUDY

GRADE: ONE

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
11. The learner will observe a living organism and discuss what the organism needs to live.	2.1, 2.2, 2.3
12. The learner will demonstrate an awareness of change over time by describing an event or process that he/she observed.	1.3, 2.3, 3.2
13. When presented with a new situation or phenomena, the learner will ask, "What if . . ." and "Why . . ." questions related to his/her understanding of the scientific concept in the situation.	1.2, 3.2
14. The learner will use an electronic instrument to record an event.	1.3

INSTRUCTIONAL OBJECTIVES	THEME
1.0 INSTRUCTIONAL UNIT: LIVING PATTERNS OF CHANGE	
1.1 Using diverse resources, the learner will ask "Why" living things need many kinds of survival techniques, identify different developmental stages of life, explore organisms that share indoor and outdoor environments in relationship to the learner's experiences and report information obtained through various methods.	Systems and Interactions
1.2 Working in small/large groups, the learner will use many strategies to resolve issues involving organisms and objects and how they react to changing conditions in their environment, presenting their personal hypothesis in various ways, including peer reporting.	Patterns of Change
1.3 Using multiple procedures, the students will design, conduct, and test explorations that show cause and effect relationships and interactions between living organisms, objects, and changing conditions around them, thus learning care for living organisms.	Systems and Interactions

INSTRUCTIONAL OBJECTIVES	THEME
2.0 INSTRUCTIONAL UNIT: WEATHER	
2.1 Using a cross-curricular approach, the learner will explore ways in which organisms react to changing weather conditions, then use a variety of media to search for information which they can share in many ways in both large and small group activities while leading them to make personal choices regarding personal health and safety based on changing conditions.	Systems and Interactions
2.2 Using a variety of groupings, the learner will investigate the impacts of the water cycle on the earth for the purpose of empowering students to make wise choices for themselves in their community (i.e. erosion, plant life, agriculture, flooding).	Scale
2.3 Using a cross-curricular approach focusing on the water cycle, the learner will explore the dependence of living things on water while conducting investigations to discover the properties and uses of water while allowing them to make personal choices regarding waters use and conservation.	Systems and Interactions

INSTRUCTIONAL OBJECTIVES	THEME
3.0 INSTRUCTIONAL UNIT: LAND CHANGES	
3.1 Reflecting upon available information accessed through various technologies and using a cross-curricular approach, the learner will describe simple cause and effect relationships regarding land changes, including local examples known to the learner, to identify a sequence of events that have occurred over time.	Patterns of Change
3.2 Utilizing community resource people or other sources, the learner will, through measurement and observations, use various scales and technological devices to estimate and compare the duration of natural events and the sizes of geological objects in relationship to the learner's habitat.	Scale
3.3 Through small/large groups, the learner will construct and model representations of cause/effect relationships of earth changes, such as the Darby Creek or another ecosystem known to the learner, that illustrate how organisms and objects react to changing conditions.	Model
3.4 Through cross-curricular activities and by reflecting on prior knowledge of the earth processes and their affects on the habitat (i.e. earthquake zones, flood plains), the learner will explore the varied needs of living things to determine why certain choices regarding lifestyles are made and to reflect these choices into the learner's own situation.	Systems and Interactions

SCIENCE COURSE OF STUDY

GRADE: TWO

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
1. The learner will observe living organisms (animals or plants) in the classroom and make several predictions related to their behavior or response to stimulus.	1.1, 1.2, 1.3, 2.1, 2.3, 3.3
2. Given the results of a simple investigation, the learner will suggest several new questions to investigate.	1.1, 1.2, 1.3, 2.2
3. The learner will discuss the basic needs of living things and describe the ways that organisms meet these needs.	1.1, 1.2, 1.3, 2.1, 2.3, 3.4
4. Given a season of the year or local weather conditions, the learner will predict how different organisms will react.	1.2, 1.3, 2.1, 2.2, 2.3
5. The learner will decide what information is necessary to make a simple weather report, collect the information, and make the report.	2.2
6. Given a variety of scales, the learner will select and use the appropriate scale for the activity.	2.2, 3.2
7. Shown a natural event, the learner will ask several questions related to what happened and what may have caused it to occur.	1.1, 1.2, 2.2, 3.1
8. The learner will use an instrument to record an event.	2.2, 3.2, 3.3

	PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
9.	The learner will select and use appropriate materials and tools to construct a useful device.	2.2
10.	The learner will compare the mass, dimensions, and volume of familiar objects and organisms using non-standard measures.	2.2, 3.2
11.	The learner will demonstrate an awareness of changes over time by modeling an event or process that has occurred.	1.1, 1.3, 2.2, 3.1, 3.3
12.	Given a familiar but unordered sequence of pictures that represent a physical change, the learner will describe the sequence using appropriate terms.	1.1, 3.1
13.	Provided with a familiar organism, the learner will describe/design/construct a simple home for the organism and describe its contributions to meeting the needs of the organisms.	1.3, 2.1, 3.3
14.	The learner will describe an episode (i.e., ages of the earth, life cycles) in terms of its duration and timing.	1.1, 3.1, 3.2

INSTRUCTIONAL OBJECTIVES	THEME
1.0 INSTRUCTIONAL UNIT: LIVING THINGS	
1.1 In large or small group settings, the learner will explore the ways in which living things maintain life by depending on each other and on the physical environment by reporting their findings through various methods (lists, illustrations, models, role playing. . .) and relate the information to the learner's environment.	Systems and Interactions
1.2 By participating in the selection of topics of personal interest, the learner will explore identifying and classify the way living things are adapted to their diverse environments and report their finding using a variety of methods.	Systems and Interactions
1.3 Working collaboratively, the learner will investigate the ways in which humans in various ways affect diverse habitats, including the learner's own situation, and collectively present/display their findings.	Systems and Interactions

INSTRUCTIONAL OBJECTIVES	THEME
2.0 INSTRUCTIONAL UNIT: HOW THINGS WORK	
2.1 Participating in individual and group settings, the learner through exploration will identify the use and purpose of machines in everyday life through models while relating the models to the function of common machines known to the learner.	Models
2.2 Through hands on experiences, the learner will explore the construction of simple and compound machines including ones known by the learner, discover the machine's functions and document their findings in a variety of ways (i.e. graphs, sketches, journals. . .).	Systems and Interactions
2.3 Using a cross-curricular approach, the learner will investigate how machines continually change by comparing, contrasting, and hypothesizing on these changes, report their investigations through various methods, and relate these ideas to the learner's daily life.	Patterns of Change

INSTRUCTIONAL OBJECTIVES	THEME
3.0 INSTRUCTIONAL UNIT: EARTH AND ITS RESOURCES	
3.1 The learner will use mathematics and language arts as tools to investigate and report the properties of rocks using a collection gathered by the learner from their own environment.	Scale
3.2 Using a variety of representational materials used in small and large group settings, the learner will explore and research how the earth's resources have changed and evolved through time especially in relationship to the learner's lifetime.	Patterns of Change
3.3 The learner will search for information from multiple sources to investigate the contributions of earth's resources to our society and how it affects the learner's daily life and environmental conditions.	Technology and Society
3.4 The learner will seek evidence to evaluate current environmental issues in order to make and act upon evidence-based decisions which will help to ensure a sustainable environment for the learner and their extended family.	Technology and Society

INSTRUCTIONAL OBJECTIVES	THEME
4.0 INSTRUCTIONAL UNIT: THE SOUND AROUND US	
4.1 Through hands-on experiences, the learner will investigate sound; how it's produced, how it travels, and how it can vary in pitch and volume, report theirs results using various methods and relate their investigations to the learner's everyday experiences.	Scale
4.2 By exploring indoor and outdoor environments and the sounds around them, the learner will explain and discuss the various influences sound has on the survival of living things and allow the learner to apply this knowledge to their personal safety.	Systems and Interactions
4.3 In a collaborative setting, the learner will explore, by using community resources, various technological devices which help people to communicate by sound (i.e. hearing aids, megaphone) and to identify these devices in the learner's extended surroundings.	Technology and Society

SCIENCE COURSE OF STUDY

GRADE: THREE

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
1. Given a diverse collection of living and non-living things, the learner will distinguish between living and non-living things and provide justification for this classification.	1.1, 1.2, 2.1
2. The learner will discuss the basic needs of living things and describe the ways that organisms meet these needs.	1.1, 1.2, 1.3
3. The learner will discuss the impact of human activity in selected natural environments.	1.1, 1.2, 1.3, 2.3, 3.3, 3.4
4. Provided with a suggested familiar organism the learner will describe, draw a picture of, or create a model of a simple home for the organism and describe its contributions to meeting the needs of that organism.	1.1, 1.2
5. The learner will identify a community problem (i.e. recycling, endangered animals/plants, habitat destruction, pollution) and propose a solution to that problem using information collected to support that proposal.	1.3, 2.3, 3.3, 3.4, 4.2
6. Shown a natural event (i.e. sound waves, food chain, rock formation, earth's resources), the learner will ask several questions related to what happened and what may have caused it to occur.	1.1, 1.2, 3.1, 3.2, 3.4, 4.1, 4.2
7. Given data from a simple mechanical or biological system (i.e. simple machine, habitat, ecosystem, sound waves), the learner will describe how changing one component impacts the other components of the system.	1.1, 1.2, 1.3, 2.1, 2.2, 2.3, 3.2, 3.4, 4.1, 4.2
8. Given several opportunities to investigate and observe, the learner will use both quantitative and qualitative descriptions to explain the attributes and behaviors of an object or organism (i.e. properties of rocks/minerals, patterns of sound, habitats, simple machines).	1.1, 1.2, 1.3, 2.1, 2.2, 2.3, 3.1, 4.1, 4.2
9. Given a collection of working devices, the learner will explain the function of a selected device and comment on its use.	2.1, 2.2, 2.3, 4.3

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
10. Given the results of a simple investigation, the learner will suggest several new questions to investigate.	1.1, 1.2, 1.3, 2.1, 2.2, 3.1, 3.2, 3.3, 3.4, 4.1, 4.2
11. The learner will select and use appropriate materials to construct a model using at least one simple machine.	2.1, 2.2
12. The learner will use the scientific method to carry out an investigation (i.e. the effects of gravity, friction, increased mass, height of an incline on different surfaces, pitch, volume, frequency of sounds) on an object.	2.1, 2.2, 4.1, 4.2

INSTRUCTIONAL OBJECTIVES	THEME
1.0 INSTRUCTIONAL UNIT: THE SOLAR SYSTEM	
1.1 The learner will participate in group investigations to explore the properties of the sun and its impact and importance in the learner's daily life and they will communicate their findings through various methods to their classmates.	Systems and Interactions
1.2 Individually and collaboratively, the learner will compare and contrast the properties of members of our solar system (i.e. planets, comets, asteroids, etc.) with those of the Earth and share results through the construction and interpretation of models or other visual representations in order to gain insight into the learner's unique world.	Models
1.3 In research groups, the learner will investigate the Earth's position within the solar system, consider its unique ability to support life, and then hypothesize and generalize conditions necessary for life on other members of the solar system as envisioned by the learner.	Systems and Interactions
1.4 Using community resources (i.e. organizations, publications and sites of educational value), the learner will participate in individual and group to explore and investigate technological advances in space exploration to gain an insight into the value of space exploration and the world's finite resources.	Technology and Society

INSTRUCTIONAL OBJECTIVES	THEME
2.0 INSTRUCTIONAL UNIT: MAGNETS & ELECTRICITY	
2.1 The learner will work in small groups to investigate the behavior of common household/industrial magnets/magnetic fields found in the learner's habitat and the learner will use a variety of representations to analyze the usefulness of these objects.	Patterns of Change
2.2 The learner will explore the limitations and usefulness of various magnets/magnetic fields known to the learner by spending time examining magnets inside and outside of the classroom and formulating explanations and inferences on the verifiable data.	Systems and Interactions
2.3 The learner will investigate electricity as a form of energy using caution and demonstrating care and concern for oneself, classmates, equipment, and the environment when making observations, conducting experiments and participating in cooperative groups.	Models
2.4 The learner will investigate the transmission of and conservation of electricity by accepting and generalizing results of investigations based upon repeated observations from multiple sources, and then describe investigative findings through the evidence to their classmates.	Systems and Interactions
2.5 In a variety of groupings or independently, the learner will use the inquiry process to solve problems of personal interest (i.e. static electricity build-up) that can be addressed scientifically by listening to, reflecting upon, and discussing the ideas and expressions of others through six key questions: 1. What do you think will happen? 2. What actually happened? 3. How did it happen? 4. Why did this happen? 5. How can we find out which of these hypotheses is the most reasonable? 6. How can you relate the investigation to your daily life?	Systems and Interactions

INSTRUCTIONAL OBJECTIVES	THEME
3.0 INSTRUCTIONAL UNIT: WASTE AND OUR WORLD	
3.1 Using a variety of media to search for information, the learner will work collaboratively to explore the impact of waste and biodegradable materials upon his/her daily life and propose creative solutions for waste management to their classmates.	Systems and Interactions
3.2 The learner will participate in research groups to investigate conservation (i.e. limiting usage, recycling) problems and solutions in their home, school and community and report findings (i.e. graphs, charts, visual representations).	Models
3.3 The learner will participate in individual and/or group design to investigate his/her changing roles as producers, consumers, and decomposers and practice appropriate conservation methods (i.e. waste disposal).	Systems and Interactions

INSTRUCTIONAL OBJECTIVES	THEME
4.0 INSTRUCTIONAL UNIT: GROWING UP GREEN	
4.1 The learner will work in cooperative groups to explore pollination as a growth process through observation of local garden flowers, to report information visually and relate the explorations to their home situations.	Patterns of Change
4.2 The learner will work in small groups to explore plant classification characteristics through observation of plant groups both in the learner's home and school habitat and report these characteristics by sketching, drawing, or displays.	Systems and Interactions
4.3 In small groups learners will work together to explore the different conditions that affect plant germination through personal observations of seed growth, explain the changes observed through written and visual reports and relate these concepts to their personal experiences.	Patterns of Change
4.4 Based on personal experiences, the learner will explore in small groups the uses of plant parts for food (i.e. edible fruits and vegetables), through identification and visual descriptions and report their inquiries using a variety of media in various settings.	Systems and Interactions
4.5 Learners in small groups will explore through activities the impact of light as a factor of photosynthesis and observe at least two ways they benefit from the process through caring for plants.	Systems and Interactions
4.6 In collaborative groups the learner will explore through hands-on experience the parts of a flower and compare reproductive similarities to other living organisms they are familiar with (i.e. human, animals) through identifying, modeling, and labeling the information.	Systems and Interactions

SCIENCE COURSE OF STUDY

GRADE: FOUR

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
1. The learner will create and follow a simple procedure to carry out an investigation.	all
2. Given a collection of electrical working devices (e.g. low voltage electrical circuit components), the learner will explain the function of a selected device and comment on its safe use.	2.1, 2.2, 2.3, 2.4
3. Given a diverse but familiar set of objects (e.g. magnetized/non-magnetized objects, conductors/insulators), the learner will prepare a simple key for another learner to use to distinguish between objects in the set.	2.1, 2.2, 2.3, 2.4, 4.2, 4.6
4. The learner will propose reasons why observations made by another learner may be different from his/hers.	1.2, 1.3, 2.4, 2.5, 4.3, 4.4, 4.6
5. Given a set of objects or observations, the learner will construct a graphic representation and use it to make simple comparisons.	1.1, 1.2, 2.1, 3.2, 4.1, 4.4, 4.6
6. Given a set of related events, the learner will analyze the series and predict the next likely event.	1.3, 1.4, 2.2, 2.4, 2.5, 3.1, 3.2, 3.3, 4.3, 4.5
7. The learner will discuss the impact of human activity in selected natural environments.	1.3, 1.4, 3.1, 3.2, 3.3, 4.4, 4.5, 4.6

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
8. The learner will demonstrate a basic understanding of the forces of the earth (e.g. electricity, magnetism, gravity, etc.) by constructing a model to communicate these understandings.	1.1, 1.2, 1.3, 2.3
9. The learner will describe the duration and timing of observed patterns when given a repetitive pattern found in nature (e.g. rotations/revolutions of the planets, moon phases, etc.).	1.1, 1.3, 2.1
10. The learner will design a project for presentation (e.g. oral, poster/bulletin board/hallway displays, etc.) that will lead to an understanding of the effects of human activity in selected natural environments (e.g. waste in our world).	3.1, 3.2, 4.6
11. The learner will identify a societal problem (e.g. increasing waste disposal problems, etc.) and propose a solution to that problem using a variety of collection methods to support the learner's proposal.	3.1, 3.3

INSTRUCTIONAL OBJECTIVES	THEME
1.0 INSTRUCTIONAL UNIT: WHAT'S THE MATTER?	
1.1 In a variety of groupings, the learner will analyze "How do you know?" inquiries by formulating and investigating reasonable "What might happen if. . .?" questions concerning matter within the learner's everyday experiences while, during learning activities, working toward resolution of disagreements.	Systems and Interactions
1.2 Through individual or group explorations, the learner will design, describe and carry out investigations demonstrating use of the Scientific Method to answer simple questions posed by the teacher or peers while making connections to everyday decisions.	Models
1.3 Using scientific processes on a sample collection, the learner will investigate matter to determine its various properties by using the appropriate senses to make observations and measurements on the samples and to extend the process to a learner collected set.	Systems and Interactions
1.4 Through the use of models, multimedia and/or technologies, the learner will investigate the composition and level of organization of objects and/or living and non-living organisms (i.e. crystals, elements, microorganisms, atoms, compounds) and relate their investigations to the learner's extended environment.	Models
1.5 The learner will accurately report findings, using the journal format, of the variability of observations while engaged in scientific inquiry (controlled experiments and natural occurring events).	Systems and Interactions
1.6 Throughout all investigations, each learner will take responsibility for the proper care of supplies and equipment used in investigations to ensure the safety and well-being of all students.	Technology and Society

INSTRUCTIONAL OBJECTIVES	THEME
2.0 INSTRUCTIONAL UNIT: OUR BIG WET WORLD	
2.1 Through collaborative exploration, the learner will perceive and describe the complex structure of H_2O using available technologies (microscopes, hand lens, etc.) and relate this exploration to the learner's world.	Systems and Interactions
2.2 Using a variety of groupings, the learner will investigate the impacts of the water cycle on the earth for the purpose of empowering students to make wise choices for themselves in their community (i.e. erosion, plant life, agriculture, flooding).	Systems and Interactions
2.3 The learner will examine and refine their personal role in the global community by investigating the impact of man's choices concerning his ecological systems (i.e. pollution, conservation, acid rain).	Technology and Society
2.4 Through group or individual exploration, the learner will investigate the interdependence of living things and their environment to propose solutions to existing environmental issues which affect the learner's daily life.	Systems and Interactions
2.5 The learner will use tools, instruments, community resources and devices to contribute to maintaining the learner's safe, healthful, and efficient environment.	Technology and Society

INSTRUCTIONAL OBJECTIVES	THEME
3.0 INSTRUCTIONAL UNIT: THE INVENTION CONVENTION	
3.1 Independently or in small groups, learners will investigate the history of various techniques and technologies evaluating their impact on society (i.e. inventors and inventions) and the learner.	Technology and Society
3.2 Through participating in class experiments, the learner will investigate the transmission and conservation of various forms of energy through simple systems (i.e. simple objects and machines) and find examples in their everyday lives.	Systems and Interactions
3.3 Through group or independent explorations, the learner will undertake in the assembly, disassembly and/or modification of existing mechanism of the learner's choice and relate their findings to another invention.	Models
3.4 The learners will collaborate to identify existing local problems known to the learner to invent alternative solutions to the problem and evaluate their economic and/or environmental impact on the learner's future.	Technology and Society
3.5 In a variety of groupings, the learner will design and construct a simple invention of their choice and describe the invention by producing a portfolio of the entire process.	Models

SCIENCE COURSE OF STUDY

GRADE: FIVE

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
1. Using sense-extending devices (e.g. magnifying lenses, microphones) and models, the learner will describe an object or organism observed in terms of it's attributes and behaviors.	1.3, 1.4, 1.6, 2.1
2. Given data from a simple mechanical or biological system, the learner will describe how changing one component impacts the other components of the system.	1.1, 1.2, 1.3, 1.5, 1.6, 2.1, 2.3, 2.4, 2.5, 3.4
3. The learner will propose "What if. . .?" questions regarding a simple physical change, design and test his/her questions, and cite and justify appropriate safety precautions.	1.1, 1.2, 1.3, 1.5, 1.6, 2.1, 2.2, 2.3, 2.4, 3.4, 3.5
4. The learner will choose a simple technological device and describe the advantages and disadvantages to the user.	1.1, 1.4, 1.6, 2.1, 3.1, 3.3
5. The learner will choose and use appropriate tools to assemble and disassemble a simple mechanism or model.	1.4, 1.6, 3.3, 3.5
6. The learner will trace the transmission, transformation, and conservation of various forms of energy in a simple system (e.g. bicycle, kite, scissors).	1.1, 1.4, 1.6, 3.2
7. Using a variety of collection methods the learner will propose and defend a possible solution for an environmental concern.	1.1, 1.2, 1.5, 1.6, 2.2, 2.3, 2.4, 2.5, 3.1, 3.4, 3.5

SCIENCE COURSE OF STUDY

GRADE: FIVE

	PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
8.	The learner will demonstrate an understanding of the role of technology in the study of science by properly using various types of technology to collect, analyze and communicate information.	All
9.	The learner will propose a question, design and carry out an investigation that demonstrates use of the scientific method, and form an evidence based conclusion to be shared with the class.	All
10.	The learner will collaboratively collect and analyze data to investigate the composition of simple to more complex matter (i.e. atoms, elements, compounds) in objects and living or non-living organisms.	1.4, 1.6
11.	The learner will research and share information to develop an understanding of the impact of the water cycle on the earth and propose ways to solve environmental concerns.	2.2, 2.3, 2.4
12.	The learner will construct a model relevant to the learner's interest that reflects their understanding of design and organization. (i.e. create an invention.)	1.4, 3.5
13.	The learner will demonstrate the proper care of supplies, equipment, and tools for scientific investigations.	1.6, 2.5
14.	The learner will demonstrate safe and responsible behavior while engaging in science investigations.	1.6, 2.5
15.	The learner will discuss and report findings as an individual, or in a small group, the importance of water in our daily lives.	1.1, 1.2, 1.5, 2.1, 2.2, 2.3

INSTRUCTIONAL OBJECTIVES	THEME
The sixth grade science student will work in a variety of groups and individually to identify and explore the stated objectives. All investigations should be of a local nature including backyard and community studies. The model of inquiry should be hands-on, discovery oriented, with emphasis on the concrete while being relevant and engaging to students in their own integrated world.	
1.0 INSTRUCTIONAL UNIT: SPACE AND AERODYNAMICS	
1.1 Using a variety of groupings and materials, the learner will design, construct, and evaluate a model to demonstrate an understanding of the flight principles (e.g. kites, hot air balloons, birds, seeds, and/or insects while gaining a personal insight into the variety of flight modes.	Models
1.2 In a variety of groupings, the learner will investigate and explain the historical and technological development of flight while reflecting on their own personal experiences, and they will display their findings in a visual format.	Technology and Society
1.3 Using a variety of groupings and measurements, the learner will compare their own models to other student models and assess his/her design, models, and flight results (i.e., hang time, weight, distance traveled, etc.) through a series of activities while gaining an awareness of the mechanics of flight.	Models/Scale

INSTRUCTIONAL OBJECTIVES	THEME
2.0 INSTRUCTIONAL UNIT: WEATHER, CLIMATE AND GLOBAL CLIMATE CHANGE	
2.1 Using manipulative and recording devices, the learner will collect and analyze local weather data (e.g., fronts, precipitation, clouds, winds, temperatures, cycles, barometric pressure), choose appropriate units for measurements, and use collected information to predict future weather patterns which effect the learner's daily life.	Patterns of Change
2.2 Provided with current data (newspapers, television programs, magazines, etc.), the learner will investigate human impact on local weather (e.g., acid rain) and propose solutions by developing an awareness campaign for a selected local concern.	Technology and Society
2.3 In a variety of groupings using available resources, the learner will investigate the historical significance of meteorology (including instrument development and past weather phenomena), researching data and comparing the data to today's technology and weather in order to bring about a personal insight into the science of meteorology.	Technology and Society

INSTRUCTIONAL OBJECTIVES	THEME
3.0 INSTRUCTIONAL UNIT: LOCAL ORGANISMS	
3.1 Using available equipment, the learner will develop skills for using the microscope and creating slides to distinguish between plant and animal cells by observing microscopic plants and animals found locally while actively participating in research teams.	Systems and Interactions
3.2 Using organisms collected and observed by students in a local environment, the learner will create classification systems that are based on characteristics of organisms and will recognize the value of classification systems in the learner's daily life.	Systems and Interactions
3.3 Using available local resources, the learner will investigate the patterns of change in local organisms (life cycle, seasonal changes, migration, hibernation, etc.), perform investigations over long or short time periods, describe investigative findings to classmates, and support the findings with evidence to answer student-determined questions.	Patterns of Change
3.4 Using scientific and non-scientific information found in folklore, the learner will design and create a fictional organism, describe its characteristics, habitat, and life cycle, and demonstrate a personal understanding of the interdependence of an organism and its environment.	Systems and Interactions

INSTRUCTIONAL OBJECTIVES	THEME
4.0 INSTRUCTIONAL UNIT: ECOSYSTEMS AND BIOMES	
4.1 Posing and extending questions to improve investigative methods, the learner will explore the interdependence of local organisms and their environments and apply this knowledge to other ecosystems (e.g., habitats, mutualistic and commensal relationships, predator/prey, parasite/host, food chains and webs) by formulating explanations and inferences in order to explain the learner's personal impact on such interactions in his/her local ecosystem.	Systems and Interactions
4.2 By considering the risks and benefits of collecting, displaying, or maintaining organisms in a different environment, the learner will evaluate the ability of the organism to adapt successfully, document potentially hazardous conditions, by designing and/or constructing and maintaining an environment which will enable his/her organism to survive.	Systems and Interactions
4.3 By working individually or as a member of a collaborative group, the learner will demonstrate an understanding that he/she impacts his/her environment, investigate the consequences of human actions, technology, and population growth on the local environment, in order for the learner to make responsible consumer decisions.	Technology and Society
4.4 Through selecting and utilizing community resources, the learner will investigate local land use and development (e.g., landfill, trash-burning power plant, housing developments, industrial land use) and their impact on the local environment, formulate personal explanations in order to develop an informed point of view on government regulations regarding land use.	Technology and Society
4.5 Examining cycles (e.g., water, nitrogen, oxygen/carbon dioxide, seasonal, life cycles, etc.) through observations, models, and simulations, the learner will explain the role of cycles in local organism (butterflies, moths, etc.) habitats (e.g., pond, forest, soil, under a rock), observe and document events and characteristics of cycles, in order to explain the effect of cycles on his/her daily life.	Patterns of Change

INSTRUCTIONAL OBJECTIVES	THEME
5.0 INSTRUCTIONAL UNIT: THE PHYSICAL WORLD	
5.1 Using a variety of investigative techniques, the learner will review the characteristics and properties of matter and conduct group investigations into physical and chemical change by designing and conducting a range of investigations associated with the learner's everyday experiences.	Systems and Interactions
5.2 Following step-by-step instructions, recipes, and diagrams to conduct experiments while recording the collected data, the learner will interpret and represent quantifiable data using computer technology (when available) in order to explore the impact of common chemicals on his/her daily life.	Systems and Interactions
6.0 UNIT: SCIENCE CAREERS	
6.1 The learner will select and utilize resources to evaluate job opportunities related to the learner's interests in science which will enable them to make career choices.	Technology and Society
7.0 UNIT: INVESTIGATION PROCEDURES	
7.1 The learner will follow safety rules and guidelines in assessing potential hazards in any investigation and will take appropriate actions to ensure the safety of the learner and others within the classroom.	Technology and Society

SCIENCE COURSE OF STUDY

GRADE: SIX

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
1. The learner will identify a community problem (e.g., recycling, water quality, animal and plant overpopulation and competition, extinction, urban growth, soil conservation, transportation issues, physical recreation opportunities) and propose a solution for that problem using information collected to support their proposal.	4.4
2. Given a collection of data collected in tabular or graphic form, the learner will make inferences to explain the events or phenomena from which the data was collected.	2.2, 5.1, 5.2
3. Presented with different versions of a historical event in science or technology, the learner will discuss the impact of scientific and social context at the time of the event.	1.2, 2.3, 6.1
4. Given a set of data and a set of attendant conclusions, the learner will verify or refute the accuracy of the conclusions.	1.1, 1.3, 2.1, 3.2, 5.1, 6.2
5. Provided with examples of patterns in natural phenomena, the learner will design and perform an investigation to document the constancy of the pattern.	2.3, 3.4, 4.5, 5.1, 6.2
6. Given data from a local organism, the learner will describe how changing one component impacts the other components of the system.	3.3, 4.1, 4.2, 4.5
7. The learner will discuss the impact of human activity in selected natural environments.	2.2, 4.3
8. The learner will choose and use appropriate technologies to collect observations regarding a system or organism (e.g., the weather or an ecosystem) and use the observations to make predictions about the effects of changes made in various components of the system.	2.1, 3.1, 4.4, 7.1
9. The learner will compare and contrast structures and their associated functions.	1.1, 1.3, 4.5
10. The learner will collect and interpret data utilizing various sources and techniques.	1.1, 1.3, 2.1, 3.2, 5.1, 6.2

	PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
11.	Given a repetitive pattern in nature (e.g., seasons, cycles, growth), the learner will describe the duration and timing of the pattern.	2.1, 3.3, 4.5
12.	The learner will demonstrate an understanding of a model of a concept or phenomena, expressing essential components, interactions, and limitations of the model.	1.3, 3.4
13.	The learner will demonstrate an understanding of the importance of honest, clear, and accurate records in science by maintaining a science journal/notebook.	All
14.	The learner will demonstrate the ability to read and organize simple tables and graphs by identifying the relationships they reveal.	1.3, 2.1, 2.2, 2.3, 3.2
15.	The learner will acknowledge the value of all hypotheses and explanations, true or untrue, by designing worthwhile investigations.	1.1, 2.3, 3.3, 5.1, 5.2
16.	Given a series of related and unrelated events, the learner will analyze the series and predict the next likely event.	1.1, 2.1, 2.3
17.	The learner will create and follow procedures to carry out an investigation of their own design.	1.1, 3.4, 5.1, 5.2, 7.1
18.	The learner will propose reasons why observations and/or conclusions made by another learner may be different than their own.	All
19.	Using historical data, the learner will construct a time line depicting past, present, and future scientific events.	All
20.	The learner will identify a variety of science careers and their impact on science, technology, and society.	All

INSTRUCTIONAL OBJECTIVES	THEME

The seventh grade science student will work in a variety of groups and individually to identify and explore stated objectives. All investigations should be of a state or regional nature. The model of inquiry should be hands-on, discovery oriented, with emphasis on the concrete while being relevant and engaging to students in their own integrated world.

1.0 INSTRUCTIONAL UNIT: ECOSYSTEMS AND BIOMES

1.1	Using various technologies and multiple sources to collect, analyze, and organize information about the biotic and abiotic components of an ecosystem, the learners will demonstrate their understanding of the interdependence of organisms and their environment by designing an ecosystem in which they could live that might exist in Ohio or the United States and report their findings to the class through various forums (e.g., drawings, paintings, demonstrations, diagrams, dioramas, tables, charts).	Systems and Interactions
1.2	Through a variety of collaborative groupings, the learners will use multimedia resources and human contacts to collect information about the causes of changes in the population levels of organisms within an ecological system found in Ohio or the United States; use mathematical models (e.g., tables, graphs) to illustrate how a change in the population level of one organism affects the population levels of other organisms; make informed decisions about the ramifications of these changes; and discuss the learners' role in maintaining a balance within a selected ecosystem.	Patterns of Change
1.3	Making repeated observations, the learners will select an ecosystem within the community for a field study; choose, modify, or invent devices to aid their investigation; accurately record in a journal the interactions observed or inferred; make inferences about the changes or responses that take place over a given period of time; and cite how the learner can influence the changes or be impacted by them.	Patterns of Change

INSTRUCTIONAL OBJECTIVES	THEME
1.4 Using a diversity of writing styles, the learners will select and investigate a topic concerning an event, either natural or human-made, that can have positive or negative effects on a regional environment; evaluate the effects based upon their knowledge of the earth's renewable and nonrenewable resources; suggest strategies for managing these resources; use verifiable data to make decisions about the risks and benefits of using these management strategies; and promote and carry out practices that contribute to a sustainable environment in the learner's extended habitat.	Science, Technology, and Society
1.5 Working in small cooperative groups, the learners will select a regional environment of which they are a part; use multiple resources to investigate the roles of various organisms within the ecosystem; make a model to aid their understanding of the transmission and conservation of energy through the system; and describe the learner's role and responsibilities within the ecosystem.	Models

INSTRUCTIONAL OBJECTIVES	THEME
2.0 INSTRUCTIONAL UNIT: WEATHER AND CLIMATE	
2.1 Using a combination of personal observations and community resources, the learners will effectively use tools and instruments to collect and accurately record data about regional weather patterns; analyze the effects of regional weather systems on local weather conditions; predict changes that will occur over a long period of time; and use their information to design a home that would allow the learner to live comfortably in a given climatic region.	Patterns of Change
2.2 Working individually or in cooperative teams, the learners will find and read facts and figures in news media, books, or databases to investigate the causes, characteristics, and damage done by extreme/severe forms of weather; choose a method to communicate their findings (e.g., news report, picture story, rap, video); and make decisions about strategies to insure personal safety.	Systems and Interactions
2.3 Using available technology, the learners will investigate patterns in nature (e.g., jet streams, gulf streams, winds, fronts) and geographic conditions (e.g., proximity to mountains, bodies of water, forests, longitude, latitude) that influence weather and climate in Ohio and the United States; analyze, organize, and display the information gained; and use their knowledge to decide on an ideal location for the learner to live, work, and play.	Patterns of Change
2.4 Working in collaborative groups, the learners will investigate the short and long-term impact of human or natural disasters on climatic conditions and weather patterns, accurately record their findings in a journal, and present a position statement on the learner's co-existence with potentially hazardous conditions.	Systems and Interactions

INSTRUCTIONAL OBJECTIVES | THEME

3.0 INSTRUCTIONAL UNIT: SPACE AND AERODYNAMICS

3.1 In small cooperative groups the learners will explore basic laws and principles of physics governing flight; use analogies to explain how things work; invent or design a model of flight; test their experimental design; repeat their investigations to check the accuracy of their results; assess the success or failure of their experimental design; and demonstrate their understanding of these principles by finding an object they use in the learner's daily life that is designed or operated using one or more of these principles.

Systems and Interactions

3.2 Using multimedia resources, the learners will use appropriate terminology to investigate the classification systems of a variety of objects observed and studied by astronomers; accurately describe the appearance of the moon, stars, planets, etc., as viewed from the earth; share their findings with their classmates by creating an artistic display of one or more of the objects observed; and use a variety of written forms to describe how the learner's life would be different if the learner was suddenly transported to another planet to live.

Models

3.3 Using available communications technology, the learners will investigate the factors that affect the regularity of motion found in the interactions in the solar system (e.g., seasons, tides, planets, moons, comets, satellites); where applicable, use patterns of geometry to describe these motions; utilize mathematical models to organize and display their information; teach others about their findings; and predict how the learner's life would change if the earth's location or motion were to change.

Scale

INSTRUCTIONAL OBJECTIVES | THEME

4.0 INSTRUCTIONAL UNIT: THE PHYSICAL WORLD

4.1 Through collaborative exploration, the learners will investigate the organization of the lithosphere and the composition and organization of objects within the lithosphere (e.g., rocks, crystals, minerals, layers, elements, fossils, periodic table, atoms, etc.); make a personal collection of artifacts found in their environment; create their own taxonomy using the information obtained; and report their findings in a variety of ways.

Models

4.2 Selecting and using appropriate resources to gather and evaluate information, the learners will investigate the forces that shape the earth; describe the events using appropriate concepts (e.g., rate of change, duration, cause and effect, constancy); identify an area in Ohio or the United States that currently demonstrates geologic forces in action; create a visual time line or display that illustrates the effects of these forces over time; and use a variety of modes to explain how the learner's own actions could have a positive or negative effect on one of the forces they have studied.

Patterns of Change

4.3 Working individually and cooperatively, the learners will use multiple resources to investigate the renewable and nonrenewable nature of the natural resources found in Ohio and the United States; discuss the benefits and liabilities of using the different energy resources; suggest technological and biological strategies for managing these resources in a positive manner; and write a position statement defining the learner's personal responsibility toward maintaining a sustainable environment.

Science, Technology, and Society

INSTRUCTIONAL OBJECTIVES	THEME
5.0 INSTRUCTIONAL UNIT: LARGER ORGANISMS	
5.1 Working individually and collaboratively, the learners will use a variety of resources, including personal observations, to explore the diversity of methods by which living things in Ohio and the United States adapt to their environment; make and accurately record their observations; choose a format to report their findings to the class; and illustrate their understandings of the concepts involved by designing a new plant or animal that could survive in a habitat of the learner's choosing.	Systems and Interactions
5.2 By investigating living organisms in Ohio and the United States, holistically looking at their component systems and functions, the learners will use analogies to understand how things work; use a variety of written methods to create descriptive models of various systems explaining their functions; and compare and contrast one of the learner's body systems with that of another organism.	Systems and Interactions
5.3 Gathering information from various sources and personal observations, the learners will investigate and analyze the patterns of change in the life cycles of a variety of organisms found in Ohio and the United States; explore the impact of human interactions on these life cycles; and compare significant stages in the learner's own development with those of another organism.	Patterns of Change
5.4 Working cooperatively using multiple resources, the learners will select topics to be investigated that would describe both beneficial and harmful interactions between plants and animals found in Ohio and the United States (e.g., impact on culture and economics; causes for the endangerment/ extinction of a species; impact on the environment); organize their information into an appropriate format; and propose a course of action for how the learner can become personally involved in protecting an organism (e.g., endangered plant or animal; wildlife; pet).	Systems and Interactions

INSTRUCTIONAL OBJECTIVES	THEME
5.5 Working individually or collaboratively, the learners will consider the scientific thinking and language of others by using a variety of resources to investigate and explain the standard classification system used by scientists to classify organisms found in Ohio/United States and gain insight into how the learner fits into this classification scheme.	Scale
6.0 UNIT: SCIENCE CAREERS	
6.1 The learner will select and utilize resources to evaluate job opportunities related to the learner's interests in the earth sciences which will enable them to make career choices.	Technology and Society
7.0 UNIT: INVESTIGATION PROCEDURES	
7.1 The learner will follow safety rules and guidelines in assessing potential hazards in any investigation and will take appropriate actions to ensure the safety of the learner and others within the classroom.	Technology and Society

SCIENCE COURSE OF STUDY

GRADE: SEVEN

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
1. The learner will recognize the impact of human activity in selected natural environments.	1.2, 1.3, 1.4, 1.5, 2.4, 4.2, 4.3, 5.3, 5.4
2. Given a repetitive pattern in nature (e.g., seasons, phases of the moon, growth), the learner will describe the duration and timing of the pattern.	2.1, 3.3, 4.2, 5.3
3. The learner will demonstrate an understanding of the importance of honest, clear, and accurate records in science by maintaining a science journal/notebook.	All
4. The learner will acknowledge the value of all hypothesis and explanations, true or untrue, by designing worthwhile investigations.	All
5. The learner will create and follow procedures to carry out an investigation of their own design.	All
6. The learner will propose reasons why observations and/or conclusions made by another learner may be different than their own.	All
7. Given a selected set of organisms or objects, the learner will prepare a simple key for another learner to use to distinguish between the individuals in the set.	3.2, 5.5
8. Given data from a simple biological or physical system or cycle, the learner will describe how changing one component impacts the other components of the system or cycle.	1.2, 1.4, 4.3, 5.3
9. The learner will demonstrate an understanding of the structure of a complex system (e.g., ecosystem, atmosphere) by describing the interrelationships found within the system and making inferences and predictions about the effects of changes made in various components of the system.	1.1, 1.2, 1.3, 2.2, 2.4, 5.3

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
10. The learner will demonstrate an understanding of energy flow within an ecosystem by explaining the various roles of organisms within the system.	1.5
11. The learner will use state-of-the-art technology (e.g., computers, calculators, microscopes, laser discs) and a variety of media to collect, store, analyze, manipulate, and evaluate appropriate data for making investigations and assemble the information into a meaningful forum for communication (e.g., tables, graphs, oral presentations, models, written proposal, persuasive materials, videos, artistic display, mathematical models, graphic representation).	All
12. Using available technologies, the learner will describe an object not easily observed in terms of its attributes and behaviors.	3.2, 3.3
13. Given a question about a natural phenomenon, the learner will propose several sources of information that may assist in addressing questions about the phenomenon.	All
14. The learner will choose (or invent/make) and use appropriate tools to investigate systems or make a model.	1.5, 2.1, 3.1, 4.1, 5.1, 5.3
15. The learner will identify a community or environmental problem (e.g., animal and plant overpopulation and competition, extinction, soil conservation, depletion of resources, natural and human disasters) and propose a solution for that problem using information collected to support their proposal.	1.2, 1.4, 2.2, 2.4, 4.2, 4.3, 5.4
16. Provided with examples of patterns in natural phenomena (e.g., variation in populations, position of the moon), the learner will design and perform an investigation to document the constancy of the pattern.	1.2, 3.3, 7.1
17. The learner will design and use procedures to test the suitability of various materials for different purposes.	3.1

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
18. Presented with data on the consumption pattern of a resource in the local community, the learner will propose (e.g., written proposal, persuasive materials, videos) a strategy to manage the resource more efficiently and economically.	1.4, 4.3, 5.4
19. The learner will use scientific terminology appropriate to their developmental level to make predictions in a complex system (e.g., weather, ecosystems).	1.4, 2.1, 2.2, 3.2, 4.2, 5.3, 5.5
20. Presented with appropriate charts, graphs, and other representations of changes in a dynamic system (e.g., ecological balance in nature, climate, energy), the learner will describe the type and rate of change represented.	1.3, 2.1, 4.2, 5.3, 5.4
21. The learner will test a physical or mathematical model of a pattern, structure, or behavior (e.g., conservation of energy, planetary motion, flight, earthquakes) and evaluate the results of that test to make improvements in the model.	3.1, 3.3, 4.2
22. The learner will access primary and secondary data from remote sources (e.g., weather satellites, seismographs, radar, sonar) and make inferences and predictions that are possible from that data.	2.1, 2.2, 3.2, 4.2
23. The learner will use cause-and-effect relationships to determine the likelihood of event outcomes.	1.2, 2.1, 2.2, 4.3, 5.3, 5.4
24. The learner will work cooperatively with other students by optimizing the individual contributions made by group members in order to prepare and perform individual and group presentations of explorations.	All
25. The learner will individually or collaboratively collect and analyze data regarding weather conditions/patterns and geographic location to determine the influence of climate on adaptations made by organisms.	2.1, 2.3, 5.1

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
26. The learner will design a research project that will demonstrate an understanding of the impact of natural disasters on the environment and on the organisms that exist within that environment.	1.4, 2.2, 2.4, 4.2, 4.3, 7.1
27. The learner will use a variety of resources to gather information about the objects observed in space and explain the principles that govern their motion.	3.2, 3.3
28. The learner will demonstrate an understanding of the forces that shape the earth by working collaboratively to identify local areas showing those forces in action and explaining the learner's influence on those forces.	4.2
29. The learner will gather information from multiple resources to design an investigation that will demonstrate an understanding of the systems found within individual organisms and use examples from the learner's own existence to explain the functions of the systems and their individual components.	5.2, 5.3
30. The learner will identify a variety of science careers and their impact on science, technology, and society.	All

INSTRUCTIONAL OBJECTIVES	THEME
The eighth grade science student will work in a variety of groups and individually to identify and explore the stated objectives. The investigations shall be of a global nature. The model of inquiry should be hands-on, discovery oriented, with emphasis on the concrete while being relevant and engaging to students in their own integrated world.	
1.0 UNIT: ECOSYSTEMS AND BIOMES	
1.1 By working individually or collaboratively to investigate the characteristics of biomes, the learner will construct a biome model and they will compare and contrast their model with others in order to gain an insight into the learner's role in maintaining a balanced habitat.	Models
1.2 Working with a group developed model of the whole earth ecosystem, the learner will investigate the impact of various changes in the earth system by presenting various possible new models that may result from these changes while describing the learner's role and responsibilities within the ecosystem.	Systems and Interactions
2.0 UNIT: THE PHYSICAL WORLD	
2.1 Using available media materials, the learner will investigate forces of the earth, explain how these forces cause change over time, predict how future changes will affect the entire physical world, and cite how the learner can influence these changes or be impacted by them.	Patterns of Change
2.2 As a part of a laboratory team, the learner will design investigations of chemical reactions as a natural force of the earth and present their results by demonstrating how the reactions interrelate to the natural forces known to the learner.	Systems and Interactions
2.3 The learner will investigate various forms of energy found on earth, explore by group investigations how systems and mechanisms work, and demonstrate this knowledge by proposing ways to alter these systems and mechanisms in order to improve them or change their function while gaining an insight to the learner's personal situation.	Systems and Interactions

INSTRUCTIONAL OBJECTIVES	THEME
3.0 UNIT: ORGANISMS	
3.1 By collecting data, the learner will investigate various interrelationships among organisms and their physical environments while constructing a model showing these interrelationships using the learner's medium of choice.	Models
3.2 Individually and collaboratively, the learner will investigate by comparing and contrasting the scale and complexity of various living processes that promote the continuation of and changes in life by demonstrating their knowledge by interacting with other learners to gain insight into how the learner fits into these patterns of change.	Patterns of Change
4.0 UNIT: THE HUMAN IMPACT	
4.1 The learner will investigate the unique role of humans that enables them to cope with and create changes in their environment and will demonstrate this understanding by proposing and advocating courses of action for global scientific issues using global networks.	Science, Technology, and Society
4.2 By considering the scientific thoughts of others, the learner will investigate why curiosity, honesty, openness, and skepticism are so highly regarded in science and how they are incorporated into the way science is carried out. The student will exhibit those traits from their own lives and show the value of them in others.	Science, Technology, and Society

INSTRUCTIONAL OBJECTIVES	THEME
5.0 UNIT: SPACE AND AERODYNAMICS	
5.1 By accessing information from various media, the learner will identify benchmarks in global space exploration and construct a model that helps the learner gain insight into past and future events in relationship to the learner's daily life.	Models
5.2 The student will examine the various technologies that have resulted from space exploration, determine the impact that these technologies have on humans as consumers, and predict future impact on the learner and human kind.	Science, Technology, and Society
6.0 UNIT: WEATHER, CLIMATE AND GLOBAL CLIMATE CHANGE	
6.1 By using various state-of-the-art technologies, the learner will collect, store, retrieve, and manipulate information about global climate patterns while using this data to construct a model that illustrates global climatic conditions in order for the learner to bring relevancy to his/her daily life.	Models
6.2 By constructing questions and investigations using reliable data, the learners will present predictions of the effects of various events on global weather patterns and climatic change and cite how the learner can influence these effects or be impacted by them.	Systems and Interactions

INSTRUCTIONAL OBJECTIVES	THEME
7.0 UNIT: SCIENCE CAREERS	
7.1 The learner will select and utilize resources to evaluate job opportunities related to the learner's interests in the earth sciences which will enable them to make career choices.	Technology and Society
8.0 UNIT: INVESTIGATION PROCEDURES	
8.1 The learner will follow safety rules and guidelines in assessing potential hazards in the laboratory and will take appropriate actions to ensure the safety of the learner and others within the classroom.	Technology and Society

SCIENCE COURSE OF STUDY

GRADE: EIGHT

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
1. The learner will demonstrate an understanding of the importance of honest, clear, and accurate records in science by maintaining a science journal.	All
2. The learner will acknowledge the value of all hypothesis and explanations, true or untrue, by designing worthwhile investigations.	All
3. The learner will demonstrate the ability to read and organize simple tables and graphs by identifying the relationships they reveal.	All
4. By using a variety of media, the learner will locate information and assemble the information into a meaningful form (i.e., tables, graphs, oral presentations, multiple media, modeling, etc.)	All
5. When presented with information, the learner will question and compare claims and conduct risk-benefit analysis.	1.2, 4.1, 5.2
6. The learner will identify a variety of science careers and their impact on science, technology, and society.	All
7. The learner will be skeptical of arguments based on small and/or biased samples, and be aware of various ways to interpret findings by being critical or arguments which intermingle fact and opinion and illogical conclusions.	All
8. The learner will recognize the impact of human activity in selected natural environments and identify examples of technologies having effects other than those intended.	1.2, 4.1, 4.2, 5.2
9. The learner will identify an example of an improbable, illogical event in selected media and point out contradictions (i.e., magazines, newspapers, video, television, literature).	All
10. Given a series of related and unrelated events, the learner will analyze the series and predict the next likely event.	1.2, 2.1, 3.2, 4.1, 5.1, 5.2, 6.2

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
11. The learner will gather appropriate data, use state-of-the-art technology (i.e., computers, calculators, microscopes, etc.), and will construct a graphic representation to make comparisons.	All
12. The learner will create and follow procedures to carry out an investigation of their own design.	All
13. The learner will propose reasons why observations and/or conclusions made by another learner may be different than their own.	All
14. Given data from a system or cycle (i.e., biological, ecological, chemical, mechanical, geological, etc.), the learner will describe how changing one component impacts the other components of the system or cycle.	1.1, 2.2, 2.3, 3.1, 4.1, 6.2
15. The learner will demonstrate an understanding of the structure of an ecosystem and how the subsystems relate by describing the most likely changes to occur and evaluating the impact of the change.	1.1, 1.2, 2.1, 3.1, 3.2
16. Using the complex concepts involved in the analysis of a biome, the learner will log, chart, and graph the interactions within the biome, compare their results with others, and identify the degree of interdependence.	1.1, 1.2
17. The learner will demonstrate an understanding of energy flow within an ecosystem by explaining the process of photosynthesis and the various roles of consumers in that energy cycle.	1.1, 1.2, 2.3, 3.1, 4.1
18. The learner will describe the characteristics, roles, and cycles of water on earth and identify its importance to living and non-living things.	1.1, 1.2, 2.1, 3.1, 3.2, 4.1 6.2

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
19. The learner will demonstrate an understanding of the forces of the earth (i.e., gravity, magnetism, light, sound, heat, electricity, etc.) by explaining their role in the earth systems (i.e., biological, chemical, geological, mechanical). The learner will construct a model illustrating these understandings.	1.2, 2.1, 2.2, 2.3
20. The learner will design a research project (i.e., poster display, pamphlet, oral presentation, report, video, etc.) that will lead to an understanding of the role of a single organism (such as an endangered species in a food web) and instruct others in that role.	1.1, 1.2, 3.1, 3.2, 4.1, 7.1
21. The learner will propose a solution to a current global ecological problem (i.e., acid rain, global warming, ozone depletion, greenhouse effect, etc.) and communicate the proposal to other students using a multimedia approach.	1.2, 3.2, 4.1
22. The learner will individually or collaboratively collect and analyze data regarding a biome of choice and participate in the construction of a biome model (booth) and will share this model with other learners.	1.1, 1.2, 3.1, 4.1, 6.1, 7.1
23. The learner will collect and analyze past evidence and current data from various sources and will propose reasonable predictions as to long-term global trends (i.e., global warming, greenhouse effect, acid rain, ozone depletion, mass extinctions, global catastrophes, abrupt climate change [volcanic action and meteor impact] etc.).	2.1, 4.1, 6.1, 6.2
24. The learner will demonstrate an understanding of the essential nature of technology in the study of science by using technology to collect, analyze, and communicate information.	All
25. The learner will design an investigation concerning consumer products, analyzing the effectiveness and efficiency of the product and the technology used in its manufacture and report the results.	5.2, 7.1

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
26. Given a learner-identified issue of global importance (i.e., air, water, and soil pollution; deforestation; soil depletion; endangered species; etc.), the learner will collect information and observations and will take action on a decision made regarding the issue.	1.2, 4.1, 7.1
27. The learner will demonstrate an understanding of the kinetic model of matter by applying this model to explain common phenomena. (i.e., expansion, change of state, conservation of matter and energy, etc.)	2.2
28. The learner will demonstrate an understanding of interconnected global food webs by constructing simulations using given components.	1.2, 2.3, 3.1, 3.2
29. The learner will propose hypothesis regarding simple chemical changes, design and implement investigations of their hypothesis, predict, explain, and share outcomes with others.	2.2
30. Individually or collaboratively, the learner will utilize the fossil record to construct a time line illustrating the long history of changing life forms on earth.	2.1, 3.2
31. Using the history of space exploration, the learner will construct a model depicting future benchmarks in global space exploration.	5.1

INSTRUCTIONAL/SUBJECT OBJECTIVES	THEME
1.0 UNIT: INTRODUCTION TO SCIENCE	
1.1 The learner will select and use mathematics to measure, sort and identify information from observations while investigating the function of various technologies while examining and discussing different perspectives on physical phenomenon in order to implement appropriate choices based on the scientific information.	Systems and Interactions
1.2 The learner will formulate an understanding of modern technology and its impact on society by investigating systems based on current technology and by communicating ideas, questions, and information in order to make everyday scientific and technological decisions.	Technology and Society
1.3 The learner will formulate theories of matter, energy, space, and time by investigating the interactions of various objects and maintaining records of group investigations in order to analyze scientific information.	Scale
2.0 UNIT: ATMOSPHERIC INTERACTIONS	
2.1 The learner will produce quality instructional maps and plans while investigating the organization within the atmosphere, hydrosphere, and lithosphere by participating in group investigations designed to relate to the learners' life.	Models
2.2 The learner will determine the likelihood of events, by identifying contributory and causal factors related to and the impact of weather and the patterns in nature on the earth through recognizing and criticizing fact and fiction by predicting and investigating the variables involved.	Systems and Interactions
2.3 The learner will recognize regular occurrences in nature while investigating various resource cycles in physical water systems by communicating scientific questions, purposes, procedures, and results through investigating the natural world while observing the impact of different combinations on the world.	Patterns of Change

INSTRUCTIONAL/SUBJECT OBJECTIVES	THEME
3.0 UNIT: VIEWING THE EARTH AND SKY	
3.1 The learner will make and read scale drawings, maps and models to investigate and measure a wide variety of distances, locations and time changes by effectively using tools, instruments and devices that facilitate the planning, making and explaining the operation of everyday devices.	Models
3.2 The learner will analyze, identify, compare and contrast different solar objects by investigating their motion, interaction, physical properties and phenomena using current scientific information, concepts and technology to recognize the intersystem relationships existing within the solar system.	Systems and Interactions
3.3 The learner will collect and analyze verified data and accepted hypotheses to investigate the regularity of behavior found in the life, distance and interaction of stars and galaxies by gathering and evaluating information related to science topics from multiple sources thereby gaining insight into his/her own situation in light of the historical background of important inventions and technologies.	Scale
3.4 The learner will explore events, analyze changes and organize information into simple tables, timelines on graphs to investigate the various biological and geological activity throughout the history of the earth through differentiating between the scientific and non-scientific information.	Patterns of Change
3.5 Based on data analysis, experiments, and models, the learner will draw conclusions through investigations to formulate models and hypotheses about change over time using a variety of modes of expressions to communicate ideas that identify and reduce risks and threats to a sustainable environment.	Models

INSTRUCTIONAL/SUBJECT OBJECTIVES	THEME
4.0 UNIT: THE STUDY OF MATTER	
4.1 The learner will organize information into simple tables or graphs to investigate the chemical and physical attributes of elements and mixtures by performing investigations over a period of time and manipulate combinations of ingredients to observe the impact of different combinations on the effectiveness of common household products.	Model
4.2 The learner will conduct research using observational instruments and other methods of formulating ideas that can be used to describe fundamental molecular interactions while performing investigations of scientific concepts such as the periodic table in order to research and write impact statements of their own design.	System of Interactions
4.3 The learner will suggest and defend experimental designs or explanations through formulating models of molecular, atomic, ionic, and subatomic structures and investigate the physical and biological implications of these structures by performing investigations responsibly and safely while manipulating the amount and combinations of ingredients in order to observe the impact of different combinations.	Patterns of Change
4.4 The learner will explore events while developing and testing explanations of observations in order to formulate explanations for the development of descriptions of motions, interactions, and transformations of matter and energy by exploring and analyzing a variety of perspectives on science and comparing learner perspectives to those of the scientific community.	Patterns of Change
4.5 The learner will explore and research through investigation current technology in metals and alloys while constructing a portfolio of products designed to contribute to the learner's satisfaction and growth.	Technology and Society

INSTRUCTIONAL/SUBJECT OBJECTIVES	THEME
5.0 UNIT: PHYSICAL INTERACTIONS	
5.1 The learner will draw conclusions based on the relationship among data analysis, experimental design including possible models and theories to formulate an explanation for the development of a description of motion, interactions or transformations of matter and engergy in order to determine the validity of the model through the operation of everyday devices.	Systems and Interactions
5.2 The learner will organize information into simple tables or graphs to look for relationships in order to investigate models and theories that help to explain the interaction of components in systems such as conservation of mass, energy, momentum, stress and friction reduction by individually and collaboratively producing clearly written representations of investigative results that will predict the working of toys and tools while controlling and manipulating variables such as friction, gravity and force.	Models
5.3 The learner will demonstrate various logical connections between related energy concepts by investigating the relationship between the rates of energy exchange and performing investigations that require observations over varying periods of time by using appropriate technologies to present the findings through tables, graphs, diagrams and text.	Technologies and Systems
5.4 The learner will create, standardize and document procedures that will investigate the principles that describe and predict the movement of electromagnetic energy by explaining and refining personal understanding of scientific concepts through designing, building and testing working models of structures and systems.	Models
5.5 The learner will design and conduct a range of investigations that shows the impact of various forms of mechanical and electromagnetic waves by using various means to communicate the concepts which explains the operatives of everyday devices based upon scientific principles.	Models

INSTRUCTIONAL/SUBJECT OBJECTIVES	THEME
5.0 UNIT: PHYSICAL INTERACTIONS (Cont'd.)	
5.6 The learner will store, retrieve and manipulate information with a computer that formulates models which can be used to explain the interactions of objects and organisms which will enable the learner, through investigations, to choose consumer products that utilize recent innovations.	Technology and Society
6.0 UNIT: INTERACTIONS OF LIFE	
6.1 The learner will explore inferences about organisms and cells, through investigations in a community environment, while raising questions related to choices that can be investigated scientifically.	Patterns of Change
6.2 The learner will formulate personal explanations and references based on reliable data to investigate the heredity of attributes and the maintenance of diversity by participating in group investigations in order to make decisions in light of possible outcomes of different genetic combinations of inherited characteristics.	Patterns of Change
6.3 The learner will examine relationships in nature, offer alternatives and explanations for the observations and collect evidence that can be used to help judge among these explanations through investigating various impacts of biological activities on the earth, investigating living and non-living things holistically through models, simulations, multimedia, and technologies in order to consider intersystem relationships.	Systems and Interactions
6.4 The learner will investigate the diversity of methods by which living things meet their needs by formulating taxonomic schemes based on multivariate models that help explain similarities and differences in form, distribution, behavior, survival and origin of organism while performing investigations in a community environment by advocating the consideration of intersystem relationships.	Systems and Interactions

INSTRUCTIONAL/SUBJECT OBJECTIVES	THEME
6.0 UNIT: INTERACTIONS OF LIFE (Cont'd.)	
6.5 The learner will investigate inferences about organism and systems made by performing these investigations in a community environment in order to make decisions regarding personal wellness through monitoring body system performance.	Systems and Interactions
6.6 The learner will identify, compare, and contrast different modes of inquiry, attitudes to investigate the history and function of various scientific techniques and technologies in order to develop an understanding of how different cultural factors are dependent on the impact of the uses of technology on their community.	Technology and Society
6.7 The learner will demonstrate an understanding of ecosystems and biomes while formulating models and theories on topics for investigation in order to answer student developed questions which foster an understanding of a sustainable environment.	Systems and Interactions
6.8 The learner will recognize regular occurrences in nature as they investigate the renewable and non-renewable nature of the earths resources while developing strategies for managing these resources by observing and discussing the differences between the scientific and non-scientific information uncovered by the learner.	Technology and Society
7.0 UNIT: LABORATORY SAFETY	
7.1 The learner will design/perform investigations/activities that are safe and ethical (i.e., obtain consent and inform others of potential outcomes, risks and benefits, and show evidence of concern for human health and safety, concern for non-human species) in order to promote and carry out life long practices that contribute to a safe working environment.	Technology and Society

SCIENCE COURSE OF STUDY

SUBJECT:
INTEGRATED SCIENCE

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
1. Using sense extending devices, the learner will describe an object or organism not easily observed in terms of its attributes and behaviors.	1.1, 1.2, 1.3, 3.[illegible], 4.1, 4.2, 4.3, 4.4, 4.5, 6.1 thru 6.8
2. Given data from a simple mechanical system, the learner will describe how changing one component impacts the other components of a system.	1.1, 1.2, 1.3, 4.1, 4.2, 4.3, 4.4, 4.5, 5.4, 6.1 thru 6.8
3. Given data from a simple biological system, the learner will describe how changing one component impacts the other components of a system such as extinction, drought, over population.	1.1, 1.2, 1.3, 2.2, 3.5, 6.1 thru 6.8
4. The learner will choose a simple technological device and describe the advantages and disadvantages to the user.	1.1, 1.2, 1.3, 2.3, 5.3, 5.6
5. Given a question about a natural phenomenon, the learner will propose several sources of information that may assist in addressing questions about the phenomenon.	1.1, 1.2, 1.3, 2.2, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5
6. The learner will trace the transmission in transformation and conservation of energy in biological systems such as food web, human body.	1.1, 1.2, 1.3, 6.1 thru 6.8
7. The learner will trace the transmission, transformation and conservation of energy in a mechanical system such as bicycle, kite, scissors.	1.1, 1.2, 1.3, 5.1

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
8. Using data representing the change over a period of time, the learner will construct a testable hypothesis regarding the nature of the change and conduct an experiment to test it.	1.1, 1.2, 1.3, 3.3, 3.4, 4.1, 4.2, 4.3, 4.4, 4.5, 6.1 thru 6.8
9. The learner will demonstrate skill in the use and interpretation of data from various technologies such as blood pressure apparatus, telescopes, calculation, computers.	1.1, 1.2, 1.3, 2.1, 3.1, 3.2, 3.3, 3.4, 3.5, 5.3, 5.6, 6.1 thru 6.8
10. The student will demonstrate an understanding of the kinetic model of matter by describing its effects on the interactions and transformations in living and non-living systems such as endothermic and exothermic processes, diffusion and osmosis, changes of phase.	1.1, 1.2, 1.3, 3.2, 3.3, 5.1, 6.1 thru 6.8
11. The learner will identify and discuss structure and function relationship in complex systems such as physiological systems, biotechnological systems, aeronautical systems, energy production and transmission systems.	1.1, 1.2, 1.3, 3.2, 5.4, 6.1 thru 6.8
12. Given performance data on consumer products, the learner will analyze the effectiveness and efficiency of the products and recommend improvement to the manufacturer.	1.1, 1.2, 1.3, 5.6

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
13. Given a repetitive pattern in nature found in light and sound waves, the learner will describe the durations and timing of the pattern.	1.1, 1.2, 1.3, 3.2, 5.1, 5.5
14. Given the repetitive pattern found in nature through the seasons, the learner will describe the duration and timing of the pattern.	1.1, 1.2, 1.3, 2.2, 3.2, 3.3, 6.1 thru 6.8
15. Given the repetitive pattern found in the growth of organisms, the learner will describe the duration and timing of the pattern.	1.1, 1.2, 1.3, 6.1 thru 6.8
16. The learner will discuss the impact of human activity in selected natural environments.	1.1, 1.2, 1.3, 2.3, 3.4, 3.5, 6.1 thru 6.8
17. Given a series of related events, the learner will analyze the series and predict the next likely event.	1.1, 1.2, 1.3, 2.2, 3.3, 3.5, 4.1 thru 4.5, 5.1
18. Given a set of observations or objects, the learner will construct a graphic representation and use it to make simple comparisons.	1.1, 1.2, 1.3, 2.1, 3.1, 3.4, 4.1 thru 4.5, 5.2, 6.1 thru 6.8

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
19. The learner will create and follow a simple procedure to carry out an investigation.	All
20. Given a collection of simple tools, the learner will explain the function of a selected device and comment on its safe use.	1.1, 1.2, 1.3, 4.1 thru 4.5, 5.3
21. The learner will collect and interpret data utilizing various sources and techniques on continental drift on weather patterns that occur over a period of time.	1.1, 1.2, 1.3
22. Given a collection of data in areas such as motion of objects, astronomical data, environment and habitat changes, the learner will prepare an organizatinal structure for a database of the information that is usable to other learners.	1.1, 1.2, 1.3, 3.1, 3.2, 3.3, 3.4, 3.5, 5.2
23. Given a set of learner-collected data concerning the transormations of matter and energy such as heat, the cell processes, the rock cycle and electricity, the learner will construct a model which represents the transformation.	1.1, 1.2, 1.3, 3.1, 3.3, 5.4, 6.1 thru 6.8

SCIENCE COURSE OF STUDY

SUBJECT:
INTEGRATED SCIENCE

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
24. The learner will design an investigation of a natural phenomenon such as the reproduction of organisms or the soil structure and present the results of the investigation to an appropriate audience.	1.1, 1.2, 1.3, 3.1, 4.1, 4.2, 4.3, 4.4, 4.5, 6.1 thru 6.8
25. Given contradictory observatins of a phenomenon like collision of events, patterns of ocean tides, or relationships of cells the learner will present a proposal for testing a hypothesis to include a clear statement of the problem, scientific procedures, data collection methods and analysis of the problem.	1.1, 1.2, 1.3, 3.2, 3.5, 6.1 thru 6.8
26. The learner will demonstrate the use of standard classification systems to predict properties, interactions, or analyze data between groups of organisms.	1.1, 1.2, 1.3, 6.1 thru 6.8
27. The learner will construct and present a summary of human impacts on the environment when provided with data collected from an area.	1.1, 1.2, 1.3, 3.5, 6.1 thru 6.8
28. Presented with data on the motion of objects and as celestial bodies, freely falling objects and projectile motion the learner will construct a representation that can be used to predict the motions of different objects.	1.1, 1.2, 1.3, 3.1, 3.2, 5.2, 5.4, 5.5, 6.1 thru 6.8
29. Provided with objects or organisms the learner will identify the organism or obje t.	1.1, 1.2, 1.3, 6.1 thru 6.8
30. Given data collected by self and others regarding change over time such as succession, erosion, or glaciation the learner will construct a model of the changes that have occurred.	1.1, 1.2, 1.3, 3.5, 6.1 thru 6.8

SCIENCE COURSE OF STUDY

SUBJECT:
INTEGRATED SCIENCE

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
31. Given data collected by self and others regarding change over time such as evolutionary time the student will describe the changes with a high degree of accuracy.	1.1, 1.2, 1.3, 3.3, 3.5, 6.1 thru 6.8
32. The learner will create a sketch or map of streets, topography, electrical fields, longitudes and time zones for other learners to use in following directions.	1.1, 1.2, 1.3, 3.1, 3.4
33. The learner will construct a model or device such as a robot or vehicle to enhance personal learning.	1.1, 1.2, 1.3, 5.4, 5.6
34. The learner will analyze and critique the science presented in the media.	1.1, 1.2, 1.3, 4.1 thru 4.5, 6.1 thru 6.8
35. The learner will design and use procedures to test the suitability of various materials.	1.1, 1.2, 1.3, 4.1 thru 4.5, 6.1 thru 6.8
36. The learner will choose and use appropriate technologies to collect observations regarding complex systems; and use the observations to make predictions about the effects of change.	1.1, 1.2, 1.3, 2.1, 3.1, 3.2, 4.1 thru 4.5, 5.3, 6.1 thru 6.8
37. Given a set of data on a phenomena the learner will summarize the data in meaningful ways.	1.1, 1.2, 1.3, 2.2, 3.1, 4.1 thru 4.5, 5.1, 6.1 thru 6.8
38. The learner will use appropriate terminology to make predictions in a complex system.	1.1, 1.2, 1.3, 3.2, 3.5, 4.1 thru 4.5, 5.1, 6.1 thru 6.8

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
39. The learner will use proper safety procedures to safely perform all laboratory experiments.	All
40. Presented with a series of events such as permeability the learner will analyze features related to the changes represented.	1.1, 1.2, 1.3, 4.1 thru 4.5, 6.1 thru 6.8
41. The learner will construct simple models to represent macro scale phenomena.	1.1, 1.2, 1.3, 3.1, 4.1 thru 4.5, 5.4, 6.1 thru 6.8
42. The learner will predict and test the effects of influences on the motion of selected objects.	1.1, 1.2, 1.3, 3.2, 5.1, 5.5
43. Provided with examples of patterns in natural phenomena the learner will describe those factors determining the constancy of the pattern.	4.1, 1.2, 1.3, 2.3, 3.2, 3.3, 5.1, 6.1 thru 6.8
44. Given a collection of data presented in a variety of forms, the learner will make logical inferences to explain those events on phenomena from which the data was collected.	1.1, 1.2, 1.3, 2.2, 2.3, 3.3, 3.5, 4.1 thru 4.5, 5.1

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
45. Presented with appropriate charts, graphs, and other representations of changes in any type of dynamic system the learner will describe and/or calculate the type and rate of change represented (e.g. conservation of energy, conservation of momentum, velocity, balance of nature).	1.1, 1.2, 1.3, 2.1, 3.2, 3.3, 5.2, 6.1 thru 6.8
46. The learner will test a physical on mathematical model of a pattern, structure, or behavior, (e.g. planetary motion, doppler effect, reflection and refraction, electric circuits).	1.1, 1.2, 1.3, 3.1 thru 3.5, 5.2, 5.4
47. The learner will collect data on variability in a dynamic system and explain how the system remains constant. (e.g. metabolic rate, planetary orbits, light behavior).	1.1, 1.2, 1.3, 3.1, 3.3, 5.5, 6.1 thru 6.8
48. The learner will access primary and secondary data from a variety of sources and make inferences and predictions that are possible from that data. (e.g. heredity, weather, diseases).	1.1, 1.2, 1.3, 2.2, 3.5, 5.1, 5.2, 6.1 thru 6.8
49. The learner will compare and contrast diverse structures and their associated functions. (e.g. Morphology, geological formations, ecosystems, atomic and subatomic structures).	1.1, 1.2, 1.3, 3.2, 5.1, 6.1 thru 6.8

INSTRUCTIONAL/SUBJECT OBJECTIVES	THEME
1.0 UNIT: GENERAL OBJECTIVE	
1.1 The learner will select and utilize resources to evaluate job opportunities related to the learner's interests in the earth sciences which will enable them to make career choices.	Technology and Society
1.2 The learner will follow safety rules and guidelines in assessing potential hazards in the laboratory and will take appropriate actions to ensure the safety of the learner and others within the classroom.	Technology and Society
2.0 UNIT: HISTORY OF THE EARTH	
2.1 Through the process of scientific thinking and performing investigations, the learner will acquire a knowledge of the earth's materials and levels of organization which they will then use to analyze theories about the earth's geologic history, the states rock strata and fossils while developing a personal understanding of their environment.	Patterns of Change
3.0 UNIT: CHANGES WITHIN AND ON THE EARTH	
3.1 Through group activities and investigations, the learner will analyze data and develop models to explain the changes that shape the earth with emphasis on local topography, construction technology, and land development in order to gain a personal insight into the forces which shape the earth.	Models
4.0 UNIT: WATERS OF THE EARTH	
4.1 The learner will investigate the chemical and physical effects of the hydrosphere using records or data to analyze, perceive, and describe complex structures and events within the hydrosphere and their relevance to local water usage which will allow the learner to carry out practices that contribute to a sustainable environment.	Systems and Interactions

INSTRUCTIONAL/SUBJECT OBJECTIVES	THEME
5.0 UNIT: ATMOSPHERE, WEATHER AND CLIMATE	
5.1 The learner will formulate explanations and representations of weather and climatic phenomena by conducting theory-based research using surveys, observational instruments, and technology to explore and analyze a variety of data in order to predict various atmospheric scenarios and local weather conditions which effect the learner.	Systems and Interactions
6.0 UNIT: NATURAL RESOURCES AND ENVIRONMENTAL CHOICES	
6.1 The learner will investigate the renewable and non-renewable nature of the earth's resources and analyze the various strategies for managing these resources while identifying and addressing the impact of the uses of technology on the learner's direct and extended environment.	Technology and Society

SCIENCE COURSE OF STUDY

SUBJECT: EARTH SCIENCE

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
1. The learner will discuss the impact of human activity in selected natural environment (resources).	1.1, 6.1
2. Given a series of related events, the learner will analyze the series and predict the next likely event (e.g., weather, climate, earthquakes, diastrophism, vulcanism).	1.2, 2.1, 3.1, 4.1, 5.1, 6.1
3. The learner will create and follow a simple procedure to carry out an investigation (e.g. soils, water, rock cycle).	1.2
4. The learner will predict and test the effects of influences on the motion of selected objects (e.g. flowing water).	1.2, 3.1, 4.1, 5.1
5. The learner will identify a community problem (e.g. recycling, water quality, soil conversation) and propose a solution for that problem using information collected to support their proposal.	6.1
6. Given a collection of data presented in tabular or graphic form, the learner will make inferences to explain the events or phenomena from which the data was collected (e.g., earthquakes, weather patterns, plate tectonics).	All
7. Presented with different versions of a historical event in science or technology, the learner will discuss the impact of scientific and social context at the time of the event (e.g., volcanism, earthquakes, and natural resources).	2.1, 3.1, 4.1, 5.1, 6.1

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
8. The learner will choose and use appropriate technologies to collect data regarding a complex system (e.g., atmosphere, earthquakes, water, and soil).	1.2, 2.1, 3.1, 4.1, 5.1, 6.1
9. Given a set of data on an event or phenomenon, the learner will summarize the data in several meaningful ways (e.g., graphs, tables, narratives, models).	2.1, 3.1, 4.1, 5.1, 6.1
10. The learner will construct a simple working model (e.g., stream table, topographic map, seismograph, volcano, erosion, glaciation).	1.2, 2.1, 3.1, 4.1, 5.1, 6.1
11. Presented with appropriate charts, graphs, and other representation of changes in an earth system (e.g., climate, weather, water cycle, environment, natural resources) the learner will describe the type and rate of change represented.	2.1, 3.1, 4.1, 5.1, 6.1
12. The learner will identify the characteristics of the lower and upper boundaries of the layers of the earth's atmosphere.	5.1
13. The learner will list and note the importance of the major gases that make up the earth's atmosphere.	5.1, 6.1
14. The learner will compare and contrast atmosphere, lithosphere, hydrosphere, biosphere, and magnetosphere.	3.1, 4.1, 5.1
15. The learner will identify and describe crust, mantle, core, magnetic declination, and isogonic lines as they relate to the earth.	2.1, 3.1
16. The learner will describe the properties of minerals and explain how minerals are formed.	2.1
17. The learner will use the properties of minerals to identify several minerals in a laboratory setting.	2.1

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
18. Through laboratory work and tests, the leraner will demonstrate his ability to identify rocks and minerals based on their properties.	2.1
19. The learner will name and describe how the three kinds of rocks are formed.	2.1, 3.1
20. The learner will list and describe the characteristics of water and its usefulness to mankind.	4.1
21. The learner will describe the factors that determine the usefulness of streams, underground aquifers, ponds, lakes, and oceans as a source of fresh water, minerals, and power, etc.	3.1, 4.1, 6.1
22. The learner will sketch and diagram the water cycle.	4.1
23. The learner will give some examples of the differences in rainfall over the earth and point out the impact on the respective areas.	4.1, 5.1, 6.1
24. The learner will evaluate water samples for pH and mineral content.	4.1
25. The learner will discuss in writing the growing water resource problems of the earth.	4.1, 5.1, 6.1
26. The learner will sketch and label the physical features that make up the ocean floor.	4.1
27. The learner will list and describe the methods used to desalinate seawater.	4.1
28. The learner will distinguish between surface currents, density currents, and tidal currents and then explain how they affect the biosphere.	4.1, 5.1, 6.1

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
29. The learner will explain the idea of continental drift and how it causes the formation of mountains, volcanoes, trenches, continents, and oceans.	2.1, 3.1
30. Given seismic information and maps, the learner will locate the epicenter for several earthquakes.	2.1, 3.1

INSTRUCTIONAL/SUBJECT OBJECTIVES	THEME
1.0 UNIT: HISTORY OF ASTRONOMY	
1.1 The learner will trace and analyze the developmental history and ramifications of the history of astronomy in order to pose a personal prediction of our future fate in the universe.	Patterns of Change
1.2 The learner will perceive, investigate, gather and assess how ancient civilizations attempted to explain the heavens in terms of models in order to gain an insight into our past.	Models
1.3 Using a variety of media, the learner will describe, investigate, gather and assess the contributions of Galileo, Ptolemy, Brahe, Kepler, and Newton to the field of Astronomy.	Technology and Society
2.0 UNIT: TOOLS AND METHODS OF ASTRONOMY	
2.1 Given a set of data, the learner will recognize and investigate how dispersion, diffraction, interference, refraction, etc. contribute to the knowledge of solving astronomical puzzles and report their findings through various forms.	Technology and Society
2.2 Using a variety of sources, the learner will recognize how measurements are used to investigate and create models in astronomy, and will therefore construct an accurate diagnosis of the structural system which is of interest to the learner.	Technology and Society
2.3 The learner will perceive, investigate, recognize, and draw conclusions that radiation consists of much more than just visible light and make inferences on how it can be used to tell the learner about the surrounding universe.	Systems and Interactions
2.4 The learner will examine and investigate the kinds of information that can be obtained by analyzing special features and how they effect the learner's world.	Systems and Interactions
2.5 The learner will be able to identify by investigation at least four different telescope designs and evaluate the advantages of each, report their findings in various form, and use this knowledge to make a personal telescope selection.	Models

INSTRUCTIONAL/SUBJECT OBJECTIVES	THEME
3.0 UNIT: STRUCTURAL SYSTEM OF ASTRONOMY	
3.1 The learner will design and construct models to scale and investigate the physical systems promoting "hands on" Astronomy of structural systems in order to gain a personal insight into the heavens above.	Models
3.2 While working as a contributing member of a group, the learner will identify at least three distinguishing characteristics, and create a series of data cards with facts, pictures, etc. of the structural systems while reflecting on the observed events in their own lives.	Models
3.3 The learner will identify and investigate the steps in the birth, life and death of the structural systems, present the results in a variety of ways, and prepare through personal insight other possible avenues that the system might take during their evolution.	Models
4.0 UNIT: COSMOLOGY AND EXTRATERRESTRIALS	
4.1 The learner will formulate and present a coherent "word picture" of the origin and evolution of the universe, realize where we reside in the universe and recognize how insignificant our spot is in the universe by reflecting on the learner's own situation.	Models
4.2 The learner will understand and investigate some of the techniques used to search for extraterrestrials, predict what might be the best way to communicate with an ETL or ETI, and then design a step-by-step instruction to contact an ETL/ETI.	Models
5.0 UNIT: SELF STUDY INVESTIGATIONS	
5.1 The learner will create, by collecting and using up-to-date materials from a variety of sources, a series of different perspectives on current astronomical topics (e.g., design a space colony, summarize articles, mode of future travel, etc.) which are of interest to the learner.	Systems and Interactions

SCIENCE COURSE OF STUDY

SUBJECT: ASTRONOMY

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
1. The learner will appreciate the age-old quest to understand our world and the universe we live in.	All
2. The learner will illustrate how the earliest human being placed themselves in harmony with the cycles of nature.	1.2
3. The learner will see how some ancient civilizations attempted to explain the heavens in terms of models.	1.2
4. The learner will understand how Newton's laws of gravity explain Kepler's laws and other theories of astronomy.	1.3
5. The learner will demonstrate an understanding of the six different classifications of radiation within the electromagnetic spectrum.	2.1, 3.1, 3.2, 3.3
6. The learner will demonstrate and understand the dual nature of light.	2.2, 2.3
7. The learner will be able to diagram at least three different reflector telescope designs and one refractor telescope design.	2.4, 2.5
8. The learner will demonstrate an understanding of the Doppler effect by an investigation.	2.3, 3.1, 3.2, 3.3, 4.1
9. The learner will realize that every element produces a distinctive and recognizable pattern of spectral lines and the kinds of information obtained by analyzing spectral features.	2.3, 3.3
10. The learner will identify the other types of non-optical telescopes and what advantages and disadvantages they have over optical telescopes.	2.5

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
11. The learner will construct a scale model of the earth's interior and atmosphere as a "model" planet of our solar system.	3.1
12. The learner will list the factors that produce precision in the earth and give at least two consequences of that motion.	1.3, 3.2
13. The learner will describe satellites rotation and revolution in relation to each other and discuss the principle theory regarding the evolution of these motions.	1.3, 3.1
14. The learner will understand the differences between the terrestrial and the Jovians planets and gain an overall perspective of the solar system.	3.1, 3.2
15. The learner will demonstrate understanding of the life cycles of all stars (birth, main sequence, death) and how mass determines the life of the star.	3.3
16. The learner will be able to sketch, plot and use H-R diagrams to discuss the evolutionary cycles of stars.	3.3
17. The learner will be able to discuss the production of elements, heavier than helium, in the core of a hot star.	3.3
18. The learner will be able to state the best evidence for existence of neutron stars, pulsar, quasars, and black holes.	3.3
19. The learner will be able to describe and sketch the shapes of the different galaxies.	3.3
20. The learner will explain why our estimated mass of the galaxies is not static.	3.3

	INSTRUCTIONAL/SUBJECT OBJECTIVES
21. The learner will understand the leading evolutionary models of the universe.	1.3, 3.1, 4.1
22. The learner will cite evidence of how we estimate the age of the universe and how it is determined.	4.1, 4.2
23. The learner will evaluate the chances of finding life in the solar system, galaxy, universe.	4.2
24. The learner will speculate as to the language and content of a message to communicate to an alien being who lives on a planet that orbits a distant star.	4.2
25. The learner will demonstrate the ability of how to use resource material.	5.1
26. The learner will be able to design a space colony based on research evidence found in periodicals.	5.1
27. The learner will demonstrate writing and organizing skills.	5.1
28. The learner will demonstrate opinion writing skills based on their general knowledge of Astronomy.	5.1

OBJECTIVES	THEME
1.0 UNIT: CHARACTERISTICS	
1.1 Through a variety of groupings, the learner will solve unique problems through collecting and analyzing observations made while conducting investigations related to the interest of the learner.	Systems and Interactions
1.2 By manipulation of basic units of weights and measures and investigation of estimates in measurements, the learner will interpret information from his own realm on a scientific basis.	Scale
1.3 The learner, having investigated the characteristics and levels of life (i.e. organisms) using different modes of inquiry, will produce clearly written investigative results using database, spreadsheet or other reporting mechanisms.	Models
2.0 UNIT: SIMPLE ORGANISMS	
2.1 The learner will formulate an interpretation of the structure, function, and diversity in a variety of organisms (i.e. virus, bacteria, and protozoa) by collecting and analyzing observations and comparing these to scientific theories in order to trace their development and history to the learner's everyday life.	Systems and Interactions
3.0 UNIT: PLANTS AND FUNGUS	
3.1 The learner will compare and contrast the many members of the plant and fungi kingdoms as well as identify them according to modern classification systems by using activities, examining species and performing investigations, and then apply this information to understand the kingdoms' roles in contributing to the learner's sustainable environment.	Systems and Interactions
3.2 By studying the development of photosynthetic theory the learner will investigate physical and chemical changes in living systems by considering the scientific thinking of current and past scientists in order to understand why plants and their processes are important in promoting and carrying out practices that contribute to the learner's sustainable environment.	Patterns of Change

INSTRUCTIONAL/SUBJECT OBJECTIVES	THEME
3.0 UNIT: PLANTS AND FUNGUS (Cont'd.)	
3.3 By studying plant growth, the learner will investigate physical and chemical changes in living systems by working with plant species in a laboratory setting and comparing the growth of different kinds of plants as well as studying the work of biologists in order to understand why plant growth processes are important to sustaining the learner's earth environment.	Systems and Interactions
4.0 UNIT: ANIMALS	
4.1 The learner will examine relationships in nature and offer alternative explanations for observations done while investigating the similarities and differences of organisms by collecting, storing, retrieving information related to questions about vertebrates and invertebrates that can be investigated scientifically by the learner.	Systems and Interactions
4.2 The learner will collect and analyze information utilizing various techniques to investigate models and theories of natural selection between selected warmblooded and coldblooded vertebrates in order to construct, clarify and extend questions which answer self-generated questions related to the collected information.	Models
5.0 UNIT: HEREDITARY ADAPTION	
5.1 The learner will collect and analyze information to help understand the heritability of patterns and attributes found in the natural world using activities, resources and concepts from a variety of sources while using this information to make decisions based upon the risks and benefits associated with various resource utilizations.	Patterns of Change
5.2 The learner will use complex concepts to investigate the historical development of theories of change-over-time by considering the scientific thinking and language of others as well as utilizing various lab resources which will enable them to use this information to draw conclusions that will validate and demonstrate a personal understanding of these scientific principals.	Patterns of Change

OBJECTIVES	THEME
6.0 UNIT: ECOLOGY	
6.1 The learner will recognize regular occurrences in nature as they investigate the renewable and nonrenewable resources of the earth and develop strategies for managing these resources by observing and discussing the differences between the scientific and non-scientific information discovered by the learner.	Technology and Society
6.2 The learner will demonstrate an understanding of ecosystem and biomes while formulating models and theories on topics for investigation in order to answer student developed questions which foster an understanding of a sustainable environment.	Technology and Society
6.3 The learner will predict the outcomes through their investigation of food chains to present their results, written or orally, while guiding other learners in their understanding of the interaction in the environment.	Systems and Interactions
7.0 UNIT: HUMAN BIOLOGY	
7.1 The learner will utilize models and microscopic technology to investigate the organization and function of living systems by investigating the structure and function of living things in order to gain a better understanding of their own body and how it functions.	Models
7.2 The learner will utilize a variety of informational sources to investigate the structure and function associated with human reproduction and through this the learner will be able to communicate an individual understanding of the reproductive process so the student can make decisions regarding personal and public health.	Systems and Interactions
7.3 The learner will collect and analyze information while investigating the cause and effect of foreign substances through participating actively in dialogue which answers learner developed questions in order for the learner to make decisions concerning personal and public health.	Systems and Interactions

8.0 UNIT: LABORATORY SAFETY

8.1 The learner will design/perform investigations/activities that are safe and ethical (i.e., obtain consent and inform others of potential outcomes, risks and benefits, and show evidence of concern for human health and safety, concern for non-human species) in order to promote and carry out life long practices that contribute to a safe working environment.

Technology and Society

PERFORMANCE OBJECTIVES	INSTRUCTIONAL/SUBJECT OBJECTIVES
1. The learner will use the scientific method to accurately analyze information and predict outcomes in a laboratory setting.	All
2. The learner will demonstrate an understanding of the metric system by accurately measuring various objects and shapes.	1.2
3. The learner will list the characteristic of living things and identify those things needed for survival.	1.3, 2.1, 3.2, 3.3, 5.1, 7.1, 7.2, 7.3
4. The learner will compare and contrast cold-blooded and warm-blooded vertebrates.	4.2
5. Given specimens and descriptions of fish, amphibians, reptiles, birds, and mammals the learner will accurately describe the parts and functions of each one.	1.3, 3.1, 3.2, 3.3, 4.1, 4.2, 5.1, 5.2, 7.1,7.2
6. Given a set of data on genetics the learner will summarize the data in several meaningful ways.	6.3, 7.2
7. Given lab materials the learner will demonstrate paper safety procedures.	1.1, 1.2, 1.3, 2.1, 3.1, 3.2, 3.3, 4.1, 4.2, 5.1, 5.2, 6.1, 6.2, 6.3, 7.1, 7.2, 7.3
8. Given lab materials the learner will demonstrate proper disposal of materials.	1.1, 1.2, 1.3, 2.1, 3.1, 3.2, 3.3, 4.1, 4.2, 5.1, 5.2, 6.1, 6.2, 6.3, 7.1, 7.2, 7.3
9. Given cell structure the learner will demonstrate an understanding of the life processes involved.	1.1, 2.1, 1.3, 2.1, 3.1, 3.2, 3.3, 4.1, 4.2, 5.1, 5.2, 7.1, 7.2, 7.3

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
10. The learner will identify the parts of a virus and describe virus reproduction.	1.1, 1.2, 1.3, 2.1, 3.1, 3.2, 3.3, 5.1, 5.2
11. The learner will identify the parts of a bacteria and be able to classify bacteria.	1.1, 1.2, 1.3, 2.1, 3.1, 3.2, 3.3
12. The learner will be able to list the characteristics of protozoans.	1.2, 1.3, 2.1, 3.1, 3.2, 3.3
13. Given a plant, the learners will be able to demonstrate a knowledge of photosynthesis.	1.2, 1.3, 2.1, 3.1, 3.2, 3.3
14. The learner will collect and interpret data utilizing various sources and techniques on photosynthesis.	1.2, 1.3, 2.1, 3.1, 3.2, 3.3
15. Given a set of data on invertebrates the learner will summarize and compare the data in several meaningful ways.	1.2, 1.3, 4.1, 4.2, 7.1, 7.2, 7.3
16. The learner will demonstrate an understanding of vertebrates by accurately describing each species.	1.2, 1.3, 4.1, 4.2, 7.1, 7.2, 7.3
17. The learner will be able to, given a set of different specimens, sort them into one of 5 levels of organization.	1.2, 1.3, 2.1, 3.1, 3.2, 3.3, 4.1, 4.2, 7.1, 7.2, 7.3
18. The learner will be able to sort a variety of living things or replicas of living things into the proper kingdom according to the current 5 kingdoms systems.	1.2, 1.3, 2.1, 3.1, 3.2, 3.3, 4.1, 4.2, 7.1, 7.2, 7.3
19. The learner will be able to identify to which kingdom he/she belongs.	1.2, 1.3, 2.1, 3.1, 3.2, 3.3, 4.1, 4.2, 7.1, 7.2, 7.3

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
20. Provided with several objects or organisms and the appropriate key, the learner will identify the organisms or objects.	1.2, 1.3, 2.1, 3.1, 3.2, 3.3, 4.1, 4.2, 7.1, 7.2, 7.3
21. The learners will be able to identify the different kinds of algae and know the basic differences among them.	1.2, 1.3, 2.1, 3.1, 3.2, 3.3
22. The learner will be able to identify the major kinds of fungi and show understanding of their role in the breakdown of organic matter.	1.2, 1.3, 2.1, 3.1, 3.2, 3.3
23. Presented with appropriate charts, graphs, and other representations of changes in the dynamic system and change in general the learner will describe the type and rate of change represented.	1.2, 1.3, 2.1, 3.1, 3.2, 3.3, 4.1, 4.2, 5.1, 5.2, 6.1, 6.2, 6.3, 7.1, 7.2, 7.3
24. The learner will be able to show differences and similarities among members of the plant kingdom.	1.2, 1.3, 3.1, 3.2, 3.3
25. The learners will show knowledge of plant growth by making graphs of the growth of a series of plants.	1.2, 1.3, 3.1, 3.2, 3.3
26. The learner will show knowledge of the body systems by creating models of a given system and presenting a particular system in a group setting.	1.2, 1.3, 7.1, 7.2, 7.3
27. The learner will identify and discuss structure/function relationships in complex systems.	1.2, 1.3, 4.1, 4.2, 6.1, 6.2, 6.3, 7.1, 7.2, 7.3

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
28. The learner will change and use appropriate technologies to collect observations regarding a complex system and use the observations to make predictions about the effects of change made in various components of the system.	1.2, 1.3, 7.1, 7.2, 7.3
29. The learner will demonstrate knowledge of reproduction by accurately explaining how it works.	1.2, 1.3, 4.1, 4.2, 5.1, 5.2, 7.1, 7.2, 7.3
30. The learner given graphs and charts will be able to show how a given disease spreads through a population.	1.2, 1.3, 2.1, 5.1, 5.2, 7.1, 7.3
31. The learner will show life by learning of the ill effects of drugs, alcohol and tobacco by making good decisions about personal health and hygiene.	1.2, 1.3, 5.1, 5.2, 7.1, 7.2, 7.3
32. Given a learner-identified issue of local community importance, the learner will collect information and observations and take action on a decision made regarding the issue.	1.2, 1.3, 5.1, 5.2, 7.1, 7.2, 7.3
33. Presented with appropriate charts, graphs, and other representations of changes in a dynamic system, the learner will describe the type and rate of change represented.	1.2, 1.3, 5.1, 5.2, 7.1, 7.2, 7.3
34. The learner will make a physical or mathematical model of a pattern, structure or behavior and be able to summarize and present the results in a class with a high degree of accuracy.	1.2, 1.3, 5.1, 5.2, 7.1, 7.2, 7.3

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
35. The learner will demonstrate skill in use and interpretation of data from various technologies (e.g. blood pressure).	1.2, 1.3, 7.1, 7.2, 7.3
36. The learner will demonstrate an understanding of evolution by describing the changes which have occurred over time.	1.2, 1.3, 7.1, 7.2, 7.3
37. The student will demonstrate an understanding of heredity and adaption by developing charts of change.	1.2, 1.3, 7.1, 7.2, 7.3

INSTRUCTIONAL/SUBJECT OBJECTIVES	THEME
1.0 UNIT: CYTOLOGY	
1.1 STRUCTURE AND FUNCTION The learner will identify, compare and contrast various models and theories that help to explain components of the cell by individually and collaboratively producing representations of cells, while making inferences and drawing conclusions related to structure and function, based on scientific and student generated data through hands-on activities.	Models
1.2 PROCESS The learner will formulate explanations and representations of cellular processes by identifying, comparing, and contrasting various components and processes while performing hands on investigations and constructing models while analyzing the contributions and advances in technology throughout history.	Models
2.0 UNIT: GENETICS	
2.1 MENDELIAN A. The learner will estimate and justify probabilities of outcomes using ratios and proportions based on experimentation and other strategies derived by investigating the heritability of attributes and the maintenance of diversity.	Patterns of Change
B. The learner will be performing and repeating investigations in a laboratory setting to verify data, determine regularity and minimize experimental error in order to demonstrate a personal understanding of the scientific principles involved in genetics.	Technology and Society
2.2 HUMAN The learner will conduct research using surveys, observational instruments and other methods to investigate patterns of heredity in human populations. The learner will be using various creative means to communicate interpretations of scientific ideas, concepts, phenomena, and events to enable themself to make informed personal and societal decisions concerning genetics-based issues.	Patterns of Change

INSTRUCTIONAL/SUBJECT OBJECTIVES	THEME
3.0 UNIT: CHANGE OVER TIME	
3.1 CLASSIFICATION **The learner will examine, compare, contrast and investigate standard biological classification systems while recognizing and utilizing various systems to classify organisms in a variety of settings.**	Systems and Interactions
3.2 ORIGIN OF LIFE **The learner will analyze information and investigate scientific hypotheses regarding the origin of life throughout geologic time through participating actively in a dialogue about the issues, in order to make personal decisions by interpreting information that has a scientific basis.**	Technology and Society
3.3 EVIDENCE AND THEORY **The learner will trace the development (e.g., history, controversy, and ramification) of various scientific theories of evolution focusing on supporting or new evidence while formulating interpretations of the historical development of these theories of possible causes of diversity among biological organisms. The learner will be analyzing the historical context which has led to scientific theories by evaluating the social and ecological risks and benefits to a sustainable environment throughout time.**	Patterns of Change
4.0 UNIT: INVERTEBRATES	
4.1 COMPARATIVE STRUCTURE/FUNCTION **Through laboratory activities and lecture/discussion the learner will formulate schemes to explain similarities and differences in form, distribution, behavior and survival while developing an understanding of the relationship among organisms and their environment based on structure and function. The learner will be individually and collaboratively collecting and investigating various specimens while developing an understanding of intersystem relationships.**	Systems and Interactions

INSTRUCTIONAL/SUBJECT OBJECTIVES	THEME
4.0 UNIT: INVERTEBRATES (Cont'd.) 4.2 IMPACT AND EFFECT The learner will read, verify, debate and, where necessary, relate information used to investigate models and theories that help to explain the interactions of components in systems (e.g., food webs, natural selection, ecosystems). Through laboratory activities and lecture/discussion the learner will collect and analyze observations made over an extended period of time and make choices promoting and carrying out practices that contribute to a sustainable environment.	Systems and Interactions
5.0 UNIT: VERTEBRATES 5.1 COMPARATIVE STRUCTURE/FUNCTION Through laboratory activities and lecture/discussion the learner will formulate schemes to explain similarities and differences in form, distribution, behavior and survival while developing an understanding of the relationship among organisms and their environment based on structure and function. The learner will be individually and collaboratively collecting and investigating various specimens while developing an understanding of intersystem relationships.	Systems and Interactions
5.2 IMPACT AND EFFECT The learner will read, verify, debate and, where necessary, relate information used to investigate models and theories that help to explain the interactions of components in systems (e.g., food webs, natural selection, ecosystems). Through laboratory activities and lecture/discussion the learner will collect and analyze observations made over an extended period of time and make choices promoting and carrying out practices that contribute to a sustainable environment.	Systems and Interactions

INSTRUCTIONAL/SUBJECT OBJECTIVES	THEME
6.0 UNIT: PLANTS	
6.1 COMPARATIVE STRUCTURE/FUNCTION Through laboratory activities and lecture/discussion, the learner will formulate schemes to explain similarities and differences in form, distribution, behavior and survival while developing an understanding of the relationship among organisms and their environment based on structure and function. The learner will be individually and collaboratively collecting and investigating various specimens while developing an understanding of intersystem relationships.	Systems and Interactions
6.2 IMPACT AND EFFECT The learner will read, verify, debate and, where necessary, relate information used to investigate models and theories that help to explain the interactions of components in systems (e.g., food webs, natural selection, ecosystems). Through laboratory activities and lecture/discussion the earner will collect and analyze observations made over an extended period of time and make choices promoting and carrying out practices that contribute to a sustainable environment.	Systems and Interactions
7.0 UNIT: LABORATORY SAFETY	
7.1 The learner will design/perform investigations/activities that are safe and ethical (i.e., obtain consent and inform others of potential outcomes, risks and benefits, and show evidence of concern for human health and safety, concern for non-human species) in order to promote and carry out life long practices that contribute to a safe working environment.	Technology and Society

SCIENCE COURSE OF STUDY

SUBJECT: BIOLOGY I

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
1. Cytology	
a. Structure and Function	
The learner will identify and discuss structure/function relationships in cells while constructing accurate models.	1.1, 1.2
Given data (i.e., tables, charts, specimens) the learner will identify different types of cells.	1.1, 1.2
The learner will demonstrate proper care and use of microscopes while engaged in laboratory activities.	7.1
b. The learner will demonstrate an understanding of cell reproduction (i.e., mitosis, metosis, etc.), through group discussion.	1.2
Given data students will be able to complete a table which compares and contrasts cellular processes.	1.1, 1.2
Students will demonstrate a knowledge of cellular biochemical processes (i.e., protein synthesis, respiration, homeostasis, etc. by accurately contrasting the process.	1.2
2. Genetics	
a. The learner will either orally or in a written format, state and explain Mendel's three principles.	2.1A
Using Mendelian Principles students will accurately predict the outcome of test crosses.	2.1A, 2.1B, 2.2

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
b. The learner will relate the impact of historical scientific discoveries to the issues confronting contemporary society as they sustain to human genetics.	2.1B
Given data and using Mendelian Principles students will accurately predict the outcome of crosses between humans.	2.1A
The learner will demonstrate an understanding of human genetics (i.e., sex-linked traits, sex-influenced traits, trisomy, mutations, etc.	2.1A, 2.1B, 2.2
3. Evolution	
a. Classification Provided with several objects or organisms and the appropriate key, the learner will identify the organisms or objects.	3.1
Given a collection of data or objects the learner will propose and construct an organizational structure for classifying the information.	3.1
b. Origin of Life The learner will construct models to explain theories on the origin of life as proposed by Redi, Spallanzoni, Oparin, and others.	3.2
c. Evidence and Theory Presented with different versions of a historical even in science (e.g., Wallace, Darwin, and natural selection) the learner will discuss the impact of social and scientific context at the time of the event.	3.3

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
Students will explain the significance of living organisms (comparative anatomy biochemical differences) and fossil evidence in determining evolutionary relationships.	3.1, 3.2, 3.3
4. Invertebrate	
a. Comparative Structure/Function The learner will compare and contrast diverse structures and their functions fusing a systemic approach.	4.1
b. Impact and Effect Using a dichotomous key students will identify different specimens as part of a laboratory exercise.	3.1, 4.1, 4.2, 7.0
The learner will construct and present a summary of invertebrate impacts on the environment and its occupants when provided with appropriate data.	4.2
5. Vertebrates	
a. Comparative Structure/Function The learner will compare and contrast diverse structures and their functions using a systemic approach.	3.1, 5.1
b. Impact and Effect Using a dichotomous key students will identify different specimens as part of a laboratory exercise.	3.1, 5.1, 7.0
The learner will construct and present a summary of vertebrate impacts on the environment and its occupants when provided with appropriate data.	5.2

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
6. Plants	
a. Comparative Structure/Function The learner will compare and contrast diverse structures and their functions using a systemic approach.	3.1, 6.1
b. Impact and Effect Using a dichotomous key students will identify different specimens as part of a laboratory exercise.	3.1, 6.1
The learner will construct and present a summary of plant impacts on the environment and its occupants when provided with appropriate data.	6.2
7. Laboratory Safety	
The learner will engage in safe laboratory practices at all times.	7.0

INSTRUCTIONAL/SUBJECT OBJECTIVES	THEME
1.0 UNIT: CYTOLOGY	
1.1 The learner will analyze the contributions of technology in food production by designing and performing investigations, manipulating data, and developing models of food production in order for the learner to gain an insight into the contribution of technology.	Models
1.2 The learner will investigate the morphology and physiology of cells, including pathogenic microbes, for the purpose of identifying the risks and threats to a sustainable environment and cite how the learner can reduce these risks or be impacted by them.	Scale
2.0 UNIT: GENETICS	
2.1 The learner will investigate Mendelian genetics by performing and repeating investigations to verify data, generating testable hypotheses and drawing conclusions based on data in light of possible outcomes of different genetic combinations of inherited characteristics while reflecting on observed combinations in their own lives.	Patterns of Change
2.2 The learner will formulate opinions based upon their own interpretation of risk-benefit analysis concerning macro molecular structures of Biological importance, showing an informed point of view towards scientific statements and claims of advocates.	Technology and Society
2.3 The learner will consider the scientific thinking and contributions of individuals involving various theories while individually formulating models and testable hypotheses, based upon their own interests, of molecular structures of importance to biological systems and interactions.	Systems and Interactions
2.4 The learner will use technology in the form of multimedia presentations to create, communicate and document their interpretations of both diversity and uniformity within groups of organisms in order to clarify these concepts within their own lives.	Patterns of Change

INSTRUCTIONAL/SUBJECT OBJECTIVES	THEME
2.0 UNIT: GENETICS (Cont'd.)	
2.5 For the development of an informed point of view, the learner will investigate models and theories of change over time by examining the ideas, perspectives and ethics of notable scientists while using scientific evidence to formulate their own personal hypotheses concerning the topic.	Systems and Interactions
3.0 UNIT: ECOLOGY	
3.1 The learner will formulate interpretations involving the interaction and exchange of energy within systems by collecting information from a variety of sources, and analyzing potential changes within these systems as the inputs of energy are altered allowing for student designed environmental action plan.	Systems and Interactions
3.2 The learner, working independently and in small groups, will investigate models and theories that help to explain the interactions of components in living systems, and analyze the changes within a system when inputs, outputs and interactions are altered thus allowing the learner to promote and carry out policies that contribute to a sustainable environment.	Systems and Interactions
4.0 UNIT: ANIMAL BEHAVIOR	
4.1 The learner will investigate patterns of behavior in animals by performing investigations that require observations over varying periods of time while examining the relationships in nature that help define the interdependence of organisms and their physical environments while relating these concepts to the learner's own situation.	Technology and Society
5.0 UNIT: LAB SAFETY	
5.1 The learner will investigate natural phenomena by collecting and analyzing information and performing investigations responsibly in a safe manner for all of those involved which includes the proper use of equipment and appropriate disposal of all hazardous materials.	Patterns of Change

SCIENCE COURSE OF STUDY

SUBJECT: BIOLOGY II

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
1. Provided with examples of patterns in natural phenomena (e.g., variations in populations, the spread of diseases, biome development, atmospheric cycles, food webs, prey-predator cycles, evolutionary adaptations), the learner will design and perform an investigation to document the constancy of the pattern.	1.2, 2.5, 3.1, 3.2, 4.1, 6.1
2. The learner will identify a community problem (e.g., recycling, water quality, animal and plant overpopulation, food production/preservation, dioxin generated conditons, lack of "green spaces", sludge disposal, solid waste management), and propose a solution for that problem using information collected to support their proposal.	1.1, 1.2, 2.2, 2.3, 2.4, 3.1, 3.2
3. Given a set of data on an event or phenomenon, (trophic levels, temperature/moisture recordings, modes of disease transfer, human population statistics) the learner will summarize the data in several meaningful ways (e.g., population genetics, Darwinian evolution).	1.2, 2.1, 2.2, 2.5, 3.1, 3.2, 4.1
4. Given data collected by self and others regarding changes over long time frames (e.g., ecological succession, human evolution, lactic acid fermentation, population fluctuations, speciation, biotechnology development, genetic research), the learner will construct a model of the changes that have occurred.	1.1, 2.1, 2.2, 2.3, 2.4, 2.5, 3.1, 3.2, 4.1
5. Presented with appropriate charts, graphs, and other representations of chages in a dynamic system (e.g., Homeostasis, ecological balance in nature, genetic variation, biome distribution and development, human evolution, antibiotic resistance development), the learner will describe the type and rate of change represented.	1.1, 1.2, 2.1, 2.2, 2.4, 2.5, 3.1, 3.2, 4.1

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
6. Presented with different versions of a historical event in science or technology (e.g., Wallace and Darwin and natural selection, biome destruction, species extinction, human development, Human Genome Project), the learner will discuss the impact of social and scientific context at the time of the event.	1.1, 1.2, 2.1, 2.2, 2.3, 2.5, 3.2, 4.1
7. The learner will identify and discuss structure/function relationships in complex systems (e.g., physiological systems, biomes, molecular genetics, trophic relationships) with appropriate community and field experts.	2.2, 2.4, 2.5, 3.1, 3.2, 4.1, 6.1
8. Provided with an example of a living area or workplace, the learner will propose practices to minimize potential hazards and risks to inhabitants (e.g., lab safety, sterilization, food preparation).	1.1, 2.4, 5.1
9. The learner will relate the impact of historical scientific discoveries to the issues confronting contemporary society (e.g., vaccinations, anesthesia, antiseptics, lactic acid fermentation, Gram's procedure, Human Genome Project, Genetic engineering, evolutionary theory) using a persuasive presentation of a fully-developed position.	1.1, 1.2, 2.1, 2.2, 2.3, 2.5, 3.1, 3.2, 4.1
10. The learner will design an investigation of a natural phenomenon (e.g., lactic acid fermentation, bacterial fermentation of milk products, genetic variation, biome distribution, biotechnology, bioremediation) and organize a team of students to summarize and present the results of the investigation.	1.1, 1.2, 2.1, 2.2, 2.3, 2.5, 3.1, 3.2, 4.1

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
11. The learner will develop an evidence-based position regarding a scientific issue (e.g., Genetic Engineering, Biotechnology, Human Genome Project, biome destruction, species extinction, bioremediation) and present an evidence based, persuasive argument in an oral debate situation.	1.1, 1.2, 2.1, 2.2, 2.3, 2.4, 2.5, 3.1, 3.2
12. The learner will demonstrate an understanding of a model, concept or phenomenon (e.g., Genetics, Hardy-Weinberg, biome deterioration, atmospheric cycles, prey-predator relationships, trophic level interactions) by translating between physical and mathematical presentations, expressing the essential components of the models, interactions between components, and limitations of the model.	1.1, 1.2, 2.1, 2.2, 2.3, 2.5, 3.1, 3.2, 4.1

INSTRUCTIONAL OBJECTIVES	THEME
1.0 UNIT: OCEANOGRAPHY	
1.1 The learner will use a variety of technologies to collect and review data to be used in constructing a model showing the role of geologic processes in determining both ocean floor and terrestrial topography.	Patterns of change
1.2 The learner will cooperatively collect data on a collection of oceanic variables used in predicting predominate terrestrial weather patterns.	Systems and Interactions
1.3 The learne. will formulate a hypothesis showing the factors involved in determining oceanic waves and tides based on the relationships of data analysis, experimental design, and possible models and theories.	Models
1.4 The learner will investigate the chemical composition of the marine environment through collaborative explorations involving standardized procedures used in maintaining artificial environments.	Systems and Interactions
1.5 The learner will be given several opportunities to formulate their own interpretations of both marine and freshwater environments through planning and coordinating field trips and excursions allowing for personal reflection and fulfillment of personal interests.	Systems and Interactions
2.0 UNIT: ZOOLOGY/TAXONOMY	
2.1 The learner will obtain scientific information from a variety of sources and formulate an understanding of the relationships among organisms.	Systems and Interactions
2.2 The learner will investigate different classification systems using a variety of technologies in developing an understanding of marine organisms.	Technology and Society

INSTRUCTIONAL OBJECTIVES	THEME
2.0 UNIT: ZOOLOGY/TAXONOMY (cont'd.)	
2.3 The learner will formulate models which explain the interaction of marine components by accessing information from a variety of sources in developing their personal understanding of the marine environment.	Models
3.0 UNIT: ECOLOGY	
3.1 The learner will use cooperative learning to analyze the interdependence of organisms, energy, and environments in resolving issues of personal interest utilizing various strategies.	Systems and Interactions
3.2 The learner will investigate the interdependence of energy cycles as a contributing member of a collaborative group demonstrating logical connections between each cycle and proposing solutions to related ecological issues.	Systems and Interactions
4.0 UNIT: CAREERS	
4.1 The learner will select and utilize resources to evaluate job opportunities of learner interest in Marine Biology as applied to their making career choices.	Scale
5.0 UNIT: SAFETY	
5.1 Learners will document potentially hazardous conditions in all laboratory procedures by performing investigations responsibly in a healthy environment by promoting and carrying out practices that contribute to a sustainable environment.	Technology and Society

SCIENCE COURSE OF STUDY

SUBJECT:
MARINE BIOLOGY

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
1. Given a repetitive pattern in nature (e.g. wave and tidal patterns, chemical composition of seawater, various cycles) the learner will design and perform an investigation to document the consistency of the pattern.	1.3, 1.4, 1.5, 3.2
2. The learner will implement a plan for the management of a system over a period of one month or more (e.g. a marine aquarium) that is based upon learner collected information and data.	1.4, 2.1, 3.1
3. Given data from a biological system, the learner will describe how changing one component impacts the other components of the system.	1.4, 2.1, 2.3, 3.2
4. The learner will use scientific terminology appropriate to their development level to make predictions in a complex system (e.g. weather, aquarium management, wave and tidal actions, systems, cycles, etc.).	All
5. The learner will collect and analyze data utilizing various sources and techniques on an event or phenomenon that occurs over a period of time (e.g. continental drift, mountain building, structural fatigue in geological systems, coral reef development, sedimentation, fossilization, etc.).	1.1, 1.2, 1.3, 1.4, 2.1, 2.3
6. The learner will demonstrate the use of a standard classification system to accurately predict the composition of and interactions between organisms of specific marine habitats.	2.1, 2.2, 2.3
7. The learner will develop an evidence-based position regarding a scientific issue (e.g. resource management, environmental decay) and present a persuasive oral presentation or written document.	1.5, 3.1, 4.1
8. The learner will demonstrate knowledge of various marine biology fields based on personal interests.	4.1

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
9. Provided with the task of maintaining a desirable workplace, the learner will propose practices to minimize potential hazards and risks to inhabitants.	5.1
10. The learner will present possible solutions to marine ecological problems (e.g. sea level fluctuation, pollution, human interaction) through persuasive presentations of various types (e.g. video presentations, poster displays, oral presentations) to others within the class.	1.2, 1.4, 1.5, 3.1, 3.2
11. The learner will demonstrate an understanding of the factors involved in the determination of global weather patterns (e.g. currents, ocean and terrestrial topography, lower and upper level winds, temperature gradients) through the construction and presentation of a multimedia presentation.	1.1, 1.2, 1.3
12. The learner will collaboratively collect and present information from a variety of sources to suggest positions of and reasons for major ocean currents and their importance to terrestrial life (e.g. water cycles, temperature determination, biome location).	1.1, 1.2, 1.3, 2.1, 2.2, 2.3
13. The learner will perform both individual and group investigations to analyze the changes within a system as inputs, outputs and system interactions are altered (e.g. ammonia, nitrate, nitrite, phosphate, dissolved oxygen, vegetative and animal species) allowing the learner to develop an effective management plan for the system (e.g. aquarium).	1.4, 3.1, 3.2
14. The learner will formulate hypotheses involving species interactions within a natural environment (e.g. oceans, lakes, rivers, streams) through their observations of species within both a closed artificial system (e.g. aquaria) and a natural one and will share these hypotheses with others in a manner chosen by the learner.	1.4, 2.1, 2.2, 2.3

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
15. The learner will demonstrate an understanding of the essential nature of technology in the study of science by using technology to collect, analyze, and communicate information.	All
16. The learner will conduct learner developed investigations concerning marine organisms of personal interest (e.g. plants, invertebrates, vertebrates, mammals, monerans) communicating their findings to the class in a method chosen by the learner.	2.1, 2.2, 2.3
17. The learner will formulate hypotheses concerning the physical interactions between two major groups of marine organisms (e.g. plants, invertebrates, vertebrates, mammals, monerans) in a collaborative setting, allowing each member of the group to use a different media in the presentation of their individual section.	2.1, 2.2, 2.3
18. The learner will maintain a record of sites visited (e.g. Lake Erie, streams, rivers, ponds, Exuma Cays of the Bahamas) and information gained (e.g. biological, geological, chemical, societal) throughout the year by constructing a portfolio documenting their experiences along with maintaining a journal allowing for reflection on and discussions about their personal experiences and interests.	All
19. The learner will investigate the transmission and conservation of energy (e.g. chemical, solar) through the marine environment by collaboratively examining the input and output of a specific habitat (e.g. reef, grass beds, pelagic, benthic, intertidal, etc.) and reporting to the group the evidence of intersystem energy relationships among various components.	1.2, 1.3, 3.1, 3.2

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
20. The learner will investigate the renewable/nonrenewable nature of an earth resource (e.g. chemical, biological, physical) of personal interest using a variety of sources to design and construct a plan for correct ecological management of an ecosystem.	2.1, 3.1, 3.2
21. The learner will investigate strategies that can be used to optimize human interaction in ecological systems (e.g. pollution, recycling) by exercising possible actions (e.g. writing elected officials, foreign governments, world organizations) in response to global, regional, or local issues to help promote public awareness.	3.1, 3.2
22. The learner will investigate various types of dynamic equilibrium (e.g. abiotic and biotic) by analyzing the scientific ideas of others and as a result present new questions towards current courses of action being undertaken either on the global, regional, or local level.	1.2, 1.3, 1.4, 2.1, 2.3
23. The learner will investigate and make inferences from geologic maps, fossils, and/or artifacts collected on site, observed in a museum, or experienced pictorially to draw conclusions concerning the natural construction or design of a geographical region or feature (e.g. island, continent, river, ocean, etc.).	1.1, 2.2, 2.3

INSTRUCTIONAL/SUBJECT OBJECTIVES	THEME
1.0 UNIT: LEVELS OF ORGANIZATION	
1.1 Through laboratory activities and lecture/discussion, the learner will investigate the levels of organization within the body and demonstrate a knowledge of how cells, tissues, organs and systems keep the learner alive and healthy thus allowing the learner to develop an understnading of these intersystem relationships.	Scale
2.0 UNIT: SKELETAL SYSTEM	
2.1 In a cooperative learning situation, the learner will use articulated and disarticulated skeletons in order to demonstrate a knowledge of the bones and their markings as components of the skeletal system which enables the learner to make personal health decisions by interpreting information that has a scientific basis.	Systems and Interactions
3.0 UNIT: MUSCULAR SYSTEM	
3.1 Using a vertebrate dissection (i.e., mink), the learner will individually demonstrate a knowledge of how skeletal muscles produce movement in relationship to the principle skeletal muscles in different regions of the body while relating this information to decisions regarding the learner's personal wellness.	Systems and Interactions
4.0 UNIT: CIRCULATORY SYSTEM	
4.1 Using hands-on activities, the learner will conduct a range of investigations to formulate an understanding of the components of the cardiovascular system and its role in maintaing homeostasis in order to make everyday scientific and technological decisions which effect the learner's personal wellness.	Systems and Interactions

INSTRUCTIONAL/SUBJECT OBJECTIVES	THEME
5.0 UNIT: RESPIRATORY SYSTEM	
5.1 The learner will study the structure and function while making and accurately recording their observations of the respiratory system in reference to how and why activity can influence this system which will enable the learner to make decisions regarding personal wellness through monitoring body system performance.	Systems and Interactions
6.0 UNIT: DIGESTIVE SYSTEM	
6.1 Implementing appropriate wellness strategies that will contribute to personal satisfaction and growth, the learner will examine and refinean understanding of the digestive system by being able to identify and describe its structural and functional components in relationship to its ro' in maintaining homeostasis.	Systems and Interactions
7.0 UNIT: URINARY SYSTEM	
7.1 In order to be able to make decisions regarding personal wellness through monitoring body system performance, the learner will examine and refine a personal understanding of the urinary system by being able to identify and describe its structural in relationship to functional components and its role in maintaining homeostasis.	Systems and Interactions
8.0 UNIT: REPRODUCTIVE SYSTEM	
8.1 By raising issues and engaging in discussions of current issues, the learner will collect and analyze information about the structure, functions and disorders of the reproductive system in order to make personal behavior decisions through interpreting information that has a scientific basis.	Systems and Interactions

INSTRUCTIONAL/SUBJECT OBJECTIVES

THEME

9.0 UNIT: LAB SAFETY

9.1 The learner will design/perform investigations/activities that are safe and ethical (i.e., obtain consent and inform others of potential outcomes, risks and benefits, and show evidence of concern for human health and safety, concern for non-human species) in order to promote and carry out life long practices that contribute to a safe working environment.

Technology and Society

SCIENCE COURSE OF STUDY

SUBJECT:
ANATOMY & PHYSIOLOGY

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
1. The learner will choose and use appropriate technologies to collect observations regarding a complex system (i.e., cardiovascular, respiratory, integument) to make predictions about the effects of changes made in various components of the system.	All
2. The learner will use scientific terminology appropriate to their developmental level to describe the structure, function and disorders of the various systems of the body.	All
3. Presented with appropriate charts, graphs and other representations of changes in a dynamic system (i.e., circulatory, urinary, respiratory, homeostasis) the learner will describe the type and rate of change represented.	9.1
4. The learner will collect data on variability in a dynamic system (i.e., skeletal, cellular, muscular, respiratory, circulatory) and explain how the system remains predictably constant.	All
5. The learner will compare and contrast diverse structures and locations and their associated functions (i.e., subcellular, cellular, organs and systems).	All
6. The learner will identify and discuss structure/function relationships in complex systems using appropriate laboratory activities (i.e., LAB practicals).	9.1
7. The learner will demonstrate skill in the use and interpretation of data from various technologies (microscope, blood pressure apparatus, spirometer).	9.1
8. The learner will describe the significance of cell division, list the structure, function and location of various tissues, (i.e. loose connective, dense, elastic and reticular), list the symptoms of tissue inflammation and describe the conditions necessary for tissue repair.	1.1, 2.1, 3.1, 4.1, 5.1, 6.1, 7.1, 8.1
9. The learner will describe the bones of the axial and appendicular skeleton including the histological features of dense bone, bone construction, destruction, and homeostasis and copare the principle structural differences between male and female skeletons.	1.1, 2.1

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
10. The learner will list the characteristics and functions of muscle tissue while describing the physiological events associated with a normal contraction vs. an abnormal contraction.	1.1, 3.1
11. The learner will describe the structure and function of the components of blood and explain ABO and Rh blood groupings.	1.1, 4.1
12. The learner will describe the structure and function of the heart, the flow of blood through the heart, major arteries and veins and contrast the clinical significance of systolic, diastolic and pulse pressures.	1.1, 3.1, 4.1
13. The learner will identify the organs of the respiratory system including the coverings and gross anatomical features of the lungs and list the sequence of pressure changes involved in inspiration and expiration.	1.1, 5.1
14. The learner will describe the structural and functional features of the digestive system including the organs of the alimentory canal and assessory organs.	1.1, 6.1
15. The learner will describe the gross and microscopic anatomical features and their functions of the kidney and describe the effects of blood pressure, diet, temperature and emotions on urine production.	1.1, 7.1
16. The learner will list and describe the organs that comprise the male and female reproductive systems and the events involved in conception, pregnancy and delivery.	1.1, 8.1
17. The learner will be able to describe the causes and symptoms of various reproductive disorders and diseases (i.e. VD and Aids).	1.1, 8.1

INSTRUCTIONAL OBJECTIVES	THEME
1.0 UNIT: EVALUATIONS	
1.1 The learner will participate actively in formulating positions about the health and safety of the learner and others by investigating, recognizing, and utilizing the principles of physiological evaluation of the human body, (i.e. ankle, knee, hip, low back, shoulder, elbow) through a variety of classroom activities.	Models
2.0 UNIT: WEIGHT TRAINING AND CONDITIONING	
2.1 The learner will be making decisions regarding personal and public health by seeking information to formulate and interpret representation of a weight training program.	Scale
2.2 The learner will investigate models and theories of weight training programs while utilizing caution and concern in promoting and carrying out weight training practices related to the learner's personal wellness.	
3.0 UNIT: NUTRITION	
3.1 Through collaboration, the learner will investigate and formulate the factors of basic nutrition in order to prepare and implement appropriate personal wellness strategies which will determine the likelihood of event outcomes through identifying casual factors while speculating on the possible outcomes.	Systems and Interactions

INSTRUCTIONAL OBJECTIVES	THEME
4.0 UNIT: BASIC FIRST AID	
4.1 The learner will work in small groups investigating and performing the principles of basic first aid while utilizing caution and care in making decisions regarding personal and public health.	Systems and Interactions
5.0 UNIT: CAREERS	
5.1 The learner will select and utilize resources to evaluate job opportunities in allied health fields which will allow them to make career choices relating to the learner's personal interest.	Technology and Society

SCIENCE COURSE OF STUDY

SUBJECT: PHYSIOLOGY OF SPORTS SCIENCE

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
1. The learner will use scientific terminology appropriate to their development level to make predictions in a complex system (e.g., mechnism of injury, injury recognition, healing phase, rehabilitation of injury).	1.1, 2.1, 2.2, 3.1, 4.1
2. The learner will identify and discuss structure/function relationships of the human body's joints (e.g., ankle, knee, hip, low back, shoulder, elbow, hand).	1.1, 2.1
3. The learner will demonstrate skill in the use and interpretation of data from various techniques (e.g., stress test, range of motion apparatus, skinfold callipers).	1.1, 2.2, 3.1, 4.1,
4. The learner will identify a community problem (e.g., physical recreation equipment habits) and propose a solution for that problem using information collected to support their proposal.	2.1, 2.2, 3.1, 4.0, 5.1
5. Given performance data on several consumer products, the learner will analyze the effectiveness and efficiency of the products and recommend improvements to the manufacturer.	3.1

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
6. The learner will implement a plan for the management of a system over a period of one month or more (e.g., weight training program, diet, behavior modification) that is based on learner-collected information and data.	2.1, 2.2, 3.0
7. The learner will demonstrate skill in the use and interpretation of data from various technologies (e.g., free weights, weight machines, vertical jump).	2.1, 2.2
8. Given a learner identified issue of local community importance (AIDS, diet aide, weight programs) the learner will collect information and observation and take action on a decision made regarding the issue.	4.1, 1.1
9. Given performance data on several consumer products (e.g., Erogonic Aids, Diet Aide, weight programs) the learner will analyze the effectiveness and efficiency of the product.	2.2, 3.1, 4.1
10. The learner will demonstrate skill and knowledge in the use and interpretation of basic first aid in practical situations (e.g., splinters, wound care, ice, heat, bandaging, evaluation criteria).	1.1, 4.1
11. The learner will demonstrate knowledge at various allied medical fields based on personal interest.	5.1

INSTRUCTIONAL/SUBJECT OBJECTIVES	THEME
1.0 UNIT: AIR AND OTHER GASES	
1.1 Based on data analysis, experiments and models, the will analyze the pressure, volume and temperature relationships of gases in biological and chemical systems.	Scale
1.2 The learner will explore and analyze the importance of each component of the atmosphere to plant and animal life.	Systems and Interactions
1.3 Given a variety of experimental data, the learner will evaluate the economic, environmental, and personal impact of commercial uses of gases.	Technology and Society
1.4 Using scientific information gathered from a variety of sources, the learner will predict the effects on animal and plant life of industrial and agricultural activities that produce different types of atmospheric pollutants or other threats to a sustainable environment.	Systems and Interactions
2.0 UNIT: ANIMAL LIFE PROCESSES	
2.1 The learner will analyze the role of the senses in helping humans and other animals to maintain stable internal conditions under changing conditions in their environment.	Patterns of Change
2.2 Using a variety of models, the learner will explore the processes by which food is transformed into energy within the body.	Models
2.3 The learner will appraise the effect of various health states and environmental conditions on the maintenance of fluid balance in the human body.	Systems and Interactions
2.4 The learner will investigate the processes by which waste products are produced and eliminated from the body.	Systems and Interactions

INSTRUCTIONAL/SUBJECT OBJECTIVES	THEME
2.0 UNIT: ANIMAL LIFE PROCESSES (Cont'd.)	
2.5 Through cooperative interaction, the learner will plan an appropriate environment and care plan for an animal that takes into account that animal's needs to maintain homeostasis.	Systems and Interactions
3.0 UNIT: CONTINUITY OF LIFE	
3.1 The learner will explore the cell's chemical code: DNA.	Patterns of Change
3.2 The learner will identify what animal breeders need to know about genetic inheritance in animals to produce more economically valuable breeds.	Patterns of Change
3.3 Using scientifically sound data, the learner will compare the results of natural selection in wild populations to the results of artificial selection in similar domesticated species.	Patterns of Change
3.4 Using an example of a domesticated species, the learner will outline methods for altering the genetic makeup of an organism.	Patterns of Change
3.5 Given a selected scenario, the learner will predict how genetic engineering might affect society during your lifetime.	Technology and Society
4.0 UNIT: NATURAL RESOURCES	
4.1 Using a student selected resource, the learner will analyze whether or not a natural resource will be available in the future.	Technology and Society
4.2 Given examples of how natural resources are used to produce energy, the learner will make products, provide food and shelter and improve the quality of life.	Technology and Society

INSTRUCTIONAL/SUBJECT OBJECTIVES	THEME
4.0 UNIT: NATURAL RESOURCES (Cont'd.)	
4.3 Using industry generated data, the learner will analyze problems that result from obtaining and using natural resources.	Systems and Interactions
4.4 Working in a variety of groupings, the learner will propose solutions to problems resulting from obtaining and using natural resources.	Technology and Society
4.5 Using selected geographical areas, the learner will relate jobs to natural resources.	Technology and Society
5.0 UNIT: PLANT GROWTH AND REPRODUCTION	
5.1 The learner will evaluate the roles of different plant parts in growth and reproduction of a plant.	Systems and Interactions
5.2 Using hands-on activities, the learner will investigate the conditions under which different types of plants grow and reproduce.	Systems and Interactions
5.3 Using laboratory conditions, the learner will create an environment which provides optimal growth conditions for a selected plant.	Models
5.4 The learner will evaluate decisions made in modern crop farming from the standpoint of cost to the grower, yield of this year's crop, and management of the land for continued high yield.	Technology and Society

INSTRUCTIONAL/SUBJECT OBJECTIVES	THEME
6.0 UNIT: WATER	
6.1 Using community resources, the learner will evaluate the effect of different water uses on water quality and water quantity.	Systems and Interactions
6.2 The learner will analyze the role of water in maintaining life: as a transporter of nutrients, in biochemical reactions, in maintaining water balance and in regulating temperature.	Systems and Interactions
6.3 The learner will analyze neutralization reactions, interpret pH readings and use the pH scale as an indicator of water's acidity or alkalinity.	Technology and Society
6.4 Given selected experimental data, the learner will review tests to determine water quality, including pH, biochemical oxygen demand, total solids, and concentrations of various solutes in water.	Scale
6.5 The learner will suggest several different methods to prevent water pollution during personal or domestic use of water and handling of wastes.	Technology and Society
7.0 UNIT: LABORATORY PROCEDURE AND SAFETY	
7.1 The learner will document potentially hazardous conditions in all laboratory investigations while correctly following laboratory procedures and acceptable chemical disposal techniques in order to perform all investigations responsibly.	Technology and Society

SCIENCE COURSE OF STUDY

SUBJECT: APPLIED BIOLOGY/CHEMISTRY

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
The learner will:	
1. differentiate among different types of particles making up gases: atoms, ions, and molecules;	1.1, 1.2, 1.3, 1.4
2. demonstrate how air temperature, air pressure, and relative humidity of the air are measured;	1.1, 1.2, 1.3, 1.4
3. convert Celsius and Fahrenheit temperatures to Kelvin and Rankine temperatures, as appropriate, so that Charles' law can be used to solve problems;	1.1, 1.2, 1.3, 1.4
4. use the Combined Gas law to solve commercial problems concerning temperature, volume, and pressure;	1.1, 1.2, 1.3, 1.4
5. describe the relationship between altitude and atmospheric pressure;	1.2, 1.3, 1.4
6. describe the cycles of the three atmospheric gases most essential to life: carbon dioxide, oxygen, and nitrogen;	1.2, 1.3, 1.4
7. analyze animal respiration in terms of three aspects of the behavior of gases: gas diffusion, partial pressure, and the solubility of gases;	1.4
8. explain how photosynthesis replenishes cellular energy;	1.2
9. explain what happens during cellular respiration at the molecular level;	1.3
10. demonstrate through a schematic drawing and an oral presentation the principles at work in a pneumatic device;	1.3
11. explain how acid rain results from the burning of fossil fuels;	1.4

SCIENCE COURSE OF STUDY

SUBJECT: APPLIED BIOLOGY/CHEMISTRY

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
The learner will:	
12. relate the chemical structure of ozone to the problem of too much ozone in the lower atmosphere;	1.4
13. explain the dispersion of potentially hazardous gases in terms of Graham's law;	1.4
14. recommend ways to minimize the effect of air pollution on health;	1.4
15. identify the types of stimuli that can be perceived by each of our senses;	2.1
16. carry out a routine activity with one or more of your senses artificially impaired;	2.1, 7.1
17. relate a person's energy level to: a. eating habits b. the way the body processes energy-rich substances;	2.2
18. compare the energy value of complex carbohydrates to that of simple sugars for various types of activities;	2.2
19. compare the ability of water to keep body temperature stable with the same ability of other solvents;	2.3
20. explain the source of blood pressure and predict the effect of hydrostatic pressure on measured blood pressure;	2.3
21. describe four ways in which you might typically gain or lose body heat in a specific climate, based on the clothing you wear;	2.3
22. describe the roles of the liver, kidney, and large intestine in processing body wastes, including toxic substances;	2.4

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
The learner will:	
23. develop a hypothesis about the dietary habits of ectothermic and endothermic animals, based on data you have compiled;	2.5
24. using a model, demonstrate how cells are organized and how they relate to their environment via a membrane;	3.1
25. construct a model of DNA;	3.1
26. explain how DNA is able to control the activities of the cell;	3.1
27. explain the role of meiosis in organisms that reproduce sexually;	3.1
28. analyze the genetic relationship among members of the same family;	3.2
29. contrast the inheritance pattern of a dominant trait with a recessive trait;	3.2
30. predict the characteristics of an offspring based on a knowledge of genotypes;	3.2
31. evaluate contributions each of the following has made to the diversity of life on Earth: a. mutations in DNA b. natural selection c. artificial selection;	3.3
32. compare and contrast the effects of natural and artificial selection in animal populations;	3.3

SCIENCE COURSE OF STUDY

SUBJECT: APPLIED BIOLOGY/CHEMISTRY

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
The learner will:	
33. predict how an environmental change will encourage or discourage: a. formation of a new species b. extinction of existing animal species;	3.3
34. explain how new technologies can be used to detect defects in genes;	3.4
35. describe the basic processes used in genetic engineering;	3.4
36. evaluate the ethical issues surrounding the use of genetic engineering;	3.5
37. classify natural resources by the following categories: a. Limited resource b. Unlimited resource c. Renewable resource d. Non-renewable resource;	4.1
38. explain how the water cycle works;	4.1
39. identify the ways that people use plants and animals as natural resources;	4.2
40. explain how plants and animals are related through the food web and through the carbon dioxide-oxygen cycle;	4.2
41. explain the major problems that affect plants and animals as natural resources;	4.3
42. evaluate possibilities for replacing fossil fuels with alternative sources of energy;	4.4
43. propose steps that industries and communities may take to preserve water quality and reduce water shortages;	4.4

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
The learner will:	
44. analyze jobs to see how natural resources are involved in every job;	4.5
45. locate the main vegetative and reproductive parts of plants;	5.1
46. compare the primary, secondary, and trace nutrients required by plants in terms of why they are required and how available they may be in soil;	5.2
47. describe the importance of flower structure to the practice of artificial pollination;	5.2
48. trace the movement of forms of nitrogen and phosphorus through the environment as they become available to plants;	5.3
49. analyze the decisions involved in planting seeds as they relate to seed variety, moisture, temperature, spacing and care of seedlings;	5.4
50. analyze the relationship between crop yield and different types of farming practices such as irrigation, soil conditioning and pest control;	5.4
51. create categories for the different uses of water according to the properties that make water useful;	6.1
52. predict how selected organisms will react to environmental temperature changes, based on the role of water as a temperature regulator;	6.2
53. describe how diffusion and osmosis help animals and plants to obtain nutrients and maintain water balance;	6.2

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
The learner will:	
54. explain the relationship between the molar concentration of hydrogen ions and the pH scale;	6.3
55. predict the potential impact on the quality of surface and/or ground waters of at least seven different types of water pollution;	6.4
56. identify the sources of water pollution;	6.5
57. distinguish between point-source and nonpoint-source pollution;	6.5
58. investigate five ways that pollution can be prevented or reduced.	6.5

INSTRUCTIONAL/SUBJECT OBJECTIVES	THEME
1.0 UNIT: LABORATORY PROCEDURE AND SAFETY	
1.1 The learner will document potentially hazardous conditions in all laboratory investigations while correctly following laboratory procedures and acceptable chemical disposal techniques in order to perform all investigations responsibly and safely.	Technology and Society
2.0 UNIT: NATURE OF THE ATOM	
2.1 Using a variety of grouping, the learner will demonstrate and investigate the knowledge of atomic theory and electronic structure of the atom in relationship to social issues while constructing and testing models of the atom.	Models
2.2 The learner will demonstrate an understanding of the periodic table patterns and the usefulness to the relationship between periodic properties and their structures while storing information using various strategies and methods of organization and access classification systems for elements, and exploring and predicting properties and behaviors.	Systems and Interactions
3.0 UNIT: BONDING AND STRUCTURE	
3.1 The learner will work in a variety of activities in class/laboratory to investigate, communicate and build an understanding of the relationship between molecular structure and shape by using various scientific ideas, concepts, phenomena and events and through inferences, draw conclusions using data base, spreadsheet and other technologies.	Models
3.2 The learner will explore various connections between chemical bonding and the characteristics of ionic, covalent, and metallic substances by using appropriate terminology to discuss investigations of chemical bonding while refining personal career interest through investigations of the diversity of manufacturing, research, service and invention process.	Patterns of Change

INSTRUCTIONAL/SUBJECT OBJECTIVES	THEME
4.0 UNIT: MATTER	
4.1 The learner will use a variety of activities in the classroom and laboratory to investigate a wide range of quantities using various lab instruments while demonstrating accuracy and precision and will organize this information into various representational forms (i.e., tables, graphs, charts) in order to interpret scientific relationships.	Scale
4.2 The learner, through activities, investigate ways in which matter is classified and the changes it undergoes by collecting and analyzing observations made over extended periods of time and comparing these to scientific theories by communicating the results through a variety of ways.	Patterns of Change
4.3 The learner, through a variety of activities in the classroom and laboratory, will consider the scientific thinking and language of chemists to communicate formulas for and names for chemical compounds and demonstrate personal understanding of nomenclature utilizing proper naming systems.	Models
4.4 The learner will demonstrate an understanding of the mole concept and its use in connection with chemical formulas, complete and balance chemical equations representing chemical reactions proposing courses of action that will validate and demonstrate personal understanding of this scientific principle in a variety of situations.	Systems and Interactions

INSTRUCTIONAL/SUBJECT OBJECTIVES	THEME
4.5 The learner will demonstrate an understanding of the kinetic molecular theory in relationship to the states of matter while proposing a course of action that will validate and demonstrate personal understandings of these scientific principles while constructing and testing models from various theories.	Models
4.6 The learner will demonstrate various logical connections between related concepts using diverse modes of expression to analyze the scientific understanding of molar gas volume, and its use in solving gas reaction problems by predicting and investigating the working of toys and tools while controlling and manipulating variables using existing algebraic formulas or create new formulas for appropriate problem solving situations.	Systems and Interactions
5.0 UNIT: DYNAMICS	
5.1 Utilize appropriate units for measurement in computations performed by hand, calculator or computer, the learner will explore mass and energy relationships in chemical reactions while utilizing scientific concepts and their application by guiding other learners in their understanding of these interactions in technologies and society at various periods of time.	Systems and Interactions
5.2 The learner will examine and refine personal understanding of scientific concepts by investigating acid-based concepts and various types of equilibrium systems to make and accurately record observations, inferences, hypothesis, and explanations in order to solve unique problems.	Systems and Interactions

SCIENCE COURSE OF STUDY

SUBJECT:
CHEMISTRY I

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
1. The learner will relate the impact of historical scientific discoveries to the issues confronting contemporary society (e.g., acid rain, carcinogens, nuclear energy, fertilizers) using a persuasive presentation of a fully developed position.	4.6, 2.1, 2.2, 5.1, 5.2
2. The learner will demonstrate the use of a classification system to accurately predict properties, interactions, and analyze data (e.g. using accepting nomenclature for naming compounds and formula writing use the periodic table to predict properties and interactions among and between various elements, homogeneous and heterogeneous matter, elements and compounds).	4.3, 2.1, 3.1
3. Demonstrate understanding of the model concept or phenomenon (e.g., Rutherford-Bohr quantum-mechanical model of the atom, Avagodro's #, mole concept, enthalpy ideal gas law) by translating between physical, verbal and mathematical presentations, expressing the essential components, and limitations of the model.	4.4, 4.6, 2.1, 2.2, 5.1, 5.2
4. Provided with an example of a laboratory area, or workplace, the learner will propose practices to minimize potential hazards and risk to inhabitants.	All
5. Given a set of learner collected data concerning the transformation of matter and energy (e.g., stoichiometry, gas laws, quanta changes, phase changes, reaction ratios, physical and chemical changes, the learner will construct a model which adequately represents the transformation.	4.1, 4.2, 4.4, 4.5, 4.6, 5.1, 5.2
6. Given a collection of data (e.g., electron configurations, SI (base and derived) units show an accuracy and precision, stiochiometry will use an organizational structure for a database of information that is usable by other learners.	4.1, 4.4, 4.6, 2.1, 3.2, 5.1, 5.2

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
7. The student will demonstrate an understanding of the kinetic theory of matter by describing its effects on the interactions and transformation systems (e.g., a diabetic change, endothermic and exothermic reactions, change of phase).	5.1, 5.2
8. The learner will demonstrate skill in the use and interpretation of data from various technologies (balances, pippets, graduated cylinders).	4.1, 4.6, 5.2
9. Provided with data (solubility, pH, rates of reactions, problem-solving skills, metric system, gas laws, empirical and molecular formulas, density, molarity, (e.g. Ka scientific notation in graphic form, the learner will transform the data into another form that is useful in understanding phenomenon.	4.1, 4.3, 4.4, 4.6, 5.1, 5.2
10. Given a set of data on the behavior of mechanical and electromagnetic waves and their interactions with matter (e.g. refraction, reflection) the learner will evaluate the strengths and limitations of the wave and particle duality of light to explain these interactions.	2.1, 2.2
11. The learner will compare and contrast diverse structures and their associated functions (e.g. chemical structure, subatomic, particles).	3.1, 3.2
12. The learner will test a physical or mathematical model of a pattern, structure or behavior (gas laws, conservation of energy and mass, reaction types, atomic theory).	4.1, 2.1, 2.2, 3.2
13. Given a set of data on an event or phenomenon, the learner will summarize the data in several meaningful ways (e.g. graphs, tables, charts).	4.1, 4.2, 4.4, 4.5, 4.6, 2.1, 3.1, 5.1, 5.2

INSTRUCTIONAL/SUBJECT OBJECTIVES	THEME
1.0 UNIT: LABORATORY PROCEDURE AND SAFETY	
1.1 The learner will document potentially hazardous conditions in all laboratory investigations while correctly following laboratory procedures and acceptable chemical disposal techniques in order to perform all investigations responsibly and safely.	Technology and Society
2.0 UNIT: NATURE OF THE ATOM	
2.1 Using a variety of grouping, the learner will demonstrate and investigate the knowledge of atomic theory and electronic structure of the atom in relationship to social issues while constructing and testing models of the atom.	Models
2.2 The learner will demonstrate an understanding of the periodic table patterns and the usefulness to the relationship between periodic properties and their structures while storing information using various strategies and methods of organization and access classification systems for elements, and exploring and predicting properties and behaviors.	Systems and Interactions
3.0 UNIT: BONDING AND STRUCTURE	
3.1 The learner will work in a variety of activities in class/laboratory to investigate, communicate and build an understanding of the relationship between molecular structure and shape by using various scientific ideas, concepts, phenomena and events and through inferences, draw conclusions using data base, spreadsheet and other technologies.	Models
3.2 The learner will explore various connections between chemical bonding and the characteristics of ionic, covalent, and metallic substances by using appropriate terminology to discuss investigations of chemical bonding while refining personal career interest through investigations of the diversity of manufacturing, research, service and invention process.	Patterns of Change

INSTRUCTIONAL/SUBJECT OBJECTIVES	THEME
4.0 UNIT: MATTER	
4.1 The learner will use a variety of activities in the classroom and laboratory to investigate a wide range of quantities using various lab instruments while demonstrating accuracy and precision and will organize this information into various representational forms (i.e., tables, graphs, charts) in order to interpret scientific relationships.	Scale
4.2 The learner, through activities, investigate ways in which matter is classified and the changes it undergoes by collecting and analyzing observations made over extended periods of time and comparing these to scientific theories by communicating the results through a variety of ways.	Patterns of Change
4.3 The learner, through a variety of activities in the classroom and laboratory, will consider the scientific thinking and language of chemists to communicate formulas for and names for chemical compounds and demonstrate personal understanding of nomenclature utilizing proper naming systems.	Models
4.4 The learner will demonstrate an understanding of the mole concept and its use in connection with chemical formulas, complete and balance chemical equations representing chemical reactions proposing courses of action that will validate and demonstrate personal understanding of this scientific principle in a variety of situations.	Systems and Interactions

INSTRUCTIONAL/SUBJECT OBJECTIVES	THEME
4.5 The learner will demonstrate an understanding of the kinetic molecular theory in relationship to the states of matter while proposing a course of action that will validate and demonstrate personal understandings of these scientific principles while constructing and testing models from various theories.	Models
4.6 The learner will demonstrate various logical connections between related concepts using diverse modes of expression to analyze the scientific understanding of molar gas volume, and its use in solving gas reaction problems by predicting and investigating the working of toys and tools while controlling and manipulating variables using existing algebraic formulas or create new formulas for appropriate problem solving situations.	Systems and Interactions
5.0 UNIT: DYNAMICS	
5.1 Utilize appropriate units for measurement in computations performed by hand, calculator or computer, the learner will explore mass and energy relationships in chemical reactions while utilizing scientific concepts and their application by guiding other learners in their understanding of these interactions in technologies and society at various periods of time.	Systems and Interactions
5.2 The learner will examine and refine personal understanding of scientific concepts by investigating acid-based concepts and various types of equilibrium systems to make and accurately record observations, inferences, hypothesis, and explanations in order to solve unique problems.	Systems and Interactions
6.0 UNIT: REDUCTION-OXIDATION	
6.1 Using reading, writing, and mathematics as tools for analysis, the learner will investigate electrochemistry and oxidation-reduction reactions to formulate personal explanations and inferences based on systematic analysis of reliable data to solve unique problems.	Models

SCIENCE COURSE OF STUDY

SUBJECT: ACCELERATED CHEMISTRY I

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
1. The learner will relate the impact of historical scientific discoveries to the issues confronting contemporary society (e.g., acid rain, carcinogens, nuclear energy, fertilizers) using a persuasive presentation of a fully developed position.	2.1, 2.2, 4.6, 5.1, 5.2
2. The learner will demonstrate the use of a classification system to accurately predict properties, interactions, and analyze data (e.g. using accepting nomenclature for naming compounds and formula writing use the periodic table to predict properties and interactions among and between various elements, homogeneous and heterogeneous matter, elements and compounds).	2.1, 3.1, 4.3
3. Demonstrate understanding of the model concept or phenomenon (e.g., Rutherford-Bohr quantum-mechanical model of the atom, Avagodro's #, mole concept, enthalpy ideal gas law) by translating between physical, verbal and mathematical presentations, expressing the essential components, and limitations of the model.	2.1, 2.2, 4.4, 4.6, 5.1, 5.2
4. Provided with an example of a laboratory area, or workplace, the learner will propose practices to minimize potential hazards and risk to inhabitants.	All
5. Given a set of learner collected data concerning the transformation of matter and energy (e.g., stoichiometry, gas laws, quanta changes, phase changes, reaction ratios, physical and chemical changes, the learner will construct a model which adequately represents the transformation.	4.1, 4.2, 4.4, 4.5, 4.6, 5.1, 5.2, 6.1
6. Given a collection of data (e.g., electron configurations, SI (base and derived) units show an accuracy and precision, stoichiometry will use an organizational structure for a database of information that is usable by other learners.	2.1, 3.2, 4.1, 4.4, 4.6, 5.1, 6.1

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
7. The student will demonstrate an understanding of the kinetic theory of matter by describing its effects on the interactions and transformation systems (e.g., a diabetic change, endothermic and exothermic reactions, change of phase).	5.1, 5.2, 6.1
8. The learner will demonstrate skill in the use and interpretation of data from various technologies (balances, pipettes, graduated cylinders).	4.1, 4.6, 5.2
9. Provided with data (e.g., solubility, pH, rates of reactions, problem-solving skills, metric system, gas laws, empirical and molecular formulas, density, molarity, (Ka scientific notation), the learner will transform the data into another form that is useful in understanding phenomenon.	4.1, 4.3, 4.4, 4.6, 5.1, 5.2, 6.1
10. Given a set of data on the behavior of mechanical and electromagnetic waves and their interactions with matter (e.g. refraction, reflection) the learner will evaluate the strengths and limitations of the wave and particle duality of light to explain these interactions.	2.1, 2.2
11. The learner will compare and contrast diverse structures and their associated functions (e.g. chemical structure, subatomic, particles).	3.1, 3.2
12. The learner will test a physical or mathematical model of a pattern, structure or behavior (e.g., gas laws, conservation of energy and mass, reaction types, atomic theory).	2.1, 2.2, 3.2, 4.1, 6.1
13. Given a set of data on an event or phenomenon, the learner will summarize the data in several meaningful ways (e.g. graphs, tables, charts).	2.1, 3.1, 4.1, 4.2, 4.4, 4.5, 4.6, 5.1, 5.2, 6.1

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
14. The learner will demonstrate an understanding of oxidation-reduction reactions and their use in electrochemistry by translating between physical, verbal and mathematical presentations by expressing the essential components and mathematical solutions to selected examples.	5.1, 5.2, 6.1

INSTRUCTIONAL/SUBJECT OBJECTIVES	THEME
1.0 UNIT: MATTER	
1.1 The learner will use a variety of activities in the classroom and laboratory to investigate a wide range of quantities using various lab instruments while demonstrating accuracy and precision and will organize this information into various representational forms (i.e., tables, graphs, charts) in order to interpret scientific relationships.	Scale
1.2 The learner, through activities, investigate ways in which matter is classified and the changes it undergoes by collecting and analyzing observations made over extended periods of time and comparing these to scientific theories by communicating the results through a variety of ways.	Patterns of Change
1.3 The learner, through a variety of activities in the classroom and laboratory, will consider the scientific thinking and language of chemists to communicate formulas for and names for chemical compounds and demonstrate personal understanding of nomenclature utilizing proper naming systems.	Models
1.4 The learner will demonstrate an understanding of the mole concept and its use in connection with chemical formulas, complete and balance chemical equations representing chemical reactions proposing courses of action that will validate and demonstrate personal understanding of this scientific principle in a variety of situations.	Systems and Interactions
1.5 The learner will demonstrate an understanding of the kinetic molecular theory in relationship to the states of matter while proposing a course of action that will validate and demonstrate personal understandings of these scientific principles while constructing and testing models from various theories.	Models

INSTRUCTIONAL/SUBJECT OBJECTIVES	THEME
1.6 The learner will demonstrate various logical connections between related concepts using diverse modes of expression to analyze the scientific understanding of molar gas volume, and its use in solving gas reaction problems by predicting and investigating the working of toys and tools while controlling and manipulating variables using existing algebraic formulas or create new formulas for appropriate problem solving situations.	Systems and Interactions
2.0 UNIT: BONDING AND STRUCTURE	
2.1 The learner will work in a variety of activities in class/laboratory to investigate, communicate and build an understanding of the relationship between molecular structure and shape by using various scientific ideas, concepts, phenomena and events and through inferences, draw conclusions using data base, spreadsheet and other technologies.	Models
2.2 The learner will explore various connections between chemical bonding and the characteristics of ionic, covalent, and metallic substances by using appropriate terminology to discuss investigations of chemical bonding while refining personal career interest through investigations of the diversity of manufacturing, research, service and invention processes.	Patterns of Change
3.0 UNIT: NATURE OF THE ATOM	
3.1 Using a variety of grouping, the learner will demonstrate and investigate the knowledge of atomic theory and electronic structure of the atom in relationship to social issues while constructing and testing models of the atom.	Models
3.2 The learner will demonstrate an understanding of the periodic table patterns and the usefulness to the relationship between periodic properties and their structures while storing information using various strategies and methods of organization and access classification systems for elements, and exploring and predicting properties and behaviors.	Systems and Interactions

INSTRUCTIONAL/SUBJECT OBJECTIVES	THEME
4.0 UNIT: LABORATORY PROCEDURE AND SAFETY	
4.1 The learner will document potentially hazardous conditions in all laboratory investigations while correctly following laboratory procedures and acceptable chemical disposal techniques in order to perform all investigations responsibly and safely.	Technology and Society
5.0 UNIT: DYNAMICS	
5.1 Utilize appropriate units for measurement in computations performed by hand, calculator or computer, the learner will explore mass and energy relationships in chemical reactions while utilizing scientific concepts and their application by guiding other learners in their understanding of these interactions in technologies and society at various periods of time.	Systems and Interactions
5.2 The learner will examine and refine personal understanding of scientific concepts by investigating acid-based concepts and various types of equilibrium systems to make and accurately record observations, inferences, hypothesis, and explanations in order to solve unique problems.	Systems and Interactions

INSTRUCTIONAL/SUBJECT OBJECTIVES	THEME
6.0 UNIT: REDUCTION-OXIDATION	
6.1 Using reading, writing, and mathematics as tools for analysis, the learner will investigate electrochemistry and oxidation-reduction reactions to formulate personal explanations and inferences based on systematic analysis of reliable data to solve unique problems.	Models
7.0 UNIT: QUALITATIVE ANALYSIS	
7.1 To fulfill responsibilities as part of a research group, the learner will investigate the principles of qualitative analysis and then translate information from, and represent information in, various forms by taking time to access and effectively use laboratory equipment, instruments, and devices that will enable investigations to proceed effectively.	Systems and Interactions
8.0 UNIT: ORGANIC	
8.1 Considering the scientific thinking and language of chemists, the learner will investigate the chemical and physical attributes of organic compounds and develop logical thinking strategies in order to make every day scientific and technological decisions concerning the learner's personal life.	Systems and Interactions

SCIENCE COURSE OF STUDY

SUBJECT:
CHEMISTRY II

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
1. The learners will relate the impact of historical scientific discoveries to the issues confronting contemporary society (e.g., acid rain, carcinogens, nuclear energy, fertilizers) using a persuasive presentation of a fully developed position.	1.6, 3.1, 3.2, 5.1, 5.2
2. The learner will demonstrate the use of a classification system to accurately predict properties, interactions, and analyze data (e.g. using accepting nomenclature for naming and formula writing for organic and inorganic compounds, use the periodic table to predict properties and interactions among and between various elements, homogeneous and heterogeneous matter, elements and compounds).	1.3, 2.1, 3.2, 8.1
3. Demonstrate understanding of the model concept or phenomenon (e.g., Rutherford-Bohr quantum-mechanical model of the atom, Avagodro's #, mole concept, enthalpy ideal gas law) by translating between physical, verbal and mathematical presentations, expressing the essential components, and limitations of the model.	1.4, 1.6, 3.1, 3.2, 5.1, 5.2, 6.1, 7.1
4. Provided with an example of a laboratory area, or workplace, the learner will propose practices to minimize potential hazards and risk to inhabitants.	All
5. Given a set of learner collected data concerning the transformation of matter and energy (e.g., stoichiometry, gas laws, quanta changes, phase changes, reaction ratios, physical and chemical changes, the learner will construct a model which adequately represents the transformation.	1.1, 1.2, 1.4, 1.5, 1.6, 5.1, 5.2, 6.1
6. Given a collection of data (e.g., electron configurations, SI (base and derived) units show an accuracy and precision, stoichiometry will use an organizational structure for a database of information that is usable by other learners.	1.1, 1.4, 1.6, 2.2, 3.1, 5.1, 5.2, 6.1

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
7. The student will demonstrate an understanding of the kinetic theory of matter by describing its effects on the interactions and transformation systems (e.g., a diabetic change, endothermic and exothermic reactions, change of phase.	5.1, 5.2
8. The learner will demonstrate skill in the use and interpretation of data from various technologies (balances, pipets, graduated cylinders).	1.1, 1.6, 5.2
9. Provided with data (e.g. acid-based titration, Ksp, heat of reaction solubility, pH, rates of reactions, problem-solving skills, metric system, gas laws, empirical and molecular formulas, density, molarity, (e.g. Ka scientific notation in graphic form, the learner will transform the data into another form that is useful in understanding phenomenon.	1.1, 1.3, 1.4, 1.6, 5.1, 5.2, 6.1, 7.1
10. Given a set of data on the behavior of mechanical and electromagnetic waves and their interactions with matter (e.g. refraction, reflection) the learner will evaluate the strengths and limitations of the wave and particle duality of light to explain these interactions.	3.1, 3.2
11. The learner will compare and contrast diverse structures and their associated functions (e.g. chemical structure, subatomic, particles).	2.1, 2.2, 8.1
12. The learner will test a physical or mathematical model of a pattern, structure or behavior (gas laws, conservation of energy and mass, reaction types, atomic theory).	1.2, 2.2, 3.1, 3.2, 6.0
13. Given a set of data on an event or phenomenon, the learner will summarize the data in several meaningful ways (e.g. graphs, tables, charts).	1.1, 1.2, 1.4, 1.5, 1.6, 2.1, 3.2, 5.1, 5.2, 6.1, 7.1
14. The learner will implement a plan for the management of a system over a period of a month or more (e.g. qualitative analysis) that is based upon learner-collected information and data.	7.0

INSTRUCTIONAL/SUBJECT OBJECTIVES	THEME
1.0 UNIT: MATTER	
1.1 Reflecting on laboratory experiences, the learner will analyze and explain the structure of matter through atomic theory, chemical bonding and nuclear chemistry by using scientific evidence derived from experimentation.	Systems and Interactions
1.2 By performing and repeating investigations to verify data, the learner will investigate and explain the states of matter by using scientific evidence collected in the laboratory.	Scale
1.3 Using descriptive chemistry, the learner will comprehend the development of principles and concepts, relate fact to theory, properties to structure and understand systematic nomenclature by comparing a school-based perspective with technological application.	Systems and Interactions
1.4 By synthesizing scientific information from a variety of sources, the learner will investigate the periodicity and the properties of the elements in terms of atomic theory.	Systems and Interactions
1.5 Using models and simulations of real and ideal gases, the learner will explore the laws that describe the properties and behaviors of gases.	Models
1.6. By performing investigations that require observations over varying periods of time, the learner will investigate the aspects of energy changes in relationship to chemical systems.	Systems and Interactions
2.0 UNIT: DYNAMICS	
2.1 By conducting investigations with multiple variables, the learner will demonstrate an understanding of chemical reactions including redox, reaction types, chemical kinetics, acid/base systems and thermodynamics by analyzing laboratory results and solving unique problems.	Systems and Interactions

INSTRUCTIONAL/SUBJECT OBJECTIVES	THEME
2.0 UNIT: DYNAMICS (cont'd.)	
2.2 Working as a contributing member of a research group, the learner will investigate the characteristics of inter-molecular forces.	Systems and Interactions
2.3 Conducting formal scientific investigations, the learner will measure, alter and predict the rates of chemical reactions.	Systems and Interactions
2.4 The learner will explore acid/base systems and apply chemical equilibrium principles to their interactions in a laboratory setting.	Models
3.0 UNIT: ANALYSIS	
3.1 The learner will demonstrate proper laboratory procedures by making observations of chemical substances and reactions, recording data and by calculating and interpreting results based on quantitative data and report their findings through various formats.	Technology and Society
3.2 Using the knowledge acquired in algebra and mathematics, the learner will perform calculations and measurements used by the chemist and apply this knowledge to a variety of situations.	Models
3.3 Selecting and utilizing resources that are appropriate to the investigations being conducted, the learner will perform equilibrium calculations involving buffers, solubility products and complexions.	Scale
4.0 UNIT: LABORATORY PROCEDURE AND SAFETY	
4.1 The learner will document potentially hazardous conditions in all laboratory investigations while correctly following laboratory procedures and acceptable chemical disposal techniques in order to perform all investigations responsibly and safely.	Technology and Society

INSTRUCTIONAL/SUBJECT OBJECTIVES

THEME

5.0 UNIT: ORGANIC

5.1 Considering the scientific thinking and language of chemists, the learner will investigate the chemical and physical attributes of organic compounds and develop logical thinking strategies in order to make every day scientific and technological decisions concerning the learner's personal life.

Systems and Interactions

SCIENCE COURSE OF STUDY

SUBJECT: ADVANCED PLACEMENT CHEMISTRY

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
Through experimentation and synthesizing scientific information from a variety of sources, the learner will:	
1. explain atomic theory and structure including atomic weights, atomic number, electron energy levels and periodic relationships.	1.1, 1.2, 1.4, 3.1, 3.2, 4.1
2. demonstrate and explain chemical bonding, using binding forces, the geometry of particles and nuclear chemistry.	1.1, 1.2, 1.3, 2.2, 3.1, 3.2, 4.1, 5.1
3. classify and explain chemical reactions by groups; acid-base, precipitation and oxidation - reduction reactions.	2.1, 2.4, 3.1, 3.2, 3.3, 4.1, 5.1
4. describe and explain the concept rate of reaction including the effects of temperature on the rate, the role of catalysts in the reaction, the order of reactions and the rate constant.	1.6, 2.1, 2.3, 2.4, 3.1, 3.2, 3.3, 4.1
5. derive the activation energy of a reaction.	1.6, 2.1, 2.3, 3.1, 3.2, 4.1
6. explain the relationships between the rate determining step and the reaction mechanism.	1.6, 2.1, 2.3, 3.1, 3.2, 4.1
7. apply the First Law of Thermodynamics to reactions through enthalpy, heat of formation, Hess's Law and the heat of vaporization.	1.6, 2.1, 2.3, 3.1, 3.2, 4.1
8. apply the Second Law of Thermodynamics to reactions through entropy and Gibbs Free Energy Constant.	1.6, 2.1, 2.3, 3.1, 3.2, 4.1
9. explain the relationships of changes in free energy to equilibrium constants, electrode potentials and calorimetry.	1.6, 2.1, 2.3, 3.1, 3.2, 4.1

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
Through experimentation and synthesizing scientific information from a variety of sources, the learner will:	
10. locate in the laboratory and demonstrate proper use of: a) eye wash fountain, safety shower, goggles b) fire blanket and fire extinguisher c) hood	4.1
11. list and explain the safety regulations for the laboratory.	4.1
12. use laboratory equipment safely and skillfully.	4.1
13. perform the following experiments: a) determination of the formula of a compound b) determination of the percentage of water in a hydrate c) determination of molecular weight by vapor density d) determination of molecular weight by freezing-point depression or boiling-point elevation e) determination of the molar volume of a gas f) determination of concentration by acid-base titration g) determination of concentration by oxidation-reduction titration h) standardization of a solution using a primary standard i) determination of weight and mole relationship in chemical reactions j) determination of the equilibrium constant for a chemical reaction k) determination of appropriate indicators for acid-base titrations; pH determination l) determination of the rate of a reaction m) determination of enthalpy change associated with a reaction n) separation and qualitative analysis of cations and anions o) synthesis of a coordination compound and its chemical analysis	All

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
Through experimentation and synthesizing scientific information from a variety of sources, the learner will:	
13. Perform the following experiments: (cont'd.) p) analytical gravimetric determination q) colorimetric or spectrophotometric analysis r) paper chromatography s) preparation and properties of buffer solutions t) determination of electrochemical series u) measurements using electrochemical cells	
14. describe and explain the behavior of gases through the Kinetic Molecular Theory.	1.2, 1.5, 2.2, 2.3, 3.1, 3.2, 4.1
15. differentiate and describe solids, liquids and solutions including concentrations.	1.2, 1.6, 2.1, 2.3, 2.4, 3.1, 3.2, 3.3, 4.1
16. describe and apply chemical reactivity to products of chemical reactions.	1.3, 1.4, 1.6, 2.1, 2.2, 2.3, 3.1, 3.2, 3.3, 4.1, 5.1
17. compare to the elementary relationship in the Periodic Table.	1.3, 1.4, 1.6, 2.1, 3.1, 3.2, 4.1
18. explain the chemistry of the main groups and transition elements with emphasis on alkali metals, alkaline earth metals, halogens and the first series of transition elements.	1.3, 1.4, 1.6, 2.1, 3.1, 3.2, 4.1
19. perform calculations relations to stoichiometry including net ionic reactions, balancing equations, redox reactions and the mole concept.	1.2, 1.6, 2.1, 2.2, 2.4, 3.1, 3.2, 3.3, 4.1
20. explain and solve problems relating to equilibrium including LeChatelier's principle, equilibrium constants (Kp, Kc, pK, pH), solubility products, buffers and hydrolysis.	1.1, 1.2, 1.4, 1.6, 2.1, 2.2, 2.3, 2.4, 3.1, 3.2, 3.3, 4.1

INSTRUCTIONAL/SUBJECT OBJECTIVES	THEME
1.0 UNIT: MECHANICS	
1.1 The learner will analyze experimental data from various sources to formulate definitions and relationships in order to describe various forms of motion of familiar and unfamiliar objects by gathering and evaluating information in the form of graphs, equations and other presentations.	Patterns of Change
1.2 Using measuring and mathematical techniques, the learner will apply Newton's Laws of motion, including the vector nature of forces, to real physical systems by means of force diagrams, role playing, or demonstrations.	Patterns of Change
1.3 The learner will observe and analyze teacher selected film clips (cartoon, feature films), commercially prepared films and experiments using traditional lab equipment to investigate the conservation laws of mechanical systems in order to predict the outcome of various scenarios.	Systems and Interactions
1.4 Using data to construct models, the learner will explore: a) the effects of the law of gravity on objects ranging in scale from ordinary objects to galaxies and beyond b) how Kepler's laws relate to gravity c) an historical perspective of the derivation of this knowledge by explaining the models developed and producing a time line of the historical process leading to this knowledge	Models
1.5 The learner will formulate an interpretation of relativity and frames of reference by describing consequences of near light speed motion and the learner's concept of various scenarios for future space travel.	Scale
2.0 UNIT: PROPERTIES OF MATTER	
2.1 The learner will compare and contrast the models used to describe the three states of matter and how they are related to the atomic nature of matter by investigating the properties of materials in various states and relate this to the affects on the learner's every day life through such things as weather, environmental impact, and materials in daily use.	Models

INSTRUCTIONAL/SUBJECT OBJECTIVES	THEME
3.0 UNIT: HEAT	
3.1 Using simple learner designed experiments, the learner will investigate the concept of temperature, laws of thermodynamics, and the transport and equilibrium of energy throughout various systems which are examples from the learner's daily life.	Models
4.0 UNIT: WAVES	
4.1 From the knowledge of the characteristics of waves, the learner will predict how waves will behave as they interact with each other and other materials (i.e. lenses, gradings, fiber optics), and illustrate the behavior by means of diagrams or other presentations by various forms of modern technology.	Systems and Interactions
5.0 UNIT: ELECTRICITY AND MAGNETISM	
5.1 The learner will observe and document observations dealing with the properties and behavior of charges at rest through teacher demonstrations and student laboratory investigations in order to explain electrostatic phenomena that the learner encounters daily.	Systems and Interactions
5.2 The learner will analyze changes within a system when inputs, outputs, and interactions are altered to explain the behavior of charges in motion as reflected in currents, circuits, and circuit elements by constructing and working with actual circuits and use this knowledge to explain applications of electricity in the learner's home.	Systems and Interactions

INSTRUCTIONAL/SUBJECT OBJECTIVES	THEME
5.0 UNIT: ELECTRICITY AND MAGNETISM (Cont'd.)	
5.3 The learner will conduct a range of demonstrations and investigations to describe how charges in motion are created and how they are affected by magnetic fields in order to relate this knowledge to the operation of generators and motors found in the learner's extended habitat.	Technology and Society
6.0 UNIT: ATOMIC AND NUCLEAR PHYSICS	
6.1 Given a variety of reference materials, the learner will formulate explanations for the historical development of models of the atom and its nucleus through interpreting historical experiments, graphs, data, and simulations of radioactive decay, fission, fusion and other nuclear reactions in order to gain a personal insight into modern physics.	Models
7.0 UNIT: LABORATORY PROCEDURE AND SAFETY	
7.1 The learner will document potentially hazardous conditions in all laboratory investigations while correctly following laboratory procedures in order to perform all investigations responsibly and safely.	Technology and Society

SCIENCE COURSE OF STUDY

SUBJECT:
CONCEPTUAL PHYSICS

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
1. The learner will collect and interpret data utilizing various sources and techniques including laboratory investigations, scientific charts and graphs, and film clips or photographs on an event or phenomenon. (Motion of object, interactions between objects in motion, gravitation force and acceleration, mechanical energy, satellite motion, transmission of heat, interactions of waves, static electricity, circuits and currents, electromagnetic induction).	1.1, 1.2, 1.3, 1.4, 3.1, 4.1, 5.1, 5.2, 5.3
2. In all calculations and discussions the learner will use correct units and scientific terminology.	1.1
3. Given contradictory observations of a phenomenon, the learner will be able to explain the differences in terms of a change in the frame of reference.	1.5
4. The learner will follow all classroom guidelines concerning the learner's personal safety as well as others in the direct vicinity.	3.1
5. The learner will trace transmission, transformation, and conservation of various forms of energy in mechanical systems, atomic systems and phase transformation systems.	1.3, 2.1, 6.1
6. Presented with different versions of a historical event in science or technology (e.g., Ptolemy and Copernicus, Huygens and Newton, Teller and Urey, Edison and Tesla), the learner will discuss the impact of social and scientific context at the time of the event.	1.4
7. Provided with data (e.g., linear motion, simple harmonic motion, radioactive decay, planetary motion, Ohm's law) in graphic or tabular form, the learner will transform the data into another form that is useful in understanding the phenomenon.	1.1, 5.2, 6.1

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
8. Given a set of data on the behavior of mechanical and electromagnetic waves and their interactions with matter (e.g., absorption, transmission, reflection, refraction, diffusion, polarization), the learner will prepare and present an evaluation of the strengths and limitations of the wave and particle models to explain these behaviors and interactions.	4.1
9. Demonstrate understanding of a model of a concept or phenomenon (e.g., mechanical, solar system, gas laws, thermal, electrical and atomic) by translating between physical, verbal, and "mathematical" presentations, expressing the essential components of the models, interactions between components, and limitations of the model.	1.3, 1.4, 2.1, 3.1, 5.2, 6.1
10. The content of this course will be presented in such a manner as to maximize the learner's utilization of previously learned mathematical skills.	1.1

INSTRUCTIONAL/SUBJECT OBJECTIVES	THEME
1.0 UNIT: MECHANICS	
1.1 The learner will analyze experimental data from various sources to formulate definitions and relationships in order to describe various forms of motion of familiar and unfamiliar objects by gathering and evaluating information in the form of graphs, equations and other presentations.	Patterns of Change
1.2 Using measuring and mathematical techniques, the learner will apply Newton's Laws of motion, including the vector nature of forces, to real physical systems by means of force diagrams, role playing, or demonstrations.	Patterns of Change
1.3 The learner will observe and analyze teacher selected film clips (cartoon, feature films), commercially prepared films and experiments using traditional lab equipment to investigate the conservation laws of mechanical systems in order to predict the outcome of various scenarios.	Systems and Interactions
1.4 Using data to construct models, the learner will explore: a) the effects of the law of gravity on objects ranging in scale from ordinary objects to galaxies and beyond b) how Kepler's laws relate to gravity c) an historical perspective of the derivation of this knowledge by explaining the models developed and producing a time line of the historical process leading to this knowledge	Models
1.5 The learner will formulate an interpretation of relativity and frames of reference by describing consequences of near light speed motion and the learner's concept of various scenarios for future space travel.	Scale
2.0 UNIT: PROPERTIES OF MATTER	
2.1 The learner will compare and contrast the models used to describe the three states of matter and how they are related to the atomic nature of matter by investigating the properties of materials in various states and relate this to the affects on the learner's every day life through such things as weather, environmental impact, and materials in daily use.	Models

INSTRUCTIONAL/SUBJECT OBJECTIVES	THEME
3.0 UNIT: HEAT	
3.1 Using simple learner designed experiments, the learner will investigate the concept of temperature, laws of thermodynamics, and the transport and equilibrium of energy throughout various systems which are examples from the learner's daily life.	Models
4.0 UNIT: WAVES	
4.1 From the knowledge of the characteristics of waves, the learner will predict how waves will behave as they interact with each other and other materials (i.e. lenses, gradings, fiber optics), and illustrate the behavior by means of diagrams or other presentations by various forms of modern technology.	Systems and Interactions
5.0 UNIT: ELECTRICITY AND MAGNETISM	
5.1 The learner will observe and document observations dealing with the properties and behavior of charges at rest through teacher demonstrations and student laboratory investigations in order to explain electrostatic phenomena that the learner encounters daily.	Systems and Interactions
5.2 The learner will analyze changes within a system when inputs, outputs, and interactions are altered to explain the behavior of charges in motion as reflected in currents, circuits, and circuit elements by constructing and working with actual circuits and use this knowledge to explain applications of electricity in the learner's home.	Systems and Interactions

INSTRUCTIONAL/SUBJECT OBJECTIVES	THEME
5.0 UNIT: ELECTRICITY AND MAGNETISM (Cont'd.)	
5.3 The learner will conduct a range of demonstrations and investigations to describe how charges in motion are created and how they are affected by magnetic fields in order to relate this knowledge to the operation of generators and motors found in the learner's extended habitat.	Technology and Society
6.0 UNIT: ATOMIC AND NUCLEAR PHYSICS	
6.1 Given a variety of reference materials, the learner will formulate explanations for the historical development of models of the atom and its nucleus through interpreting historical experiments, graphs, data, and simulations of radioactive decay, fission, fusion and other nuclear reactions in order to gain a personal insight into modern physics.	Models
7.0 UNIT: LABORATORY PROCEDURE AND SAFETY	
7.1 The learner will document potentially hazardous conditions in all laboratory investigations while correctly following laboratory procedures in order to perform all investigations responsibly and safely.	Technology and Society

SCIENCE COURSE OF STUDY

SUBJECT: PHYSICS I

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
1. Given a graph of changing motion (displacement-time, velocity-time or acceleration-time), the learner will describe the motion using terminology, numerical values and units and produce the other two graphs for that motion that are not given.	1.1, 1.2, 1.3, 1.4, 1.5
2. The learner will collect data from actual moving objects and construct displacement-time, velocity-time and acceleration-time graphs.	1.1, 1.2, 1.3, 1.4, 1.5
3. The learner will derive the relationships $a = \Delta v/t$, $v = d/t$, $v_f = at$ and $d = 1/2at^2$ and solve for unknowns in situations with zero and non-zero initial speed.	1.1, 1.2, 1.3, 1.4, 1.5
4. The learner will predict where a projectile will land when released at any angle.	1.1, 1.2, 1.3, 1.4, 1.5
5. The learner will catagorize quantities as vectors or scalers.	1.1, 1.2
6. The learner will add and resolve vectors graphically and trigometrically.	1.1, 1.2
7. Given a situation, the learner will describe and calculate the forces acting (including friction) and calculate the resulting motion.	1.1, 1.2
8. The learner will apply Newton's second law to explain why the acceleration of an object in free fall does not depend upon the mass of the object.	1.2
9. The learner will identify action reaction pairs.	1.2

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
10. Using Newton's second law the learner will derive the relationship between impulse and Δ in momentum and use it to solve problems.	1.1, 1.2, 1.3
11. Using conservation of momentum law, the learner will calculate the resulting motion of one and two dimensional elastic and inelastic collisions.	1.1, 1.2, 1.3
12. The learner will explain why impulse is greater when an object bounces than when it does not.	1.3
13. The learner will demonstrate an understanding of mass, weight and volume by answering multiple choice or short answer questions.	1.4
14. The learner will collect and interpret data utilizing various sources and techniques including laboratory investigations, scientific charts and graphs, and film clips or photographs on an event or phenomenon. (Motion of object, interactions between objects in motion, gravitation force and acceleration, mechanical energy, satellite motion, transmission of heat, interactions of waves, static electricity, circuits and currents, electromagnetic induction).	1.1, 1.2, 1.3, 1.4, 3.1, 4.1, 5.1, 5.2, 5.3
15. In all calculations and discussions the learner will use correct units and scientific terminology.	1.1
16. Given contradictory observations of a phenomenon, the learner will be able to explain the differences in terms of a change in the frame of reference.	1.5
17. The learner will follow all classroom guidelines concerning the learner's personal safety as well as others in the direct vicinity.	3.1

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
18. The learner will trace transmission, transformation, and conservation of various forms of energy in mechanical systems, atomic systems and phase transformation systems.	1.3, 2.1, 6.1
19. Presented with different versions of a historical event in science or technology (e.g., Ptolemy and Copernicus, Huygens and Newton, Teller and Urey, Edison and Tesla), the learner will discuss the impact of social and scientific context at the time of the event.	1.4
20. Provided with data (e.g., linear motion, simple harmonic motion, radioactive decay, planetary motion, Ohm's law) in graphic or tabular form, the learner will transform the data into another form that is useful in understanding the phenomenon.	1.1, 5.2, 6.1
21. Given a set of data on the behavior of mechanical and electromagnetic waves and their interactions with matter (e.g., absorption, transmission, reflection, refraction, diffusion, polarization), the learner will prepare and present an evaluation of the strengths and limitations of the wave and particle models to explain these behaviors and interactions.	4.1
22. Demonstrate understanding of a model of a concept or phenomenon (e.g., mechanical, solar system, gas laws, thermal, electrical and atomic) by translating between physical, verbal, and "mathematical" presentations, expressing the essential components of the models, interactions between components, and limitations of the model.	1.3, 1.4, 2.1, 3.1, 5.2, 6.1
23. The content of this course will be presented in such a manner as to maximize the learner's utilization of previously learned mathematical skills.	1.1

INSTRUCTIONAL/SUBJECT OBJECTIVES	THEME
1.0 UNIT: MOTION	
1.1 The learner will analyze experimental data from various sources to formulate definitions and relationships to describe various forms of motion of familiar and unfamiliar objects by gathering and evaluating information in the form of graphs, equations and other forms of presentation.	Patterns of Change
1.2 The learner will analyze experimental data from various sources to formulate definitions and relationships to describe various forms of motion of familiar and unfamiliar objects by gathering and evaluating information in the form of graphs, equations and other forms of presentation.	Patterns of Change
1.3 Using measuring and mathematical techniques, the learner will apply Newton's laws of motion, including the vector nature of forces, to real physical systems by means of force diagrams, role playing, or demonstrations.	Patterns of Change
1.4 Using measuring and mathematical techniques, the learner will apply Newton's laws of motion, including the vector nature of forces, to real physical systems by means of force diagrams, role playing, or demonstrations.	Patterns of Change
2.0 UNIT: WORK AND ENERGY	
2.1 Observing and analyzing teacher selected film clips (cartoon, feature films), commercially prepared films and experiments using traditional lab equipment, the learner will investigate conservation laws of mechanical systems by predicting the outcome of various scenarios.	Systems and Interactions

INSTRUCTIONAL/SUBJECT OBJECTIVES	THEME
3.0 UNIT: GRAVITATION	
3.1 Using data to construct models, the learner will investigate: a. the effects of the law of gravity on objects ranging in scale from ordinary objects to galaxies and beyond b. how Kepler's laws relate to gravity c. an historical perspective of the derivation of this knowledge by explaining the models developed and producing a time line of the historical process leading to this knowledge.	Models
4.0 UNIT: ELECTRICAL INTERACTIONS	
4.1 The learner will analyze changes within a system when inputs, outputs, and interactions are altered to explain the behavior of charges in motion as reflected in currents, circuits, and circuit elements by constructing and working with actual circuits and use this knowledge to explain applications of electricity in the home.	Systems and Interactions
5.0 UNIT: LABORATORY PROCEDURE AND SAFETY	
5.1 The learner will document potentially hazardous conditions in all laboratory investigations while correctly following laboratory procedures in order to perform all investigations responsibly and safely.	Technology and Society

SCIENCE COURSE OF STUDY

SUBJECT: ADVANCED PLACEMENT PHYSICS (PHYSICS II)

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
1. The learner will: a. write the mathematical definitions of displacement, instantaneous velocity, and acceleration, and define all terms;	1.1
b. distinguish between average and instantaneous values of velocity and acceleration, and distinguish between position and displacement and between velocity and speed;	
c. given a graph of position as a function of time, for one-dimensional motion, determine either average or instantaneous velocity; given a graph of velocity as a function of time, determine acceleration and displacement;	
d. given a mathematical expression for position as a function of time, for one-dimensional motion, determine an equation for velocity as a function of time, determine the equations for acceleration and displacement as a function of time;	
e. given the case of one-dimensional motion of a body with constant acceleration, determine the displacement, velocity, and/or acceleration of the body; e.g., a body falling freely near the surface of the earth.	
2. The learner will: a. given a particle's time-dependent positon vector $r(t) = x(t)i + y(t)j$, draw its path in the plane;	2.1
b. given r(t), calculate velocity v(t), speed v(t), and acceleration a(t);	
c. given a particle's position r, velocity, and acceleration a at a specified time, determine whether at this instant: 1) it's distance from the origin is increasing, decreasing, or not changing; 2) r is turning clockwise, counterclockwise, or not turning;	361

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
3) its speed is increasing, decreasing, or not changing; 4) v is turning clockwise, counterclockwise, or not turning;	
d. given that a particle moves with constant acceleration in two dimensions, sole problems involving position, velocity, acceleration, and time;	
e. given that a particle moves in a circular path at a constant speed, solve problems involving position, velocity, acceleration, and time.	
3. The learner will: a. draw a diagram of a particle representation of a body isolated from its environment in an inertial reference frame; and 1) illustrate, with vectors, all forces that act upon it; and 2) identify, by name, the source and each force illustrated;	1.3
b. write Newton's first and second laws in mathematical form; and 1) choosing an appropriate coordinate system, apply the second law to a given problem involving a single massive body, solving for either a specified force or the acceleration of the body; and 2) apply Newton's third law to a problem to relate the forces exerted and experienced by a body' 3) solve a problem concerning the motion of a body (acceleration, velocity, and displacement) given sufficient information concerning the external forces acting on the body. (These external forces may be gravitational forces or contact forces exerted by another particle, by friction, by nonstretchable ropes, or by rigid rods.)	
4. The learner will: a. for a particle undergoing circular motion, draw a free-body diagram and identify the interactions responsible for the centripetal force; these forces may be gravitational forces or contact force exerted by another body;	1.4

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
b. search out the necessary conditions concerning radius, speed, and forces to solve problems by applying Newton's second law to a particle undergoing circular motion;	
c. for a system of two or three interacting bodies, (1) identify the forces of interaction; and (2) draw a free-body diagram (using a particle representation) for each body;	
d. apply Newton's third law to determine action-reaction force pairs between the bodies of a two or three-body system;	
e. use Newton's second law to solve problems relating the motion of several bodies comprising a system and the external and internal forces acting where (1) the acceleration is uniform; or (2) the motion is uniform circular.	
5. The learner will: a. define the work done by a force and the work done on a particle; calculate the work done by a constant or variable force oriented parallel or obliquely to the displacement of the particle;	2.1
b. define and calculate the kinetic energy of a particle or system of several particles, given their masses and velocities;	
c. relate the work done on a particle to change is kinetic energy, and solve problems of particle motion in one dimension using this relationship;	
d. define power and apply the relationships of power to work, force, velocity, and kinetic energy in connection with the motion of a particle in one dimension.	

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
6. The learner will: a. define a conservative or a nonconservative force, or distinguish between them in problems;	2.1
b. calculate the potential energy function U(x), given a conservative force F(x) depending on one coordinate; or conversely, given U(x), find (F(x);	
c. use the law of conservation of mechanical energy for conservative forces to solve problems involving particle motion in one dimension;	
d. apply the law of conservation to total energy, specifically including frictional forces, in the solution of problems of particle motion in one dimension.	
7. The learner will: a. write the formulas for the center of mass (c.m.) of a system and explain all the terms. Write the formulas for the linear momentum of a system and explain all the terms;	1.4
b. given the masses, positions, and velocities of all particles in a system, find the position and velocity of the center of mass, and the total (vector) linear momentum;	
c. given a force versus time graph or function for a system calculate the change of the system's linear momentum;	
d. recognize conditions for which the linear momentum of a system is conserved.	

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
8. The learner will: a. define or state: (1) elastic collison, (b) inelastic collision, (c) perfectly or completely inelastic collision, and (d) the law of conservation of linear momentum; b. solve problems involving collisions between two or more bodies and/or the splitting up of a body into two or more fragments.	2.1
9. The learner will: a. define angular displacement, velocity, and acceleration for the case of rotation of a rigid body about a fixed axis; for the case of constant angular acceleration, use the relation among these quantities to solve problems in rotational motion; b. using the solution of a problem in angular variable, determine the linear displacement, velocity, a and acceleration of a point on the rotating body;' c. define torque and angular momentum and apply them to a point mass moving in a plane. For some specific examples, calculate torque and angular momentum f om force and velocity; show in such examples that the time rate of change of angular momentum is equal to the torque.	1.4
10. The learner will: a. apply the definition of moment of inertia, and the parallel-axis theorem where needed, to calculation of moments of inertia of simple extended bodies (not requiring integration), or demonstrate general understanding of the concept of moment of inertia by ranking several regular and irregular bodies according to their moments of inertia; b. write down the moments of inertia of a circular hoop (identical to that for an oil drum without ends), a circular disk (identical to that for a solid cycinder), and a long thin rod about an axis through the center of mass, and perpendicular to the	1.4

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
plane of hoop or disk, or perpendicular to the length of the rod; c. in cases of rotation about a fixed axis, solve problems using Newton's second law of motion for rotation, or by using conservation of energy; d. for a system of objects rotating about a fixed axis where some of the following quantities are given, find others: moment of inertia, angular momentum, angular velocity, rotational kinetic energy, work, and power; e. for a system of objects rotating about a fixed axis, solve problems where angular momentum is conserved about some axis, but where angular velocity changes because the system changes size or shape; be able to recognize those groups of objects for which angular momentum will be conserved about a given axis.	
11. The learner will: a. define the following terms and describe the application of each to a physical object or system; first condition of equilibrium (translational); second conditon of equilibrium (rotational); center of gravity;	1.4
b. analyze translational equilibrium problems by identifying all forces, making a free-body diagram, and applying the first condition of equilibrium to solve for the unknown parameters. These problems may involve weight acting at the center of gravity, tensions in ropes or wire, compressional forces on rods or hinges, and frictional forces; c. analyze problems involving both the first and second conditions of equilibrium. These problems will involve torques as well as forces referred to in Objective 1.2.	

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
12. The learner will: a. define a set of terms or relate them to the solution of Newton's second law for simple harmonic motion, $x = A \cos (t + 0)$;	1.4
b. analyze the motion of a particle to determine whether simple harmonic motion occurs, and if so, determine its angular frequency;	
c. organize the necessary data about a particle undergoing linear simple harmonic motion to find any or all of the following quantities: the particle's position as a function of time, angular frequency, period, amplitude, phase, frequency, velocity, acceleration, mass, and the restoring force, kinetic energy, or potential energy of the system;	
d. apply Newton's second law or conservation of energy to simple physical systems carrying out rotational or approximately linear simple harmonic motion to determine any or all of the quantities listed in Objective 1.3.	
13. The learner will: a. use Newton's law of universal gravitation to determine (a) the (vector) gravitational force exerted by one object on another - or the distance or a mass when the force is know; and (2) the gravitational field of an object;	3.1
b. use the gravitational force law, together with the expression for centripetal acceleration, to find the speed, period, orbital radius, and/or masses of objects moving in circular orbits as a result of gravitational forces;	
c. determine the potential energy of one object in the gravitational field of another; and use energy conservation to relate changes in this potential energy to changes in kinetic energy and speed of the first object.	

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
14. The learner will: a. make the distinction between insulators and conductors'	4.1
b. calculate, for group of point charges at rest, 1) the resultant force on one of the charges caused by all of the others, and/or 2) the total electric field at some point in space caused by all the charges;	
c. apply the definition of electric field to solve problems involving a charge particle in an electric field, where 1) the particle is at rest under the influence of additional forces, like gravity or tension, and/or 2) the particle moves in a constant electric field. These problems will require you to calculate any of the following quantities: force, acceleration, time, position, velocity, work, kinetic energy. For vector quantities you must be able to calculate components, magnitude, and direction.	
15. The learner will: a. state Gauss' law and explain all its symbols;	4.2
b. recognize when Gauss' law cannot be used to determine the electric field caused by a static charge distribution, and explain why;	
c. use Gauss' law to 1) determine the electric field due to certain symmetric charge distribution; or 2) determine the net charge inside volumes where the electric field is know everywhere on the surface of the volume;	

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
d. given a conductor with a static charge distribution, use the properties of a conductor and/or Gauss' law to 1) explain why the electric field is perpendicular to the surface of the conductor; 2) explain why the electric field is zero inside the conductor; 3) explain why the excess charge is on the surface of the conductor.	
16. The learner will: a. relate electric potential to (1) work done on a displaced charge, (2) the electric field, and (3) electric potential energy. Use the electron volt to express energy and solve simple problems applying energy conservation;	4.1
b. state and interpret the conservative nature of the electrostatic field;	
c. use the definition and/or the superposition principle for finding the electric potential caused by (1) one or more given point charges, and (2) continuous charge distribution with planar, cylindrical, or spherical symmetry;	
d. determine the electric field when given an electric potential that is a function of one position variable only;	
e. use equipotential surfaces and field lines for describing the potential and field semi-quantitatively near several given point charges and/or simply shaped metallic surfaces.	
17. The learner will: a. define the terms "capacitor" and "capacitance" and use these definitions to relate capacitance, voltage difference, and charge in a capacitor;	4.1
b. derive and use expressions for the capacitance of capacitors that have planar, cylindrical, or spherical symmetry;	

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
c. determine the equivalent capacitance of a set of capacitors connected together, and determine the charge and voltage on each capacitor of the set;	
d. determine the energy stored in a capacitor or combination of capacitors, and compute the energy stored per unit volume in a region where an electric field exists;	
e. describe the effect on a capacitor's capacitance, voltage, charge, and stored energy, as well as the electric field in the capacitor, if the space between the conductors of the capacitor contains dielectric material; describe qualitatively the distribution of polarization charges that accounts for these effects.	
18. The learner will: a. apply the definition of current or current density to problems in conductors in which these are related to electric charge;	4.1
b. apply the microscopic model for conduction in a metal to problems where you are given information concerning several of the quantities (drift speed, current, current density, charge, charge density, cross-sectional area) and are asked to solve for another;	
c. solve problems using the relationships among resistance, potential difference, electric current, current density, electric field, resistivity, and the physical dimensions of a conductor;	
d. apply the relation for instantaneous power ($P = IV$) to problems dealing with resistive elements obeying Ohm's law.	

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
19. The learner will: a. analyze a single-loop direct-current (dc) circuit consisting of resistances and a seat of emf to find the loop current, the power developed in the circuit elements, and the terminal potential difference of the seat of emf;	4.1
b. determine an equivalent resistance for a series or parallel combination of resistances;	
c. write the differential equation for a single RC loop, and verify that particular assumed solutions satisfy this equation;	
d. write the equation for the current, charge or voltage of a capacitor as a function of time in a single RC loop, and manipulate this equation to determine the value of one of the parameters when an appropriate set of other values is given.	
20. The learner will: a. calculate the force on a moving charged particle in a uniform magnetic field; for the case of V perpendicular to B, find the radius and/or frequency of the resulting circular orbit;	4.1
b. calculate the force on a current-carrying wire in a uniform magnetic field;	
c. calculate the magnetic moment of a current loop; use this to determine the torque on such a loop in a uniform magnetic field;	
d. for problems with balanced electric and magnetic forces (Hall effect, velocity selectors) use the relation v = E/B to relate the fields to parameters such as the Hall field or potential difference, current density, or charge sign and velocity.	

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
21. The learner will: a. write Ampere's law and use it to calculate the magnitude and direction of the magnetic field B caused by currents flowing in a conductor of cylindrical cross-sectional area with a simple symmetric shape, such as a long, straight wire, a solenoid, or a toroid, or a combination of these (principle of superposition);	4.1
b. given the currents in parallel conductors, solve for the force on one of the conductors;	
c. write the Biot-Savart law and employ it to find the magnitude and direction of the magnetic field dB at a point P caused by a current element at another point P; and/or find the magnetic field B at the center of a circular or semicircular loop of current-carrying wire.	
22. The learner will: a. write the equation for Faraday's law in the form = -d /dt and define all terms with correct units;	4.1
b. determine the magnetic flux or the time rate of change of the magnetic flux for an area in a magnetic field;	
c. determine, using Faraday's law, the induced current and/or voltage for a situation involving either (1) a stationary circuit in a time varying magnetic field, or (2) a conductor moving in a magnetic field.	

PERFORMANCE OBJECTIVES	CORRELATION TO INSTRUCTIONAL/SUBJECT OBJECTIVES
23. The learner will: a. apply the definition of inductance, Ampere's law, and Faraday's law to toroids and long solenoids to (1) find the inductance :; and (2) relate the induced emf to the rate of change of current or flux;	4.1
b. determine currents, voltages, stored energies, and power dissipations in simple LR circuits. (This includes adding up voltages around the circuit to find a differential equation and determine the time dependence.);	
c. determine charges, voltages, currents, and stored energies in simple LC circuits. (This includes using the principle of energy conservation to find maximum values, as well as to obtain a differential equation and determine the time dependence.)	
24. The learner will: a. use Ampere's law (including the displacement current) to find the B field produced by changing E field, or vice versa;	4.1
b. state Maxwell's equations in vacuum (i.e., in the presence of charges and currents, but with no dielectrics or magnetic materials), and indicate the physical significance of each;	
c. for a plane electromagnetic wave, use information about E or B at given times or places, the direction the wave moves, the frequency, and/dor the wavelength to determine other information in this list; also, write down mathematical expressions for the components of E and B, and show that your expressions satisfy the appropriate simplified differential form of Maxwell's equations.	

PROGRAM ASSESSMENT
POLICY AND PROCEDURES

OVERVIEW:

Assessment in science can be in many forms. Central to the ideals of competency-based education (CBE) is the reliance on qualitative and quantitative assessment to make decisions. The decisions to be made in a CBE program occur at many levels from state-mandated requirements of CBE through assessments that are used to make instructional decisions at the individual and classroom levels.

DISTRICT LEVEL ASSESSMENT:

Competency based education requires assessment of student progress in a standardized fashion. This means that all students in the district must be assessed in the same manner using a common scoring criteria. South-Western City Schools will meet the state requirement for district-wide grade level tests by:

- administering a standardized achievement test in grades three, five, six and seven until the Sixth Grade Science Proficiency Test is implemented. We are currently administering the California Test of Basic Skills (CTBS) at these grade levels;
- administering the Fourth, Sixth, Ninth and Twelfth Grade Science Proficiency Tests when they become available; and
- reporting the district-wide assessment results through the Educational Management Information System (EMIS).

With the addition of the fourth, sixth and ninth grade proficiency test in science, we will have one more indicator of our program effectiveness. Our program evaluation, (coupled with the results from the proficiency tests) occurs yearly through adjustments made to the curriculum in areas indicated as inadequate. An array of district level assessment information is used to gather valid and reliable information.

CLASSROOM ASSESSMENT:

Because scores on standardized norm-referenced tests do not provide the total picture for making decisions about individual students' needs for intervention services, this information is best identified through assessment strategies conducted at the classroom level. Good instruction is the best preparation for assessment. Classroom assessments, designed to support a science process approach with an emphasis on observable, hands-on activities, provide students, teachers and parents immediate and detailed feedback. The best assessments designed to support instruction are characterized as informal, classroom adapted, locally scored, sensitive to short-term changes in students' performance and meaningful to students. Assessment tasks should be designed to closely resemble real learning tasks.

Indicators of competence are used as the basis for making decisions about individual stude achievement on prescribed performance objectives. Such indicators should consider:

- **Coherence of Knowledge.** Assessment should tap the connectedness of concepts and the student's ability to access interrelated chucks of information. Student understanding should be demonstrated through a variety of means.

- **Principled Problem Solving.** Assessment should focus upon the underlying principles and patterns needed to solve problems rather than the surface features of a task.

- **Knowledge Use.** Accessing knowledge and appropriately applying scientific concepts are important. Assessment should determine students' capacity to do this.

- **Automatized Skills.** Assessment should determine the degree to which students competently use basic process skills in performances.

- **Metacognitive or Self-Regulatory Skills.** Assessment should determine whether students are able to monitor their own understanding, use strategies to make questions comprehensible, evaluate the relevance of accessible knowledge, and verify their own solutions.

Taking in account individual student strengths, a combination of written, oral presentation and performance assessment would yield the most accurate evaluation.

INTERVENTION SERVICES

Intervention services are designed to remediate, reinforce, enrich and support student learning relative to the specified performance objectives. The intervention services at South-Western City Schools are based on a full-range of curriculum-embedded assessments. However, intervention is a shared responsibility which involves the classroom, building, district levels and at home.

Classroom-Level Intervention:

The primary level of responsibility for providing intervention rests with the classroom teacher. The teacher is able to identify the need for intervention, design the instructional form it will take, and implement the action. Teachers have the capacity to use content material for these activities, instruct for specific learning styles, and appropriately regroup students as special needs arise. At the core of classroom intervention is effective instruction that zeros in on individual student needs.

Intervention in the classroom takes many forms and is delivered through a variety of classroom structures in South-Western City Schools:

- one-to-one tutoring
- ad hoc skills groups
- whole-group instruction
- collaborative groups after whole group instruction
- computer-assisted instruction
- volunteer tutors
- after-school review sessions

Building-Level Intervention:

When the intervention possibilities provided in the classroom are not sufficient to meet the need of an individual student, it is necessary to provide other instructional alternatives to support and enrich learning. Many buildings have devised ways to use their staff and facilities in a creative fashion to allow for more intervention options such as, but not limited to:

- Multi-age groupings or cross-class groupings;
- Work with the assessment aide;
- Computer labs dedicated to intervention. (Unfortunately, most are used for math at this time, but additional labs are coming to the middle and high schools for other purposes.);

- Formal intervention (Care) teams which address the needs of special needs students, at-risk students, and/or those with severe academic concerns;
- Staff inservices on interpretation of test data and ways to use the data to improve instruction.

District-Level Intervention:

Students who need or desire additional support and enrichment as well as participating in classroom and building-level intervention programs provide impetus for the creation of district-level programs. The current program options include:

- Summer school at the middle and high school levels;
- Summer pre-kindergarten program;
- Summer elementary "enrichment" program for third graders;
- Extensive staff development in science process for teachers in grades K-9 (1994-95);
- Expanded staff development to facilitate a hands-on integrated curriculum (1995-96);
- Ever growing gifted education opportunities at middle and high school levels to challenge our more able students as well as development of special units and projects for elementary students which foster creativity and critical thinking skills.

Plans are being developed to add increased services as the science proficiency test becomes a reality in 1995-96. Some of the possibilities include:

- Saturday proficiency review sessions;
- Summer tutoring by administrators and teachers who volunteer to work with students who have not passed the science section of the Proficiency Test.

Throughout the curriculum cycle, intervention services will be monitored and revised as we increase our understanding of the diverse needs of our student population.

Appendix A

Learning Skills Lists

Enumerations of learning skills may be found in many publications. The lists not only vary in length but may be subdivided into quite different categories. Even the headings vary: learning skills, lifelong learning skills, critical thinking skills, higher order thinking skills, fundamental performance roles, and probably many others. The continuing development of these skills in learners now has become a major educational emphasis. As a science education program is designed the incremental development of these learning skills will be its backbone. Goal one and strand three provide additional insights into this skill development process. The learning skills lists that follow are offered only as a starting point. Some may not even fit your definition of a learning skill. Each school district should synthesize a list that is comprehensive and appropriate.

PROCESSES OF SCIENCE

The scientific endeavor involves continually examining phenomena and assessing whether current explanations adequately encompass those phenomena. The conclusions that scientists draw never should assume a dogmatic character as science necessarily is tentative. Authorities do not determine or create scientific knowledge, but rather scientists describe what nature defines and originates.

Those engaged in the scientific endeavor use and rely on certain processes. The processes can be arranged in an hierarchy of increasing complexity--observing, classifying, measuring, interpreting data, inferring, communicating, controlling variables, developing models and theories, hypothesizing, and predicting---but the processes scientists use usually do not and need not "happen" in this order.

OBSERVING
Examining or monitoring the change of a system closely and intently through direct sense perception and noticing and recording aspects not usually apparent on casual scrutiny.

CLASSIFYING
Systematic grouping of objects or systems into categories based on shared characteristics established by observation.

MEASURING
Using instruments to determine quantitative aspects or properties of objects, systems, or phenomena under observation. This includes the monitoring of temporal changes of size, shape, position, and other properties or manifestations.

INTERPRETING DATA
Translating or elucidating in intelligble and familiar language the significance or meaning of data and observations.

INFERRING
Reasoning, deducing, or drawing conclusions from given facts or from evidence such as that provided by observation, classification or measurement.

COMMUNICATING
Conveying information, insight, explanation, results of observation or inference or measurement to others. This might include the use of verbal, pictorial, graphic, or symbolic modes of presentation, invoked separately or in combination as might prove most effective.

CONTROLLING VARIABLES
Holding all variables constant except one whose influence is being investigated in order to establish whether or not there exists an unambiguous cause and effect relationship.

DEVELOPING MODELS AND THEORIES
Created from evidence drawn from observation, classification or measurement, a model is a mental picture or representative physical system of a phenomenon (e.g., aa current in aan electric circuit) or real physical system (e.g., the solar system). The mental picture or representative system then is used to help rationalize the observed phenomenon or real system and to predict effects and changes other than those that entered into construction of the model. Creating a theory goes beyond the mental picture or representative model and attempts to include other generalizations like empirical laws. Theories often are expressed in mathematical terms and utillize models in their description (e.g., kinetic theory of an ideal gas--which could utilize a model of particles in a box).

HYPOTHESIZING
Atempts to state simultaneously all reasonable or logical explanations for a reliable set of observations--stated so that each explanation may be tested and, based uppon the results of those tests, denied. Although math can prove by induction, science ccannot in science, one can only prove that something is not true. Accumulated evidence also can be used to corroborate hypotheses, but science remains mainly tentative.

PREDICTING
Foretelling or forecasting outcomes to be expected when changes are imposed on (or are occurring in) a system. Such forecasts are made not as random guesses or vague prophecies, but involve, in scientific context, logical inferences and deductions based (1) on natural laws or principles or models or theories known to govern the behavior of the system under consideration or (2) on extensions of empirical data applicable to the system. (Such reasoning is usually described as "hypothetico-deductive.")

Natural Science Teachers Association. *The Content Core: A Guide for Curriculum Designers, Vol. 1.* Washington, D.C., 1992.

LEARNING SKILLS*

The eight lifelong learning skills listed below have purposely been described first in this publication to emphasize their primary importance. Because the development of these skills in students is so critical, great care must be taken to plan carefully for their acquisition by students. These skills are too important and complex to be left to serendipitous development.

Many lists of lifelong learning skills have been published. This list is a compilation and condensation that will illustrate the wide range of skills involved.

• thinking skills	observing, classifying, predicting, inferring, hypothesizing, interpreting
• decision-making skills	recognizing the need for a decision, identifying alternative, analyzing positive and negative alternatives, examining values, making decisions
• problem-solving skills	identifying, defining, information gathering, organizing, generating alternatives, developing plans, implementing plans, evaluating outcomes
• communications skills	speaking, writing, listening, discussing
• psychomotor skills	manipulating equipment, eye-hand coordination, kinesthetic sense

• mathematical skills	computing with whole numbers, representing data, solving problems
• interpersonal relations skills	cooperating, consensus building, developing group discussion skills, improving leadership skills

*Ohio Department of Education. *Energy and Resource Conservation.* 1985, p. 7-9.

LEARNING SKILLS INDEX*

Thinking Skills

1. Classify
2. Rank Order
3. Process Order
4. Make Careful Observations
5. Interpret Symbols On A Map And Find Locations
6. Interpret Illustrations
7. Webbing Concepts
8. Make Comparisons And Analogies
9. Make Inferences And Deductions Based On Reasoning

Problem Solving and Decision Making Skills

1. Research Using Sources of Information
2. Conduct A Survey
3. Collect and Organize Data
4. Identify or Hypothesize Cause and Effect
5. Analyze Consequences And Suggest Alternatives
6. Conduct Experiments To Test Hypotheses Or To Test Variables Using Test Samples
7. Propose Solutions To Scientific Problems
8. Propose Solutions To Problems Involving Behaviors

Psychomotor Skills

1. Manipulate Materials To Construct Projects
2. Manipulate Equipment And Materials For Experiments and Demonstrations

Communications Skills

1. Follow Oral Directions
2. Listening Carefully
3. Expository Writing
4. Creative Writing
5. Creative Drawing

393

Appendix B

Science Education Resources

There exists in Ohio a large number of resources which are available to help teachers, parents and other educators deliver the highest quality science program possible. This section provides a brief listing of resources that are available for technical assistance. None of these lists are designed to be exhaustive, but rather are designed to provide a place to start. All of the resources listed can provide assistance for the school science program.

Ohio Department of Education

The most important mission of the Ohio Department of Education is to provide technical assistance to schools in designing and providing the best educational programs for the children of Ohio. Children are the future of Ohio.

The Division of Curriculum, Instruction and Professional Development (CIPD) is the primary division in the department charged with science curriculum and instruction. Other needs can be met by contacting the Ohio Department of Education using the Ohio Educational Directory.

CIPD, Curriculum, Instruction, and Assessment Section
Phone: (614) 466-2761

Competency-Based Education –
Frank Schiraldi (Assistant Director)
Science Education –
Rowena Hubler (Teaching and Learning Team)
Stan Santilli (Technology Team)
Charles Warren (Assessment Team)
Environmental Education –
John Hug (Teaching and Learning Team)

BATS – Buckeye Assessment Teams for Science
The BATS project is an ODE initiative designed to help school districts with course of study development including CBE assessments and intervention.

For more information, contact the Division of CIPD.

Ohio Department of Natural Resources

Education Section
Diane Cantrell (Asst. Dir. of Public Information and Education)
1840 Belcher Drive
Columbus, OH 43224-1329

Science Education Organizations - National

NSTA - National Science Teachers Association
Bill G. Aldridge
Executive Director
1742 Connecticut Ave., NW
Washington, DC 2009

SSMA - School Science and Mathematics Association
Don Pratt
Bloomsburg University
Department of Curriculum & Foundation
Bloomsburg, PA 17815
FAX 717-389-3894
717-389-4693

NESTA - National Earth Science Teachers Association
Frank Ireton
Executive Advisor
American Geophysical Union
2000 Florida Ave., NW
Washington, DC 20009

NABT - National Association of Biology Teachers
Mary Louise Bellamy
Education Director
11250 Roger Bacon Dr., #19
Reston, VA 22090

ACS - American Chemical Society
Sylvia A. Ware
Division Director, Education
1155 16th Street, NW
Washington, DC 20036

NAS - National Academy of Sciences
Stephen Push, Director
Office of News and Public Information
2101 Constitution Ave., NW
Washington, DC 20418

AAAS – American Association for the Advancement of Science
1333 H Street, NW
Washington, DC 20005

NSSA – National Science Supervisors Association
Kenneth Russell Roy
National Driector
Glastonbury Public Schools
330 Hubbard Street
Glastonbury, CT 06033

Science Education Organizations - State

NASA – NASA Lewis Research Center
Teacher Resource Center
Mailstop 8-1
21000 Brookpark Road
Cleveland, OH 44135
216-433-2017

SECO – Science Education Council of Ohio (NSTA)
Diana Hunn, Executive Director
University of Dayton
Dayton, OH

OCESS – Ohio Council for Elementary School Science
Margie Ball
COSI
280 E. Broad St.
Columbus, OH 43215

OAS – Ohio Academy of Sciences (NAS)
Lynn Elfner, Executive Director
1500 W. Third Ave.
Columbus, OH 43212

OESTA – Ohio Earth Science Teachers Association
Carl Bohn
6422 Cleveland-Massachusetts Rd.
Clinton, OH 44216

OCOEA – Ohio Conservation & Outdoor Education Association
Kevin Hennis
Wooster City High School
Wooster, OH 44691

Project Discovery

Nancy Eberhart
Ohio Department of Education
Curriculum, Instruction, and Professional Development
65 S. Front Street
Columbus, OH 43266-0308

Project Atmosphere

Marianne J. Ceritelli
1860 Wythe Street
Worthington, OH 43235
614-792-3350

CORE – Central Operation of Resources for Educators

NASA CORE
Lorain County JVS
15181 Route 58 South
Oberlin, OH 44074
216-774-1051 Ext. 293
FAX 216-774-2144

Science Education Organizations - Regional Level

West

West Regional Training Center
Nancy Houston
Montogomery County Board of Education
451 West Third St., Box 972
Dayton, OH 45422
513-225-4606

West Region Project Discovery
West Region Coordinator
Public Education Fund
2100 Kettering Tower
Dayton, OH 45423
513-222-2934

Challenger Center
Dr. James Rowley
300 College Park Dr.
Dayton, OH 45469
513-229-3344

Center For Excellence in Science and Mathematics
Dr. Ed Jones
Miami University
301 McGuffey Hall
Oxford, OH 45056
513-529-6443

Northwest

Northwest Regional Training Center
Judith Wahrman
Northwest Ohio Educational Technology Foundation
245 Troup Avenue
Bowling Green, OH 43403
419-372-7038

Northwest Regional Project Discovery
Larry Williams
Northwest Regional Coordinator
4553 Weldwood
Sylvannia, OH 43560
419-885-8385

SciMaTEC – Science Mathematics and Technology Education Center
Charlene Czerniak
College of Education and Allied Professions
University of Toledo
1260 Southwest Academic Center
Toledo, OH 43606
419-537-3912

Teaching Science With Toys
Dr. Richard Hansgen
280 W. College Ave.
Bluffton, OH 45817
419-358-3326

Northeast

Northeast Regional Training Center
Linda Freeman and Jean Wynne
GCEDC - 901 RT
Cleveland State University
Euclid at 24th Street
Cleveland, OH 44115
216-523-7107

Northeast Regional Project Discovery
Ray Knight
Northeast Region Coordinator
Unified Technologies Center
2415 Woodland Avenue
Cleveland, OH 44115
216-987-3168

C.R.A.B.S. – Cleveland Regional Association of Biologists
David McNamara
Shaker Heights High School
Shaker Heights, OH 44120

Cleveland Regional Council of Science Teachers
Harry Nash
John Carroll University, Physics Dept.
Cleveland, OH 44118

CREST: Cleveland Revitalizes Elementary Science Teaching
LaWanna White
Cleveland City Schools
1380 E. 6th St.
Cleveland, OH 44114
216-574-8000

Lakeland Area Center for Science and Mathematics
James Porter
Lake County Office of Education
Painesville, OH 44077

EQUALS/Sequels, Family Math & Family Science Project
Marie French, Coordinator
R.T. 1319
Euclid at E. 24th
Cleveland, OH 44115
216-687-4600

East

East Regional Training Center
Joan Burrier and Ralph Waltman
Stark County Board of Education
2100 38th Street, NW
Canton, OH 44709
216-492-8136 ext. 358

East Regional Project Discovery
East Region Coordinator
The Education Enhancement Partnership, Inc.
220 Market Avenue South
Suite 350
Canton, OH 44702
216-452-0829

Ohio Section/AAPT
Gene Easter
510 Delmar St
Akron, OH 44310

Project Link
Dr. Loren Hoch
The University of Akron
Akron, OH 44325
216-972-6883

Science-Language Arts Integrated Program
Dr. Tony Rorman
The University of Akron
Akron, OH 44325
216-972-5125

Science Activities Using Household Materials, Workshops for K-8 Teachers
Dr. Matt Arthur
Ashland University
Ashland, OH 44805
419-289-5208

Project Moonbase, Project Seabase, Operation Physics, Operation Chemistry
Dr. Doris Simonis
404/401 White Hall
Kent State University
Kent, OH 44242
216-672-2580/2477

Lake-to-River Science Day
Dr. Daryl Mincey
Dept. of Chemistry
Youngstown State University
410 Wick
Youngstown, OH 44555
216-742-1996

Southeast

Southeast Regional Training Center
Coordinator
Ohio University
College of Education
133 McCracken Hall
Athens, OH 45701
614-593-4400

Southeast Regional Project Discovery
Christine Knisely-Engle
Southeast Region Coordinator
5855 Hopewell Church
Lancaster, OH 43130
614-969-4891

Ohio University Teacher Leader Project
Dr. Ralph Martin
Ohio University College of Education
246 McCracken Hall
Athens, OH 45701
614-593-4455

Appalachian Distance Learning Project
Dr. Coleen Sexton
124H McCracken Hall
Ohio University
Athens, OH 45701
614-593-4429

South

South Regional Training Center
Sharon Yates
University of Rio Grande
Anniversary Hall
218 North College Avenue
Rio Grande, OH 45674
614-245-5353

South Regional Project Discovery
David Todt
South Region Coordinator
Shawnee State University
940 Second Street
Portsmouth, OH 45662
614-355-2239

SOS AAPT – Southern Ohio Section, American Association of Physics Teachers
Michael G. Grote, Ed.D.
Assistant Professor
Science and Math Education
Computer Technology
Department of Education
Phillips Hall
Ohio Wesleyan University
Delaware, OH 43015
614-368-3561

The Center for Science and Mathematics
Dr. Thomas Carnevale and David Todt
940 Second Street
Shawnee State University
Portsmouth, OH 45662
614-355-2544

SCAN Science Network
Karen Newland
Hillsboro City Schools
410 East Main Street
Hillsboro, OH 45133
513-393-3475

Southwest

Southwest Regional Training Center
Mark Stevens
Deans Office
Miami University
200 McGuffey Hall
Oxford, OH 45056
513-529-6418

Southwest Regional Project Discovery
Ann Dinkheller
Southwest Region Coordinator
Department of Mathematics
Xavier University
3800 Victory Parkway
Cincinnati, OH 45207
513-745-2016

Terrific Science & Math
Mickey Sarquis
Miami University
Oxford, OH 45056

Central

Central Regional Training Center
Heather Ness and Judythe Hummel
Franklin County
Educational Council
52 Starling Street
Columbus, OH 43215
614-365-6701

Central Regional Project Discovery
Robert Lower
Central Region Coordinator
Franklin County Board of Education
1717 Alum Creek Drive, Room 109
Columbus, OH 43207
614-445-3769

Unified Science Systems
Dr. Vic Showalter
231 Battele Hall
Capital University
Columbus, OH 43209
(614) 236-6816

PLESE: Program for Leadership in Earth Systems Education
Dr. Vic Mayer
249 Arps Hall 1945 N. High Street
The Ohio State University
Columbus, OH 43210
614-292-5381

BESS: Biological and Earth Systems Science
Dan Jax
Bexley City Schools
348 S. Cassingham Rd.
Bexley, OH 43209
614 231-7611

Comprehension Via Computers
Dr. Robert Tierney
257 Arps 1945 N. High Street
The Ohio State University
Columbus, OH 43210
614-292-1257

Everyday World as a Science Library
Karen Robinson, Project Director
Education Department
Otterbein College
Westerville, OH 43081
614-898-1263

Science & Mathematics Network of Central Ohio
Pat Barron
445 King Ave.
Columbus, OH 43201
614-421-9800

Colleges of Education

There are forty-nine colleges and universities in Ohio that provide programs for teacher certification. They are listed in the Ohio Educational Directory.

Eisenhower Clearinghouse for Mathematics and Science Education

The mission of the Eisenhower Clearinghouse is to catalog and provide access to the science and mathematics programs funded by the federal government. This clearinghouse, located at The Ohio State University, will by 1998 be electronically linked to schools to provide on-line assistance for the planning of science experiences for students.

Eisenhower Clearinghouse for Mathematics and Science Education
Dr. Len Simutis, Director
The Ohio State University
1929 Kenny Rd.
Columbus, OH 43210
614-292-7784

ERIC Clearinghouse for Science, Mathematics, and Environmental Education

The ERIC system is one of the world's largest databases of educational materials and research. It is available at libraries all around Ohio. The Clearinghouse for Science, Mathematics and Environmental Education is located at The Ohio State University.

ERIC Clearinghouse for Science, Mathematics, and Environmental Education
David L. Haury, Director
The Ohio State University
1929 Kenny Rd.
Columbus, OH 43210
614-292-6717

Museums of Science and Technology in Ohio

COSI, Ohio's Center of Science and Industry
Stephanie A. Martin
Vice President for Education and Visitor Programs
280 East Broad Street
Columbus, OH 43215
614-228-2674 ext. 226

Cincinnati Museum of Natural History
DeVere Burt
Executive Director
1301 Western Avenue
Cincinnati, OH 45203
513-287-7020

Cleveland Children's Museum
Dianne L. Smith
Education Department Coordinator
10730 Euclid Avenue
Cleveland, OH 44106
216-791-7114

Cleveland Health Education Museum
Carolyn M. Bears
Director of Youth Education
8911 Euclid Avenue
Cleveland, OH 44106
216-231-5010

Cleveland Museum of Natural History
Dr. Jan McLean
1 Wade Oval
University Circle
Cleveland, OH 44106
(216) 231-4600

Dayton Museum of Natural History
Thomas Hissong
Curator of Education
2629 Ridge Avenue
Dayton, OH 45414
513-275-7431

Great Lakes Museum of Science, Environment and Technology
Richard F. Coyne
Executive Director
1100 Chester Avenue, Suite 350
Cleveland, OH 44115

National Invention Center/National Inventors Hall of Fame
Dr. Edwin J.C. Sobey
Executive Director
80 West Bowery Street, Suite 201
Akron, OH 44308
216-762-4463

Business and Industry Science Organizations - a number of professional societies and organizations operate throughout the state of Ohio. Contact your local Chamber of Commerce for lists of their organizations.

Print Resources - see bibliography

Health and Safety Resources

The following references are provided to assist school districts in the development of a Risk Reduction (Chemical Hygiene) Plan. The materials listed below are offered as non-mandatory guidance. References listed here do not imply specific endorsement of a book, opinion, technique, policy or a specific solution for a safety or health problem. Other references not listed here may better meet the needs of a specific laboratory.

Materials for the development of the Chemical Hygiene Plan:

American Chemical Society, 1155 16th Street, NW, Washington, D.C. 20036.

American Chemical Society, Safety in Academic Chemistry Laboratories, 5th edition, 1990.

American Chemical Society, Developing A Chemical Hygiene Plan.

James A. Kaufman, Laboratory Safety Consultant, 101 Oak Street, Wellesley, Ma 02181.

Kaufman, James A., Laboratory Safety Guidelines and Laboratory Health and Safety Audio-Course, Wellesley, MA, 1989.

National Academy Press, 2101 Constitution Ave., NW, Washington, D.C. 20418

National Research Council, Prudent Practices for Disposal of Chemicals from Laboratories, National Academy Press, Washington, DC, 1983.

National Research Council/National Academy of Science, Prudent Practices for Handling Hazardous Chemicals in Laboratories, National Academy Press, Washington, DC, 1981.

Hazardous Substances Information:

IARC Monographs on the Evaluation of the Carcinogenic Risk of chemicals to Man, World Health Organization Publications Center, 49 Sheridan Avenue, Albany, New York 12210 (latest editions).

NIOSH/OSHA Pocket Guide to Chemical Hazards. NIOSH Pub. No. 85-114, U.S. Government Printing Office, Washington, DC, 1985 (or latest edition).

Occupational Health Guidelines, NIOSH/OSHA. NIOSH Pub. No. 81-123 U.S. Government Printing Office, Washington, DC, 1981.

The Merck Index: An Encyclopedia of Chemicals and Drugs. Merck and Company Inc. Rahway, N.J., 1976 (or latest edition).

Information on Ventilation:

American National Standards Institute, Inc. American National Standards Fundamentals Governing the Design and Operation of Local Exhaust Systems ANSI Z 9.2-1979 American National Standards Institute, N.Y. 1979.

National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

National Fire Protection Association, Fire Protection for Laboratories Using Chemicals NFPA-45, 1982.

Safety Standard for Laboratories in Health Related Institutions, NFPA, 56c, 1980.

Fire Protection Guide on Hazardous Materials, 7th edition, 1978.

Scientific Apparatus Makers Association (SAMA), Standard for Laboratory Fume Hoods, SAMA LF7-1980, 1101 16th Street, NW., Washington, DC 20036.

Information on Availability of Reference Material:

American National Standards Institute (ANSI), 1430 Broadway, New York, NY 10018.

American Society For Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

Chemical Abstracts Services. 2540 Olentangy River R., P.O. Box 3012, Columbus, OH 43210.

Food and Drug Administration, 5600 Fishers Lane, Rockville, MD 20857.

National Clearinghouse for Alcohol and Drug Information, P.O. Box 2345, Rockville, MD 20852.

National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02269.

National Safety Council, 444 N. Michigan Ave., Chicago, IL 60611. The Laboratory Safety Workshop, A National Center for Training and Information, Curry College, Milton, MA, 02186.

Underwriters Laboratories, 333 Pfingsten Rd., Northbrook, IL 60062.

Other resources available from the National Science Teachers Association, 1742 Connecticut Ave., NW, Washington, DC 20009.

Safety in the Elementary Science Classroom (Flip Chart)
Safety in the Secondary Science Classroom (Flip Chart)
Pocket Guides to Chemical and Environmental Safety in Schools and Colleges – Volumes 1-5
Science Safety Software (Interactive) – Elementary and Secondary Levels

Eye Safety

Ohio Society to Prevent Blindness, 1500 W. Third Ave., Columbus, OH, 43212.

Protect Their Eyes: An Eye Safety Guide for the Classroom. Columbus, OH: Ohio Society to Prevent Blindness, 1981.

Safety and Chemical Hygiene Resources

Prudent Practices for Handling Hazardous Chemicals in Laboratories, National Academy Press, 2101 Constitution Avenue, NW, Washington, DC 20418, 1981.

N.J. Berberich, et al., *Manual of Safety and Health Hazards in the School Science Laboratory*, U.S. Department of Health and Human Services, November 1980; available from the Council of State Science Supervisors, Rt. 2, Box 637, Lancaster, VA 22503.

K.M. Reese, *Health and Safety Guidelines for Chemistry Teachers*, American Chemical Society, December 1979.

Handbook of Laboratory Safety, N.V. Steere, Ed. 2d ed., CRC Press, Boca Raton, FL, 1971.

Flinn Chemical Catalog Reference Manual, Flinn Scientific, P.O. Box 231, 917 W. Wilson St., Batavia, IL 60510, 1983.

Laboratory Safety and Health, J.A. Kaufman, Kaufman & Associates, 101 Oak St., Wellesley, MA 002181, 1992.

Other Resources

Center for Environmental Research Information (CERI), US EPA, 26 W. Martin Luther King Dr., Cincinnati, OH 45268.

Jakel, Inc. 6400 Robin Dr., Des Moines, IA 50322.

SAFE Science Teaching: A Diskette for Elementary Educators, 1990.

The Total Science Safety System, 4th Edition, 1991.

National Institute for Occupational Safety and Health, 4676 Columbia Parkway, Cincinnati, OH 45226.

U.S. Environmental Protection Agency, Indoor Air Quality Information Clearinghouse, P.O. Box 37133, Washington, D.C. 20013.