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ABSTRACT

The purpose of this bulletin is to describe briefly the materials developed by the staff of Pueblo Elementary School, Scottsdale, Arizona, in a program aimed at providing individualized instruction in a continuous progress setting. Although each of the curriculum guides developed by the staff differ somewhat according to subject area, grade level, or instructional procedure, all of them have common elements which are consistent with the stated philosophy and goals. The curriculum is concept based, with major concepts, principles, and generalizations identified in each subject area. Emphasis is placed upon student inquiry and individualized instruction. The units in this publication are: A Curriculum Overview, K-8 Scope and Sequence; Science Scope and Sequence by Grade Level; Health Education, Scope and Sequence; Four Representative Science Units Coded to Science Scope and Sequence; List of Science Units and Their Correlation with the Concepts and Processes; Science, Exemplary Unit for Level 1 (also Levels 4, 5 and 7); Physical Science and Math Correlation Sequence, Eighth Grade. This work was prepared under an ESEA Title III contract. (JR)

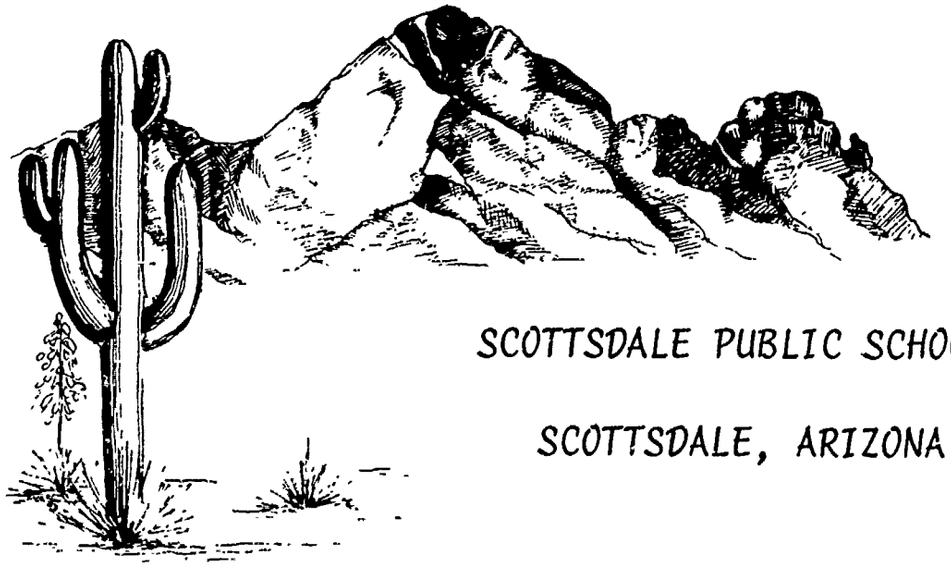
SCIENCE...

A K-8 SCOPE AND SEQUENCE

E.S.E.A. TITLE III

STAFF UTILIZATION FOR

CONTINUOUS PROGRESS EDUCATION



SCOTTSDALE PUBLIC SCHOOLS

SCOTTSDALE, ARIZONA

STAFF UTILIZATION FOR CONTINUOUS PROGRESS EDUCATION PROJECT

E.S.E.A. TITLE III

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Scottsdale Public Schools

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SCIENCE

K-8 SCOPE AND SEQUENCE

PUEBLO ELEMENTARY SCHOOL

STAFF UTILIZATION FOR CONTINUOUS

PROGRESS EDUCATION PROJECT

E.S.E.A. TITLE III

Developed by:

Reed Done, Science
Curriculum Leader
Alice Bascom, 1-2
Nancy Comes, 3-4
Bruce Turner, 5-6
Imogene Lacey, 7-8

A CURRICULUM OVERVIEW

K-8 SCOPE AND SEQUENCE

PUEBLO ELEMENTARY SCHOOL

STAFF UTILIZATION FOR CONTINUOUS

PROGRESS EDUCATION PROJECT

E.S.E.A. TITLE III

Developed by:

Richard M. Fawley, Senior
Curriculum Leader

Introduction

The staff of Pueblo Elementary School initiated in the Fall of 1970 a program aimed at providing individualized instruction in a continuous progress setting. The training program for the staff has been financed by a Title III E.S.E.A. grant and workshops for curriculum development have been held during the summers of 1970, 1971 and 1972. The purpose of this bulletin is to describe briefly the materials which have been developed.

PHILOSOPHY OF PUEBLO ELEMENTARY SCHOOL

Background The Scottsdale Board of Education has an adopted philosophy which states that, "the public school exists for the benefit of each student who presents himself, regardless of his capacity for learning." The statement further says that, "the total education process (must) proceed in an orderly, meaningful manner." Certainly these two statements suggest individualized instruction in a continuous progress curriculum. The students who attend Pueblo Elementary School will undoubtedly live in many different places as adults, therefore, while Pueblo School should have a philosophy which reflects the specific ideas of parents and staff, this statement should be compatible with the philosophy of our own school district. In order to develop this kind of "community-school" philosophy, the parents of the Pueblo School area were involved in the very beginning in preparing a statement of Goals for Pueblo Elementary School.

Goals for Pueblo Elementary School

Developed by the Educational Goals Committee

Pueblo Parent Council

The educational program provided at Pueblo Elementary School should develop in each student:

1. A sense of personal worth,
2. An appreciation of the worth of others,
3. An understanding of personal responsibilities,
4. The ability to set and work toward worthwhile goals,
5. The ability to reason and solve problems,
6. The opportunity for creativity,
7. The ability to communicate with all people using the communication skills,
8. The skills necessary to function well in society,
9. The maximum in social, emotional, and intellectual maturity,
10. The optimum physical development of the individual so that he can fully realize his intellectual and social potentials, and
11. Good citizenship.

The goal of Pueblo should be to create an atmosphere and a curriculum that will enable each individual student to grow at his or her fullest human capabilities.

GENERAL CURRICULUM FACTORS

Although each of the curriculum guides developed by the staff of Pueblo School may differ somewhat according to subject area, grade level, or instructional procedure, all of them have common elements which are consistent with and seek to implement the previously listed Goals.

Concept based – Since no person will be able to know all the factual information in every subject area, it is extremely important to provide the student with the most powerful, useful, and long-lasting information and skills. In our curriculum work we have identified the major concepts, principle, and generalizations in each subject area. Various kinds of content material is and can be used to develop understanding and application of those concepts and having once grasped the concept, the student can apply it to many different circumstances. Facts and skills are still important parts of the curriculum, but are used as tools in attaining conceptual understanding, rather than ends in themselves.

Student inquiry – A well-worn phrase states that "Education is a life-long process." This is certainly true, particularly in a world where conditions are changing. If a person is to continue effective learning throughout his life after formal schooling has been completed, he must have the skills and the experience to do this. Therefore, our curriculum units are designed so that learners participate actively in their own learning. Not every unit is planned on an "inquiry-based" model because this approach consumes time and can be inefficient if used exclusively. However, the units do identify the process or inquiry skills which are important for students to develop and use and urge the creative teacher to implement them at the appropriate time and place.

Individualized instruction - Perhaps no topic has been discussed more than "individual differences among students." The ideal goal for any school is to diagnose each individual student's own level of achievement and help him progress as far as he can at his own pace. Various factors, such as materials, personnel, and time, set limits on reaching this ideal. However, each of our instructional units has been prepared with the individual student in mind. Diagnostic tests, optional activities, multi-media, and flexible groups are all suggested in an effort to truly individualize instruction. In the final analysis, it is up to the professional teacher in the classroom to implement these ideas at the most appropriate time and in the most appropriate way.

ORGANIZATION OF THE CURRICULUM MATERIAL

Subject areas - At this particular state of the evolution of our program, the materials have been organized into traditional subject areas. Separate guides have been prepared for language arts (including reading), mathematics, science, social studies, and for the special areas of art, instrumental music, vocal music and physical education.

At the time these materials were being prepared, we were conscious of the need to consider broader, integrating themes. We are working at this in two different ways:

a. The taxonomy of educational objectives prepared by Bloom and others includes the cognitive (knowledge), affective (values and feelings), and the psychomotor (physical-perceptual) domains. These taxonomies would be one way of organizing learning experiences across traditional subject matter lines, but more work is needed before this can be done.

b. The authors of each of the separate subject area guides have identified some common, integrating themes which would be applicable in several different subjects. The concept of "interaction" might well be used as a common theme to integrate examples of social interaction in social studies, interaction of forces and systems in science, interaction of author and reader in literature, and interaction of artist and medium in fine arts. This, too, is presently in an incomplete stage in our curriculum development, but will be given conscious attention and planning in subsequent workshops.

Instructional guides - Each of the instructional guides prepared by the staff has been organized in a similar fashion and contains the following items:

1. A statement of philosophy for the subject area.

2. A listing of the major goals of the subject.

3. A scope and sequence chart or list which identifies the components of the subject area and the order in which they are presented.

4. A list of the major concepts and skills for the subject.

5. Several exemplary teaching units for use at various grade levels. The guide for each subject is bound in a loose-leaf fashion so that units can be added, deleted, or revised.

INSTRUCTIONAL UNITS

The instructional units which have been or will be prepared follow the same format so that they can be used more easily. The pattern followed by each unit is:

A. The topic of the unit and the major concepts which are included are listed. The coding and cross coding of the unit is also listed.

B. Specific performance objectives are stated if these are appropriate for the unit.

C. A pre-test is included if this is compatible with the material.

D. An outline of the content and various activities is prepared.

E. The suggested resource materials are identified.

F. Suggestions are made for the correlation with other subjects.

G. An evaluation procedure is suggested.

As noted above, more units will be added to each subject area during the course of the school year and in future workshops. Each of the units is stored in the Pueblo Curriculum Center and is coded according to the Pueblo coding scheme.

SCOPE AND SEQUENCE

INTRODUCTION

"Basic threads of scientific investigation" -- inquiry, observations, measurement, classification, etc., -- "are part of the fabric of the Pueblo School Science Program, but they are not the whole cloth." No elementary school study unit aims solely to teach individual skills, nor are any units intended primarily to illustrate particular concepts or processes or the like. Instead, by presenting interesting problems and real materials to explore, the units invite children to extend their knowledge, insight and enjoyment of some part of the world around them.

Children's interest in what they are doing is a powerful positive in a learning situation. At the same time, all people do not find the same things interesting, nor do they all learn the same way or at the same rate. Alternate paths to follow within units are found and a considerable diversity in style and organization exists among the many separate units themselves.

In each science unit, children do their investigating with materials, equipment or some part of the natural world. This interaction is very necessary. With bits of the real world before him, a child can observe for himself; he can interact with objects to try to change and to control their behavior; and he can check his own ideas and the assertions of others against what actually happens to the system which

concerns him. When he learns with things he handles, all a child's senses become tools to help strengthen the links between his thought, his imagination, and the physical world.

A single specified sequence of activities is not imposed on the teacher within a given unit. We feel strongly that good curriculum includes options. Teachers need to be able to modify units to suit the requirements of any class; they need room for their ideas and those of the students; and so we suggest a variety of approaches and leave the choice of sequence to the teacher.

PHILOSOPHY

The purpose of science education is to enable each individual to continuously develop his capacity to interact productively with his environment. Productive interaction is one in which both the individual and the environment are improved.

Since the purposes of education are rapidly changing and the pressures of our society are bringing about changes in societal needs and expectations, planning must be implemented for this change to be orderly and controlled. Some orderly steps must be taken to insure orderly planning.

1. Broad goals must be clearly determined and clearly stated.
2. Specific concepts identified.
3. Objectives for each unit of instruction must be identified.
4. The learning experiences (activities) that will help bring about these objectives must be selected and organized.
5. The materials necessary to bring about these desired learning experiences must be identified.
6. The extent to which the objectives are being attained and their validity and adequacy must be assessed.
7. Revision of objectives and means of attaining them must result from these assessments.

Aside from facilitating educational improvements, such explicit goals and objectives are necessary for communicating to the community, students, teachers, staff, and professional consultants, the aims of science education so that each may play its role in the fulfillment and revision of these goals.

GOALS

PHASE I

1. To enhance the thinking ability of the learner and provide activities compatible with preoperational, concrete operational, and formal operational thought in the pursuit of investigations of the environment or the solution of problems.

2. To enhance the learner's belief that he can interpret, manipulate and make sense of his own environment and that he is a part of his environment and dependent upon it.

3. To facilitate individual development of interests, attitudes, personality, and creativity which enhance the continued development of individuality in the learner.

4. To facilitate the learner's tendency to accept the existence of individuals who have ideas and values which are different from his own.

PHASE II*

In solving personal and social problems, the learner will be able to:

1. Employ the following processes in scientific inquiry:

   a. Identify problems.

   b. Make and use definitions consistently in solving a problem.

   c. Formulate and test hypotheses.

   d. Represent relationships among variables through graphs, tables, mathematical sentences, and verbal paragraphs.

   e. Identify and control variables.

   f. Acquire, organize, classify, analyze, validate, synthesize, interpret, evaluate, and communicate data.

* Course Goals Development. Local and Intermediate Education School Districts of Clackamas, Multnomah and Washington Counties, Portland, Oregon.

g. Examine alternative solutions to problems.

h. Make accurate predictions from models.

i. Use models to simulate real situations.

j. Develop flow charts, schematics, and other prescriptive representations for the solution of problems.

k. Use feedback in controlling real and simulated social, ecological, biological, mechanical, and technological systems.

l. Predict from models when a system might become unstable (as in the case of ecological systems).

m. Use the tools of technology.

2. Demonstrate knowledge of those scientific assumptions, theories, principles, laws and facts needed in solving personal and social problems.

3. Evaluate present and proposed activity in science and technology in terms of its impact on the quality of life.

a. Weigh the relative costs and benefits to society of new products, methods, and technology through scientific inquiry.

b. Explore and identify relationships between science, societal problems, and the extent and nature of consolity in these relationships.

c. Formulate implications of scientific process and knowledge for the individual and society.

4. Examine scientific assumptions on the perspective of historical and current information.

5. Value scientific knowledge and methodology as one means of solving personal consumer and social problems.

MAJOR CONCEPTS OF THE PUEBLO SCHOOL

SCIENCE PROGRAM

BIOLOGICAL

1. Environments
2. Growth/Development
3. Diversity of Life
4. Behavior of Organism

PHYSICAL

5. Time
6. Motion
7. Space
8. Energy
9. Matter

EARTH

10. Astronomy
11. Fluids
12. Elements
13. Changes

PROCESSES

a. Observation
b. Measurement
c. Processing Data
d. Interpreting Data
e. Inferring
f. Manipulating Equipment
g. Predicting
h. Classifying

RECOMMENDED USES OF SCIENCE GOALS, CONCEPTS, AND OBJECTIVES

1. School systems may use the collection as a measure of the adequacy of goals and objectives already in use.

2. School systems may contrast their goals and objectives with testbooks and commercial elementary science programs. This comparison can help to select the science program or textbook that best matches the school system's goals.

3. Goals can be a starting point for reviewing what schools should teach. There is a distinction between process and product, and from these two different types of goals emerges data about universality of need versus special needs based on interests, abilities, career choices, etc.

4. If an individualized program is desired, a teacher could review objectives with each student and contract for the attainment of these objectives. It is also possible to identify a set of objectives for certain groups such as: mini-classes, regular classes, target classes, etc.

5. Evaluation objectives should be explicit enough that methods of teaching them and evaluation of their attainment can be devised.

6. The collection of goals should be used in the rewriting of courses and curricula. The desired learning is stated precisely in the objectives and thereby of great use to curriculum designers.

The Pueblo School Science Curriculum Committee worked the summer of 1971 identifying goals and philosophy of the Pueblo School and district. The philosophy and goals of the commercial elementary science programs were examined and

contrasted with those of the school. The Elementary Science Study Program, McGraw Hill Book Company was the program selected to represent elementary science education of Pueblo School because of its compatability of goals.

SCIENCE SCOPE AND SEQUENCE BY GRADE LEVEL

STAFF UTILIZATION FOR CONTINUOUS

PROGRESS EDUCATION PROJECT

E.S.E.A. TITLE III

Developed by:

Reed Done

SCIENCE

CODING KEY

CONCEPTS

1. Environments
2. Growth & Development
3. Diversity of Life
4. Behavior of Organisms
5. Time
6. Motion
7. Space
8. Energy
9. Matter
10. Astronomy
11. Fluids
12. Elements
13. Changes

PROCESSES

a. Observing
b. Measuring
c. Processing Data
d. Interpreting Data
e. Inferring
f. Manipulating Equipment
g. Predicting
h. Classifying

* = ESS SUPPORTIVE UNITS
** = Local or Other Units

NOTE: Major concept or processes are underlined.

LEVEL	UNIT	CONCEPTS	PROCESSES
K	Animals in the Classroom	1,2,3,4,5,6	a,b,c,g
K	Eggs & Tadpoles I	1,2,3,4,5,6	a,b,d,e
K	Light & Shadows	5,6,7,8,9	a,b,e,g
K	Mobiles I, II	6,7,8,9	a,b,e,f
K	Sand I, II	7,8,9.12	a,b,f,g,h
K	Magnets**	7,8,9	b,c,d,f
K,1	Primary Balancing	6,7,8,9	a,b,f,e
K,1,2	Attribute Games/ A-Blocks	7,8	a,c,d,e
K,1,2	Geo Blocks	7,8	a,f,h
K,1,2	Pattern Blocks	7,8	a,f,h
K,1,2	Care of Eyes	2,4	a,g
K,1,2	Cleanliness	1,4	a,g
K,1,2	Care of Teeth	1,2,4	a,f
K,1,2	How We Grow	2,4	a,f
K,1,2	Nutrition	2,8,9,11	a,g,h
K,1,2	Safety	1,4	a,e,f,g
1	Butterflies I	1,2,3,4,5	a,c,d,e
1	Gerbils	1,2,4,5	a,c,d,e
1	Growing Seeds	1,2,3,5,7,13	a,b,c,d
1	Primary Balancing	6,7,8,9	a,b,e,f
1	Simple Machines**	6,8,9	b,d,f,h
1	Sink or Float	6,7,9,11	a,c,d,e,f,g
1	Rocks	9	a,e,h
1	Water Cycle**	11,12,13	a,c,d,f
1	Classification**	7,8	a,c,d,e,g,h
1,2	Match & Measure	7,8	a,b,e,f
1,2	Tangrams*	7,8	a,b,e,f,
1,2	Weeple People*	7	a,d,e,g,h
2	Changes	1,5,11,13	a,c,d,h
2	Watching Fish	1,3,4,6,11	a,b,c
2	Mobiles, I, II	6,7,8,9	a,b,e,f
2	Printing*	7,8,9	f
2	Mirrors, Objects & Images**	6,7,8,9	a,b,f,h
2	Structures*	7,8,9	b,f,g,h
2	Musical Instruments*	7,8,9	a,b,e,f
2	Sand, I, II	7,8,9,12	a,b,f,g,h
3	Life of Beans & Peas	1,2,3,4,5,7	a,b,c,d
3	Eggs & Tadpoles II	1,2,3,4,5,7	a,b,c,d
3	Budding Twigs*	1,2,3,4,5,7 13	a,b,c,d,g,h
3	Clay Boats	5,6,7,9,11	a,b,c,d,f,g
3	Drops, Streams & Containers	5,6,7,8,9, 11,13	a,b,c,d,f,g
3	Whistles and Strings	5,6,7,8,9	a,b,e,f
3	Rocks and Charts	1,7,9,12,13	a,b,c,d,f,g
3	Mirror Cards	6,7	a,b,e,f

CODING KEY

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3 = Diversity of Life
4 = Behavior of Organisms
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Processes
a = Observing
b = Measuring
c = Processing Data
d = Interpreting Data
e = Inferring
f = Manipulating Equip.
g = Predicting
h = Classifying

* = ESS Supportive Units
** = Local/other Units

NOTE: Major concepts or processes are underlined.

LEVEL	UNIT	CONCEPTS	PROCESSES
3	Attribute Games (People Pieces)	3,7	a,b,c,d,f,g,h
3	Tangrams	7,8	a,b,e,f,g,h
3,4	Function of Eyes & Ears	2,4	a,h
3,4	Defense Against Disease	1,2,4,9	a,e,g
3,4	Dental Hygiene	1,2,4,6	a,f,g
3,4	Human Anatomy & Physiology	2,3,4,13	a,h
3,4	Nutrition	2,8,9,11	a,g,h
3,4	Basic First Aid	1,4	a,f
4	Brine Shrimp	1,2,3,4,5,6,7	a,b,c,d,f,h
4	Butterflies II	1,2,3,4	a,e,g,h
4	Crayfish	1,2,3,4	a,c,d,e,g,h
4	Mystery Powders	5,7,9,12	a,b,c,d,e,g,h
4	Structures	5,7,9	a,b,e,f,g
4	Tangrams	7,8	a,b,e,h
5	Earthworms	1,2,4,13	a,b,c,g
5	Mealworms	1,2,3,4,13	a,b,c,d,g
5	Insects**	1,2,3,4,13	a,b,c,d,h
5	Colored Solutions	5,6,9,11,13	a,e,f,g
5	Senior Balancing	6,7,13	a,g
5	Where Is The Moon?	5,6,7,10,13	a,f,g
5	Peas & Particles	7	a,b,c,d,e,f,g
5,6	Anatomy of Eye & Ear	2,4,9,13	a,c,f
5,6	Immunization	2,3,4	a,g
5,6	Anatomy of Teeth	2,3	a,b,h
5,6	Organ Systems	2,3,4,9,13	a,f
5,6	Nutrition	2,8,9,11	a,b,d,g,h
5,6	Advanced First Aid	1,4	a,f
6	Animal Activity	1,2,3,4	a,b,c,d,e,f,g
6	Micro Gardening	1,2,3,4,13	a,b,c,h
6	Batteries & Bulbs I	8,13	a,e,f
6	Batteries & Bulbs II	8,13	a,e,f
6	Optics*	7,8,13	a,b,f,g
6	Pendulums	5,6,7,8,13	a,b,c,d,e,f,g
6	Daytime Astronomy	5,6,7,10,13	a,b,c,d,e,f,g
6	Creature Cards	3,7,9	c,d,e,f,g,h
7	Bones	2,3	a,f,h
7	Small Things	1,3,4	a,d,f,h
7	Pond Water	1,3,4	a,f,h
7	Mosquitoes	1,2,3,4	a,g,h
7	Plant Growth**	1,2,3,4	a,b,c,d,e,f,g
7	Evolution**	1,2,3	a,b,c,d,e,g
7	Environment & Ecology	1,2,3,4	a,h
7	Kitchen Physics	5,7,8,9,11	a,b,c,d,f,g
7	Balloons & Gases	5,7,8,9	a,d,f,g
7	Food Chemistry	7,8,9	a,f,g,h
7	Circulatory System	2,3	a,f,h
7	Deafness	3,4	a,e,h
7	Bacteriology	1,2,3,4	a,b,c,d,f,h
7	Drug Abuse	2,4	a,b,g,h

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b = Measuring
c = Processing Data
d = Interpreting Data
e = Inferring
f = Manipulating Equip.
g = Predicting
h = Classifying

* = ESS Supportive Units
** = Local/Other Units

NOTE: Major concepts and processes are underlined.

LEVEL	UNIT	CONCEPTS	PROCESSES
8	Physical World	5,6,7,8,<u>10</u>, 13	a,b,c,<u>d</u>,e,f
8	Microcosm to Macrocosm	7,8,<u>9</u>,11,13	<u>a</u>,b,c,d,f
8	Dimensions of the Earth	5,6,7,8,<u>9</u>,10 11,12,13	a,b,c,d,e,<u>f</u>, g,h
8	Surface of the Earth	5,6,7,8,9,11 12,<u>13</u>	a,b,c,d,<u>e</u>,f
8	Surface of the Moon	5,6,7,8,9,10, 13	b,c,<u>d</u>,e,h
8	Levels of Approximation	6,<u>7</u>,8,9,12, 13	a,<u>b</u>,c,d,e,f, g,h

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HEALTH EDUCATION

SCOPE AND SEQUENCE

STAFF UTILIZATION FOR CONTINUOUS

PROGRESS EDUCATION PROJECT

E.S.E.A. TITLE III

Developed by:

Gaynelle Fox, R.N.

PHILOSOPHY

Health Education as one unit of curriculum content is not only a structure for presenting factual knowledge of scientific discoveries, but is also on a personal level of life management and interaction with other lives. It is how to master one's evvironment, how to stay alive in a hostile world, how to realize a person's highest potential, and how to assume a mature, moral responsibility for the whorld in which he lives.

GOALS

1. To contribute to the child's developing a concept of himself as a person of worth through growth in self-understanding and personal responsibility.

2. To provide information leading to a wholesome understanding of physical, mental, and emotional growth and development, including the anatomical and physiological facts of the human body.

3. To provide education for healthful living of the individual, the family, and community now as well as in the future.

4. To bridge the gap between scientific health discoveries and man's application of these discoveries in daily life.

5. To make health education an integral part of the curriculum at every level and an essential element in the general education of all students.

6. To develop in each student an appreciation for good health and pride in developing and maintaining it.

ROLE for the NURSE in the SCHOOL HEALTH EDUCATION PROGRAM

I. Functions - General

A. Each pupil contact a learning experience
B. Promotes protection
C. Teaches basic principles of healthful living
D. Adapts and supplies resources from related films
E. Uses appropriate Community Health Services
F. Helps with curriculum
G. Helps in planning of community health projects
H. Acts as resource person
I. Correlates health instruction into other curriculum areas

II. Functions - Health Education

A. Participates on curriculum committee
B. Screens health text books
C. Screens health kits and models
D. Previews films, film strips, etc.
E. Provides current and scientific health information

III. Criteria for proposed health education programs

A. Relevance
B. Organization of material
C. Accuracy of material
D. Objectivity
E. Pupil interest

IV. Basic Questions to consider in setting up Health Program

A. Point of view - can be narrowing
   1. District
   2. School
   3. Yours

B. What content to teach - and what data sources to determine this.

   1. Must be relevant to age group
   2. Knowledge or lack thereof must be determined.

MAJOR CONCEPTS TO BE DEVELOPED:

SEPTEMBER:

1. An understanding of school health standards and school health practices will lead to the optimal school environment.

2. Boys and girls learn to recognize situations that are otentially dangerous and are helped to understand that every person bears much responsibility for his own safety as well as the safety of others.

OCTOBER

1. Knowledge of the structure, fundtion and care of our eyes and ears will help our understanding of the importance of vision and hearing conservation.

NOVEMBER AND DECEMBER

1. Communicable diseases are infectious and can be transmitted from one person to another either directly or indirectly.

2. Vaccinations and immunizations have helped to control the spread of communicable disease.

JANUARY

1. Knowledge is essential for the development of good dental health practices, including both personal and professional care, proper diet and oral habits.

FEBRUARY AND MARCH

1. Understanding your body and how it works for you is essential for optimal health knowledge, attitudes and practices.

APRIL

1. An understanding of good nutrition and the knowledge of it's application is necessary for proper growth and development.

APRIL AND MAY

1. An accident is an unplanned event that hurts, injures or kills somebody--safety and knowledge of its application will reduce accidents.

HEALTH EDUCATION PROGRAM 1972-1973

I. SEPTEMBER - ORIENTATION
- A. School Health Standards and Practices
  - 1. ECE Level
    - a. Visit with ECE mothers
      1. Emphasis on health standardsand school health practices
      2. Student transportation to and from school
      3. Physical exams and histories
      4. Medical referral cards
  - 2. 1-2 Level
    - a. Visit to nurse
    - b. Nurse visits each class
      1. Emphasis on health standards and school health proactices
      2. Introduction of FIRST AID BOX
      3. Medical referral cards
  - 3. 3-4 Level
    - a. Nurse visits each class
      1. Emphasis on health standards and practices
      2. Introduction to use of FIRST AID BOX
      3. Medical referral cards
  - 4. 5-6 Level
    - a. Nurse visits each class
      1. Emphasis on health standards and practices
      2. Introduction to use of FIRST AID BOX
      3. Medical referral cards
  - 5. 7-8 Level
    - a. Introduction - again - of good health standards and practices
    - b. First Aid Box
    - c. Medical referral cards
- B. Education for Survival
  - 1. 1st and 2nd Level
    - a. Playground Safety
    - b. Pedestrian Safety
  - 2. 3rd and 4th Level
    - a. Playground Safety
    - b. Pedestrian Safety
  - 3. 5th and 6th Level - Introduce in Spring
  - 4. 7th and 8th Level - Introduce in Spring

II. OCTOBER - SIGHT AND HEARING CONSERVATION (Prior to Vision and Hearing Screening Program)
- A. Vision and Hearing - Emphasis on Structure, Function, and Care
  - 1. Level 1-2
    - a. Cleanliness, eye exams, protection of eyes and ears
  - 2. Level 3-4
    - a. How your eyes work - and your ears
    - b. Care and Protection of eyes and ears
  - 3. Level 5-6
    - a. Anatomy of eye
    - b. Focusing of eye and how you see
    - c. Anatomy of ear
    - d. Protection of eyes and ears

4. Level 7
   a. How we hear
   b. Sound and its effects
   c. Learning sign language

5. Level 8
   a. Eye Safety
   b. Review of eye anatomy and how we see
   c. Emergency care of the ye
   d. Environmental effects on the eye

III. NOVEMBER - PREVENTION AND CONTROL OF COMMUNICABLE DISEASE (Immunization
DECEMBER - Program November 28, 1972)

A. Communicable Disease - Emphasis on Prevention - Knowledge - Care and Control

1. Level 1-2
   a. Cleanliness for Health
      1. Washing hands, food, things we use
   b. Proper clothing for health
   c. Rest for Health
   d. Regular medical checkups

2. Level 3-4
   a. Cleanliness and Disease
   b. Defending Yourself Against Disease
   c. Importance of Health Care
   d. Community Responsibility and protection

3. Level 5-6
   a. How body fights disease
   b. History--control of Contagous Disease
      1. Health heroes
   c. Immunization
   d. Microorganisms, bacteria, viruses

4. Level 7
   a. Carriers and Causes of Disease
   b. Preventive health measures
   c. Body defenses against disease
   d. Vaccines and immunology

5. Level 8
   a. Roles of Health Services
   b. Conquering disease
   c. Medical technology
   d. Medical Quackery

IV. JANUARY - DENTAL HEALTH MONTH

A. Knowledge for good Dental Health Practices

1. Level 1-2

a. Learning to Brush
b. Teeth and food
c. Dental checkups
d. Importance of Baby Teeth

2. Level 3/4

a. Knowledge for good dental hygiene
b. Calcium and teeth
c. Loosing teeth
d. Permanent teeth-care and protection

3. Level 5/6

a. Anatomy of the mouth
b. Structure of a tooth
c. Kinds of teeth and their function
d. Bacteria and teeth--flossing techniques
e. Dental hygiene

V. FEBRUARY - MARCH - BODY STRUCTURE AND PHYSIOLOGY

A. Learning to understand your body and how it works for you

1. Level 1/2

a. How We Grow
b. What Helps us Grow
c. Needs for Food, Sleep, Exercise
d. Rates of Growth
e. Resemblance to parents

2. Level 3/4

a. Your Senses
b. Your Bones and Muscles
c. Large Organs nd What They do
    1. Stomach
    2. Heart
    3. Liver
    4. Brain
    5. Skin
d. Rate of Growth
e. Good Posture--Its Importance

3. Level 5/6

a. Digestive System
b. Excretory System
c. Circulatory System
d. The Heart
e. Endocrine System
    1. Menstrual program

4. Level 7

a. Blood--Its components and their functions
b. Circulatory System
c. Heart--anatomy
    1. Anomolies
    2. Diseases
    3. Diagnostic Procedure
    4. Techniques for Remediation of Heart Disease

5. Level 8

a. Anatomy and function of Brain
b. Respiratory System
    1. Anatomy of Lung
    2. Prevention of Lung Disease
    3. Smoking and Health

VI. APRIL * NUTRITION
A. Complete teaching guides for K-6, as suggested by American Dairy Council

VII. APRIL AND MAY * EDUCATION FOR SURVIVAL

A. Accident Prevention at Home and School
1. Level 1/2

a. Fire Safety
b. Make Home Safe
c. Safety in the Car

2. Level 3/4

a. Bicycle Safety
b. Water Safety
c. Fire Safety
d. First Aid
    1. Cuts
    2. Burns
    3. Bleeding
    4. Mouth to Mouth Resuscitation
    5. Use of Bandaids

3. Level 5/6

a. Accident Prevention
    1. At Home
    2. At School
    3. On Streets and Highways
b. Water Safety
    1. Mouth to Mouth Resuscitation
c. Safety measures in case of fire
d. First Aid
    1. Bleeding
    2. Strains, sprains, fractures

FOUR REPRESENTATIVE SCIENCE UNITS

CODED TO

SCIENCE SCOPE AND SEQUENCE

STAFF UTILIZATION FOR CONTINUOUS

PROGRESS EDUCATION PROJECT

E.S.E.A. TITLE III

Developed by:

Reed Done, Science
Curriculum Leader
Alice Bascom, 1-2
Nancy Gomes, 3-4
Bruce Turner, 5-6
Imogene Lacey, 7-8

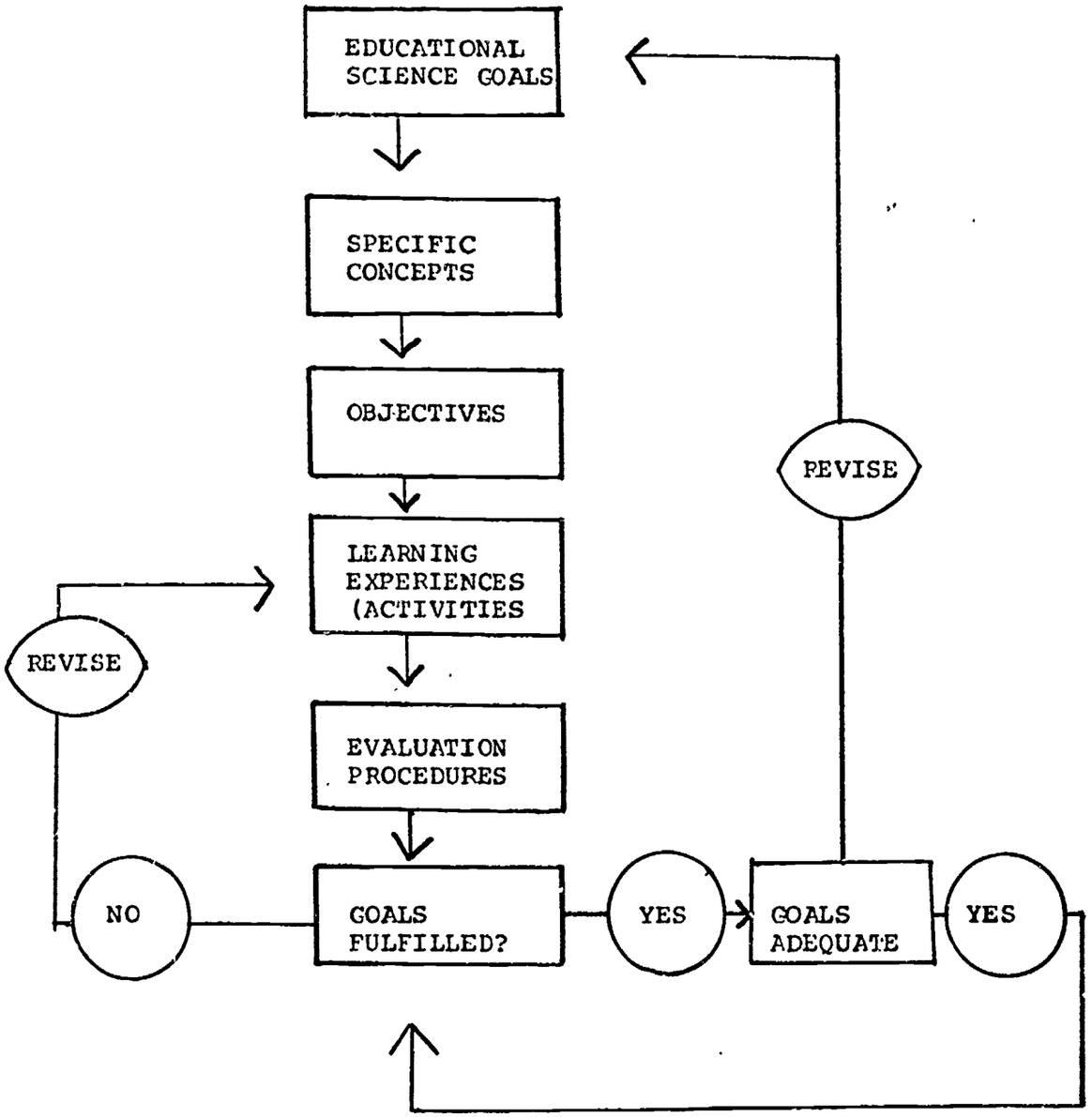
SCIENCE UNIT DESCRIPTION PAGE

The Science instructional units which have been or will be prepared follow the same format so that they can be used more easily. The pattern followed by each unit is:

a. The topic of the unit and the major concepts which are included are listed. The coding and cross coding of the unit is also listed.
b. Specific performance objectives are stated if these are appropriate for the unit.
c. A pre-test is included if this is compatible with the material.
d. An outline of the content and various activities is prepared.
e. The suggested resource materials are identified.
f. Suggestions are made for the correlation with other subjects when appropriate.
g. An evaluation procedure is suggested.

Additional units will also emphasize a "hands on" approach. Each unit will provide sutdents with opportunities to expand their explorations of the unit topic(s) as per the statement of the Science Curriculum Philosophy and the introduction to the Science Scope and Sequence.

UNIT PLANNING SEQUENCE



SAMPLE
REPORT OF SCIENCE

NAME _____

	Most of the time	About 1/2 the time	Only occasionally
1. Works independently with equipment.			
2. Seems to observe carefully during experiments.			
3. Thinks of original activities when using manipulative materials.			
4. Voluntarily chooses to make some records during certain science activities.			
5. Seems able to carry out systematic investigations with little or no guidance.			
6. Tends to provide ideas during group experiments.			
7. Indicates a desire to do more work in area of science.			
8. Conclusions are generally consistent with observations.			
9. Seems able to predict and generalize findings to new situations.			
10. Tends to interfere with the rights of other individuals who want to conduct experiments.			

EVALUATION OF STUDENTS

In light of greatly changed teaching methodology and course objectives, it becomes apparent that evaluative techniques must be realigned to consider the changes that have occurred in the classroom.

The ELEMENTARY SCIENCE STUDY UNITS are designed to be open-ended, which means that one cannot predict exactly what materials will be covered, or just what experiences will be gained as a class studies a given unit. If, in fact, objective evaluation can be a part of the teacher's evaluative effort, it must be specifically designed by the individual classroom teacher to reflect precisely the happenings that have occurred in that particular class.

While subjective evaluation is not new to teachers, and has always been a part of student evaluation, there is a natural hesitance to be more dependent on one's own subjective criteria, and to be less able to defend one's grading with objective grades.

Since each student is involved in the investigations, his performance, as well as the record of his data and observations, can be evaluated first-hand by the teacher.

What must logically follow, then, is a set of subjective evaluation criteria, reasonably well established in the teacher's mind in advance of the unit.

While these criteria must be somewhat individualized in each situation, there can be some consistency among

certain behavioral characteristics. Good interest, attitudes, co-operativeness, and participation should be considered. Any growth in abilities to perform the scientific processes should be noted and assessed, even though such growth may defy accurate measurement.

Two examples of a device that can communicate worthwhile information about a child's classroom behaviors in an activity-oriented science program are found on the next pages. The first report sheet would be more appropriate for upper level elementary grades, i. e., 4, 5, 6.

The items in this checklist are more appropriate for K-3 activities that would include "static" sets of objects rather than dynamic systems where systematic actions and thinking are required.

1. Measured the materials or used the materials to measure.
2. Ordered materials based on some observable property.
3. Made objects with the materials such as houses, faces, people, etc.
4. Made designs with the materials that are not pictorial as in above category.
5. Grouped materials based on some observable property.
6. Made sequences with the materials.
7. Played original games with the materials such as making up games, etc.
8. Used materials from the side table.
9. Voluntarily chose to make some record (sketch, data table, etc.)
10. Asked teacher to "see what I have done."
11. Voluntarily chose to share either materials or information with another student.
12. Asked the teacher, "What am I supposed to do?"
13. Seemed motivated to do what I (the teacher) consider productive activity.
14. Tried to "borrow" another child's materials.
15. Gave no attention to the materials.
16. Other.

LIST OF SCIENCE UNITS

AND THEIR

CORRELATION WITH THE

CONCEPTS AND PROCESSES

STAFF UTILIZATION FOR CONTINUOUS

PROGRESS EDUCATION PROJECT

E.S.E.A. TITLE III

Developed by:

Reed Done, Science
Curriculum Leader

	K	1	2
BIOLOGY	ANIMALS IN THE CLASSROOM		
	EGGS & TADPOLES I	BUTTERFLIES I GERBILS GROWING SEEDS	CHANGES Watching Fish
PHYSICAL	PRIMARY BALANCING		
		MUSICAL INSTRUMENTS*	
			MOBILES II PRINTING*
	LIGHT & SHADOWS MOBILES I Magnets	SINK & FLOAT Simple Machines	STRUCTURES* Mirrors, Objects & Images
EARTH	SAND I	Rocks Water Cycle	SAND II
SCIENCE SKILL		MATCH & MEASURE TANGRAMS*	
	A - BLOCKS Classification GEO BLOCKS PATTERN BLOCKS		
			WEEPLE PEOPLE*
HEALTH	Care of Eyes Cleanliness Care of Teeth How We Grow Nutrition Safety		

KEY:
ELEMENTARY SCIENCE STUDY (ESS) = ALL CAPS
ESS SUPPORTIVE UNITS = CAPS W/*
Local/Other Units = Lower Case

	3	4
BIOLOGY	LIFE OF BEANS & PEAS EGGS & TADPOLES II BUDDING TWIGS*	BRINE SHRIMP BUTTERFLIES II CRAYFISH
PHYSICAL	CLAY BOATS DROPS, STREAMS & CONTAINERS WHISTLES & STRINGS	MYSTERY POWDERS STRUCTURES
EARTH	ROCKS & CHARTS	
SCIENCE SKILL	MIRROR CARDS PEOPLE PIECES TANGRAMS	
HEALTH	Function of Eyes & Ears Defense Against Disease Dental Hygiene Human Anatomy & Physiology Nutrition Basic First Aid	

KEY:		
	ELEMENTARY SCIENCE STUDY (ESS)	= ALL CAPS
	ESS SUPPORTIVE UNITS	= CAPS W/*
	Local/Other Units	= Lower Case

	5	6
BIOLOGY	EARTH WORMS MEAL WORMS Insects	ANIMAL ACTIVITY MICRO-GARDENING
PHYSICAL	COLORED SOLUTIONS SENIOR BALANCING	BATTERIES & BULBS I BATTERIES & BULBS II PENDULUMS OPTICS*
EARTH	WHERE IS THE MOON?	DAYTIME ASTRONOMY
SCIENCE SKILL	PEAS & PARTICLES	CREATURE CARDS
HEALTH	Anatomy of Eye & Ear Immunization Anatomy of Teeth Organ Systems Nutrition Advanced Safety & First Aid	

KEY:
- ELEMENTARY SCIENCE STUDY (ESS) = ALL CAPS
- ESS SUPPORTIVE UNITS = CAPS W/*
- Local/Other Units = Lower Case

	7	8
BIOLOGY	BONES* Plant Growth SMALL THINGS Evolution POND WATER Environ/Ecol. MOSQUITOES	
PHYSICAL	KITCHEN PHYSICS BALLOONS & GASES Food Chemistry	(TIME, SPACE & MATTER COURSE) PHYSICAL WORLD MICROCOSM TO MACROCOSM
EARTH	MAPPING STREAM TABLES	DIMENSIONS OF THE EARTH SURFACE OF THE EARTH SURFACE OF THE MOON
SCIENCE SKILL		LEVELS OF APPROXIMATION
HEALTH	Circulatory System Deafness Bacteriology Drug Abuse	Blindness - Braille Drug Abuse Alcohol/Smoking The Brain

KEY: ELEMENTARY SCIENCE STUDY (ESS) = ALL CAPS
ESS SUPPORTIVE UNITS = CAPS W/*
Local/Other Units = Lower Case

CODE: SC-1-P-8*-b*

SCIENCE

EXEMPLARY UNIT FOR LEVEL 1

PRIMARY BALANCING - FIRST GRADE SCIENCE

STAFF UTILIZATION FOR CONTINUOUS

PROGRESS EDUCATION PROJECT

E.S.E.A. TITLE III

Developed by:

Alice Bascom

CODE: SC-1-P-8*-b*

PRIMARY BALANCING - FIRST GRADE SCIENCE

I. OBJECTIVES

At the completion of this unit, the student will be able to:

1. Demonstrate the use of a balance through first-hand experiences with equal arm balance and balance board.
2. Manipulate the balance with variety of materials to weigh and balance.
3. Demonstrate that the size or shape does not determine the weight of the object.
4. Determine which of two objects is lighter.

II. ACTIVITIES

1. Assemble balances.
2. Balance two unequal objects by adding additional weight to the lighter side.
3. Balance two children of unequal weight in more than one way.
4. Balance objects unlike in size.
5. Weigh things that look alike but are dissimilar in weight.
6. Balance an uneven number of objects on a balance board.

III. MATERIALS for a set of six students

Equal arm balances - 6
Pegboard beams & fulcrums - 6
Walking board balance & fulcrum
4-ft. Board balance & fulcrum
2 identical sponges - 3 sets
Styrofoam balls - 2
Paper Clips - 1 box
Large washers - 20
Corks - 20
Assorted Wooden Blocks - 20
Beans - 1-lb.
Dry Macaroni - 1-lb.
Sand - 2-lbs.
Containers for sand - 6
Cans of assorted food (fruit, chow mein noodles)
Clay - 1-lb.
Pumice Rock
Rocks

Objects supplied by students

IV. EVALUATION TECHNIQUES

The student will be evaluated on:

1. Worksheets related to the objectives.
2. Demonstrated ability to balance unequal weights on a board balance.
3. Demonstrated ability to balance a given set of objects on an equal arm balance.

CODE: SC-4-P-9*-c*

SCIENCE

EXEMPLARY UNIT FOR LEVEL 4

"MYSTERY POWDERS" - 4TH GRADE SCIENCE

STAFF UTILIZATION FOR CONTINUOUS

PROGRESS EDUCATION PROJECT

E.S.E.A. TITLE III

Developed by:

Nancy Gomes

CODE: SC-4-P-9*-C*

"MYSTERY POWDERS" - 4TH GRADE SCIENCE

I. OBJECTIVES

The student will be able to:

1. Demonstrate common tests with each of five powders: smelling, feeling, looking, matching with known powders, and mixing with specified liquids.
2. Describe and record how each powder reacts during testing.
3. Perform tests with heat.
4. Construct data records (charts) for recording and interpreting information from test results.

II. ACTIVITIES

1. Label the powders and construct a fact sheet for each powder.
2. Perform tests of smelling, feeling, and looking with each powder. Record findings on a simple chart.
3. Test the powders with heat, iodine, and vinegar. Record the results.
4. Determine the composition of a mixture of powders through testing and reference to students records.

III MATERIALS PER CLASS OF 30

5-lbs. Baking Powder
5-lbs. Powdered Sugar
5-lbs. Baking Soda
5-lbs. Laundry or Corn Starch
5-lbs. Plaster of Paris
1 box Table Salt
1-gal. White Vinegar
2 small rolls Hvy. Alum. Foil
2 rolls Waxed Paper
3 boxes Flat Toothpicks
2-oz. Tincture of Iodine
45/1-oz. Glass Dropper Bottles (with droppers)
10/4-qt. Pails
30 Wooden Clothespins
15 Heat Sources: Candles, Alcohol Lamps, etc.

Miscellaneous:
Newspapers, sponges, paper towels, broom, dustpan and brush, hand lenses and microscope(s).

IV. EVALUATION TECHNIQUES

The student will be evaluated on:

1. Construction of charts for recording of test results.
2. The methods used during laboratory and testing situations.
3. Identification of the "mystery" powder mixtures via testing.

CODE: SC-5-P-11*-g*

SCIENCE

EXEMPLARY UNIT FOR LEVEL 5

COLORED SOLUTIONS - 5TH GRADE SCIENCE

STAFF UTILIZATION FOR CONTINUOUS

PROGRESS EDUCATION PROJECT

E.S.E.A. TITLE III

Developed by:

Bruce Turner
From the Elementary
Science Study
Webster Division
McGraw Hill Publishing
Company

CODE: SC-5-P-11*-g*

Colored Solutions - 5th Grade Science

Introductory Note

A basic purpose of this unit is to foster in children the importance of gathering and interpreting their own data. No preconcieved concepts as such are taught. The unit is more oriented toward the process of scientific discovery.

I. OBJECTIVES

As a result of participating in this unit, the student will:

1. Demonstrate his ability to use liquids in a testing situation.
2. Write a rule which states that the factors which affect an experiment can be tested only one at a time.
3. Demonstrate how a lighter liquid will float on a heavier liquid.
4. State what happens when liquids of differing weights are combined.
5. Describe at least 6 possible layering combinations in a soda straw when using two solutions of different densities.
6. Order 4 liquids of different weights in an "upness-downess" scale.
7. Identify the duplicate solution when given the 4 original liquids and a 5th which is a duplicate of one of them.
8. Demonstrate his ability to place 4 unknown liquids in their proper positions on the "upness-downess" scale.
9. Demonstrate his ability to compare the weights of different liquids when given a simple balance.

II. ACTIVITIES

(Pairs of students work well. Several pairs may show a "central supply" of coloring and supplies.)

Lesson 1. (objectives 1 & 2)

Pass out pill bottles (1 per student), coloring, droppers, paper towel and water. Allow student to try different combinations of food coloring and clear tap water. Have them place tap water in pill bottle. Then introduce food coloring into the tap water. They may also drop the dye onto the paper towels. This produces interesting results. From time to time the teacher may suggest different ways of using the dye.

Lesson 2. (objective 3)

Pass out pill bottle, spoon, Kosher Salt, coloring and water for each student. Have student place salt in clear tap water and record results of what happens. Discuss. Let students add food coloring to the salt solution and describe what happens. Help students to write clear, descriptive statements about what they observe happening.

Lesson 3. (objective 4)

Each student will need a pill bottle, dropper and water for rinsing. To one-half of the class give a supply of blue solution and clear solution. To the other half give red and green. Have them combine the solutions in different ways and record their results. After a discussion of the results of their investigations, allow them to combine all four solutions in different ways. Students will discover that they can make a four layered arrangement (green, red, clear, blue).

Lesson 4. (objectives 5 & 6)

At this point, have the students make some predictions about the behavior of various solutions. On a ditto sheet, have students circle the possible combinations:

B	B	B	C	C	C	R	R	R	G	G	G
G	K	C	B	R	G	G	C	G	B	C	R

After predictions have been made, have students test them by making "colored sandwiches". They do this by dipping the straw into a solution, capping the end with their finger and withdrawing the straw. To make a sandwich, the student then dips the straw into another solution (deeper than the previous one), releases his finger, caps the end of the straw and withdraws. If he dips into the lighter solution first, a colored layer will form. If he dips into a heavier solution first, the colors will mix.

Lesson 5. (objective 7)

Give students a solution which is a duplicate of one of the original 4 solutions. You could color part of the clear. Allow them to make tests to determine which two solutions are the same.

Lesson 6. (objective 8)

Give students four new solutions, such as sugar water, cranberry juice, apple juice and cider vinegar and allow them to test each of these against the four original salt solutions. By doing this, they should be able to discover where on the "upness-downess" chart these solutions belong. Have them record the results and hold a class discussion.

Lesson 7. (objective 9)

As a concluding activity, allow students to actually weigh equal porcions of different liquids and see why some solutions were "down" solutions and some were "up" solutions. This can also be done as a demonstration. Use a simple balance for this activity.

III. MATERIALS

Each class of 30 students will require for most activities:

30 eye droppers
60 pill bottles (plastic)
15 large trays (cafeteria type)
30 small plastic spoons
10 lbs. Kosher salt
30 souffle' cups
30 soda straws (jumbo size)
2 bottles red food coloring
2 bottles green food coloring
2 bottles blue food coloring
1 bottle orange or yellow food coloring
4 compartment containers (plastic egg cartens)

Solutions:

1/3 cup of salt per 1/2 gallon water (do not color)
1 1/3 cups of salt per 1/2 gallon water (color red)
2 cups of salt per 1/2 gallon water (color green)
1/2 gallon tap water (color blue)
Bottle of rubbing alcohol
Sugar Solution (4 cups per 1/2 gallon of water)
Bottle of White Vinegar
Bottle of Apple Juice
Bottle of Cranberry Juice
Balance

IV. EVALUATION TECHNIQUES

1. Teacher observation with checklist.

2. Written tests.

3. At the end of each Lesson, the teacher may ask all or some of the students to demonstrate their ability to meet objectives as stated.

SAMPLE REPORT OF SCIENCE

NAME _____

	Most of the time	About 1/2 the time	Only occasionally
1. Works independently with equipment.			
2. Seems to observe carefully during experiments.			
3. Thinks of original activities when using manipulative materials.			
4. Voluntarily chooses to make some records during certain science activities.			
5. Seems able to carry out systematic investigations with little or no guidance.			
6. Tends to provide ideas during group experiments.			
7. Indicates a desire to do more work in area of science.			
8. Conclusions are generally consistent with observations.			
9. Seems able to predict and generalize findings to new situations.			
10. Tends to interfere with the rights of other individuals who want to conduct experiments.			

CODE: SC-7-B-3*-a*

SCIENCE

EXEMPLARY UNIT FOR LEVEL 7

"SMALL THINGS - DISCOVERY OF THE MICROSCOPIC WORLD"

STAFF UTILIZATION FOR CONTINUOUS

PROGRESS EDUCATION PROJECT

E.S.E.A. TITLE III

Developed by:

Imogene Lacey

Science:

"SMALL THINGS.....DISCOVERY OF THE MICROSCOPIC WORLD" - Seventh Grade

I. OBJECTIVES:

Student will be able to ...

1. Identify parts and demonstrate use of these parts on a microscope.
2. Distinguish between living and non-living units (cells vs. crystals)
3. Name (scientifically) some microscopic creatures and draw generalized pictures of them.
4. Properly prepare slides of materials to be examined.

II. ACTIVITIES:

1. Create and use a water drop lens.
2. Examine microscope slides (prepared by the student) of various substances such as onion, elodea, meats, vegetables.
3. Weigh samples of materials to determine the % of water in each.
4. Watch cell division and growth in yeast cells.

III. MATERIALS PER STUDENT:

1. microscope - 1
   6" elngth copper wire
   slides and cover slips
   hay infusion
   white drawing paper
   salt, sugar, yeast solns, balance
   mashed foods; banana, hamburger, apple, lettuce, carrot
   lens paper
   medicine droppers
   tooth picks
   stains-methylene blue; carmine dye

IV. EVALUATION TECHNIQUE

Student would be evaluated on ....

1. Laboratory procedures (lab points)
2. Drawings of cells and structures which he viewed.
3. Lab practical where students would be asked to identify types of cells and structures, and identify various parts of the microscope.

LANGUAGE ARTS AND THE "SMALL THINGS" SCIENCE UNIT

Creative writing could be used involving sensory experiences.. After viewing a film strip, film, etc., the student would be asked to react through creative expression. The same is possible for tactile, alfactory, gustatory and kinesthetic.

Forms -

1. Poetry
2. Lolls tales
3. Plays
4. Games
5. Stories
6. T.V. show

Example - React creatively to the following

1. You are blindfolded and placed in front of you is a jar of dirty pond water _____
2. "The Dance of the Paramecium"
3. Imagine spending the rest of your life in a drop of water _____ what would you do?
4. "Ruddy Ruby Rotifer"
5. "Amy the Amoeba"

RUDDY RUBY ROTIFER

Over in the blue pond
Close to a rock
Lives a tiny female rotifer
With her own little flock.

Her wheels go round and round
all day
Bringing home the food,
For Ruddy Ruby Rotifer
Is bread winner for her brood.

Ruby's life is often short
Sometimes a week or less,
But she's a very busy gal
And stays close to her nest.

Ruby's eggs are small in summer
As she does her job alone.
But comes the cold of winter
Her male stays close to home.

The winter days are long ones
And life comes to a stop
Her eggs stay on the bottom
Waiting for spring to pop

So goes the life of Ruddy,
Each year is much the same.
A pond, a lake and open jar
The tale is still the same.

TITLE: Physical Education and the "SMALL THINGS" Science Unit

MAIN IDEA: Science and Physical Education classes combine their resources in the study of one-celled animals ("Small Things") in this instance the Paramecium.

LEARNING OBJECTIVES:

The student will be able to identify the main parts of the paramecium and will be able to simulate those parts of the paramecium used and played in the one-celled animal game called "Paramecium."

(Review the 8mm filmloop of the Paramecium in the Instructional Material Center.)

LEARNING ACTIVITIES:

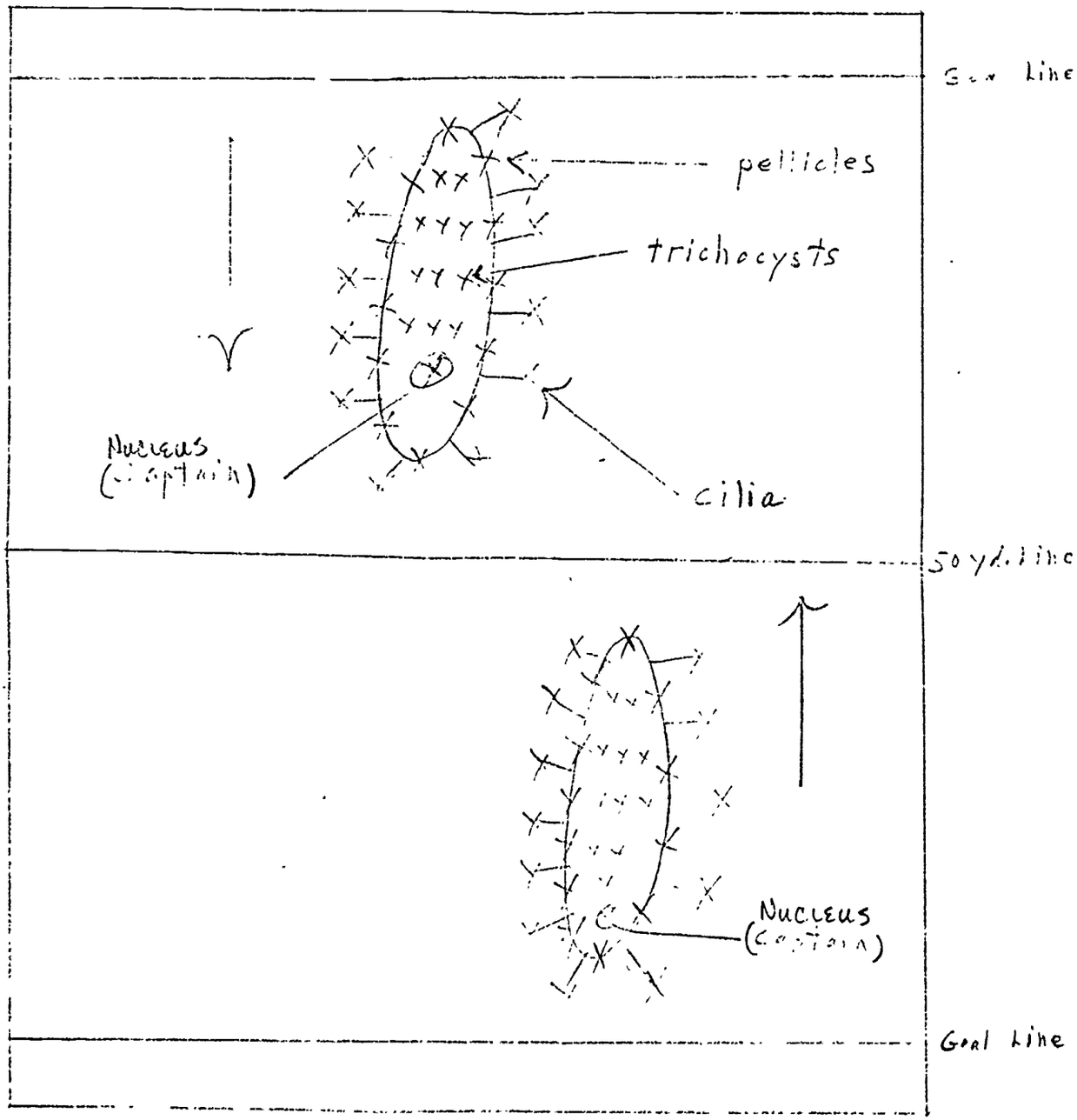
The Game - Paramecium

The Players - A large group from which can be coeducational. The players are divided into two "paramecium". Each paramecium is further divided into three groups: The membrane group, or "pellicles"; the "cilia", and the "trichocysts".

Equipment - None

Facilities - None - can be played on a regulative football field.

TEAM ORGANIZATION:



How to Play: The object of the game is for the team members to simulate the function of the parts of a paramecium.

The "pellicles", which act as the membrane of the paramecium hold hands and face inward.

The "cilia", which actually move the paramecium, hold onto the belt of the pellicles with one hand.

The "trichocysts", the offensive players in reality, are located inside the pellicles.

Scoring: By having the cilia move the paramecium across the opposing goal line with all cilia, pellicles, and trichocysts on their feet, thus scoring one point. The nucleus is appointed captain of his paramecium and he can call out a total of six trichocysts to leave the inside of the membrane (the cytoplasm) and attack and try to run and break through the pellicks of the opposing paramecium. Any trichocyst that is touched in or out of his cytoplasm by an opposing trichocyst must leave the game. If all the trichocysts from one paramecium are eliminated, the other paramecium is the winner.

At designated times the instructional manager may signal (by whistle) and the pellicles then become cilia, the cilia become trichocysts, and the trichocysts become pellicles. Thus, all players function as the three main parts of the paramecium and do not act as specialists.

Industrial Arts and the "SMALL THINGS" Science Unit

TOPICS:

1. Protozoans in the wood termites digestive system.
2. Bacteria and the operation of septic tanks.
3. Mildew and mold problems in construction trade - basements, paints, etc.

RESOURCE MATERIALS - AND THE "SMALL THINGS" SCIENCE UNIT
PUEBLO SCHOOL INSTRUCTIONAL MATERIALS CENTER

BOOKS:

Silverstein, "Cells: Building Blocks of Life"
Shippen, "Men, Microscopes, and Living Things"
Grant, "Wonder World of Microbes"
Lewis, "The First Book of Microbes"
Schatz, "The Story of Microbes"
Silverstein, "A World in a Drop of Water"
Ludovici, "The World of the Microscope"
Thompson, "The Virus Realm"
Disraeli, "New Worlds Through the Microscope"
Keen, "The How and Why Wonder Book of the Microscope and What you See"
Pinney, "Collecting and Photographing your Microzoo"
Sloan, "Under the Microscope"
Stehli, "The Microscope--and How to Use It"
Kohn, "Our Tiny Servants; Molds & Yeasts"
Frahm, "The True Book of Bacteria"
Lietz, "Junior Science Book of Bacteria"
Selsam, "Microbes at Work"
Knight, "Robert Koch; Father of Bacteriology"

A-V Material

Filmloop: Comparative Sizes of Microscopic Animals
" Amoeba
" Rhizopus
" Budding of Yeast Cells
" Euglena
" Paramecium
" Raising Microscopic Water Animals
" Rotifer

Filmstrips: Smallness of Things
" Dust
" Through the Microscope
" Bacteria
" The Pond: How Living Things Change Their Environment

Slides: Bioscope Slide Sets

Filmstrip-Records set: How Cells Work
What Is A Cell

Music and the "Small Things" Science Unit

A. Recordings we have - to play as background music for filmstrips:

1. Music of the World's Great Composers (set of 12 records including many applicable)
2. Electronic Music - 9 Images
3. We Move to Music
4. Music for Modern Dance Techniques
5. Listen and Respond : This Is Music

B. Songs

"The Amoeba" - to the tune of "Maria"

Amoeba!

They call this gray blob
an Amoeba
It only has one cell-
And yet it does quite well!
It's true

Amoeba!
Just look at the crazy Amoeba
Contentedly it sits!
Then suddenly it splits
In two

Amoeba!
It's dividing again into
four cells!
And these four cells will split
into more cells

Amoeba!
There's nothing quite like
the Amoeba

*Its Biology, Prentice-Hall p. 105

Activities:

1. Act out to music the movements of types of microbes - after seeing them on film loops
2. Write a song or some verses (use a familiar tune) about the life of a harmful bacteria
3. While listening to records draw what may be going on in a drop of water (as viewed under a microscope)

HOME EC. and the "SMALL THINGS" Science Unit

I. Uses

A. Foods

1. Yeast action in raising of bread and pickling

2. Mold action in aging of cheese

3. Decaying of fleshy covering of coffee and cocoa beans

4. Yeast action in manufacture of vinegar

B. Cloth

1. Past use of bacterial decay in freeing flax fibers in manufacturing linen

2. Bacterial decay of flesh and hair remains in tanning leather

II. Prevention of negative effects

A. Eating utinsils

1. Soap, hot water, anti-septics, germicides

B. Body hygiene

C. Food storage and preservation techniques

ART and the "SMALL THINGS" Science Unit

A. Motivations: Pretend that you are:

1. traveling into the inside of a hog's stomach and visiting the microorganisms there.
2. Being a termite and helping trees decay in the rain forest.
3. In the war of the parameceia.

B. Patterns found in forms

1. Similarities/differences
2. Cooperating with other microorganisms.
3. Geing captured as someone drinks polluted water.
4. A microorganism hiding in food and trying to conquer the food.

MA-8-X-X-X
SC-8-X-X-X

PHYSICAL SCIENCE AND MATH

CORRELATION SEQUENCE

EIGHTH GRADE

STAFF UTILIZATION FOR CONTINUOUS

PROGRESS EDUCATION PROJECT

E.S.E.A. TITLE III

Developed by:

Ed Coats
Reed E. Done

PHYSICAL SCIENCE/MATH CORRELATION- 8th Grade

THE PROBLEMS

A. SCIENCE

The philosophy of the Pueblo School Science Curriculum stresses the importance of student participation and involvement science materials, his environment and thought processes. Since much of science deals with measurement, the ability to use math and measurement techniques correctly in obtaining data is of prime importance. Previous years have shown that students have found difficulty in recalling math concepts and "transferring them" to the subject area of science. The science teacher re-taught the math again-- a time consuming, as well as inefficient, duplication of effort.

B. MATH

Students successfully complete a math course only to be stymied by practical application in science class, necessitating re-teaching. Or, in other cases, while students are studying congruence of plane figures in math class, they may be using scientific notation in science class -- without yet having studied scientific notation in math class.

Thus, the real problem arises: a need to correlate math and science. Students need to see how one complements the other; they need to see and feel a unity of purpose in school instruction instead of a seperation into seemingly unrelated classes.

THE PROPOSED SOLUTION:

1. Determine the scope and sequence of the 8th grade Physical Science Course.

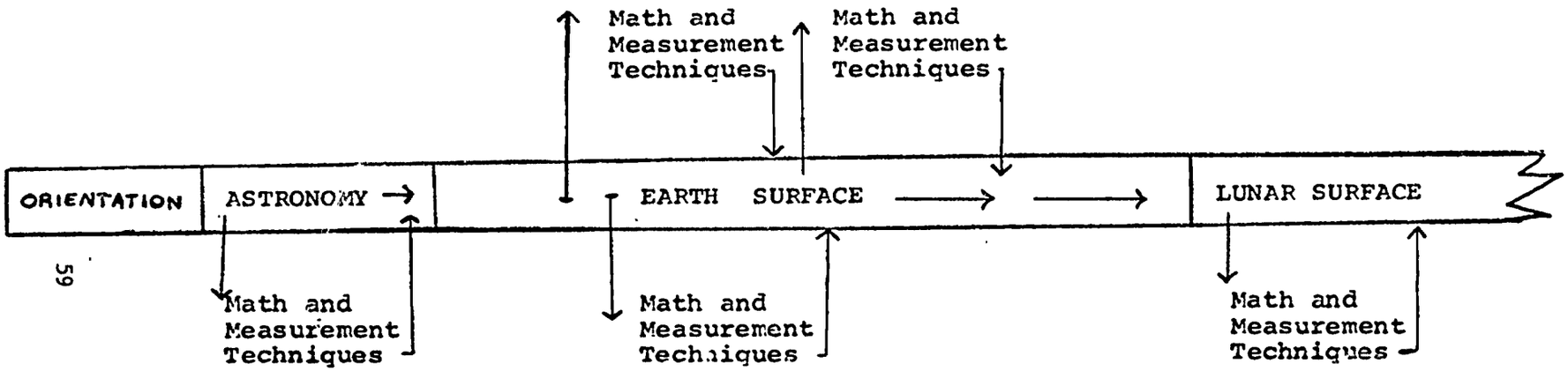
2. Determine, via a time line, the approximate time a particular math concept would be used by the student during the science course.

3. Correlate the 8th grade math scope and sequence with that of science in order that the student would have the necessary "fresh" math background ready for application in his 8th grade science course.

It is felt by the authors that both math and science will hold greater meaning for the student and he will have greater level of success in both courses of the above solutions are implimented.

PHYSICAL SCIENCE SEQUENCE FLOW CHART - EXAMPLE

("Time, Space and Matter" modified)



NOTE: Students requiring Math and Measurement Techniques leave the sequence path to aquire said skills via work in Math and Science classes.

PHYSICAL SCIENCE/MATH CORRELATION - 8th GRADE

Math Concept Number Teaching Sequence (see key pp. 136-141)	Math Concept Number (see key pp. 136-141)	Math Concepts* Required in Physical Science	Approx. Weeks
			0
1.0 to 1.6			1
2.0 to 2.6	1.0	Decimals & percent	2
	2.0	Fract. parts	
3.0 to 3.1 (b)	3.0	Multiples	3
4.0 to 4.2	4.0	Rates	
5.0 to 5.1 (b)	5.0	Averaging	4
	6.0		
6.0 to 6.6 (a3)			5
			6
7.0 to 7.9	7.0	Basic Equations	7
8.0 to 8.15	8.0	Decimal Est.	
9.0 to 9.4 (c)	9.0	Graphing Tech.	8
			9
10.0 to 10.4 (a)	10.0	Scientific notation	10
			11
11.0 to 11.3 (e)	11.0	Rectangular & prismatic area & volume	12
12.0 to 12.0	12.0	Circular & Spherical Dimen.	13
13.0 to 13.1	13.0	Formula transposing	14
			15
			16
			17
			18

*MATH CONCEPTS ARE CUMULATIVE THROUGH THE SCIENCE COURSE AND ARE NOT RELISTED EACH TIME THEY ARE REQUIRED BY THE STUDENT TO SOLVE/INVESTIGATE NEW PROBLEMS.

KEY TO MATH CONCEPT NUMBERS AND SEQUENCE

Concept Number	Description
1.0	Decimal and percent
1.1	Decimal place values
a.	Reading and writing
b.	Writing in expanded form
1.2	Comparing and arranging decimal numbers
1.3	Adding and subtracting decimals
a.	Algorithm for addition
b.	Algorith for subtraction
1.4	Multiplying and dividing decimals
a.	The multiplacation algorithm
b.	The division algorithm
1.5	Converting decimals, fractions, and percents
1.6	Solving percentage problems
a.	Finding a percent of a number
b.	Finding a number when a percentage of it is known
c.	Finding the percentage one number is of another
d.	Solving interest problems
2.0	Determining fractional parts
2.1	Adding rational numbers
a.	Adding rational numbers
b.	Adding negative rational numbers

MATH KEY CONTINUED

Concept Number	Description
2.2	Properties of addition
a.	Closure
b.	Commutative
c.	Associative
d.	Additive-identity
e.	Additive-inverse
2.3	Subtracting rational numbers
2.4	Multiplying rational numbers
a.	Multiplying a rational number and a nonnegative rational number
b.	Multiplying two negative rational numbers
2.5	Properties of multiplication
a.	Closure
b.	Commutative
c.	Associative
d.	Multiplicative-identity
e.	Multiplicative-inverse
f.	Distributive
2.6	Dividing rational numbers
3.0	Multiplies (review)
3.1	Determining multiples
a.	using the division algorithm
b.	Approximating multiples of distance
4.0	Rate
4.1	Solving general rate problems (speed in MPH, etc.)
4.2	Solving specific scientific rate problems (spin/orbit,wear/time,etc.)

MATH KEY CONTINUED

Concept Number	Description
5.0	Averaging
5.1	Mean, median, mode
a.	Applying to general problems (grade, salaries, etc.)
b.	Applying to specific scientific problems (avg. of shadow angles, avg. of pendulum periods, etc.)
6.0	Angles
6.1	Constructing geometric figures
a.	Using construction and measuring materials
6.2	Determining parallel lines
a.	A transversal
b.	Corresponding angles
c.	Interior and exterior angles
d.	Alternate angles
e.	vertical angles
6.3	Angles of a triangle
a.	acute angles
b.	obtuse angles
c.	right angles
6.4	Angles of a rectangle
6.5	Bisecting an angle
6.6	Similarity and congruency
a.	Constructing similar triangles
b.	Constructing congruent triangles
1.	Angles-side-angle
2.	side-angle-side
3.	side-side-side

MATH KEY CONTINUED

Concept Number	Description
7.0	Writing and solving equations
7.1	Number phrases
a.	using a variable
b.	determining the replacement set
7.2	Open number phrase
a.	determining the number represented by following directions
7.3	Statements and open number sentences
a.	an equation
b.	an inequality
c.	a statement
7.4	Determining solutions of a mathematical sentence
7.5	Using common sense in solving equations
a.	solving by inspection
7.6	Solving equations by transformation
7.8	Solving inequalities
7.9	Applying general equation principles to write and solve practical problems
8.0	Decimal estimation and precision
8.1	Terminating decimal numerals
8.2	Repeating decimal numerals
8.3	Irrational numbers
8.4	Real numbers
8.5	Rational approximations
8.6	Comparison property of numbers
a.	Comparing by decimal numerals
8.7	Density property of rational numbers
8.8	Density property of real numbers

MATH KEY CONTINUED

Concept Number	Description
8.9	Property of completeness of the set of real numbers
8.10	Greatest possible error in measurement
8.11	Significant digits in measurement
8.12	Rounding off to specified digits
8.13	Relative error in measurement
8.14	Making actual precise decimal measurements
8.15	Making actual estimates of decimal readings and measurement
9.0	Graphing Techniques
9.1	Writing data
a.	compiling a data table
9.2	Divided-bar graph
9.3	Circle-graph
a.	sectors
9.4	Bar and broken-line graphs
a.	vertical data
b.	horizontal data
c.	determining the trend
10.0	Scientific notation
10.1	Exponents
a.	multiplying in exponential form
b.	dividing in exponential form
c.	writing decimal numerals as powers of ten
10.2	Zero and negative exponents
a.	writing decimal numerals as negative powers of ten
10.3	Expressing a number in scientific notation

MATH KEY CONTINUED

Concept Number	Description
a.	Finding the "standard position"
b.	Counting from the standard position to the decimal point
10.4	Multiplying and dividing in scientific notation
a.	applying to actual scientific problems
11.0	Area and volume of geometric figures
11.1	Understanding units of measurement
a.	square units
b.	cubical units
11.2	Plane figures (area)
a.	rectangle
b.	triangle
c.	circle
d.	parallelogram
e.	trapezoid
11.3	Solid figures (surface area and volume)
a.	pyramids
b.	prisms
c.	cones
d.	cylinders
e.	spheres
12.0	Applying knowledge of circles and spheres to practical scientific spherical measurement problems
13.0	Formula transposing
13.1	Applying the formulas used in textbook problems to actual situations posed in math, science, etc.

PHYSICAL SCIENCE SEQUENCE OUTLINE

("Time,Space, and Matter" Revised Sequence)

SCIENCE TOPIC	MATH CONCEPT NUMBER	SCIENCE APPLICATION OF MATH CONCEPT
1. Orientation		
A. Watson-Glaser Test of Critical Thinking(pre-test)	___	
B. Recording Data (Standards/Methods)	___	
2. The Physical World		
A. Observation vs. Interpretation	___	
B. Purpose, Precision & Approximation	___	
C. Microcosm vs. Macrocosm	___	
3. Apparent Celestial Motion	1.0	Score/Grade Calculations
A. Part I Stars	___	
B. Part II Stars, Moon, Sun	___	
4. Earth's Moon Phases		
A. Part I Duplication Model	2.0	Fractional Parts of Moons Cycle
B. Part II Data Interpretation	3.0	Earth, Moon, Sun Relative Distance
5. Jupiter		
A. Moons Orbit?	___	
B. Planet Spins?	___	
6. Earth's Moon Spins?		
A. Model	4.0	Rate of Spin/Orbit
7. Stars Orbit?		
A. Star "Trails"Interp.		
8. Earth Spins?		
A. Pendulums	5.0	Average of Periods
B. Foucault Pendulum	___	

SCIENCE TOPIC	MATH CONCEPT NUMBER	SCIENCE APPLICATION OF MATH CONCEPT
9. Earth Orbits or Sun Orbits?	___	
A. Kurile Island Photo and Eclipse		
10. Sun Spins?	___	
A. Sun Surface		
B. Sun Spots		
11. Planet Orbits?		
A. Earth's Moon Phase Review		
B. Phases of Venus		
C. Size-Distance Relationship		
D. Elongation	6.0	Diagram viewing angles to plot orbit of Venus
12. Earth Orbits?	___	
A. Ptolomy		
B. Copernicus		
13. Earth's Surface-Agents of Change	___	
A. Restricted & Dramatic		
B. World wide & Gradual		
14. Running Water		
A. Hydraulic Action	7.0	Mass & Distance Calculations using unequal arm balance
	8.0	Estimating values between scale graduation on balance
	9.0	Graphing mass change with time
15. Abrasion Rates	4.0	Rate of change in mass
A. Quartz		
B. Calcite		

SCIENCE TOPIC	MATH CONCEPT NUMBER	SCIENCE APPLICATION OF MATH CONCEPT
16. Form & Substance		
A. Melting	8.0	Temperature Pattern
B. Boiling	8.0	
C. Evaporation cycle	___	
D. Paradichloro Benzene	___	
17. Solution		
A. crystals	___	
B. solubility limit	___	
18. Change & The Grand Canyon		
A. Cause of?		
B. Age?		
C. Princeton Analogy	10.0	Floor abrasion rate & duration
D. Quartz Abrasion rate	9.0	Rate of wearing
E. Topographic maps	7.0	Reading contour lines
19. Grand Canyon Dimensions		
A. Area & volume	11.0	Area & volume of canyon
B. Drainage area	11.0	Area of drainage surface
	9.0	Rate of sediment deposition
20. Leveling/Uplifting Mechanism	___	
21. Shape of Earth		
A. Apollo Photos	___	
22. Density of Earth		
A. Surface & above	___	
B. First Approximation	10.0	Express density of First Approx.
23. Size of Earth		
A. Shadow Angles	12.0	Spherical measurements
	5.0	Measure shadow angles
	13.0	Calculate radius of earth via the earth's circumference
	10.0	Same

SCIENCE TOPIC	MATH CONCEPT NUMBER	SCIENCE APPLICATION OF MATH CONCEPT
24. Mass of the Earth		
A. Density X Volume	10.0	Calculate mass of earth to first approximation
25. Moon's Surface - Cause & Change		
A. Compared to Earth's Features	8.0	Plotting Earth vs. Moon crater profiles to scale
B. Impace vs. volcanism	___	
C. Crater classification	___	
D. Sequence of event in Mare Imbrium area	___	
26. Watson-Glaser Test of Critical Thinking (post-test)	___	