DOCUMENT RESUME

ED 106 158 SE 019 218

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TITLE	[Science Modules: Materials/Textbook Review and Evaluation.]
INSTITUTION	Central Michigan Univ., Mount Pleasant.; Mount Pleasant Public Schools, Mich.
PUB DATE	Feb 75
NOTE	28p.; Appendix A to SE 019 214. Related documents are SE 019 215-219. Best Copy Available; Occasional Marginal Legibility
EDRS PRICE	MF-$0.76 HC-$1.95 PLUS POSTAGE
DESCRIPTORS	Curriculum; *Elementary School Science; Higher Education; Methods Courses; Preservice Education; *Science Course Improvement Project; *Science Education; *Teacher Education
IDENTIFIERS	Central Michigan University; Elementary Science Study; ESS; SAPA; Science A Process Approach; Science Curriculum Improvement Study; SCIS

ABSTRACT

Presented are two of the science modules (from Appendix A), developed for a study at Central Michigan University, focusing on competency-based materials in science methods education for elementary school teachers. The Materials Module is designed to involve the preservice teachers in examining, analyzing and evaluating three elementary science curriculum projects: Elementary Science Study (ESS), Science Curriculum Improvement Study (SCIS), and Science - A Process Approach (SAPA). The Textbook Review and Evaluation Module is designed to cause preservice teachers to review and evaluate different science textbook series. It is based on the rationale that as teachers the college students will some day have to serve on a textbook selection committee. (PEB)

Science Modules
Science/Social Studies Methods
ELE 340 (431)

MATERIALS MODULE

INTRODUCTION

In recent years much effort has been directed toward making science more relevant to the modern world. Both government and private foundations have invested millions of dollars in elementary science curriculum projects. In this module, you will be actively involved in examining, analyzing and evaluating the results of three of these projects.

1. Elementary Science Study (ESS) is a general science program. The developers believe that children should be encouraged to learn by experimenting and trying things on their own, and by setting their own goals.

2. Science Curriculum Improvement Study (SCIS) focuses on two areas, physical science and life science. The program's goal is to provide the students with a framework of concepts to which they can relate their science experiences and an understanding of the processes of scientific investigation.

3. Science - A Process Approach (SAPA) is a general science program which focuses on the scientific processes: observing, classifying, using numbers, measuring, using space/time relationships, communicating, formulating hypothesis, interpreting data, controlling variables, and experimenting.

GOAL

You will examine, analyze and evaluate curricular materials that can be used to conduct learning experiences for elementary children.

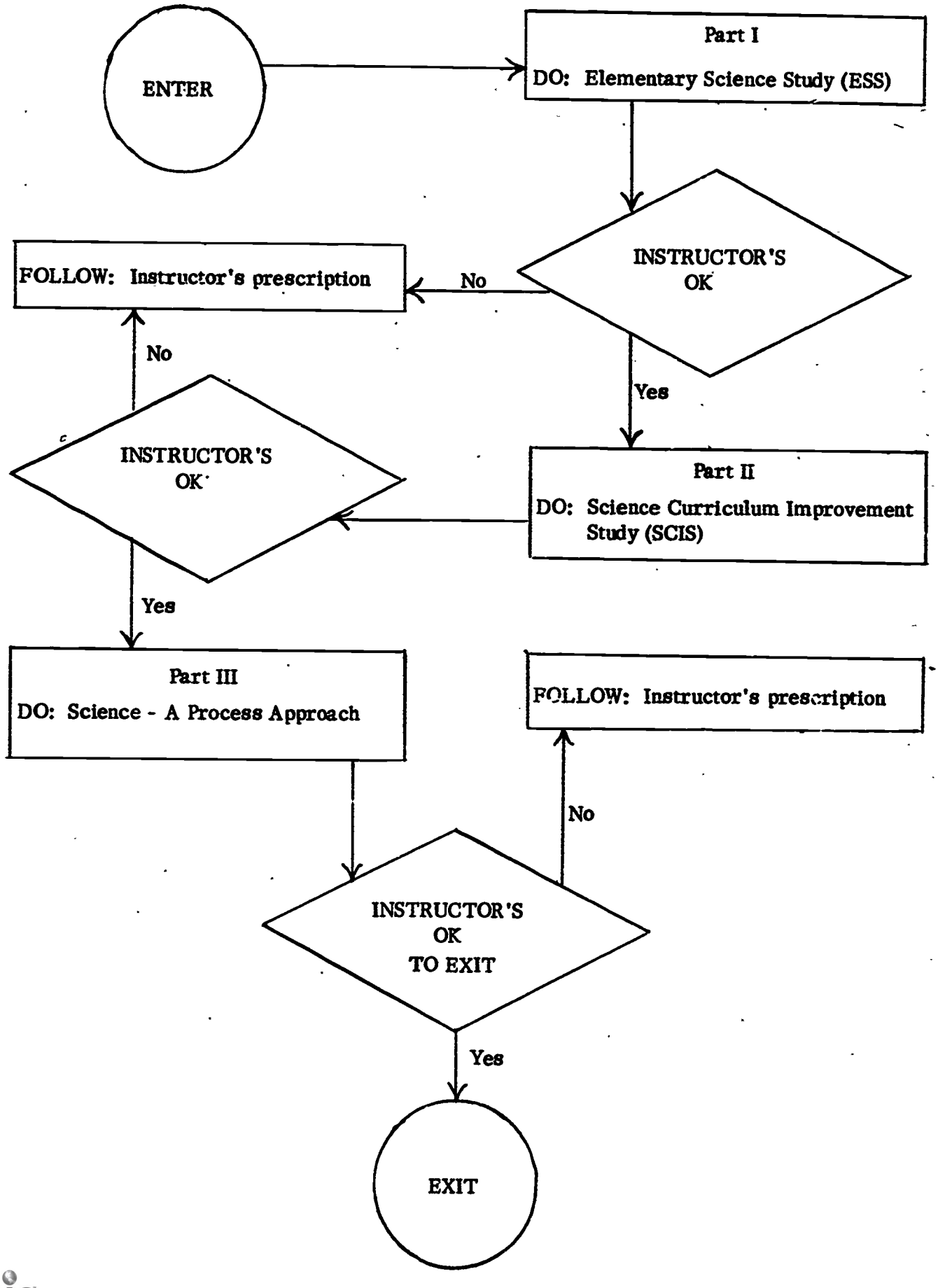
BEHAVIORAL OBJECTIVES

1. You will examine the following science programs: ESS, SCIS, and SAPA in terms of scope and sequence.

2. You will perform at least two activities from each of the following science programs: ESS, SCIS, and SAPA.

3. You will analyze and evaluate the curriculum of the following science programs: ESS, SCIS, and SAPA.

FLOW CHART: MATERIALS MODULE



PART I: ELEMENTARY SCIENCE STUDY (ESS)

Before beginning this section take a look at pages 11-13 in the Appendix. You will see that the ESS units are grouped into four principle subject areas: mathematics, biological sciences, physical sciences and earth sciences. You will be reviewing the available manuals for each area and participating in at least one activity from each area. PLEASE DO NOT TAKE THE MANUALS FROM THE ROOM. Before doing Activities One through Four, read Gega, Chapter 9: The Elementary Science Study. (Ask your instructor for a copy.) Use the answer sheets provided to report your results.

Activity One

A. Obtain from your instructor the manuals to be reviewed in the area of biological sciences.

1. Review all the available manuals giving title, grade range, and purpose of the unit. (What do they really teach?)

2. Include personal comments and opinions.

B. Obtain from your instructor a list of suggested activities for biological sciences.

1. Do at least one of the activities.

2. Report your results.

3. Include personal comments and opinions.

Activity Two

A. Obtain from your instructor the manuals to be reviewed in the area of physical sciences.

1. Review all the available manuals giving title, grade range, and purpose of the unit. (What do they really teach?)

2. Include personal comments and opinions.

B. Obtain from your instructor a list of suggested activities for physical sciences.

1. Do at least one of the activities.

2. Report your results.

3. Include personal comments and opinions.

Activity Three

A. Obtain from your instructor the manuals to be reviewed in the area of earth sciences.

1. Review all the available manuals giving title, grade range, and purpose of the unit. (What do they really teach?)

2. Include personal comments and opinions.

B. Obtain from your instructor a list of suggested activities for earth sciences.

1. Do at least one of the activities.

2. Report your results.

3. Include personal comments and opinions.

Activity Four

A. Obtain from your instructor the manuals to be reviewed in the area of mathematics.

1. Review all the available manuals giving title, grade range, and purpose of the unit. (What do they really teach?)

2. Include personal comments and opinions.

B. Obtain from your instructor a list of suggested activities for mathematics.

1. Do at least one of the activities.

2. Report your results.

3. Include personal comments and opinions.

PART II: SCIENCE CURRICULUM IMPROVEMENT STUDY (SCIS)

The SCIS materials are grouped by levels (One-Six) with the units within each level grouped as either Life Science or Physical Science. (See pages 14-15 in the Appendix.) Before doing the activities for this part, read Gega, Chapter 7: Science Curriculum Improvement Study. (Ask your instructor for a copy.) You are also to read the SCIS Sample guide, pages 4-20. In the following activities you will be reviewing the available manuals and materials and participating in at least one activity from a Life Science unit and one from a Physical Science unit. PLEASE DO NOT TAKE THE MANUAL FROM THE ROOM. Use answer sheets to record your responses.

Activity One

A. Obtain from your instructor the manuals to be reviewed in the area of Life Science.

1. Review all the available manuals giving title, grade range, and purpose of the unit. (What do they really teach?)

PART II: SCIENCE CURRICULUM IMPROVEMENT STUDY (SCIS) (Cont'd.)

2. Include personal comments and opinions.

B. Obtain from your instructor a list of suggested activities for Life Science.

1. Do at least one of the activities.

2. Report your results.

3. Include personal comments and opinions.

Activity Two

A. Obtain from your instructor the manuals to be reviewed in the area of Physical Science.

1. Review all the available manuals giving title, grade range, and purpose of the unit. (What do they really teach?)

2. Include personal comments and opinions.

B. Obtain from your instructor a list of suggested activities for Physical Science.

1. Do at least one of the activities.

2. Report your results.

3. Include personal comments and opinions.

PART III: SCIENCE - A PROCESS APPROACH (SAPA)

The SAPA materials are grouped by levels (A, B, C etc. See pages 16-19 in the Appendix.) Within each level or part are individual lessons which are designed to develop skill in the scientific processes (observing, classifying, measuring etc.) You will be reviewing the available lesson booklets from each part and participating in at least one activity from parts A or B and at least one from parts C or D. PLEASE DO NOT TAKE THE BOOKLETS FROM THE ROOM. Before doing the activity for this part, read Geg, Chapter 8: Science - A Process Approach. (Ask your instructor for a copy.) Use the answer sheets provided to report your results.

Activity One

A. Obtain from your instructor the materials to be reviewed for SAPA.

1. Examine several individual lesson plans from each part: Part A, Part B, Part C, and Part D, giving title, grade range, and purpose of the lesson. (What do they really teach?)

2. Include personal comments and opinions.

PART III: SCIENCE - A PROCESS APPROACH (SAPA) (Cont'd.)

B. Obtain from your instructor a list of suggested activities for SAPA.

1. Do at least one of the activities from parts A and B and parts C and D.

2. Report your results.

3. Include personal comments and opinions.

Name _____

Section _____

Module _____

Answer Sheet for Part I: ESS Manuals

Name	Grade Level	Purpose: What do they actually teach?	Comments
Biological Sciences			
Physical Sciences			
Earth Sciences			
Mathematics			

Name _____

Section _____

Module _____

Answer Sheet for Part II: SCIS Manuals

Name	Grade Level	Purpose: What do they actually teach?	Comments
Life Science			
Physical Science			

Name _____

Section _____

Module _____

Answer Sheet for Part III: SAPA Booklets

Name	Grade Level	Purpose: What do they actually teach?	Comments
Part A			
Part B			
Part C			
Part D			

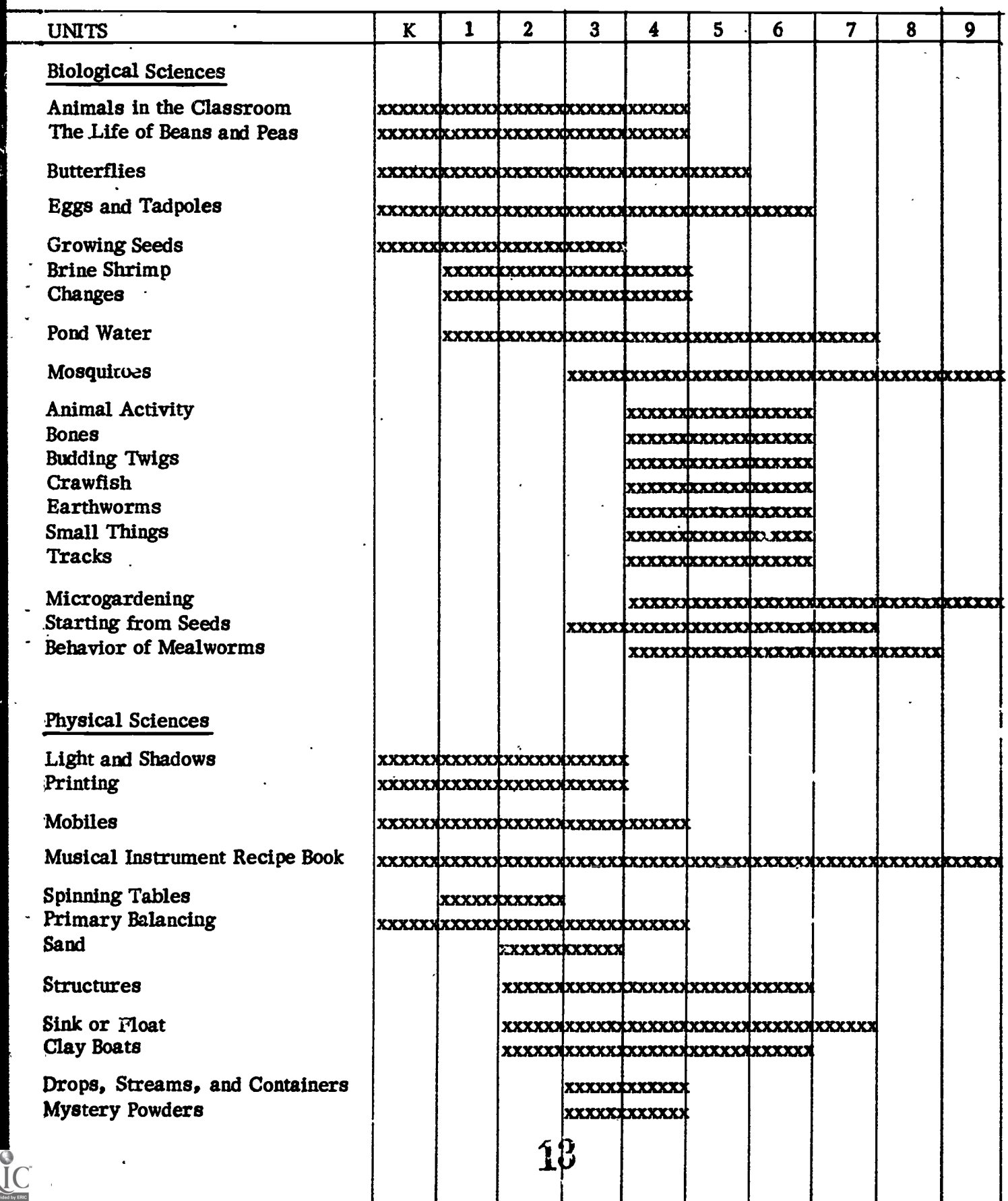
APPENDIX

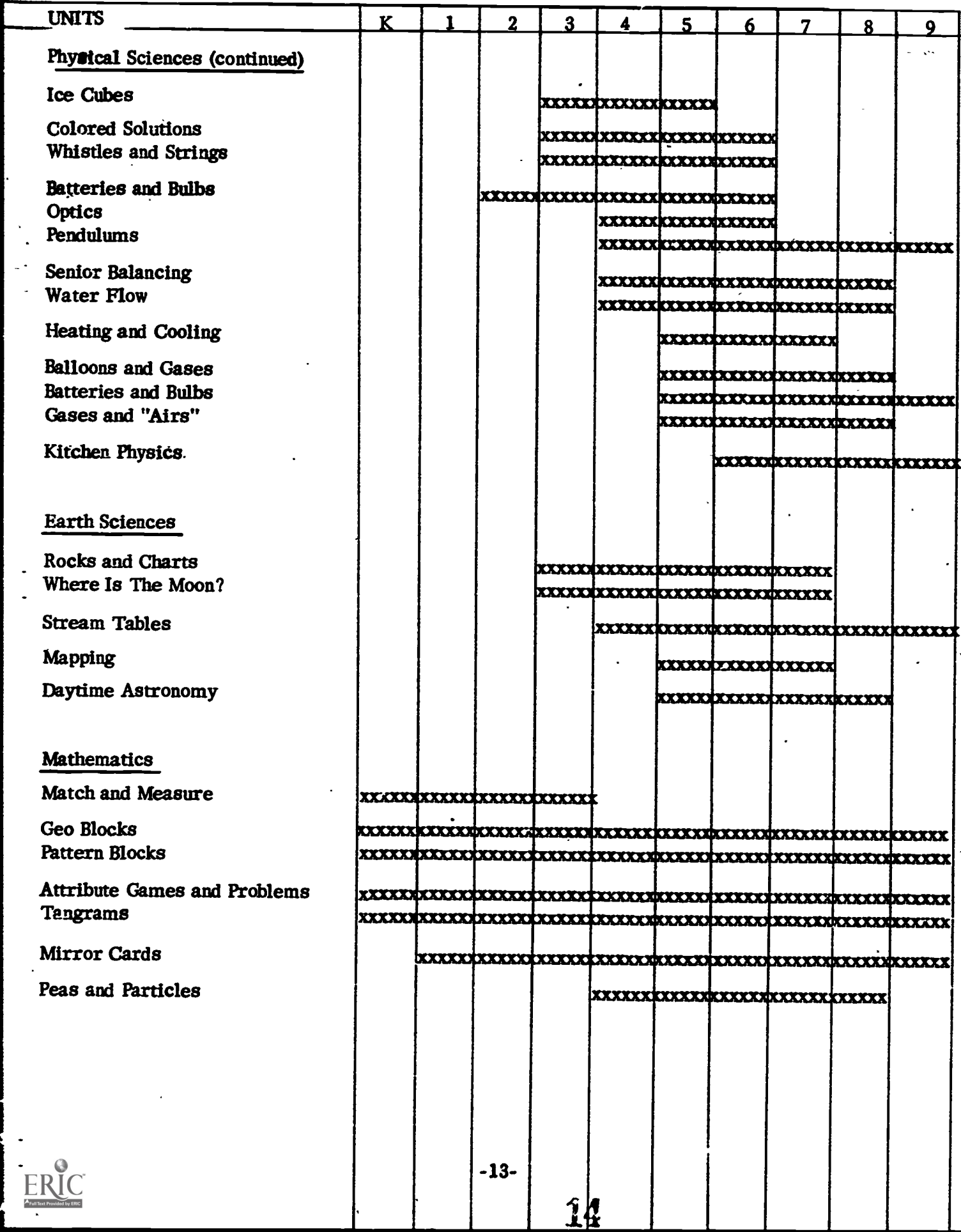
FACT SHEET: ESS, SAPA AND SCIS

	ESS	SAPA	SCIS
DIRECTOR/DEVELOPER	Frank Watson Education Development Center	John Mayor The Commission on Science Education of the American Association for the Advancement of Science	Robert Karplus The Elementary Science Project at the University of California, Berkeley
SUBJECT AREA	General Science	General Science	General Science
FOCUS	Providing materials that motivate students to meaningful "science experiences." No specific goals outlined; teacher and students focus on what interests them.	Developing skill in scientific processes (observing, classifying, measuring, etc) through a highly structured sequence	(1) To provide students with a framework of concepts in physical science and life science to which they can relate their science experiences and (2) To provide an understanding of the processes of scientific investigation
FORMAT	Supplementary or complete program	Complete program	Complete program
GRADES COVERED	K-9	K-6	1-6
TEACHER PREREQUISITES	No specialized science training needed; ability to be non-directive desirable	No specialized science training needed; training in the behavioristic approach of the program desirable	No specialized training needed; a workshop recommended in which emphasis is placed on laboratory work
AVAILABILITY OF MATERIALS (Fall 1970)	54 units available from the publisher. (See pages 12-13 in this appendix for more information.)	All units available from publisher. (See pages 16-19 in this appendix for more information.)	All units (six physical science, and six life science) available from the publisher. (See pages 14-15 in this appendix.)
PUBLISHER	Webster Division, McGraw-Hill Book Co. Manchester Road, Manchester, Missouri 63011	Xerox Education Division 600 Madison Ave., New York, N.Y. 10022	Rand McNally E. Co., P. O. Box 7600, Chicago, Illinois 60680

ESS UNITS GROUPED BY PRINCIPAL SUBJECT MATTER

The categories under which the units are listed do not encompass the total contents of the units. Activities in all of the units extend into and combine elements from a number of subject areas, both in science and other studies. A few units are essentially interdisciplinary.




UNITS
K
1
2
3
4
5
6
7
8
9
Physical Sciences (continued)
Ice Cubes
Colored Solutions
Whistles and Strings
Batteries and Bulbs
Optics
Pendulums
Senior Balancing
Water Flow
Heating and Cooling
Balloons and Gases
Batteries and Bulbs
Gases and "Airs"
Kitchen Physics
Earth Sciences
Rocks and Charts
Where Is The Moon?
Stream Tables
Mapping
Daytime Astronomy
Mathematics
Match and Measure
Geo Blocks
Pattern Blocks
Attribute Games and Problems
Tangrams
Mirror Cards
Peas and Particles

SCIS LEVEL OVERVIEWS

Levels	Life Science Concepts	Physical Science Concepts
First Level	**Organism**	**Material Objects**
The first-year units have certain common objectives: to sharpen children's powers of observation, discrimination, and accurate description. The objectives are accomplished as children care for acquatic plants and animals, raise seedlings, and investigate the properties of a broad range of non-living objects. The units can be taught in either order.	organism birth death habitat foodweb detritus	object property material serial ordering change evidence
Second Level	**Life Cycles**	**Interaction & Systems**
In both second-year units the theme is change, observed as evidence of interaction or by the development of an animal or plant. The two units therefore require children to add th mental process of interpreting evidence to the observational skill they developed the first year. In their laboratory work children use magnets, batteries, wires, various chemicals, photographic paper, pulleys, electric motors, seeds, mealworms, frog eggs, and fruit flies. The units can be taught in either order, or simultaneously.	growth development life cycle genetic identity generation biotic potential plant & animal metamorphosis	interaction evidence of interaction systems interaction-at-a-distance
Third Level	**Populations**	**Systems & Variables**
Children observe and experiment with increasingly complex phenomena as they build on the first two years of the SCIS program and move toward understanding the energy, matter, and ecosystem concepts. In the physical science unit children experiment with matter in solid, liquid, and gaseous forms, and make and analyze measurements. In the life science unit the children observe the interdependence of individuals and populations within the community.	population predator prey community plant eater animal eater food chain food web	subsystem histogram evaporation solution variable

SCIS LEVEL OVERVIEWS (Cont'd.)

Levels	Life Science Concepts	Physical Science Concepts
Fourth Level In the life science unit, children consider for the first time some of the physical conditions that shape an organism's environment. These investigations make use of the measurement skills and scientific background developed in the physical and life science units during the first three years. The physical science units introduces techniques for dealing with spatial relationships of stationary and moving objects.	**Environments** optimum range environment environmental factor range	**Relative Position & Motion** polar coordinates reference object relative position relative motion rectangular coordinates
Fifth Level The conceptual development of the SCIS program continues as examples of energy transfer are introduced in the physical science unit. Children apply the systems concept, the identification of variables, and the interpretation of data with which they have become familiar during the earlier years of the SCIS program.	**Communities** producer consumer decomposer photosynthesis community food transfer photosynthesis	**Energy Sources** energy transfer energy chain energy source energy receiver
Sixth Level The last year of the SCIS program contains both a climax and a new beginning. The life science unit integrates all the preceeding units in both physical and life sciences as children investigate the exchange of matter and energy between organisms and their environment. The physical science unit introduces the concept of the scientific model and thereby opens a new level of data interpretation and hypothesis making. At the same time, the children relate matter and energy to electrical phenomena, acquiring a basis for their later understanding of the electrical nature of all matter.	**Ecosystems** ecosystem water cycle oxygen-carbon dioxide cycle pollutant food-mineral cycle	**Models: Electric & Magnetic Interactions** scientific model electricity magnetic field

SAPA II GRADE LEVELS

The modules of SCIENCE . . . A PROCESS APPROACH II can be divided into segments of fifteen. Each series of fifteen constitutes a grade level, and represents content balanced between the life and physical sciences. Process instruction in all of the basic skills of science is included in Modules 1-60. Kits contain hardware, printed materials, a teacher instruction booklet and sufficient expendable materials for use by 30 pupils. Sharing kits will require additional expendables.

Kindergarten (Part A)

Modules 1-15: Perception of Color/Recognizing and Using Shapes/Color, Shape, Texture, and Size/ Leaves, Nuts, and Seashells/Temperature/ Direction and Movement/Perception of Taste/ Length/Sets and Their Members/Spacing Arrangements/Listening to Whales/Three-Dimensional Shapes/Numerals, Order and Counting/Animals and Familiar Things/ Perception of Odors	Kit E95779 Extra Expendables E95777 Spare Instruction Booklets E95775	170.00 20.00 15.00

First Grade (Part B)

Modules 16-30: Living and Nonliving Things/Trees in our Environment/Change/Using the Senses/Soils/ Counting Birds/Weather/Same but Different/ Comparing Volumes/Metric Lengths/Introduction to Graphing/Using a Balance/Pushes and Pulls/Molds and Green Plants/Addition Through 99	Kit E96229 Extra Expendables E96228 Spare Instruction Booklets E96227	315.00 50.00 15.00

Second Grade (Part C)

Modules 31-45: Life Cycles/A Terrarium/What's Inside/ About How Far/Symmetry/Animal Responses/ Forces/Using Graphs/Solids, Liquids, and Gases/How Certain Can You Be?/Temperature and Thermometers/Sorting Mixtures/A Plant Part That Grows/Surveying Opinion/Lines, Curves, and Surfaces	Kit E96669 Extra Expendables E96667 Spare Instruction Booklets E96665	345.00 60.00 15.00

SAPA II GRADE LEVELS (continued)

Third Grade (Part D)

Modules 46-60: Observations and Inferences/Scale Drawings/ A Tree Diary/The Bouncing Ball/Drop by Drop/ The Clean-up Campaign/Rate of Change/Plants Transpire/The Suffocating Candle/Static and Moving Objects/Sprouting Seeds/Magnetic Poles/ Punch Cards/Position and Shape/Liquids and Tissue/Metersticks, Money, and Decimals/ Relative Motion	Kit E97129	375.00
	Extra Expendables E97127	70.00
	Spare Instruction Booklets E97125	15.00

Additional Price Information

Program Guide E95323	1.00
Tracking Cards (Set of 30) Basic Processes, Modules 1-60 (K-3) E95350	9.00
Binder E95322	3.00
Planning Chart	free on request
Systems Purchase: Order the complete set of all modules, 1 through 60, at a significant saving over grade level prices. System comes complete with display cases. E97123	1,070.00

SAPA II LINE-UP

Module	Skill	Module
1	Observing a	Perception of Color
2	Using Space/Time a	Recognizing and Using Shapes
3	Observing b	Color, Shape, Texture, and Size
4	Classifying a	Leaves, Nuts, and Seashells
5	Observing c	Temperature
6	Using Space/Time b	Direction and Movement
7	Observing d	Perception of Taste
8	Measuring a	Length
9	Using Numbers a	Sets and Their Members
10	Using Space/Time c	Spacing Arrangements
11	Observing e	Listening to Whales
12	Using Space/Time d	Three-Dimensional Shapes
13	Using Numbers b	Numerals, Order, and Counting
14	Classifying b	Animals and Familiar Things
15	Observing f	Perception of Odors
16	Classifying c	Living and Nonliving Things Trees in Our Environment
17	Observing g	Change
18	Observing h	Using the Senses
19	Observing i	Soils
20	Using Numbers c	Counting Birds
21	Observing j	Weather
22	Communicating a	Same But Different
23	Measuring b	Comparing Volumes
24	Measuring c	Metric Lengths
25	Communicating b	Introduction to Graphing
26	Measuring d	Using a Balance
27	Communicating c	Pushes and Pulls
28	Observing k	Molds and Green Plants
29	Using Space/Time e	Shadows
30	Using Numbers d	Addition Through 99
31	Communicating d	Life Cycles
32	Classifying d	Terrarium
33	Inferring a	What's Inside?
34	Measuring e	About How Far?
35	Using Space/Time f	Symmetry
36	Observing l	Animal Responses
37	Measuring f	Forces
38	Predicting a	Using Graphs
39	Measuring g	Solids, Liquids, and Gases
40	Inferring b	How Certain Can You Be? Shake and Peek
41	Measuring h	Temperature and Thermometers
42	Classifying e	Sorting Mixtures

SAPA II LINE-UP (continued)

Module	Skill	Module
43	Communicating e	A Plant Part That Grows
44	Predicting b	Surveying Opinion
45	Using Space/Time g	Lines, Curves, and Surfaces
46	Inferring c	Observations and Inferences
47	Communicating f	Scale Drawings
	Communicating g	A Tree Diary
48	Predicting c	The Bouncing Ball
49	Measuring i	Drop by Drop
50	Predicting d	The Clean-up Campaign
51	Using Space/Time h	Rate of Change
52	Inferring d	Plants Transpire
53	Predicting e	The Suffocating Candle
54	Measuring j	Static and Moving Objects
55	Observing m	Sprouting Seeds
	Observing n	Magnetic Poles
56	Classifying f	Punch Cards
57	Communicating h	Position and Shape
58	Inferring e	Liquids and Tissue
59	Using Numbers e	Meterstick, Money and Decimals
60	Using Space/Time i	Relative Motion

Science Modules
Science/Social Studies Methods
ELE 340 (431)

POSTTEST FOR MATERIALS MODULE

(This test must be completed by the next class day.)

For the past two weeks the science program selection committee, of which you are chairperson, has been examining three programs: ESS, SCIS, and SAPA. You have now reached consensus as to which program best fulfills the criteria set up by your committee for program selection.

As chairperson, you will make a five minute presentation to the Board of Education of your school district in an attempt to convince them to approve the science program selected by your committee.

1. Prepare your speech (exactly what you will say) and submit it to the Board (your instructor) in writing. Use a separate sheet of paper to write your speech.

2. The board has asked that your presentation include:

   a. A brief overview of all three programs examined

   b. Criteria set up by your committee for evaluating the three programs.

   c. A rationale to support the selected program

   d. Any other information you feel would help convince them to approve your committee's selection.

Name _____

Section _____

Science Modules
Science/Social Studies Methods
ELE 340 (431)

TEXTBOOK REVIEW AND EVALUATION MODULE

INTRODUCTION

The purpose of this assignment is to review and evaluate the different science textbook series available in the IMC. As a teacher you will probably serve on a textbook selection committee. You will want to have some guidelines or criteria by which to evaluate the many series that are available.

In completing this assignment you will have a chance to examine and evaluate several science textbooks. You will be involved in both individual and small group work. Select a grade level within your group. Each member of your group will review a textbook at this grade level from a different series. (Individual review sheets are provided for collecting the necessary data.) After each member of the group has reviewed his/her chosen textbook, the group will meet together to discuss, compare and evaluate the various texts. (Group review sheets are provided.)

The groups will each have about ten (10) minutes to present their findings to the class during a regularly scheduled class time. (Check with your instructor for due date.)

The individual and group review sheets are attached.

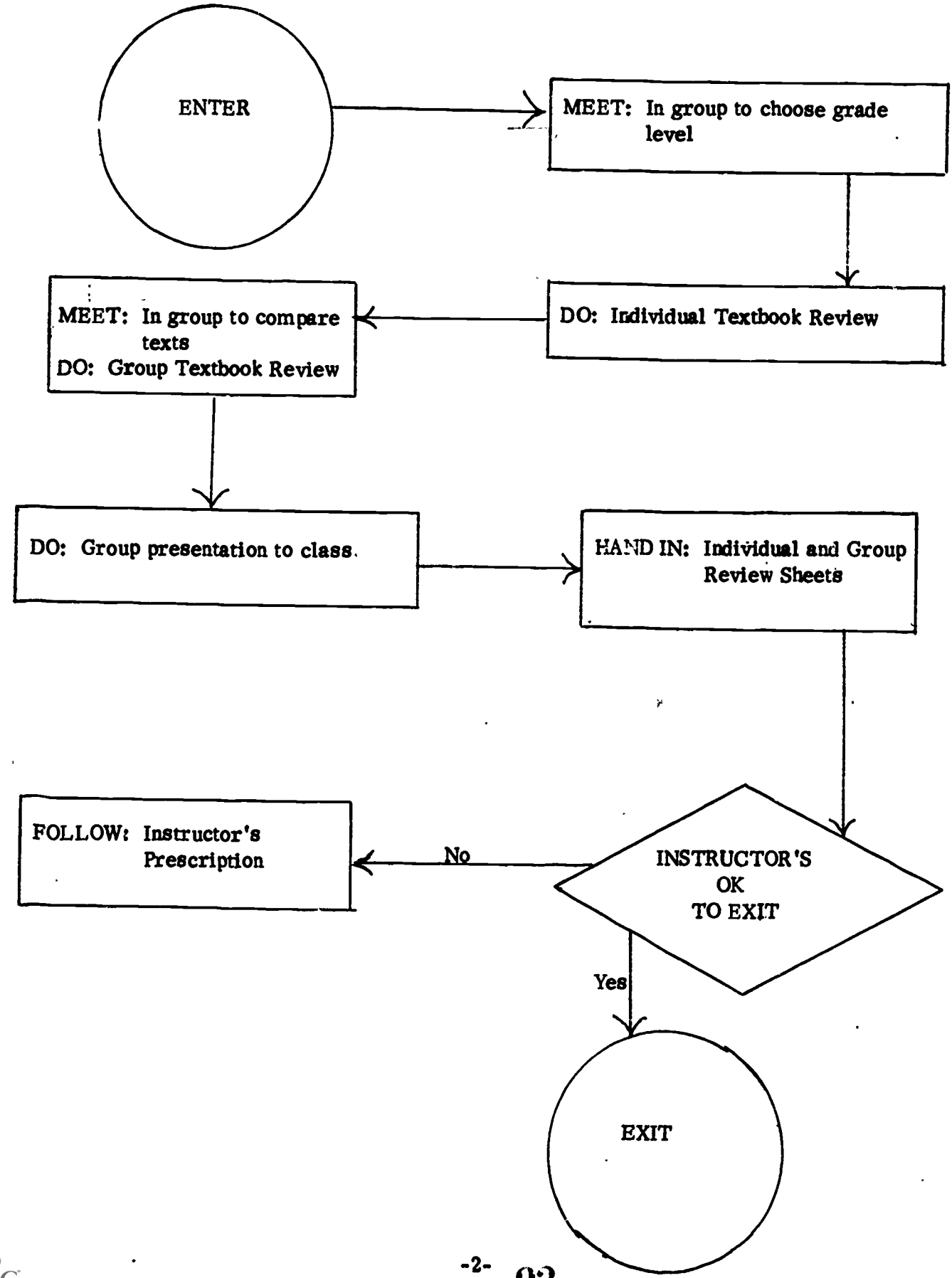
GOAL

You will identify and evaluate elementary science textbook series.

BEHAVIORAL OBJECTIVES

1. You will examine a selected elementary science textbook and rate it using the criteria provided.
2. You will compare the elementary science textbook which you have selected with at least three others which have been examined by other students.

FLOW CHART: TEXTBOOK REVIEW AND EVALUATION



INDIVIDUAL TEXTBOOK REVIEW SHEET

Publisher of textbook reviewed _____

Grade level and title of book reviewed _____

A. Examine the preface, introduction and table of contents of the selected text.

1. What are (or seem to be) the overall goals or broad objectives of the book?

2. How is the book organized? (single lessons, topic form, etc.)

3. What is the copyright date?

B. Examine several specific lessons.

1. Identify the prevalent teaching strategies suggested. (general lesson format)

2. Identify the specific teaching tactics suggested.

3. Identify the main kinds of materials suggested for use with the lessons.

4. Are specific objectives indicated for the lessons? Give examples.

5. Identify evaluation techniques suggested.

6. Additional comments. (unique features, etc.)

GROUP TEXTBOOK REVIEW SHEET

Rate each textbook reviewed by your group on the points listed below using the following rating scale:

5 = Superior
4 = Good
3 = Fair
2 = Poor
1 = Unsatisfactory

CRITERIA FOR RATING EACH TEXTBOOK	NAMES OF SERIES REVIEWED					
Physical Makeup:						
1. Attractive and appealing to children.						
2. Margins and page arrangements make for readability and attractiveness.						
3. Adequate spacing and type size.						
4. Suitable size.						
5. Durable backings.						
6. Good quality paper.						

CRITERIA FOR RATING EACH TEXTBOOK	NAMES OF SERIES REVIEWED					
Illustrations						
1. Contribute to meaningfulness of the content.						
2. Interesting and scientifically accurate.						
3. Clearly produced and well placed on the page.						
4. Placed near the text they illustrate.						
5. Appropriate to the grade level.						
6. Clear in meaning.						
Textual Material						
1. Accurate and up-to-date.						
2. Concepts and understandings can be grasped by children using book.						
3. Reading difficulty -- vocabulary, style of presentation, sentence structure -- is appropriate for children using book.						

CRITERIA FOR RATING EACH TEXTBOOK	NAMES OF SERIES REVIEWED					
14. Glossary of science terms has clearly stated explanations of meanings.						
15. Designed to help children reach the objectives.						
Teacher's Guide						
1. Offers alternate activities.						
2. Gives necessary background information for effective use of textbook material.						
3. Suggests teaching aids, games, etc.						
4. Lists resources (printed, visual, audio-visual, etc.).						
5. Suggests remedial and/or enrichment activities.						
6. Suggests a variety of evaluation techniques.						
7. Offers help in planning and implementing text material.						

CRITERIA FOR RATING EACH TEXTBOOK	NAMES OF SERIES REVIEWED					
4. Develops problem-solving skills.						
5. Material can be used to develop positive attitudes toward science.						
6. Suggested "lessons" stimulate interest that will lead to further study.						
7. Encourages active participation by children.						
8. Provides for various ability levels (the nonverbal child, the child with reading problems, etc.)						
9. Suggested lessons develops scientific attitudes in children.						
10. Well balanced in terms of science content.						
11. Variety of activities suggested (fieldtrips, experiments, research, group activities, discussion, demonstration, construction projects, etc.).						
12. Free of authropomorphism, teleology and personification (animals having human traits).						
13. Usable index and table of contents.						