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ABSTRACT

This paper outlines a project for developing a comprehensive volume devoted to concrete teaching ideas, resources, strategies, and activities relating to science education for elementary school students and teachers. An extensive bibliography of existing references on science activities and resources is included. (SL)

DEVELOPING A SCIENCE PROGRAM FOR KINDERGARTEN CHILDREN

A Project Paper
Submitted to AGA-NSTA
Science Teaching Achievement Recognition Program

(December 1, 1975)

by

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INTRODUCTION

Science and Young Children

In recent years a substantial number of articles and books have been written about young children--how they learn and what factors influence their cognitive development. Much of this literature reflects the influence of Jean Piaget and promulgates the belief that the exploratory drive is perhaps the most powerful form of motivation in childhood.[1] Young children are curious by nature; they learn best by becoming physically involved with concrete materials and benefit from having adults take part in their discoveries and investigations.[2]

Careful analysis of the characteristic behavior of a five year-old-child indicates that the inclusion of science in the kindergarten program would seem imminently appropriate. Science on this level is basically an informal observation and investigation of the various phenomena of the environment and makes use of a child's most outstanding characteristics--his or her curiosity and interest in asking questions.[3] It might even be

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[1]Alice Yardley, Discovering the Physical World (New York: Citation Press, 1973), pp. 137-139.

[2]Ann Howe and Janice Johnson, "Intellectual Development and Elementary Science: Some Implications from Piaget Research," Science and Children, XIII (October, 1975), p. 31.

[3]E. R. Wastnedge, Nuffield Junior Science: Teacher's Guide I (London, England: William Collins Sons and Co., Ltd., 1968), p.9.

suggested that science should occupy a central position in the primary curriculum, as it provides a natural way for children to find out about their environment and may provide the basis for other activities, e.g. painting, modeling, talking, counting, and sharing.[4]

Despite a strong rationale for including science in early childhood education, visits to kindergarten classrooms indicate that relatively few substantive science activities are attempted by teachers. This is not to suggest that kindergarten teachers as a group are not well-trained; on the contrary most have a good theoretical background in early childhood development, realize the importance of providing a rich learning environment, and understand the potential educational value that science experiences offer children. Nevertheless, there appears to be a gap between what is known about the behavior of young children and what in reality is taking place in the classroom. Busy teachers find it difficult to research and create a sufficient number of meaningful science experiences. Clearly, the reason that science is often a hit-or-miss affair in kindergarten is the lack of a comprehensive volume devoted to concrete teaching ideas, resources, and classroom strategies. Such a volume, if well written, would make a major contribution to bridging the gap between theory and practice in teaching science. Young children are naturally interested in science and the creation of learning activities which will foster the development of this interest can not be left to happenstance.

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[4] E. R. Wastnedge, "The Need for Sensory Experience," The Open Classroom Reader, ed. Charles E. Silberman (New York: Vintage Books, 1973), p. 719.

Purpose

It is the purpose of this paper to:

1. describe a plan for developing a comprehensive volume of science activities suitable for kindergarten children
2. provide the reader with a bibliography of professional books, teacher resource books, and children's literature related to kindergarten science education.
3. make known to the professional community that an effort to produce a flexible and open kindergarten science program is under way and to invite their on-site observation of the development and implementation process.

Project Objectives

Fairfax County's effort to develop a comprehensive, flexible and open science program for kindergaretn children was started in November of 1974 and is scheduled for piloting during the 1976-1977 school year. The underlying objectives of the project include the following:

1. to examine, field test, and evaluate a variety of science resource materials.
2. to design teaching strategies and activities to help children interpret their natural environment, and
3. to develop a comprehensive resource book containing concrete teaching ideas, resources, and classroom strategies designed to help teachers create meaningful science experiences for kindergarten children.

Development Phases

The project was organized into six separate developmental phases.

Phase I: Needs Assessment and Classroom Experience with Kindergarten Children

Phase II: Collecting and Sorting Resource Materials

Phase III: Developing and Field Testing Activities

Phase IV: Editing and Printing Trial Edition of Resource Book

Phase V: Critical Examination of the Product

Phase VI: Implementation

HISTORICAL REVIEW OF DEVELOPMENT STAGES

Phase I: Needs Assessment and Classroom Experience with Kindergarten Children

Visits to 124 elementary schools convinced the authors that there was a need for additional science resource materials in most kindergarten classrooms. Following these visitations, several months were spent working with kindergarten children in order to gain an understanding of and appreciation for five-year-olds and to establish the type and level of resource materials needed for a science program. During this classroom experience a format was established for the type of materials and strategies that would eventually make up the final product of the project. It was decided that a set of teacher resource cards would be developed and that they would be accompanied by a standard set of manipulatives designed to nurture children's natural curiosity about the environment.

Phase II: Collecting and Sorting Resource Materials

In order to produce a top quality program an abundance of resource books, manipulatives, and commercial kindergarten science kits were ordered from various sources. A major effort was made to collect appropriate juvenile books as it was noted during Phase I that children became fascinated with books related to a variety of science activities.

As these resource materials accumulated, an experienced kindergarten teacher joined the project staff to help sort and evaluate each item.[5] Upon close examination, it was determined that many of these resources, particularly the kits, were too limited in scope or duplicated activities and materials already available in most classrooms.

During this sorting process, a conceptual framework began to emerge. As the books and materials were evaluated, they appeared to fall into one of five categories:

Animals

Objects and Materials

Ourselves

Nature Studies

Wood, Sand and Water

With the screening process complete, a tentative program outline evolved. (See Figure I, page 6.)

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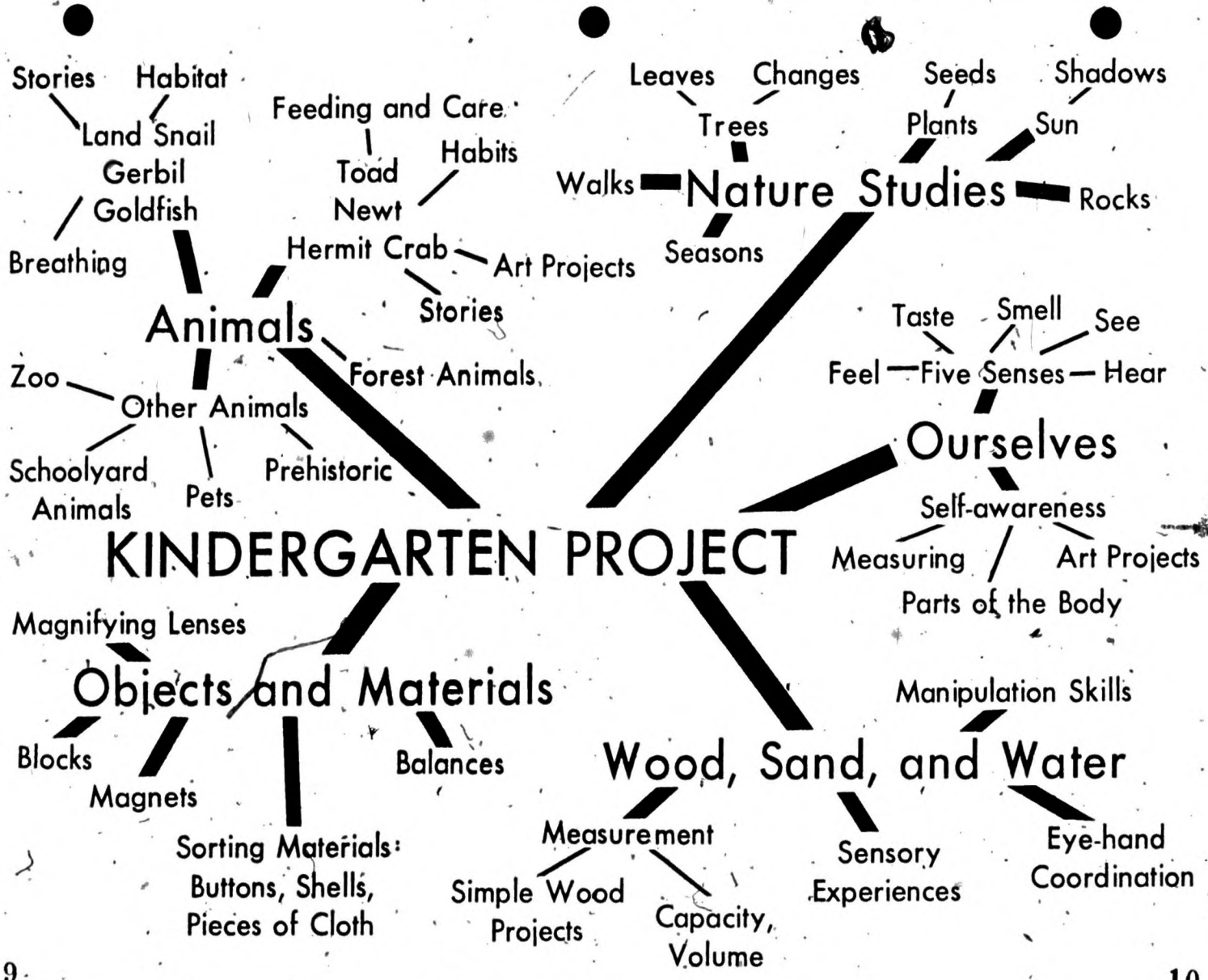
[5]The project staff consisted of the two authors, one with a science background and one with an elementary background. One experienced kindergarten teacher was hired on a temporary basis to aid in the task of sorting and evaluating materials.


KINDERGARTEN PROJECT
Animals
Stories
Habitat
Land Snail
Gerbil
Goldfish
Breathing
Feeding and Care
Toad
Newt
Habits
Hermit Crab
Art Projects
Stories
Zoo
Other Animals
Forest Animals
Schoolyard Animals
Pets
Prehistoric
Nature Studies
Leaves
Changes
Trees
Seeds
Plants
Shadows
Sun
Walks
Rocks
Seasons
Ourselves
Taste
Smell
See
Feel
Five Senses
Hear
Self-awareness
Measuring
Art Projects
Parts of the Body
Objects and Materials
Magnifying Lenses
Blocks
Magnets
Balances
Sorting Materials: Buttons, Shells, Pieces of Cloth
Wood, Sand, and Water
Manipulation Skills
Measurement
Simple Wood Projects
Capacity, Volume
Sensory Experiences
Eye-hand Coordination

Phase III: Developing and Field Testing Activities

Now that a tentative conceptual framework had emerged and an enormous amount of material had been collected and evaluated, a plan for a seminar to include teachers in designing and field testing ideas was formulated. A notice was sent to 124 elementary schools inviting interested kindergarten teachers to participate in a curriculum development class. The stated purpose of the seminar was to develop a number of science instructional modules suitable for kindergarten children. The first twenty teachers responding to the invitation were accepted.[6] The seminar sessions were scheduled to be held bi-weekly from September 24, 1975 to June 9, 1976. Teachers completing the class would receive three non-college credit hours towards renewing their Virginia Teacher's Certificate.

The first three meetings of the seminar were devoted to developing a group philosophy concerning the place of science in the kindergarten curriculum. Readings were assigned to stimulate thought and discussion, and Piaget's work was reviewed. Once the group began to demonstrate some cohesiveness, the five basic topics which had emerged during the sorting process were introduced to the class. After some discussion these topics were accepted by the group as a starting point for developing the program.

The teachers were divided into five committees, each assuming the responsibility for developing activities for a particular

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[6] The professional background of the participants varied from one year's experience to more than ten. Several members of the group have advanced degrees in Early Childhood Education.

topic.[7] Approximately fifty resource and juvenile books and a variety of manipulatives were supplied to each group. Individuals were free to choose any idea from the supplied materials to develop into an activity. The originator of an idea was responsible for field testing and evaluating the activity in a kindergarten classroom. Successful activities were recorded on a 5" x 8" card referred to as a "resource card."[8]

The completed resource cards were circulated among other members of the sub-group for additional field testing and evaluation. Periodic sharing sessions were held so that each committee could present their resource cards to the total group. This sharing time had a cross-fertilization effect and helped to generate new ideas and teaching strategies.

After each six week period all participants hand in the resource cards they have produced and rotate into a new committee. Thus, during the seminar each person will have an opportunity to work on each of the five main topics constituting the program. The resource cards are distributed to the new committee and each teacher is asked to try some of the ideas in addition to constructing additional cards. By the end of the seminar, many of the activities described on the cards will have been tested with as many as 200 children.[9]

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[7]See Appendix A for the developmental model describing the organization of the class.

[8]See Appendix B for a list of the information recorded on the resource cards.

[9]Sixteen of the twenty participants teach two sessions per day of approximately 20 students per session. Three members of the group are half-time teachers and are responsible for about 20 students per day; one participant is a resource teacher and does not have any direct responsibility for children. The total seminar group comes in contact with about 700 students per day.

During a normal six week period, each teacher will produce several resource cards. This means that the total group output will be between 75 and 100 cards every six weeks. However, only about 40% will survive the field testing process and be accepted by the total group. The cards that are approved will be edited, printed and bound into a Kindergarten Resource Book.

Phase IV: Editing and Printing Trail Edition of Resource Book

The kindergarten seminar will have its last meeting in June of 1976. Three of the participants will be employed for the summer to edit the resource cards produced by the seminar participants. A trial edition of a kindergarten science resource book will be assembled complete with graphics. Final decisions will be made concerning the manipulatives that will accompany the book.

Phase V: Critical Examination of the Product

During the 1976-77 school year, the seminar participants and twenty additional teachers will be supplied with the trial edition of the Kindergarten Science Resource Book and the materials that are necessary to do the activities. The cadre of about 40 teachers and 1,400 students will evaluate the product and work toward its refinement. Periodic meetings will be held with this pilot group to solicit their input and suggested refinements. The authors will make classroom visitations throughout the year among the forty pilot teachers. The final edition of the resource book will be constructed by the authors based on information received from the pilot teachers.

Phase VI: Implementation

Two inservice days will be devoted to the implementation of

the Kindergarten Science Resource Book during the 1977-1978 school year. One meeting day will be in September and a follow-up day is scheduled for January. Teachers will receive the resource book plus all the manipulative materials and juvenile books needed to carry out the program.

SUMMARY

In order for science to become a major part of the kindergarten curriculum it is important that there be a readily available source of ideas, activities and classroom strategies for teachers. It is the major purpose of this project to develop and publish such a document which can be used as a basis for a kindergarten science program.

The project has been working toward its goal for approximately eight months. Phases I and II have been completed and Phase III is proceeding with a high level of enthusiasm and success. Twenty teachers enrolled in a curriculum development seminar are designing and field testing ideas within a basic framework.[10] The first series of resource cards have been completed by each subgroup. The cards are being duplicated, and will be redistributed for additional testing and evaluation. The ideas that survive this evaluation process will be printed in trial edition and supplied to 40 teachers for field testing among one thousand students.

It is hoped by those involved in the development of these resource materials that they will be of value to persons outside of Fairfax County who are interested in building their own science programs.

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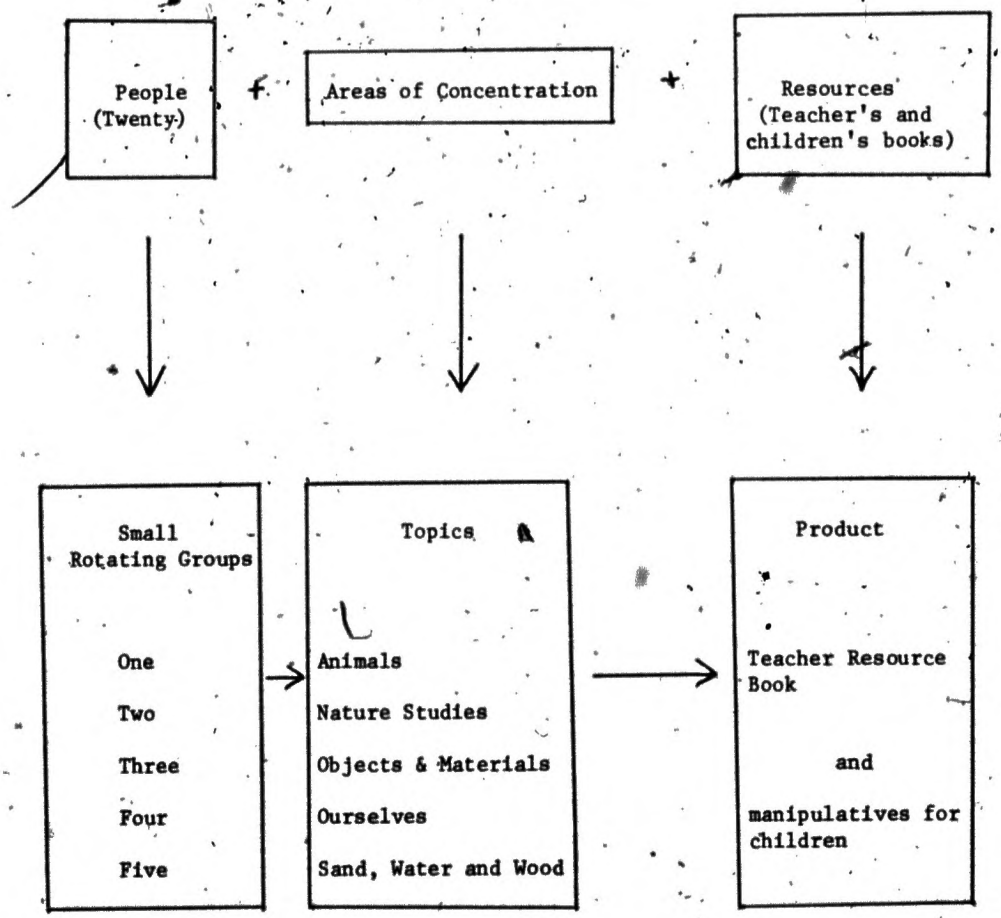
[10]Animals; Nature Studies; Objects and Materials; Ourselves; Wood, Sand and Water

APPENDIXES

APPENDIX A

DEVELOPMENT MODEL



APPENDIX B

RESOURCE CARD FORMAT

1. Side 1

Topic Card Title Materials Needed

Leading questions

Suggested graphic

2. Side 11

Teacher notes: (Particular instructions)

Additional resources for teachers: (references to specific books, etc.)

Children's Books: (appropriate titles of books that may be read to students--author, title, city: publisher, date)

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