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ABSTRACT

The Outdoor Activity Center (Atlanta, Georgia) provides enriched experiences in a natural environment for economically disadvantaged gifted primary grade students and has developed materials incorporating creative activities used at the Center to expand the elementary science curriculum of the Atlanta Public Schools. Fifty-eight gifted students went to the Center for planned creative onsite experiences related to environmental science instruction for 90-minute sessions once a week for 15 weeks. Teachers accompanied the students, observed the instruction presented to the students, and utilized learning units at their local school to followup instruction provided at the Center. Two other groups of gifted Ss in the first control group were given the learning units within their own school with no Center experience. Project staff provided orientation to the teachers of student participants and to teachers from the control schools. The Metropolitan Achievement Tests (MAT) were used as pre-post test measures. After completion of all 15 sessions, project teachers and staff used materials and experiences to write and compile model science units. Each curriculum unit contained student objectives (cognitive and affective), thought processes/skills to be developed, instructional materials needed, content, questions to be considered by students, activities and strategies, and evaluation procedures. Among findings were that the students who received the special, environmental education instruction within their home school (control 1) demonstrated better performance than either the students who attended the Center for the instruction or those who did not participate in the project (control 2). Included is a copy of "A Challenge in Science," an elementary science curriculum guide with units covering such topics as food stuff, time, physical matters, classification, the earth in regions, planets on the move, and weather. Appended materials include guidelines for keeping a journal, a table on measuring wind velocity, things to look for in identifying birds, a guide of things to make from old milk cartons, and instructions for decorating bottles. (SW)

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SPECIAL ENVIRONMENTAL EDUCATION PROJECT FOR DISADVANTAGED GIFTED PRIMARY GRADE STUDENTS

1980-81

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RESEARCH, EVALUATION, AND DATA PROCESSING

ATLANTA PUBLIC SCHOOLS

ATLANTA GEORGIA

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Report No.: 16-6, 3/82

SPECIAL ENVIRONMENTAL EDUCATION PROJECT FOR DISADVANTAGED GIFTED PRIMARY GRADE STUDENTS

1980-81

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ACKNOWLEDGMENTS

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Dr. Ray Sweigert, Division of Research, Evaluation, and Data Processing of the Atlanta Public Schools provided technical assistance to the project staff in the identification and selection of the pretest and posttest used for the project.

Mr. Larry Watts, Division of Research, Evaluation, and Data Processing of the Atlanta Public Schools, provided technical assistance to the author in the statistical analysis of the data.

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SPECIAL ENVIRONMENTAL EDUCATION PROJECT FOR DISADVANTAGED GIFTED PRIMARY GRADE STUDENTS

INTRODUCTION

On September 15, 1980, the Atlanta Public Schools (APS) submitted a proposal to the Georgia Department of Education for a short-term special project for gifted primary grade students. The proposal was prepared in response to a memorandum requesting such proposals from Dr. Lucille G. Jordan, Associate State Superintendent, Office of Instructional Services, Georgia Department of Education, dated July 17, 1980. This proposal was one of a number of proposals submitted from Georgia school districts that were reviewed through a competitive process. On November 1, 1980, the Georgia Department of Education awarded a grant of $5,000 to the Atlanta Public Schools to operate through June 30, 1981, the Special Environmental Education Project for Disadvantaged Gifted Primary Grade Students.

NEEDS ASSESSMENT

At the time the proposal for this project was submitted to the Georgia Department of Education, most elementary schools in the Atlanta Public School System had a program for the gifted, but relatively few teachers (less than 10 percent) utilized environmental science experiences in their programs.

It was reported that young children have generally exhibited a spontaneous curiosity and interest in the natural environment. Science has been observed to be self-motivating to gifted students of this age. It was reported that teachers of the gifted as well as regular classroom teachers needed additional background, creative activities, and ideas to use with primary grade students. According to research, elementary teachers in general, including teachers of the gifted, have been less prepared, have had less experience, and have felt less comfortable in teaching science than in teaching other subjects. Additionally, few science materials and learning activities had been identified for use with gifted primary grade students. Inner-city children, even those of higher ability and especially those from low-income families were deemed less likely to have opportunities for extended exposure to natural areas. It was believed to be important to begin teaching primary grade students the total interdependence of human beings and their physical and biological environment. A unique opportunity for this kind of education existed at the Outdoor Activity Center (OAC), a private nonprofit educational organization, located three miles from downtown Atlanta at 1401 Bridges Avenue, S. W. The OAC has a 20-acre climax forest covering mountainous and marshy terrain which has incorporated more than two miles of improved trails. In addition, classrooms, a manipulative museum, an animal rehabilitation center, a nature library, and two bird feeding/observation stations were available at the facility.

PROGRAM OPERATION

Objectives

The objectives of the project as outlined in the proposal were: (1) to provide enriched experiences in a natural environment for disadvantaged gifted primary grade students and (2) to develop materials incorporating creative activities used at the OAC to expand the elementary science curriculum of the Atlanta Public Schools.

Target Population

In November, each Area Superintendent randomly selected three schools which had both a Title I program and a program for gifted students in the primary grades. All gifted primary grade students involved in the project met the criteria for participation in the gifted project supplied by the Georgia Department of Education. That is:

> Gifted students are those children and youth who possess a high degree of general intellectual ability and have the potential for

high academic achievement and performance. These students, for placement in a program, must meet the State Board of Education approved eligibility criteria.

Disadvantaged gifted students are those children and youth from low-income families according to Title I, ESEA, or according to any equitable alternate low-income definition approved by the State Board of Education.

In addition, participating gifted students were those already identified and placed according to procedures outlined in The State Annual Report For The Gifted, submitted by the Atlanta Public Schools in July, 1980.

Research Design

One school from each of the areas participated in the project by having the gifted primary grade students go to the OAC for planned creative on-site experiences related to environmental science instruction for 90-minute sessions once per week for 15 weeks. The teacher for the gifted at each of these pilot schools accompanied their gifted students to the OAC, observed the instruction presented to the students, and utilized learning units at their local school to followup instruction provided at the OAC.

Three schools, one per administration area, served as Control I (CI) schools. These teachers of the gifted utilized the OAC learning units from each session within their own schools. Neither the teacher nor the students of the Control I schools attended the OAC for the pilot instruction.

The remaining three schools, one per area, served as Control II (CII) schools. The teachers of the gifted merely administered the pretest and posttest to their gifted students from the primary grades. There was no other intervention related to this project in the three Control II schools.

The independent variable of the study was treatment group and the dependent variable was test score.

Private School Participation

An invitation to participate in the project was sent to 39 private schools located within the attendance area of the Atlanta Public Schools. One parochial school, St. Anthony's School, requested to participate in the project and was included as a pilot school. Table 1 shows a listing of participating schools and the number of students involved in the project.

TABLE 1

SCHOOL AND STUDENT PARTICIPATION IN THE SPECIAL ENVIRONMENTAL EDUCATION PROJECT

Administrative Area	Pilot: School	Pilot: No. of Students	Control I: School	Control I: No. of Students	Control II: School	Control II: No. of Students
Area I	West Manor	5	White	3	Adamsville	6
Area II	Lin	18	Moreland	14	Humphries	5
Area III	Garden Hills	29	Hill	35	Brandon	47
Private School	St. Anthony's	6				
Total		58		52		58

Additional Students in the Study

Several teachers for the gifted involved in this study served their schools on an itinerant basis. The itinerant teacher of the gifted at Moreland Elementary School (CI) served Slaton Elementary, a school not originally selected for participation in the project. This teacher used the learning units of the project with her gifted primary grade students at Slaton as well as at Moreland. Therefore, the data of six Slaton students were included with the data from Moreland (CI). The itinerant teacher for the gifted at Adamsville, a Control II school (CII), also served Wright Elementary, a school not orginally included in the project. This teacher administered the pretest and posttest to her gifted primary grade students at Wright. Therefore, the data for three students from Wright were included in the Adamsville (CII) data. Finally, the itinerant teacher for the gifted at Humphries, a Control II school (CII), also served Cleveland Elementary, a school not originally selected to participate in the project.

This teacher also administered the pretest and posttest to her gifted primary grade students at Cleveland. Therefore, data for three students from Cleveland were included with the Humphries (CII) data.

Initial Program Activities

The months of November, December, and January were used by the project staff, Mrs. Thelma Mumford, Coordinator of the Program for the Gifted, Mrs. Lucy Smith, Coordinator of Science, and Mrs. Kay Blackwelder, Environmental Education Coordinator to accomplish the following activities.

1. Compile the list of project schools randomly identified for participation by the Area Superintendent.
2. Determine whether to develop a pretest and posttest or to select and/or modify an instrument that was already available.
3. Plan orientation for gifted teachers.
4. Plan and develop the 15 learning units for the project.
5. Arrange for guest instructors.
6. Notify appropriate personnel in the project schools and the private school (St. Anthony's) of the requirements, orientation, and project schedule.

In-service for Teachers

The project staff provided orientation to the teachers of the gifted from the pilot schools, the CI schools, the CII schools, as well as St. Anthony's on January 20, 1981, from 8:30 a.m. to 12:00 p.m. Participants were given a general overview of the program, expectations for teachers and students, a schedule of project activities, and instructions for pretesting and posttesting. The teachers were informed that model learning units in science would be developed as an outgrowth of the project, how they could be involved in the writing of units, and when the units would be written. Finally, the teachers were given a capsule demonstration of the 15 sessions to follow and a tour of the forest and facility.

Instrumentation

It was determined by the project staff that there was insufficient time to construct and validate a criterion-referenced test related to the objectives of 15 environmental science sessions to be held at the OAC. Project staff knowledge of the specific levels of proficiency in environmental science of participating students was limited. In addition, detailed units were constructed throughout the duration of the project. Only a brief outline of all topics and instructional concepts was available prior to the initiation of the OAC instruction. While the staff agreed that a locally constructed criterion-referenced test related to the instructional objectives of the units would have been more appropriate for the evaluation needs of the project under optimum conditions, it was decided that the use of an existing instrument would be more practical. Following examination of a number of instruments, it was concluded that the Metropolitan Achievement Tests (MAT), of the Psychological Corporation, 1978 would meet the pretest and posttest needs of the project. Written permission was obtained from the MAT publishers, Harcourt Brace Jovanovich, Inc., for use of portions of the tests. Fifty environmental science items were selected from the Science Subtest of the Primary 1, Primary 2, Elementary, and Intermediate levels of the MAT, Form JS. An effort was made to select items that covered a range of knowledge classifications. Items were selected from the four levels of the test to accommodate students from kindergarten through third grade. Items were selected that generally related to the topics and concepts to be introduced to students in the 15 OAC sessions. The resulting test was divided into two 25-item subtests, the first of which did not require the students to be able to read. All questions were read to the students by the teacher. The second subtest required that the students be able to read in order to complete the test. Table I shows the MAT Science Subtest items used in the project pretest and posttest by level. This table also shows the category of knowledge classification for each item.

The special project test, including both subtests, had a total of 21 items (42 percent) which measured recall of the subject matter, 9 items (18 percent) which measured comprehension, 11 items (22 percent) which measured inquiry skills, and 9 items (18 percent) which measured critical analysis.

TABLE 2

PRE AND POSTTESTING INSTRUMENT FOR SPECIAL ENVIRONMENTAL EDUCATION PROJECT: METROPOLITAN ACHIEVEMENT TESTS, SCIENCE SUBTEST ITEMS SELECTED BY LEVEL AND BY KNOWLEDGE CLASSIFICATION

Special Project Subtest	Metropolitan Achievement Test Level	Knowledge Classification: Recall	Comprehension	Inquiry Skills	Critical Analysis
1	Primary 1	*4, 5,7,	1,2 8,9,10, 11	3	6
	Primary 2	12,13, 15,17, 19,20, 21	18,25	14,16	22,23, 24
2	Elementary	1,2,3, 9,16, 20,31	11,25 26	17,18, 19,23, 35,38	32,36, 37
	Intermediate		19,49	37,39	38,41

*MAT item number

The pretest was administered to all three groups of students by their teacher for the gifted around the end of January, 1981. The same instrument was used as a posttest and was again administered to all three groups of students by the teacher for the gifted at the end of May, 1981.

Method

All 58 pilot students and their teachers for the gifted were provided free transportation to attend special environmental education sessions at the OAC located at 1401 Bridges Avenue, S. W., in Atlanta. The sessions were held every Tuesday beginning January 27, 1981. Each session lasted for 90 minutes. Table 3 shows the schedule of activities for all sessions, the topics addressed, instructional concepts, and instructors for each session.

The pilot teachers were given a "homework" assignment following each OAC session to be completed with the pilot students at the home school. Upon completion of each OAC session, the model environmental science unit was distributed to each CT teacher for use with the gifted primary grade students at his/her school.

After the completion of all 15 sessions, project teachers and staff used materials and experiences to write and compile model science units. These units were designed to be used as supplements to the regular Atlanta Public Schools elementary science curriculum guide. These units represent the extension of the Atlanta Public Schools science curriculum specifically intended for use with gifted primary grade sudents. Teachers were paid a stipend during the summer of 1981 to design and write units. A total of sixteen curriculum units were included in the final curriculum extension. See Attachment A for the final science curriculum extension.

Each curriculum unit was developed following the same basic outline:

Curriculum Unit Outline

Topic or Title

Target Groups

I. Student Objectives
   A. Cognitive
   B. Affective

II. Thought Processes/Skills to be Developed

III. Instructional Materials

IV. Content

V. Questions to be Considered by Students

VI. Activities and Strategies
   A. Students
   B. Teachers

VII. Evaluation

The topics/titles of the final 17 units are: (1) Food Stuff, (2) Matter — Equal to the Task, (3) TIME (Track Its Movements Energetically), (4) SOIL (Several Outstanding Investigations Likely), (5) "Give Me Room", (6) Air Is "Real", (7) Physical Matters, (8) A Matter of Change, (9) Minute Matter, (10) Growing Up, (11) Classification, (12) Using Senses, (13) The Matter of Relationships, (14) The Earth in Regions, (15) Planets on the Move, (16) "Weather" — Ready or Not, and (17) It's All on the Surface.

BUDGET

The budget for this project was divided into four categories: Student Transportation ($1,575), Consultants ($1,500), Materials and Supplies ($1,925), and In-kind Contributions ($12,640). The first three items of the budget were the direct costs for operating the project funded by the Georgia Department of Education ($5,000). The last item of the budget was the estimated cost of time needed for operating the project by existing staff which was contributed by the Atlanta Public Schools.

Student transportation funds made up 32 percent of the direct cost budget. These funds were used to provide transportation for pilot students from three schools to the OAC on 15 days at a cost of $35/trip/school.

Consultant fees made up 30 percent of the direct cost budget. These funds were used for consulting fees of guest speakers and for teacher stipends for writing and refining units.

The cost of materials and supplies for the project made up 38 percent of the direct cost budget.

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TABLE 3
SCHEDULE OF SESSIONS FOR THE SPECIAL ENVIRONMENTAL EDUCATION PROJECT

Session Number	Date	Topic and Concepts	Instructor(s)
1	January 27, 1981	Introduction/Orientation: walk through forest, tour of center	OAC and APS staff
2	February 3, 1981	Birds: appearance, color, song, adaption, camouflage, size, pattern of activity	APS and OAC staff
3	February 10, 1981	Birds: food preferences, food acquisition, adaption, how to attract birds	Deborah L. Sheppard (Audubon Society), APS, and OAC staff
4	February 17, 1981	Birds: nests and young, camouflage, adaption, shelter, eggs, how to provide bird houses and shelter	Deborah L. Sheppard (Audubon Society), APS, and OAC staff
5	February 24, 1981	Weather: temperature	APS staff
6	March 3, 1981	Weather: forecasting	Bob Richards, weatherman (WSB-TV) and APS staff
7	March 10, 1981	Reptiles and Amphibians: food chains, camouflage, predator/pray relationships	Genevieve Lewis (APS teacher from Ragsdale Science Room at the Grant Park Zoo) and APS staff
8	March 17, 1981	Interrelationships: food chains and populations	APS staff
9	March 24, 1981	Litter: man doesn't recycle	Atlanta Clean City Commission
10	March 31, 1981	Sound in the City: noise, loudness, pitch, measuring sound	APS staff
11	April 7, 1981	Sound in the Forest: identifying birds by sound	APS staff
12	April 14, 1981	The Forest and the Trees: forest succession, tree identification, uses of trees	Bob Barget, Naturalist (Ga. Dept. of Natural Resources)
13	April 21, 1981	Plants, Flowers, and Seeds: survival, change, adaption	Bob Barget- naturalist (Ga. Dept. of Natural Resources)
14	April 28, 1981	Energy: light and shadow	Bob Tate, director (an APS planetarium)
15	May 5, 1981	River and Marsh Environment: field trip to the Chattahoochee Nature Center	Chattahoochee Nature Nature Center Staff

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TABLE 4

SPECIAL ENVIRONMENTAL EDUCATION PROJECT PRETEST AND POSTTEST RESULTS BY TREATMENT GROUP

	Groups								
	Pilot			Control I (CI)			Control II (GII)		
Test Category	N	Mean	Standard Deviation	N	Mean	Standard Deviation	N	Mean	Standard Deviation
Pretest									
Subtest 1	55	20		43	21		44	21	
Subtest 2	55	15		43	16		44	16	
Total Test	55	35	5.6	43	36	5.4	44	36	5.9
Posttest									
Subtest 1	55	21		43	23		44	22	
Subtest 2	55	17		43	20		44	18	
Total Test	55	38	5.6	43	41	4.8	44	39	5.0
Gain from Pretest to Posttest									
Subtest 1	55	1		43	2		44	1	
Subtest 2	55	2		43	4		44	2	
Total Test	55	3	3.8	43	5	3.7	44	3	3.9

TABLE 5

ONE-WAY ANALYSIS OF VARIANCE FOR PRETEST SCORES OF PILOT, CONTROL I, AND CONTROL II STUDENT GROUPS

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Square	F
Between Groups	87.57	2	43.79	1.38
Within Groups	4,504.62	142	31.72	
Total	4,592.20	144		

TABLE 6

PRETEST AND POSTTEST RESULTS BY TREATMENT GROUP AND BY GRADE

Grade	Pilot N	Pilot Percent of Group	Pilot Mean Pretest	Pilot Mean Posttest	Control I N	Control I Percent of Group	Control I Mean Pretest	Control I Mean Posttest	Control II N	Control II Percent of Group	Control II Mean Pretest	Control II Mean Posttest
Kindergarten	2	4	29	29	—	—	—	—	—	—	—	—
First	9	16	36	39	7	16	32	40	1	2	29	33
Second	20	36	34	37	20	47	35	42	16	36	33	37
Third	24	44	35	39	16	37	41	45	27	61	39	41
Total	55	100	35	38	43	100	37	43	44	99	36	39

TABLE 7

ONE-WAY ANALYSIS OF VARIANCE FOR POSTTEST SCORES OF PILOT, CONTROL I, AND CONTROL II STUDENT GROUPS

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Square	F
Between Groups	301.05	2	150.52	5.57*
Within Groups	3,837.14	142	27.02	
Total	4,138.19	144		

* $p < .005$

TABLE 8

ONE-WAY ANALYSIS OF VARIANCE FOR GAIN SCORES OF PILOT, CONTROL I, AND CONTROL II STUDENT GROUPS

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Square	F
Between Groups	200.85	2	100.42	7.65*
Within Groups	1,863.01	142	13.12	
Total	2,063.85	144		

*$p < .001$

RESULTS

Only the data of students for whom there were scores available from both subtests of the pretest and posttest were included in the analysis. There was complete data on 98 percent of the pilot students, 83 percent of the CI students and 76 percent of the CII students. Table 4 shows the pretest and posttest results for Subtest 1, Subtest 2, and the Total Test.

It is apparent from examination of the pretest means that all three groups of students had some initial proficiency in the area of environmental science. The average pretest scores of each group readily exceeded the chance level score of 12 to 13 correct responses (25 percent) on a 50-item (4-choice item) test.

The average pretest scores for Subtest 1, Subtest 2, and the Total Test showed that the two control groups had a slight edge over the pilot groups. There was no difference between the average pretest scores of the two control groups on Subtest 1, Subtest 2, and Total Test. A one-way analysis of variance (ANOVA) was performed by computer using the Statistical Package for Social Sciences (SPSS). The pretest scores of the three groups were analyzed with the ANOVA to determine if there was any statistically significant difference between the mean pretest scores of the Pilot, Control I and Control II groups. (See Table 5.) The results of this analysis showed that there was no statistically significant difference between the three groups on the pretest, $\underline{F}$ (2, 142) = 1.38, $\underline{p} > .05$. A $\underline{t}$ test was employed in order to evaluate the null hypothesis against the one-sided alternative that the Pilot mean pretest score was superior to the Control I mean pretest score, that the Pilot mean pretest score was superior to the Control II mean pretest score, and that the Control I mean pretest score was superior to the Control II mean pretest score ($\underline{t} = -1.10$, $\underline{p} > .05$; $\underline{t} = -1.56$, $\underline{p} > .05$; and $\underline{t} = -0.52$, $\underline{p} > .05$, respectively). There were no statistically significant differences between the means in each of the three comparisons.

While the ANOVA for the pretest scores showed there was no significant difference between the groups, Table 6 shows that there were some substantial differences in the composition of the three groups with reference to the percent of students in each group representing the various

grade levels. Twenty percent of the Pilot group was composed of kindergarten and first grade students, while the Control II group had no kindergarten students; and only two percent of the Control II group was composed of first grade students. There were no kindergarten students represented in the Control I group, and 16 percent of the Control I group was composed of first grade students. Another obvious difference between the groups existed in the percent of third grade students in each group. Sixty-one percent of the Control II group was composed of third grade students, compared to 44 percent for the Pilot group and 37 percent for the Control I group. Table 6 also shows that the younger students tended to have the lowest pretest and posttest scores.

The ANOVA for posttest scores of the three groups is shown in Table 7. There was a highly significant difference between the three groups on the posttest, $\underline{F}$ (2, 142) = 5.57, $\underline{p} < .005$. The subsequent $\underline{t}$ tests showed that the mean posttest score of the Control I group was significantly superior to the mean posttest score of the Pilot group, $\underline{t} = -3.34$, $\underline{p} < .001$; the mean of the Control I group was also clearly superior to the mean posttest score of the Control II group, $\underline{t} = 2.08$, $\underline{p} < .05$; and there was no statistically significant difference between the mean posttest score of the Pilot group and the Control II group, $\underline{t} = -1.15$, $\underline{p} < .05$.

The final ANOVA shown in Table 8 was performed on the gains made from pretest to posttest of the three goups of students. Once again, there was a highly significant difference between mean gain scores of the three groups, $\underline{F}$ (2, 142) = 7.65, $\underline{p} < .001$. The $\underline{t}$ tests revealed that the mean gain score of the Control I group was significantly higher than the mean gain score of the Pilot group, $\underline{t} = -2.98$, $\underline{p} < .005$; the mean gain score of the Control I group was significantly superior to the Control II group, $\underline{t} = 3.82$, $\underline{p} < .001$; and there was no significant difference between the mean gain scores of the Pilot and Control II groups, $\underline{t} = 0.86$, $\underline{p} < .05$.

CONCLUSIONS

The objectives of the project were satisfied in that enriched experiences in a natural environment were provided for disadvantaged gifted primary grade students, and materials incorporating creative activities used at the OAC were developed to expand the elementary science curriculum of the Atlanta Public Schools.

The results of the pretest and posttest, however, were to some extent unexpected. The experimental hypothesis was that the Pilot group would demonstrate posttest performance superior to that of the Control I and Control II groups, and that the Control I group would demonstrate posttest performance that was superior to the Control II group. The outcome was that the Control II group out-performed the Pilot and Control II groups and that there was no difference between the Pilot and Control II group performance.

While no differences were found on the pretest performance of the three groups of students, the mean scores on the pretest demonstrated that all three groups of students had some prior knowledge of the environmental science content area. Additionally, the data related to the percent of students by grade per group showed some substantial differences between the groups. There was a larger percentage of kindergarten and first grade students within the Pilot group than within the other two groups, and there was a larger percentage of third grade students within the CII group than within the other two groups. Perhaps the pretest was not sensitive enough to measure possible difference between the groups. The validated MAT test items used in the pretest were originally selected to measure general knowledge and skills in the environmental science area. It was thought that treatment would yield differences between groups on the posttest. There was not, however, a one-to-one relationship between the individual test items and the instructional objectives of each OAC session. This limitation could have been avoided had there been sufficient time to construct a criterion-referenced test related specifically to the instructional objectives of the sessions.

Finally, there was no control for any other environmental science instruction that Pilot or Control I students may have received outside their resource class for the gifted. There was also no control for the amount of instructional time that Pilot and Control I teachers devoted to the OAC units within their home schools. Additionally, there was no control for the environmental science instruction Control II students received inside or outside the gifted resource class, other than they did not receive instruction or materials related to this special project.

The students who received the special environmental education instruction within their home school (CI) demonstrated better performance in this project than either the students who attended the OAC for the instruction (Pilot) or those who did not participate in the project (CII). There was no difference in performance of those students who attended the OAC for special instruction (Pilot) and those who did not receive the special instruction (CII). Factors such as age of participants and amount of related instruction between the groups may have contributed to these findings, but these factors were not investigated.

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ATTACHMENT A

a Challenge in Science

Atlanta Public Schools

The following units were developed as a result of a pilot project in teaching environmental science concepts to primary gifted students. The units were developed as supplements to the regular Atlanta Public Schools' elementary science curriculum guide. This publication was prepared pursuant to a grant from the Georgia Department of Education.

Barbara J. Nicholson, Director - Program for Exceptional Children

Thelma G. Mumford, Coordinator - Program for the Gifted

Lucy Smith, Coordinator - Science

Kay Blackwelder, Science Resource Teacher - Area III

Genevieve Lewis, Ragsdale Science Room

Christine Arinze, West Manor Elementary School

Martha Price, Adamsville Elementary School

Malissa Cox, Humphries Elementary School

Topic: Food Stuff

Target Group: Primary

I. Student Objectives

A. Cognitive

Students will

1. Generalize that living things need energy to function.

2. Plan a balanced diet.

3. Define these terms: herbivore, carnivore, omnivore, consumer, producer.

4. Trace food energy to its ultimate source, the sun.

B. Affective

Students will

1. Develop an awareness of our dependence on the sun for energy.

2. Appreciate the role of plants in the energy food chain.

II. Thought Processes to Be Developed

Experimenting - Helps to design and conduct simple investigations to answer questions or verify an inference or prediction.

Gathering and Interpreting Data - Explains observations.

Questioning and Hypothesizing - Selects observations which assist in answering questions.

Predicting - Records observations of an event over a period of time and uses data to predict.

III. Instructional Materials

American Book Company. Food.

Bethers, Ray. How Does It Grow.

Schell, William. Food and Nutrition.

Zim, Herbert. Your Food and You.

Pictures of animals eating

Food charts and nutrition pictures

Films

Eat for Health, Encyclopedia Britannica Films.

We Get Food From Plants, Encyclopedia Britannica Films.

Eat Well, Grow Well, Coronet.

IV. Content

One requirement of all living things is nourishment. Plants use the sun to produce their own food (photosynthesis). Animals get energy from eating other living things. Some animals eat grasses, vegetables, fruits (herbivores). Some animals eat other animals (carnivores). Some animals eat plants and animals for energy and growth (omnivores).

V. Questions to Be Considered by Students

A. How do plants make food? (What is photosynthesis?)

B. Why do animals eat other animals?

C. What are consumers? Producers?

D. What are prey animals? Predatory?

E. What does omnivore, carnivore and herbivore mean?

F. What will happen to the food chain if a link is destroyed?

VI. Activities and Strategies

A. Student

1. Collect pictures of foods you like to eat. Group them into one of four food groups - meat, vegetables and fruit, cereal and bread and milk.

2. Keep a record of what you eat for a week.

	MEAT GROUP	VEGETABLE & FRUIT	CEREAL & BREAD	MILK GROUP
Monday				
Tuesday				
Wednesday				
Thursday				
Friday				

Did you have at least two helpings of each group every day?

3. Make a booklet showing a good breakfast, lunch and dinner.

4. What things can a six and seven year old do that babies cannot do? Can a baby walk, talk, feed or dress himself? Can you do these things? What will you be able to do when you are ten years old that you can't do now? Show how large you were when you were a baby (stoop). How large will you be when you are ten? (stretch) What helped you grow? Where did your energy come from?

5. Have children bring in clothes they wore when they were babies and compare with those they wear now. Make a display.

B. Teacher

1. Introduce basic food groups: milk and milk products, cereal and bread group, meat and fish, vegetable and fruit. Name foods and place in the right group.

2. Discuss, "Food gives us energy to do all the things we do." Food helps us grow. (Energy is needed not only for running and jumping but heartbeat, breathing, and thinking).

3. Where does the "food" get the energy that we get from the food? Plant some vegetable seeds in pots. Place several pots in a dark area and others in sunlight areas.

   Treat all plants exacly the same so that the only variable will be sunlight. Observe daily. Record what happens. Draw pictures to show what happens. Can plants make "food" without sunlight? Why? All seeds will germinate in light or dark but what happens as they grow? What color are the seedlings in the dark? Light? Plants manufacture green pigment (cholorophyll) in sunlight. Chlorophyll plus carbon dioxide plus energy from the sun, help plants produce food.

4. Where does the cow get the energy to produce milk and meat?

5. Develop the concept that all living things depend on plants for food. Animals are <u>all</u> consumers. Plants are producers.

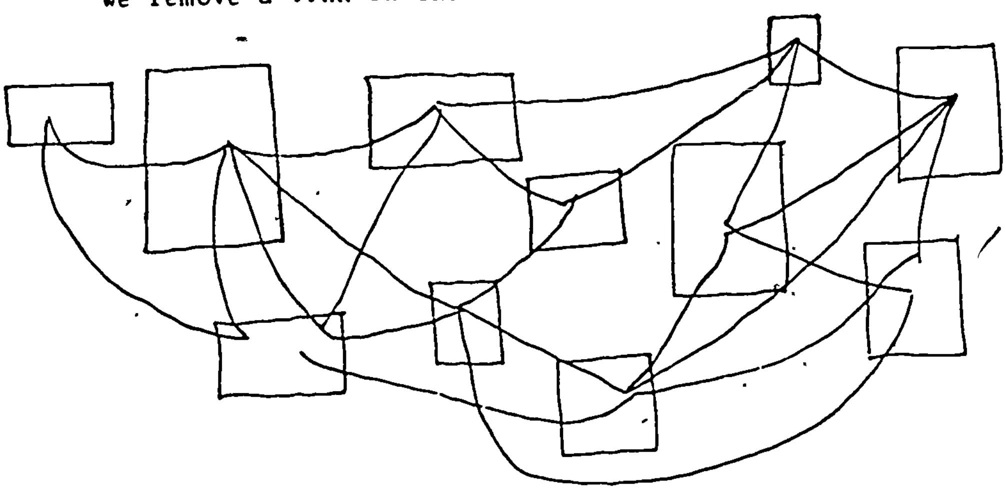
6. Invite the cafeteria manager to talk to the class about nutrition.

7. Set up an appointment to visit the kitchen. Locate all of the machines that use energy. Where does that energy come from?

8. Introduce the terms carnivore (meat eater), herbivore (plant eater), omnivore (plant and meat eater). Into which category do people fit?

C. Enrichment

On a bulletin board randomly put pictures of "air", water, sun, birds, fish, insects, plants, people, animals that eat plants, animals that eat animals. Begin by having one student connect with a piece of yarn, 2 things that are related in a food chain (such as plants and sunlight). Continue to connect. Soon you will see that all of the things are connected in a food web. What will happen if we remove a link in the web?



VII. Evaluation

A. Have a "good meal" poster contest.

B. Plan a day's menu (breakfast, lunch and dinner) that will include all daily requirements.

C. Trace each food on the menu back to green plants and the sun's energy.

D. What would happen if the sun stopped shining? Why?

Title: Matter - Equal to the Task

Target Group: Primary

I. Student Objectives

A. Cognitive

Student will

1. Show that things that are the same size may not weigh the same.

2. Demonstrate the use of a balance.

3. Generalize that things "balance" because they are equal in some way.

4. Show that when matter changes from a solid to a liquid the amount of matter remains the same.

5. Demonstrate some reversible changes.

B. Affective

1. Develop an awareness of physical properties of objects in daily use.

II. Thought Processes/Skills to Be Developed

Observing - Makes quantitative observations of objects or events.

Communicating - Records data in written or graphic form pertinent to the topic being considered.

Communicating - Constructs picture or bar graphs to represent data collected in an activity.

Measuring - Orders objects by size or weight.

Measuring - Uses non-standard units of measure (example - gem clips, coins, pencils, straws)

Inferring - Recognizes that observation is the basis for inference.

Inferring - Makes and tests inferences about everyday experiences.

Thinking Skill: Divergent Thinking - Uses the inquiry approach to determine conclusions.

Thinking Skills: Inductive Reasoning - Draws inferences and makes generalizations from evidence collected.

III. Instructional Materials

Books

Adler. Atoms and Molecules, Day.

American Book Company. From Science: Formulating Ideas.

DeVito, Alfred and Gerald H. Krockover. Creative Sciencing, Little, Brown and Company, 1976.

Jacobson, Willard J. Matter and Change.

Posin. What Is Matter, Benefic.

Schlein. Heavy Is A Hippopotamus, Scott.

Schneider. Let's Find Out, Scott.

Shapp. Let's Find Out What's Big and What's Small, Hale.

Shapp. Let's Find Out About What's Light and What's Heavy, Watts.

Available Textbooks

Films:

Heat and How We Use It.

Simple Changes in Matter.

Materials and Equipment

Balance Board
See Saw
Equal Arm Balance
Scoops
Boxes
Dried beans and peas
Balance
Hot plate
Plastic bags
Chalk
Butter
Parafin (candle wax)
Ice
Chocolate
Steam kettle
Pan
Salt
Paper clips

Films:

Measure Weight - Think Metric, 9 min., color, Barr Films.

Solids, Liquids and Gases, 39 frames, Multi-Media Production, Inc.

IV. Content

Students will learn to use a beam balance. There are factors other than size that determine the weight of an object. Changing the state or form of matter does not change its weight. (Teachers - when the weight of an object is compared to standards as on a beam balance, you are actually finding the mass of an object not its weight.)

V. Questions to Be Considered by Students

A. Do objects the same size weigh the same?

B. How do we use a balance?

C. How are the physical properties of an object helpful to us in our daily lives?

D. What are reversible changes?

E. Does the amount of matter remain the same when changed from liquid to solid or solid to liquid?

F. Vocabulary words: force, earth pull, gravity, balance.

VI. Activities and Strategies

A. Student

1. Use a physical balance beam. Have students test, two at a time, who weighs the most. Can you find two who weigh the same? How can you "balance" someone who weighs more than you do? Can you "balance" the teacher? (Try using several children as they will suggest first. Then have one walk the beam until balance is accomplished.) Children will soon discover that the distance from the object to the fulcrum is important.

2. Using equal arm pan balances, use beans to balance nuts, washers to balance gem clips, pine cones to balance rocks, etc. Count "how many". Children will find that weight and size are not necessarily synonymous.

3. Use a bathroom scale and pose questions: Do you weigh the same standing up as sitting down? Stretching? Balled up? Find out.

4. "Weigh" (balance) some specific objects with gem clips. Make a picture or bar graph of your data. (You are finding the mass.)

5. When ice melts, does it gain or lose weight?

Procedure:

a. Place an ice cube into a small plastic bag and close tightly with a string or rubber bank. Place the tied bag on one side of the balance.

b. On the other side of the balance. Add paper clips until both sides balance.

Observe! Is the ice losing weight as it melts? Is it important that you put the ice cube in a tightly closed bag? Why?

Suppose! Try placing the tightly closed bag of melted ice into the freezer and refreezing the "melted water." Replace the frozen "melted water" on the balance.

Observe! Does the refrozen water weigh the same as the original ice cube?

(Note: Under ordinary conditions, matter is neither created nor destroyed, regardless of what you do to it.)

6. Which weighs more, crushed or whole pieces of chalk?

Procedure:

a. Place three or four pieces of whole chalk in a cup on a balance.

b. Balance it using gem clips on the other side. Record mass (weight) in gem clips.

c. Crush the chalk, replace the crushed chalk in the cup. By making a physical change in the chalk (whole to crushed), did the weight change? Why? Share your reasons.

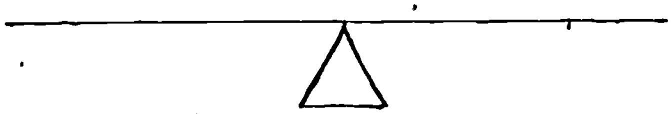
B. Teacher

Children are always balancing, comparing weights by lifting, using see saws and balancing on little walls or curbings. Help them to see that things balance when equal forces are working on them - a form of equilibrium.

1. On a table, arrange a collection of objects which will be sufficiently different in weight so that the children can order them from heaviest to lightest by lifting them. For example, you might display these objects: a brick, wooden block, a baseball, a styrofoam ball, and a pingpong ball.

Then extend this lifting and ordering activity to include a series of objects which look alike and have the same volume, but will "feel" different when they are lifted because some are heavier than others.

2. Set up balance boards on a low fulcrum.

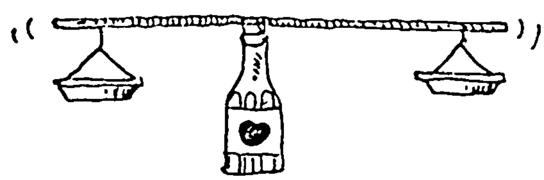


Allow children to explore using blocks of wood, books or any other materials they wish to "balance". Challenge them by asking, "How can you balance a big book with small blocks?" "A big book with a little book?" "Three blocks with two?"

Let them enjoy discovering on their own.

3. If possible, obtain or make equal-arm balances for use in the classroom.

Directions for making an equal arm balance: Take a large bottle (ketchup bottle seems to work best). Fill with sand or water, fit cork snugly in bottle. Take 5/16" dowell about 30 cm long drill 3 small holes, one in the exact center, the other 2 about 3 cm in from each end. Use "L" shaped wire through center hole, secure on each side with safety pins so that dowel moves freely. Hang pot pie pans from each end on cup hooks and bead wire.



Keep the balance in the room and accessible to the children during their free time. There are many things they can compare. Allow them to experiment to develop their own systems of arbitrary units for comparing objects and for ordering objects on the basis of their weight. For example: the child can compare the mass of small objects by counting the number of arbitrary units, such as paper clips, pins or tacks, needed to balance objects on an equal-arm balance. The child can then describe the results of his measurements, as in the following example: "The object weighs the same as eight paper clips" or "The object weighs more than nine paper clips but less than eleven paper clips."

Give the children the task of ordering assorted objects by using the balance instead of their hands to compare them.

4. The following activity is largely demonstration and class discussion. Its purpose is to have the children interpret weight as a force resulting from the pull of the earth on objects.

Put two identical closed boxes containing different numbers of books on a table in front of the class. Have several children lift each one. Is there any difference? (One is heavier to lift than the other.) What must you do to hold the box? Do you have to push or pull on the box? What is another word which means either to push or pull on the box? (Force.) You exerted or applied a force to the box in order to hold it. Do you feel the box pushing down on your hand? (Yes.) Which of the two boxes pushed harder on your hand? (The heavier one.) What causes the force? (The earth.)

A good descriptive term to introduce at this time is earth-pull. Refer back to the objects that were ordered according to weight. On which object was the earth-pull greatest?

C. Enrichment Suggestions

1. Try this!

Procedure:

a. Place an empty cup on one side of your balance and 20 or 25 paper clips in a paper cup on the other side.

b. Pour salt into the empty cup until it balances the paper clips.

c. Remove the paper cup containing the salt. Replace it with an empty cup. Pour water into the empty cup until it balances the paper clips.

d. Pour the salt into the water. Stir until salt is no longer visible. (Try this experiment with sugar also.)

Ask: Is this a physical or chemical change?

Observe! What has happened? Balance it. How many gem clips did it take? Ask: Is this a physical or chemical change? Discuss and write up your conclusions.

2. Change Solids to Liquids to Solids

Procedure:

a. Place some butter into a pan. Place the pan on an electric hot plate. Heat until completely melted. Using a candy thermometer, record the temperature of the melted butter. Place in refrigerator. Record the temperature every five minutes. Carefully note the temperature at which the butter becomes solid again.

b. Repeat this process using different substances. Place in freezer after liquifying.

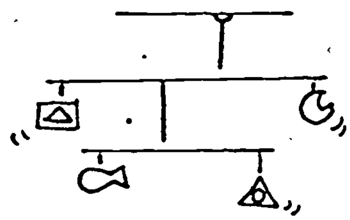
TEMPERATURE

Substance	Solid to Liquid	Liquid to Solid
Jello		
Frozen soup		
Frozen juice		
Popsicles		
Candles		
Ice Cream		

VII. Evaluation

A. Introduce new blocks and have students balance a large block. Allow them to use many small blocks or to adjust fulcrum difference.

B. Make mobiles using coat hangers, flexible sticks, or wire, pieces of string, cloth, aluminum foil, paper. Cut and make shapes. Hang from wire, sticks, or hangers so that they balance each other.



C. Children will find that the attachment hole might be moved to help the objects balance. Make leaves, birds, flowers, geometric shapes.

D. Weigh (balance) the same volumes of different liquids with gem clips. (Oil, water, syrup, detergent, etc.). Make a bar graph from your data.

E. Plan an activity!

With salt and water: Also with sugar and water

1. How would you show that salt is not chemically changed in water?

2. How would you show that sugar is not chemically changed in water?

3. How would you demonstrate that ice (in a tightly closed bag) does not "lose weight"?

4. Magic! Explain how you can change a
solid $\longrightarrow$ liquid $\longrightarrow$ solid
(Butter, candle wax, jello, etc.)

F. Do you make many physical changes in matter?

Yes, everyone does. You make many changes in matter every single day. Some of the changes made are physical changes. Make a list of five physical changes that you have made today. Can you explain why you made those five physical changes? Share your reasons with a friend, write them on your list, or perhaps you'd like to share your reasons with your classmates and teacher.

G. Can all changes be reversed such as solid to liquid to solid? Name some changes that are irreversible. Why do you think this is so?

Example: Allow whipped margarine to melt. Then place in refrigerator. What happens? Will it revert to a solid?

Title: TIME (Track Its Movements Energetically)

Target Group: Primary

I. Student Objectives

A. Cognitive

Students will

1. Demonstrate the fact that a person moves with the earth from west to east as the earth rotates.

2. Show that the sun appears in one side of the sky in the morning and in the other side in the afternoon due to the earth's rotation.

3. Describe night as the earth's shadow.

4. Demonstrate noon and midnight on a globe by showing positions on a globe relative to the sun.

5. Identify various types of time-keeping devices such as sand clocks, water clocks, sun dials, etc.

6. Identify a time interval as having a beginning and an ending.

7. Construct a demonstration clock, marking 12 hour intervals on the face and attaching an hour hand and a minute hand.

8. Demonstrate that the time needed for the earth globe to rotate from "sunrise" to "sunset" is about 12 hours on the clock and that one complete rotation of the globe requires a time interval of 24 clock hours.

9. Construct a simple sun clock and demonstrate its use.

10. Construct and use an indoor sundial.

B. Affective

Students will

1. Develop an understanding of the role of earth rotation to "day and night".

2. Develop an understanding of the role of earth rotation related to various methods of time-keeping.

3. Develop a concept of time, specifically a minute.

II. Thought Processes to Be Developed

Convergent Thinking - Arrives at one pattern out of diverse elements.

Divergent Thinking - Uses inquiry approach to determine conclusions.

Observation - Makes quantitative observations of events.

Inference - Makes an inference based on previous observations.

Communication - Observes objects and events repeatedly to accumulate sufficient evidence upon which to base an inference or prediction.

III. Instructional Materials

Supplies

- Earth globe
- Light source such as a flashlight to represent the sun
- Planetarium visit
- Doll, 4 cm tall
- Modeling clay
- Cardboard, for 10 cm diameter clock face
- Markers
- Paper brad
- Sand clock
- Candles
- Sun dial

Books

Abish. Do You Know What Time It Is?, Prentice-Hall, 1968.

Adler. Shadows, New York: John Day Co., 1961.

Akin. Tom, Sue and the Clock, Collier Books, 1966.

Allison. The Reasons for Seasons, Boston: Little, Brown and Company.

Blake. The Great Perpetual Learning Machine, Boston: Little, Brown and Company, 1976.

Elementary Science Curriculum Guide, Earth-Sky Concepts: Time, Level Three, Atlanta Public Schools, 1975.

Jacobson. Science: Building Ideas: Level Two, Atlanta: American Book Company, 1972.

Lowery. The Everyday Science Sourcebook, Boston: Allyn and Bacon, 1978.

Planetarium Guide: Rotation of the Earth, Atlanta Public Schools.

IV. Content

The student is able to relate the rotation of the earth to the process of time keeping and to associate the relative position of the sun to the time of day.

The student is able to describe and illustrate various methods of timekeeping and to show that these methods are related to the time required for earth rotation.

V. Questions to Be Considered by Students

How does the earth rotate?

How can you illustrate earth rotation?

Is night just the earth's shadow?

What simple instruments/objects can be used to demonstrate the passage of time?

Why have so many different ways of keeping track of time been invented?

VI. Activities and Strategies

A. Student

1. Outside, observe sun shadows of a 30 cm stick which stands vertically in the center of a 40 cm X 40 cm sheet of white cardboard. Mark the shadow position and record the time each hour. Have children point in the direction of the sun at each hourly recording. If possible, photograph the shadows for future reference.

   Write "morning" next to the longest shadow mark - which will be the first one in the morning and "noon" next to the shortest shadow. Mark "afternoon" by the last shadow mark observed.

2. Use an earth globe and flashlight in a darkened room and point out:

   a. Where the earth's shadow is.

   b. Where, on earth, a person is at midnight and,

   c. Where, on earth, a person is at noon.

3. Mount a "shadow stick" on a piece of board. Trace the line of the stick's shadow at one hour intervals throughout the day, and mark each line drawn with the time. The shortest line points in which direction? Use the shadow stick as a sundial. Can you tell the time by the length and direction of the shadow? How does a change in season affect its accuracy?

4. Play "shadow tag". The child who is "it" has to step on another person's shadow to tag.

5. Look at the position of the sun at different times on a sunny day. Stand with your arms outstretched at shoulder length. Have a friend trace your shadow on a piece of white, butcher paper. When you return an hour later can you "fit into it"? Why? Which way has your shadow moved? Which way (direction) has the sun moved?

DO NOT LOOK DIRECTLY AT THE SUN.

6. List as many devices as you can which help us keep track of time.

B. Teacher

1. To help develop the understanding of a time interval, ask how much time is needed for events such as:

   a. Eating a meal.

   b. Drinking a glass of milk.

   c. Growing one centimeter.

   d. Blinking your eyes.

   e. Walking around the room.

   f. Going home from school.

   g. Summer vacation.

2. Discussion: How can a burning candle be used to measure time? Will a thick candle burn as fast as a thin candle? How can we find out? Try it. Make a candle clock.

3. Discussion: Why have so many different ways of keeping track of time been invented?

4. Using a one minute sand clock (egg timer) rotate the earth globe once while the timer empties once. Repeat, using the demonstration clock. In each case, explain that 24 hours have elapsed.

   Calculate how many hours are needed for the earth to rotate once, one-half rotation, etc.

5. Discuss the length of days in the summer and winter. The longest day is June 21 and the shortest is December 22. Keep a record of day length from sunrise to sunset (newspaper). Graph the data.

6. Discuss with the children the concept of time and how time is measured by units: minute, hour, day. Ask "When do minutes seem to go by slowly? When do minutes seem to go by quickly? Why?" Set a minute timer and ask the entire class to be silent for 1 minute.

7. Make a sunclock by cutting a round cardboard carton in half lengthwise. Glue a bead to a length of thread. Fasten the thread through the centers of the carton's ends. Place the instrument on a level windowsill or outdoors in precisely the same position each day by lining the thread up in a north-south direction. The thread's shadow will indicate suntime. Students can mark the interior of the carton at fifteen minute intervals where the bead's shadow is cast. By connecting these marks, students will note a shift in the sun's apparent path with the seasons.

8. Make and use an indoor sundial. Fix a small mirror on a windowsill so that light from the sun is reflected on a large sheet of graph paper on the wall inside. If the sun does not shine directly through the window, a mirror can be attached to a tree or some other fixed object to reflect it inside. Students can mark the location of the reflected sunlight on the graph paper each day. (If students have the opportunity to observe a solar eclipse, it is interesting to begin marking several days before and continue marking several days after the eclipse.)

9. Locate a tall pole (fence post, sign, tree) in a big clear space. Place a marker (a stake in soft ground; a drawn mark on a hard surface) at the tip of the shadow every hour, using a regular clock as your guide. Check it after a week, a month, a season. Is it still accurate?

VII. Evaluation

A. Unit

1. Were the objectives met?

2. Did the course accomplish what it was designed to do?

3. Did the students enjoy the lessons/activities?

4. In what way(s) does the course need to be changed?

B. Student

1. Can the students apply the concepts to which they have been exposed?

2. Ask the student to place the small doll on the earth globe and, by rotating the globe, show in which direction the earth and doll move.

3. Ask the student to place the small doll on the earth globe and show the direction in which the doll must look to see the sun in the morning and also in the afternoon. Which way must the doll look to find the sun at noon?

4. With the room darkened, shine a flashlight on the earth globe and ask the student to point to the daytime and to the nighttime side of the earth. Is night just the earth's shadow?

5. With the room darkened, shine the flashlight on the earth globe and ask the student to rotate the globe, stopping when the doll is at the noon position and again when the doll is at the midnight position.

Title: SOIL (Several Outstanding Investigations Likely)

Target Group: Primary

I. Student Objectives

A. Cognitive

Students will

1. Discuss factors that cause soil formation.

2. Identify some materials in soil samples.

3. Examine soil samples from various places to determine likenesses and differences.

B. Affective

Students will

1. Develop an understanding of why there are different types of soil.

2. Develop an understanding of how different soils can best be used.

II. Thought Processes to be Developed

Synthesis - Recognizes cause and effect

Observation - Uses instruments such as a hand lens to extend senses.

Communication - Records data in graphic form.

Inference - Develops inferences based upon everyday observations.

Analysis - Examines different compositions of soil samples and discusses the possible/probable reasons for the differences and similarities.

III. Instructional Materials

Supplies: Baggies, magnifying glasses, (sifters) screen wire - various sizes, hammers or mallets, digging tools, heat source, water supply, jars with lids.

Books

Adler. The Earth's Crust, Day.

Andrews. Soil Ecology, Prentice-Hall.

Brennen. People and Their Environment, J.G. Ferguson.

Clark. Along Sandy Trails, Viking.

Darby. What is the Earth, Benefic.

Evans. The Dirt Book, Little, Brown & Co.

Milliken Teaching Aids. Beginning Science Adventures, Milliken.

Silver Burdett. Exploring Your Environment (Outdoor Book), Silver Burdett General Learning Corp.

Simon. A Handful of Soil, Hawthorn Books.

Stone. Rocks and Rills: A Look at Geology, Prentice-Hall.

Sutton. How and Why Wonder Book of our Earth, Grossett.

Syrocki. What is Soil? Benefic.

Film & Filmstrips

The Earth's Surface, 4 filmstrips, ERS.

Erosion, 9 minutes, Gateway.

Erosion: Leveling the Land, 14 minutes, color, EBF.

Understanding Our Earth: Soil, 11 minutes, color, Coronet.

What Is Soil?, 11 minutes, EBF.

My World - Earth, 11 minutes, Churchhill.

Agencies

Local Soil Conservation Agent, Forester & Agricultural Extension Agent.

Investigating Your Environment, Forest Services, U.S. Dept. of Agriculture, 1973.

USDA, Soil Conservation Service Area Office, Room 211, 403 West Ponce de Leon, Decatur, Ga. 30030.

Teaching Soil & Water Conservation (A Classroom and Field Guide), U.S. Dept. of Agriculture, Soil Conservation Service PA-341.

IV. Content

The earth outside our back door is an excellent resource available to us at no cost and can be used to teach even young children the scientific processes of observing, collecting, recording and sharing findings in a variety of ways.

The student will be able to demonstrate that soil is made from broken rock mixed with other materials.

V. Questions to be Considered by Students

A. Why are rocks found in such a variety of sizes?

B. Do all rocks look alike? Do all rocks feel the same? Are they the same color? Are they all made of the same substances?

C. Are all rocks/soils suitable for the same purposes or are they suitable for use according to their composition and individual properties?

VI. Activities and Strategies

A. Student

1. Have each child bring in rocks. Choose rocks that are crumbly. Put newspaper pads on the floor or out on the sidewalk and using the mallets and hammers pound the rocks until they crumble.

   a. Place the crumbled rocks in paper baggies. Discuss how falling rocks cause other rocks to crumble just as the hammers crushed the rock.

   b. Examine the rock pieces with magnifying glasses. Feel them between your fingers. Describe how they look and feel.

   c. Select a rock that breaks easily. Hold it over a sheet of paper and rub it against a larger harder rock. Note the rock dust that is worn off and falls on the paper.

2. Take a field trip around the school yard and neighboring community. Observe any exposed rock formations and notice the bits of rocks at the bottom of the large rocks. Ask: "Where did the small rocks come from?"

3. Find places where the soil looks different.

   a. Collect soil samples in paper baggies.

   b. Examine your soil samples carefully using magnifying glasses. What kinds of things do you see? Is all the material alike?

c. Use sifters of different sizes and sort out different substances - wood, leaves, rocks, dirt, etc. Make into piles. Do all of the samples look alike?

d. Collect more samples and identify, label and display your samples.

4. Put some soil into a jar of water. Shake it up. Let it stand for an hour or two. Slowly pour the water into a bowl. Observe the water in the bowl. Does it look the same as when you poured it into the jar? If there are bits of soil in it, feel them. Are they hard or soft? Look at them under the magnifying lens. What do you think they are?

   Take some of the soil from the bottom of the jar. Rub it between your fingers. Do you feel rough bits in it? Look at some of this soil with a magnifying lens. Are the pieces all the same size? Are they the same shape? Are they the same color? What do you think these pieces are?

5. Find a place where there is a steep bank, exposed ditchbank, excavation for a road or a building. Are there plants at the top of the bank? What color is the soil at the top of the bank? Are there different layers of soil? What color is the soil at the bottom of the bank? Are there rocks along the bank? Identify the various soil horizons or layers, their color, texture and the influence of the "parent" material.

6. Bring in soil from different places. Get soil from garden, the woods, the bank of a brook, a place where a house or road is being built. Put a cupful of each kind of soil into jars. Add water until each jar is nearly full. Put tops on the jars. Shake. Let each jar stand until the water is almost clear. Do any of the jars have different layers of soil? Which layer has the largest pieces? Use a spoon to get some of the sediment. Feel the sediment. Does it feel like sand or pebbles? Analyze the differing compositions of these soils as a group and discuss the possible reasons for the differences.

7. Heat several comparatively soft rocks over a flame then pour cold water over them to show what effect the changes in temperature

play in soil formation. Discuss observations and findings related to previous activities.

8. On a walk around the school/neighboring community, gather soil samples and record as a group the answers to the following: (Have the teacher, a parent or an older child record the necessary findings).

Chart from <u>Exploring Your Environment</u>

Where I Got My Soil Samples	Color	Wetness	Smell	How It Feels (Texture)	Plants in the Soil	Other Living Things	Dead Things	Man-Made Things

B. Teacher

1. Lead students through activities asking relevant questions to generate thinking and concept development.

2. Conduct portions of the experiments which are too complicated for the students to do. Assist/supervise students in those activities/experiments which they can perform.

3. Have a resource specialist explain how soils are classified and how certain characteristics determine how soils can best be used.

VII. Evaluation

A. Unit

1. Do students now desire to collect soil samples on their own and conduct similar experiments to those conducted in class?

2. Are students able to discuss factors that cause soil formation?

3. Are students able to determine likenesses and differences of several soil samples?

4. Were the objectives met?

5. Did the unit accomplish what it was designed to do?

6. Did the students enjoy the lessons/activities?

7. In what way(s) does the unit need to be changed?

B. Student

1. Draw pictures of things that cause rocks to break up.

2. Draw pictures showing what you found in your soil samples and label the pictures.

3. Evaluate student interest and enthusiasm as evidenced through analyzing student work.

Title: "Give Me Room"

Target Group: Primary

I. Student Objectives

A. Cognitive

Students will

1. Generalize that living things are affected by the space they occupy and by time.

2. Demonstrate that the amount of space required by living things depends on the size of the organism and its needs for various resources.

B. Affective

Students will

1. Appreciate the complexity of life.

2. Seek alternative means of using resources.

II. Thought Processes to Be Developed

Communicating - Orders "events" serially, orally or in pictures.

Inferring - Makes inferences about everyday experiences.

Gathering Data - Selects data useful to answer questions under consideration.

Thinking Skill - Inductive Reasoning - Draws inferences and makes generalizations from evidence collected.

III. Instructional Materials

Books

Benefic Press. What Is A Season?.

Coward, McCann. Time After Time.

Coward, McCann. The Cave: What Lives There, The Desert: What Lives There.

Fox, Charles Phillip. When Winter Comes.

Film

Care of Pets, Encyclopedia Britannica Films.

IV. Content

Living things require space and time. Time changes space and needs requirements. Living things affect and are affected by the environement. Resources are renewable or non-renewable - how should they be managed wisely?

V. Questions to Be Considered by Students

A. What things are really necessary for life to continue?

B. How can we use resources wisely?

C. What are some renewable and non-renewable resources?

VI. Activities and Strategies

A. Student

1. Plant four corn seeds each day for four weeks. At the end of this time, compare the space occupied by plants as they develop. (Seeds soaked in water overnight will germinate more readily.)

2. Bring in labels from boxes or cans of pet foods. Notice the difference in recommendations for feeding according to size of pet.

3. Make bird feeders and place where they can be observed all year. Observe battles for territory, changes in bird clientele as the seasons change. Provide food throughout year. Bird feeders may be made from plastic bottles, aluminum pie pans, ice cream or cheese cartons - be original.

4. Adopt a tree limb. Mark it in some way. "Tie a yellow ribbon" around it in the fall. Observe weekly throughout the year. Draw pictures of changes as they occur. Keep the pictures in a folder and watch the sequence of events. Have you ever seen the flowers on a sweetgum tree or a maple tree?

5. Adopt a square meter of school yard. Mark it in some way. Observe closely - kinds of plants and animal life to be found. Record findings. Visit the area weekly and record findings as seasons change.

6. Keep a record of the daily temperature. Plot the temperatures on bar or line graphs. Discuss how people dress to adapt to the various temperatures on the graph. What other adaptations do people make to adapt to seasonal changes? How is your life different at different times of the year?

7. Find out about seasonal changes in other states and countries - Mexico, Alaska, Hawaii, Colorado, Arizona. What kinds of animals and plants are found in these places? Do space and time have any affect on the plants and animals in other places?

B. Teacher

1. Prepare a year-round bulletin board. Ground - sky - leafless tree - clouds. As seasons change, have leaves on tree, birds, animals, children at play, etc. change with the seasons. For example, in the fall have the children make colored leaves for tree, acorns, pumpkins, squirrels, etc.

2. Invite a pet shop operator to visit and discuss how many fish can survive in an aquarium according to its size. Ask him about how fish grow and develop if the aquarium is overcrowded. Have the proprietor discuss animal space, food requirements and care of pets.

3. Visit an environmental center or invite someone from the center to visit you to discuss animal space requirements and seasonal changes.

4. Discuss what happens when an animal habitat becomes over-populated or resources become depleted.

C. Enrichment Suggestions (optional)

Pretend that your class has become stranded on an abandoned island. Decide what is necessary for survival. List needs, resources, division of labor (jobs). Guide the plan of survival to include wise use of resources. This activity should last at least 2 weeks, sometimes more, depending on complexity of students' design and imagination.

List what resoruces are available. List what you need for life. List necessary jobs. Plan your island. Set aside farm land for food and a dump site for garbage. Decide who will do what jobs. Farmers? Rescue party? Builders?

VII. Evaluation

A. What do you think would happen if the world became overpopulated? What natural resources would be overused?

B. What happens to animals if they are kept in a space too small for too long a time?

C. How can we help conserve our natural resources?

Topic: Air Is "Real"

Target Group: Primary

I. Student Objective

A. Cognitive

Students will

1. Show that two objects cannot be in the same place at the same time.

2. Show that space is occupied by visible as well as invisible matter.

3. Apply the term "gas" to air.

4. Demonstrate that air is matter since it has weight and takes up space.

5. Demonstrate that air is composed of a mixture of various forms of matter.

B. Affective

Student will develop an understanding that all things are made up of matter and therefore have specific properties, weight and occupy space.

II. Thought and Skill Processes to Be Developed

Experimenting - Helps design and conduct simple investigations to answer questions.

Communicating - Describes an observation orally or pictorially.

Predicting - Makes simple predictions based on evidence from observations of everyday occurrences.

Measuring - Selects and uses appropriate tools to make precise measurements.

Constructing and Using Models and Equipment - Constructs a physical model to express an abstract idea. Uses equipment to make observations.

Constructing and Using Models - Selects suitable equipment for testing ideas.

Gathering and Interpreting Data - Explains observations.

Thinking Skills - Convergent Thinking - Identifies social, political, and economic problems.

Thinking Skills - Inductive Reasoning - Draws inferences and makes generalizations from evidence collected.

III. Instructional Materials

Books

Bendick. Wind (Advanced), Rand.

Black. Busy Winds, Holiday.

Branley. Air Is All Around You, Crowell.

Conger. Who Has Seen The Wind, Abingdon.

DeVito and Krockover. Creative Sciencing.

Matter, Matter, Everywhere, Silver Burdette, 1976.

ETS. Gilberto and the Wind, Viking.

La Fontaine. The North Wind and the Sun, Watts.

Mizumura. I See the Winds (Poetry), Crowell.

Shapp. Let's Find Out About Air, Watts.

Tresselt. Follow the Wind, Lothrop.

Zolotow. The Storm Book, Harper.

Available Texts

Films and Filmstrips

Air Around Us, EBF.

Introduce Air, Bailey.

What Is In The Air, 52 frames.

Wind and What It Does, 11 minutes, EBF.

Wind at Work, 1 reel, color, Dowling.

Materials

Tumblers or wide mouthed glass jars

Small balls

String

Foil pans or saucers

Water

Plastic bags and twists

Balloons

Balance beam

IV. Content

The size and shape of things matter.

A. Matter occupies space and has weight.

B. All things in the universe are forms of matter and can be identified by specific properties.

V. Questions to be considered by students:

A. Can two objects be in the same space at the same time?

B. Is there such a thing as invisible matter?

C. Is air a form of matter? Why?

VI. Activities and Strategies

A. Students

1. You will be provided with objects tied on a string (small ball, a rock, wooden block, large nail), a tumbler or wide mouth jar about two-thirds filled with water and a shallow pan to set under the container. Lower an object into the water and raise it. Make a chart describing and explaining what you saw happen.

2. Open a small plastic bag. (Swoop the bag until it is inflated.) Close the open end and tie it tightly. Place a book on the bag. Observe what happens. Was the bag really empty? What was in the bag? Does air take up space?

3. Hang two empty balloons on a balance beam. Do they balance? Now blow up one balloon and replace it on the beam. What happens? What does this show? Try this with various types of balls (football, basketball, etc.).

4. The fact that air occupies space can be demonstrated by the following experiments:

   a. Push an empty glass upside down into the water in a bowl. See that the water cannot enter the glass because it is filled with air. You can further expand this experiment by wadding a piece of paper into a ball and placing it in the bottom of the glass. Push the glass upside down into the water again. Remove the glass carefully and show that the piece of paper has not gotten wet. Why?

   b. Blow up a balloon. Why does the balloon swell?

5. Wet three pieces of cloth. Crumple one piece and place it in a jar with the cap screwed on. Smooth out one piece and place it in your room. Hang the other piece on a clothesline.

Watch to see which one dries first. What helped the pieces of cloth to dry? Where did the water go?

6. To show how strong wind effects the surface of the ground, place a pan filled with sand in front of a fan. Explain how this action takes place on the beaches as winds blow in from the ocean.

7. Show that water vapor is present in air. Put some water in a shiny tin can. Add ice cubes. Stir. Put a top on the can. Observe the sides of the can. What do you see?

8. Which has more dustfall, the air in your classroom or the air outside your classroom? Get two small dishes that are the same size. Cover one side of each glass dish with a layer of petroleum jelly. Place one of the glass dishes on an outside windowsill. Put the other glass dish in the classroom where it will not be disturbed. Observe the two dishes for several days.

9. During a heavy rain, place a piece of white cloth on a flat grassy surface or on a paved walk. After the rain, bring the cloth inside. Inspect the cloth. Is there any dirt on the cloth? Where did the dirt come from?

10. Collect rain water. Pour it through a piece of filter paper or paper towel. Examine the water. Inspect the filter paper.

11. Observe the effect of smoke, dust, and exhaust gases on plants. Compare the condition of plants growing near the road and those growing some distance away from the road. Note any differences in the size and color of leaves on the plants. Explain any differences that are found.

B. Teacher

1. Ask this riddle. "You cannot see it but it is all around you. It is inside your desk. It touches the floor and walls sometimes it moves very fast and sometimes it stands still., It can be warm or cold. It is worth more to you than gold, but it costs nothing at all. What is it?"

2. Ask the children to describe what they see, hear and feel that indicates <u>air</u> is present.

3. Plan for the use of library books and audio visual aids to stimulate interest about air.

4. At recess time tell the children to look up to the sky. Ask them, "Do you see anything in the air?" "How far can you see?" "Is the atmosphere clear?" If the children already have ideas and impressions about the atmosphere, encourage them to talk about their ideas. Do this on a smoggy day.

5. So that the children might feel <u>air</u>, allow time for the following experiences:

a. Have the children exhale against their hands. Can they feel air? Can they do this at home? In the country? Anywhere on earth? Is air everywhere?

b. Have children swing their arms through the air quickly. Let them describe what they feel.

c. Let them hold a book in their hands with their arms outstretched and swing. What do they feel now? Is the book pushing against anything? Explain.

d. Fill a balloon with air and then allow air to escape on childrens' hands.

7. Help the children make pinwheels of colored paper. Let them use their pinwheels and discover how energy from wind can make them turn.

8. Float small toy sail boats in a pan of water. Let the children blow on them. What happens? What happens when you blow too hard?

9. Have children make paper fans. As they fan themselves, ask them why they feel cooler.

C. Enrichment

1. You will need:

   a one-hole stopper
   a two-hole stopper
   two bottles
   one funnel

   Pour water into a funnel that is held in place by the one-hole stopper. What happens?

   Try this again, only this time put the funnel into a two-hole stopper. What happens this time? Can you tell why?

2. Have a child open a large can of juice with a portable can opener, punching only one hole in the top. Have this child attempt to pour the juice from the can into a glass. Ask the class what the student must do in order to make the juice pour. Encourage the students to give an explanation.

3. Let one student push a small neck bottle upside down into the water in an aquarium; being careful not to let the water enter. With his other hand instruct him to immerse a glass, tilted so that water will enter. At this point of the experiment ask the class, "What is in the bottle?" (air) "What is in the glass?" (water) Now place the glass so that the opening of the bottle can be placed inside. The air will fill the glass and displace the water. Encourage the students to describe what has occurred.

4. Show that dust is present in the air. Cut out a piece of white paper so that it just fits the bottom of a deep pan. Use masking tape to fasten the paper to the pan. Put the pan outside on the windowsill. After a day or two, note the dust on the paper.

5. Make a wind vane. You will need the following items:

   straight pin
   soda straw
   feather
   pencil

   Push the pin through the middle of the straw. Insert the end of the pin through the rubber of a pencil. A feather should then be put in one end of the straw. Blow on the feather. What happens? Which way does the feather point? Which way is the air moving?

6. How can you help keep our air "clean"?

VII. Evaluation

A. Show students a tumbler full of water placed in a shallow pan. Ask them to predict what will happen if objects are lowered into this tumbler. Ask them to explain answer.

B. Draw a picture of the balloon experiment. Ask them to explain why the beam is not balanced.

C. Ask the class to explain that normally there is no such thing as an "empty" bottle (or box, glass or other container).

D. Plan to have a bulletin board or simply a large poster paper with several pictures involving air as being useful and harmful. Examples.

   1. Sailboats with fullblown sails.

   2. Some musical instruments.

   3. Clothes hanging on a line to dry.

   4. Disaster areas during or after hurricane.

E. What happens when a car has a flat tire? Try rolling a ball that is barely inflated and one that is filled. Which is easier to roll? Why do we put air in automobile tires?

F. Demonstrate:

   1. Air takes up space.

   2. Air has weight.

   3. Air can move objects.

G. Arrange a display pertaining to air pollution on the bulletin board. Include illustrations that show air pollution caused by smog, dust storms, forest fires, industrial operations, and exhaust wastes from motor vehicles.

H. Show that air is real. Carry some air from the playground into the classroom.

Topic: Physical Matters

Target Group: Primary

I. Student Objectives

A. Cognitive

Student will

1. Describe objects according to observable physical characteristics such as color, shape, size, and texture.

2. Construct and name the following plane, or two-dimensional shapes: triangle, circle, square, rectangle and ellipse.

3. Identify and name the following three-dimensional shapes: sphere, cube, cylinder, pyramid and cone.

4. Distinguish between different types of materials.

5. Demonstrate what kinds of things are magnetic.

B. Affective

Develop an awareness of the variety of characteristics that can be used to describe matter.

II. Thought and Skills Processes to Be Developed

Experimenting - Performs simple short-term activities to answer some questions.

Using Working Definitions - Distinguishes between a general description and a working definition.

Observing - Selects an object according to observable characteristics.

Classifying - Names, groups and constructs objects based upon likenesses and differencess.

Classifying - Groups a set of objects into subsets based on a single characteristic.

Thinking Skills: Categorizing - Groups objects on the basis of common characteristics.

Identifying - Based upon observable physical characteristics, recognizes geometric shapes.

III. Instructional Materials

Books

Bendrick. <u>Shapes</u>, Watts Publishing Company.

Borton. Do You See What I See?, Scott Publishing Company.

Branley. Mickey's Magnet, Crowell.

Branley. North, South, East and West, Crowell.

Budbey. A Kiss Is Round, Lothrop Publishing Co.

Freeman. Book of Magnets, Four Winds.

Knight. Let's Find Out About Magnets, Watts.

Orgami Paper Folding Book, (Available in most libraries).

Pine. Magnets and How to Use Them, McGraw.

Quigley. The Blind Man and the Elephant, Abelaid Press.

Sacks. Magnets, Coward.

Wyler. Prove It!, Harper.

Available textbooks

"Judy" Color Shapes No. 404100, General Learning Corp., $7.35.

Playskool No. 506 - Sorting Box, Milton Bradley, $7.50.

Materials

Magnets
Assorted objects
Felt and cardboard squares, circles, triangles, rectangles, ellipses (two-dimensional shapes), soda straws, strips of poster board or heavy paper, lengths of string or yarn, small boxes of different shapes and sizes, box of shapes made from a variety of textures, thicknesses, and weight (wood, metallic, paper, sandpaper, metal, plastic, etc.), pictures of three-dimensional shapes such as the cube, pyramid, sphere, cylinder and cone, solid objects in three-dimensional shapes (ball, funnel, party hats, sugar cube, gift boxes, building blocks, etc.).

IV. Content

Matter is made up of a variety of substances but can be put into categories according to its similarities and differences.

V. Questions to Be Considered by Students

A. How do we describe objects?

B. What are some characteristics of objects?

C. In what ways are specific objects alike? Different?

D. How are you and the others in your family alike? Different?

VI. Activities and Strategies

A. Student

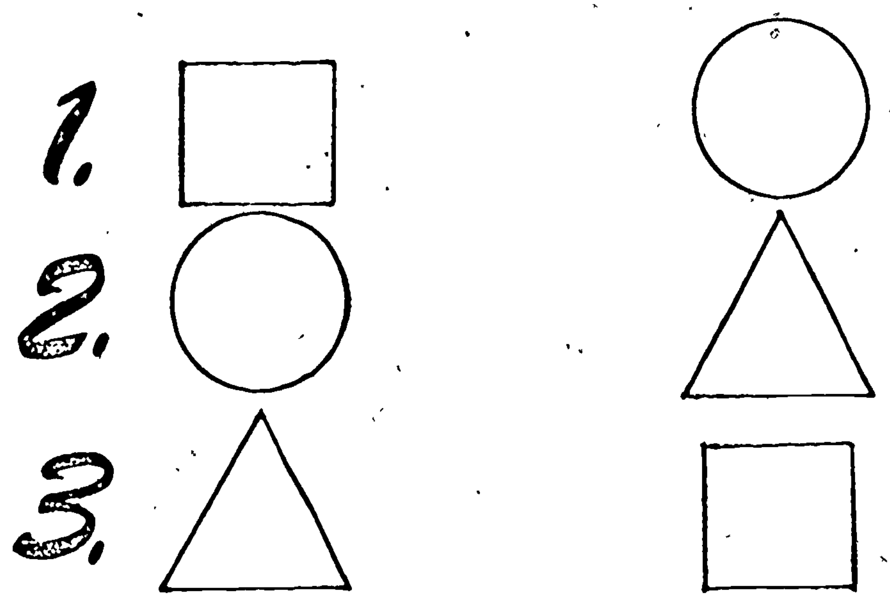
1. "Finger Play" - Using the fingers, hands, or arms, make different shapes. One child may make a shape and the one who identifies the shape may have the next turn to make a shape. Have another child identify the shape, etc. Repeat.

2. Using two dimensional shapes drawn on construction paper, cut and fold making a cube, pyramid, cone or cylinder. (Patterns may be found in paper folding [Oragami] books.) Have the children observe flat two-dimensional figure and compare with three-dimensional figures. How are they alike? Different?

3. From a box of assorted shapes, select shapes that match those which have been selected for the "post-test shape box." (The "post-test" shape box should contain shapes identical in size, shape, texture, and color to a matching shape in the larger box of assorted shapes.)

4. Play a shape game. One child may describe a particular shape. The child who identifies the shape description may have the next turn. (Encourage variety in terminology rather than repetitious terms.)

5. Matching - Prepare a pencil and paper post-test. Shapes are drawn and matched by drawing lines to those which form a match.



6. Push one bar magnet along the table top with another bar magnet. Do not let the two magnets touch. Putting the two like poles near one another will cause one magnet to move away from the other.

7. How strong is your magnet? Use metal objects that are attracted but of different sizes. See how large or how many objects your magnet can move or hold.

8. Find out what materials magnetic fields will penetrate. This can be determined by placing materials between a magnet and objects that are attracted by a magnet. Let students decide what material they wish to try.

   Paper, wood, glass, and cloth can be penetrated by a magnetic field.

9. Steel thumbtacks can be attached to the bottom of miniature paper figures which are placed on a smooth, non-magnetic surface, they can be moved by a magnet concealed under the surface.

B. Teacher

1. From a variety of cardboard shapes, have each child select one. When all have made a selection, the teacher or a student may show them one shape. Ask students having the same shape to stand up. Ask, "Are the shapes the same?"; "What is the name of the shape?" Using arms and fingers "draw" the shapes in the air. Repeat until all shapes have been identified, named, and drawn in the air.

2. Prepare envelopes with an assortment of shapes, at least 3 of each shape. Cut the shapes from a variety of materials. Be sure to include shapes of different colors and textures. Let students sort shapes according to likenesses. Record the characteristics used for grouping.

3. Show children cubes and spheres. Ask them to identify these shapes. Name classroom objects that are cubes and spheres. Introduce cone, pyramid and cylinder in a similar way. After each shape is introduced, have children identify familiar objects which exemplify these shapes.

4. Ask children to bring (home, workshop) objects containing these shapes to school to help them relate the name to the shape. Pictures of ice cream cones, rocket nose cones and Egyptian pyramids help make shape names meaningful. Arrange the objects into a display or bulletin board, classified according to shape.

Set trays up of materials such as buttons, nails, brads, gem clips, beads, thimbles, wood, crayons, etc. Have students put them in sets according to what they are made of. (Some discussion may take place if they are made of two or more substances.) How can you tell what they are made of? What is the difference between plastic and wood? Metal and non-metal? Paper and wood? Compare many kinds of substances. Refer to Science 4 - Houghton/ Mifflin, pages 35-44.

Using the same tray, predict which ones of these a magnet might attract. Divide them into two groups. Test with magnets after predictions are made. Introduce terms magnetic and non-magnetic.

C. Enrichment

1. Make a magnet: Rub a long, thick nail with a magnet. Rub only one way. You can now use the magnetized nail to pick up metallic objects. In order to determine the poles of the nail, use a bar magnet to see which end of the nail will be attracted and which will be repelled.

2. Make magnetic brooms by tying magnets to the end of pointers. Using magnetic brooms, you can try to pick up a variety of pins and tacks to see which contain iron or steel.

3. Prepare a magnetic bulletin board for the classroom. Display magnets brought in by the students. Magnets are often used by tailors to hold pins and by hair dressers to hold hair pins. Illustrate these and other similar magnetized objects such as screwdrivers, scissors, etc.

VII. Evaluation

A. Make string models of the five shapes learned. Name and match with familiar room objects of similar shape. Record the number of each shape found.

B. From a variety of shapes, the child may make a selection, name the shape and match with similar shapes found in the classroom.

C. Make a building field trip and record names of objects that are:

Round

1.	4.
2.	5.
3.	6.

Square

1.	4.
2.	5.
3.	6.

D. Ask child to make specific finger shape. Record child's performance on a checklist.

Name ______________________________

Yes	No	
___	___	1. Square
___	___	2. Circle
___	___	3. Triangle
___	___	4. Rectangle
___	___	5. Ellipse

E. Art: Sprinkle a sheet of white paper with iron filings. Place the sheet over several bar magnets and a horseshoe magnet. Spray filings gently with a mist of water from an atomizer. Over night rusting will stain the paper and make a permenant "map" of the magnetic field.

F. Make a list of all the things in the classroom that are attracted by a magnet. The list should include nuts and bolts, hinges, pencil sharpeners, some doorknobs, and so on.

G. What is a magnetic substance?

Title: A Matter of Change

Target Group: Primary

I. Student Objective

A. Cognitive

Student will

1. Demonstrate that changing position of an object may change the way it looks even though the object does not really change.

2. Illustrate position words: over, under, above, beside, right, left, etc.

3. Identify examples of simple physical and chemical change.

4. Demonstrate that the form of a substance can be changed without changing the substance.

5. Explain that when a chemical change takes place one or more new substances will be formed.

B. Affective

Student will

1. Develop an awareness that physical and chemical changes affect our daily lives.

II. Thought Processes to Be Developed

Observing - Identifies physical properties of objects by direct observations, using all five senses purposefully. Recognizes that changing position or environment of an object may change the perception of the object.

Communicating - Describes an observation verbally or pictorially.

Constructing and Using Models - Develops pictures to express ideas.

Experimenting - Performs simple short term activities to answer questions.

Thinking Skills: Creative Thinking - Predicts logical conclusions based on initial information.

III. Instructional Materials

Books

Emlerley. The Wing On A Flea, Little.

Quigley. The Blind Man and the Elephant, Scribner.

Raskin. Spectacles, Atheneum.

Fresselt. Hide and Seek, Fog, Lathrop.

Webber. It Looks Like This, Hale.

National Science Teaching Association. Science and Children.

Materials

Shadow boxes (see directions, Activity 7)

Environment boxes (Activity 3 and 4)

Rust - screen wire, steel wool

Boiling water - pan, hot plate, water

Candles

Matches

Pieces of aluminum foil or small foil pans

Available texts

IV. Content

When a physical change occurs, only the shape, state or size of matter changes. A chemical change in matter results in the formation of a new substance or substances.

V. Questions to Be Considered by Students

A. How does changing the position of an object affect the way it looks?

B. What is physical change?

C. What is chemical change?

VI. Activities and Strategies

A. Student

1. Make a "magic box". Line a shoe box with black material or paper. Have a "peephole" cut into one side. Have children observe and describe small objects. Then place them in the box with the top on and peep in the peephole. How does the object look now? Is it still the same object? If you take it out will it look the same?

2. Make a box (shoe box) as above but line with a color. Put a colored cellophane peephole on top so the light can shine through. Do activity as above.

3. Using a mirror, watch facial movements as well as arm and body movements. Are they physical or chemical changes?

4. Place a piece of screen wire, nail or steel wool in container with water (small amount), wet sponge or cloth. Let stand - overnight observe what happens. Keep a log of changes. Is rust formation a physical or chemical change?

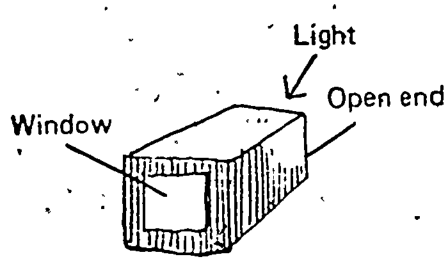
5. Pour 1 or 2 cups of water into boiler. Place on hot plate. Turn heat to medium high. Let water boil. Observe what happens. Is this a physical or chemical change?

B. Teacher

1. Give many directions involving position words. "Look down at the floor, up at the ceiling, to the right, to the left." "Hold your hand over your head, under your elbow, on top of your foot," etc. (If children have difficulty learning right from left, try making paper bracelets and wearing them on the right arm.)

2. Place a small wagon or other simple toy on the floor. Have children draw pictures of the toy from all angles - over (on a chair looking down), facing it, eyes as low as the wagon, from each side, front, back. Place it on the edge of a table and have children draw how it looks when they are below it.

3. Make a shadow box by putting a transluscent material such as onion skin over a square cut into the bottom of a box. Shine a light (from a filmstrip projector) behind it. Place objects inside and allow children to "guess" what the object is from the two dimensional shadow.



4. Play making shadows on a screen.

5. Discuss: things may look different to different people depending on their position, feelings, environment.

6. Provide a small candle for each two children. Have the class describe the candle, using as many physical properties as they can observe (shape, hardness, smoothness, etc.). Let them also identify and describe the wick.

7. Light each group's candle and have the children describe what they see happening. Ask them to collect melted wax on the foil or in the pan. Now ask them to compare the wax which melted and hardened with the original candle, and the burned portion of the wick with an unburned portion. Discuss which are chemical and which are physical changes and why.

C. Enrichment Suggestions

1. Have student keep an observation sheet. Have them record the physical and chemical changes they observe for a suggested period. Length of time for record keeping will depend on students.

VII. Evaluation

A. Draw a dog as he might look if you were an ant on the ground underneath it; if you were another dog beside it; another in front of it. How would the dog look if you were in an airplane looking down at it? Suppose you were a flea on his back. How would the dog look to you?

B. Draw a picture of something you dislike, like, are afraid of. Does anyone in your class like what you dislike, dislike what you like? Do things "look" the same to everyone? Why?

C. Demonstrate a physical change and a chemical change, such as tearing paper and burning paper, and ask the class to name which is which.

D. Heat sugar in a test tube until it is blackened. There will be water vapor on the sides of the test tube. Ask: Is this a chemical change or a physical change? Explain your answer.

E. Ask children to bring in pictures of change. Let them group them as to whether they are examples of physical or chemical change.

F. Find examples of simple physical change and chemical changes outside. Prepare illustrations and/or examples to share with class.

Title: Minute Matter

Target Group: Primary

I. Student Objectives

A. Cognitive

Students will

1. Demonstrate that matter can be divided into smaller and smaller pieces until the pieces become invisible.

2. Explain how a solid can disperse itself through a liquid.

3. Show evidence that molecules of a substance move through air.

4. Demonstrate that molecules of matter are in constant motion.

B. Affective

Through activities student will almost "invent" the particulate state theory.

II. Thought and Skill Processes to Be Developed

Using Working Definitions - Distinguishes between a general description and a working definition.

Experimenting - Performs simple short term activities to answer some questions.

Developing Mental Models - Develops a mental model from direct observation.

Using Models and Equipment - Uses equipment to perform basic process.

Thinking Skills - Convergent Thinking - Arrives at one pattern out of diverse elements.

Thinking Skills - Inductive Reasoning - Draws inferences and makes generalizations from evidence collected.

III. Instructional Materials

Books

Bemelman. Madeline's Rescue, Viking.

Adler. Atoms and Molecules, Day.

Bendick. All Around You, McGraw.

Carona. True Book of Chemistry, Children's Press.

Freeman. Your Wonderful World of Science, Random.

Meyer. Picture Book of Molecules and Atoms, Lothrop.

Posin. What Is Matter, Benefic.

Victor. Molecules and Atoms, Follett.

Lewellen. Mighty Atom, Knoff.

Freeman. All About The Wonders of Chemistry, Random.

Freeman. Ski Pup, Viking.

Carona. Water, Follett.

Carona. True Book of Chemistry What Things Are Made Of, Children's Press.

Lindman. Flicka, Ricka, Dicka and Their New Skates, Whitman.

Lindman. Sailboat Time, Whitman.

Lindman. Snipp, Snapp, Snurr Learn To Swim, Whitman.

Lindman. Snipp, Snapp, Snurr and the Yellow Sled, Whitman.

Machetanz. Puppy Named Gih, Scribner.

Pine. Water All Around, McGraw.

700 Common Science Experiments, UNESCO.

Materials

Fruit (apple)
Sugar cubes
Water/containers
Candy thermometer
Perfume, ammonia, extracts
Cotton, Moth balls
Hard candy
Food coloring
Peppermint oil
Clock (with second hand)
Mr. Sketch Instant Water Colors (fragrance)

IV. Content

All matter is made up of minute particles, called molecules, which are in constant motion.

V. Questions to Be Considered by Students

A. Of what is matter made up?

B. What happens to substances when we dissolve them in water?

C. Do molecules move?

D. Do they move faster when they are hot or cold?

VI. Activities and Strategies

A. Student

1. Using an atomizer, show the liquid in the container, then spray in the air. Can you see the liquid as it comes from the can? Then what happens to it? Is the liquid made of tiny particles?

2. Observe and feel a piece of chalk. Break it in two and hold up half of a piece. Continue to break and reduce, in size, discard half until it gets to be very small. Crush it into even smaller pieces. Ask if the children can see and pick up one small piece.

3. Fill a cup or beaker with sand. Try to add marbles. What happens? Now fill with marbles and try to add sand. What happens? What can we add to the sand? Try water. Why can the water go in but the marbles can't?

4. Examine newspaper print. Do the letters look filled in? Now use your magnifying glass. What do you see?

5. Using two large clear jars, put hot water in one and cold water in another. Carefully drop a small amount of dark food color or ink onto the water surface of each jar. Watch closely and describe what happens. Do not stir but allow movement to occur as it will. In which jar does the color disperse faster?

6. "Lunch Menu for Today." For at least a week, make the lunch menu based on odors of the cooking food. "No peeking" at printed menu before guesses are made.

7. Discuss - particles of substances (which we cannot see) move through the air to our olfactory nerves so we can smell.

8. How do objects change in water? Try these things. Keep a written record of what happens.

   a. Place a sugar cube in water. (Beaker [glass] of cold water/hot water)

   b. Place a piece of colored hard candy in hot water and another in cold.

   How did the objects placed into the containers of water change? What do you think made it happen?

   Can you think of the missing word for each change you observed? Do the experiment again and keep a time record. Discuss movement of particles through the liquid.

B. Teacher

1. Give each child a sugar cube and a magnifying glass. Observe the cube. Can you see the little pieces? Now divide in half. Discard one-half. Divide and discard as far as you can. use the magnifying glass. How small are the pieces? How can you make them so small that they will disappear?

2. Give each student an eyedropper, a magnifying glass, another sugar cube and a small cup of water. Put the sugar on a small paper plate. Now add a drop of water. Observe. Add more water and observe. Continue until the cube disappears. What has happened? Where did the pieces of sugar go? Are they still there? How can we tell?

3. Leave some of the paper plates on a window sill. Watch for a day or two as the sugar reappears. What happened to the water?

4. Discuss: All matter is made up of very small particles.

5. Discuss: All matter is made up of very small particles, and there is space between these particles.

6. Saturate a piece of cotton with perfume, ammonia, peppermint oil, or other liquids which have a strong odor.

   a. Ask the students to raise their hands. As they smell the odor, a graph may be made showing time and distance. (As the molecules evaporate, students will smell the odor because the molecules reach the olfactory nerve.)

   b. Hold near a light bulb, radiator or similar heat source. Compare the time with that of Part a.

7. Using small boxes into which numbered containers of various items with characteristic odors have been placed. Have the students identify the substances based on odor,

   a. Box with small envelopes containing such things as baby powder, laundry detergent, nutmeg, cinnamon, etc.

   b. Box with chewing gum of different flavors.

   c. Box with vials of liquid - such as vinegar, perfume, furniture polish, vanilla, lemon, almond extracts, etc. (sniff bottles).

   d. Box of Mr. Sketch - Instant Water Colors. (Purchase a box of these magic markers, each has a different color and fragrance.) Sniff and identify the odor. Why are they different colors?

C. Enrichment Suggestions

1. Suppose nothing would dissolve. How would this change your life? (First think of how many things at home and at school are used in solutions.)

2. Think of some other properties of matter. How would your life change if: rubber wouldn't bounce, glass wasn't transparent, iron wasn't hard, snow was red? Think of some other "ifs". Write a science fiction story.

VII. Evaluation

A. Do you think the particles of water are closer together in hot water or cold water (Student Activity 5)? Why do you think so?

B. Dissolve some salt in water. Do you think the salt is still there? How can you find out? Can you get it back? Demonstrate.

C. Using a dirt clod, demonstrate that matter is made of very small pieces.

Title: Growing Up

Target Group: Primary

I. Student Objectives

A. Cognitive

Students will

1. Generalize that all living things reproduce their own kind.

2. Explain that although methods of reproduction differ, all organisms grow and change.

B. Affective

Students will

1. Realize that all living things change as they grow.

2. Appreciate that although offsprings may be similar to parents, there are always differences in all individuals.

II. Thought Processes to Be Developed

Measuring - Selects and uses appropriate tools to make precise measurements.

Classifying - Orders a group of objects serially.

Predicting - Makes simple predictions based on evidence from observations of everyday occurrences.

Thinking Skill-Synthesis - Recognizes cause and effect.

III. Instructional Materials

Various seed types (lima, green, snow, etc.), growth medium, pots, etc. Pictures of your students when younger (ask parents). Pictures of parent and young animals (Ranger Rick, World, etc.).

References:

What Made You You?, Bendick, Jean.

Hooray For Me, Charlip, Remy.

When Animals Are Babies, Schwartz, Charles.

All Kinds of Babies, Selsom, Millicent.

IV. Content

All living things grow. All living things reproduce their own kind. Different living things reproduce in different ways (seeds, spores, egg cases, eggs, placental, etc.). Young living things don't always look like adult living things. Hence different requirements. (include

care of young.) Time changes all things especially living things.

V. Questions to be Considered by Students

A. Why do living things reproduce?

B. How do living things change from infancy to adulthood?

C. How and why do some living things care for their young?

D. What living things care for their young?

E. What living things do not care for their young?

VI, Activities and Strategies

A. Student

1. Collect pictures of baby animals and their mothers. Discuss how they are alike and how they are different.

2. Plant some seeds and watch them grow. Does the young seedling look like the adult plant in the seed package? Bring some of your baby pictures from home. Do you look like you did when you were a baby? Ask your parents for some of their pictures. Do they still look the same? Look at pictures of baby animals. Do baby animals always look like their parents? Explain.

3. Discuss pets. Have they changed as they grew older? If anyone has a mother cat or dog with babies, make arrangements for them to be brought to school. Discuss how the baby animals resemble their mother. If it is not possible to bring animals, use pictures of animal "families."

4. Examine different kinds of vegetable seeds and compare (size, shape, color, texture). Plant them in small containers (put a few seeds of each in plastic bags. Attach to container). Observe daily. Discuss how they change. Compare different types of seedlings with seeds they came from.

B. Teacher

1. Have each child bring in a baby picture of himself with names on them. Talk about how each child has changed. Discuss how they resemble their parents. Have each child find out how long he was and how much he weighed. Let children measure and weigh and compare. Have them predict how tall they will be when they are grown. Draw pictures showing themselves as babies, as they are now and how they will be when grown.

2. Find filmstrips and films showing birds or chickens hatching from eggs. Do they look like their parents when they are born? Later?

3. Try to find some frog eggs (February-April is the best time) or order from a biological supply firm. Observe them daily. Look for tadpoles. When tadpoles grow legs, be sure they have a way to emerge from water as they make further changes.

C. Enrichment Suggestions (optional)

Bring in family pictures. Discuss characteristics of the family members. Who looks like whom?

VII. Evaluation

A. Pretend you are a baby chicken. Show how you were born.

B. Draw pictures to illustrate how animals change as they grow.

C. Do living things continue to grow as long as they live?

D. Make a poster mural showing full grown plants and the seeds they came from.

Title: Classification

Target Group: Primary

I. Student Objectives

A. Cognitive

Students will

1. Explain why classification of objects is necessary.

2. Invent ways to classify objects.

3. Describe characteristics of living things.

4. Generalize that all living things are different.

B. Affective

Students will

1. Demonstrate a need for classification.

2. Demonstrate an awareness of similarities and differences in animals.

II. Thought Processes to Be Developed

A. Convergent Thinking

B. Divergent Thinking

C. Categorizing

III. Instructional Materials

Telephone book, roll book, catalogue

Cut outs of different colors, sizes, shapes and textures

Laminated pictures of all kinds of living things and/or words

Animals

IV. Content

Things are classified by common characteristics: ordering or classifying objects makes identification easier. There are many ways to classify the same things. Things can be placed in alphabetical order or ordered by size, weight, height, color, shape, covering, food, environment, composition or texture.

V. Questions to Be Considered by Students

Why is it necessary to classify things? How do we classify objects? What are some different characteristics used to classify things? How can we make order out of chaos?

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VI. Activities and Strategies

A. Student

1. Given various cut outs, arrange them in groups based on similar characteristics. (Students will group by size, color, shape, texture. All systems are correct.)

2. Classify all objects and organisms in an aquarium into two groups. Continue to do this with each group until every object is in an individual group of one.

3. Given animal pictures, group them based on similarity of characteristics. Discuss on the basis of what characteristics you grouped them.

4. Do research to determine characteristics of various classes of animals.

B. Teacher

1. Discuss the terms characteristics and classification. How do students use classification daily? Discuss the concept.

2. Discuss uniqueness of individual organisms. Include the human organism.

C. Enrichment Suggestions

1. Keep a journal of animals seen on the school yard. Don't forget "wee" animals under rocks, in webs, on branches or underneath leaves of plants.

2. Classify all living things seen in school yard over the course of one week.

3. Build a diorama or draw a mural showing known classes of animals. Make drawing environmentally correct. Show habitat, food sources, water sources, etc.

VII. Evaluation

Given a set of objects, develop a classification system.

III. Instructional Materials

A. Laminated pictures of living things - cull from:

1. Ranger Rick

2. National Wildlife

3. International Wildlife

4. World

5. Your Own Backyard

6. Audubon magazines

B. Source books - R.T. Peterson Field Guide Series, Golden Nature Series.

C. Hand lens, sugar cube, felt, marble, rock, etc.

D. Blindfold, earplugs, gloves, nose clip

IV. Content

The students generalize that living things must control their environment, become adjusted to it, move, or perish. All animals, including human beings, are able to interpret their environment through the use of their senses.

V. Questions to Be Considered by Students

A. Why do people have 5 senses? How are the senses used?

B. Do all living things have 5 senses?

C. Do all living things use all 5 senses equally?

D. What information do our senses convey?

E. What do people do when they loose a sense? What do animals do?

VI. Activities and Strategies

A. Student

1. Given a variety of objects, describe objects using all 5 senses. Use quantitative terms in the description.

2. Block a sense - then describe objects. Use blindfolds, ear plugs, nose pinchers. Wear gloves. Experience changes in perception when senses are handicapped.

3. Play "What's my object?". Describe something until someone guesses it.

III. Instructional Materials

A. Laminated pictures of living things - cull from:

1. Ranger Rick

2. National Wildlife

3. International Wildlife

4. World

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2. Block a sense - then describe objects. Use blindfolds, ear plugs, nose pinchers. Wear gloves. Experience changes in perception when senses are handicapped.

3. Play "What's my object?". Describe something until someone guesses it.

4. Catch some living things in the school yard (insects, worms, etc.). Observe their reactions when placed in different environments. Vary color, temperature, light, etc. Describe reactions and make inferences as to why different organisms react as they do.

5. Name objects that these words describe:

a. crunchy
b. scary
c. loud
d. soft
e. high
f. low
g. screechy
h. squeaky
i. thud
j. splash

6. Use any three of the following words to describe an object:

a. warm
b. hot
c. cold
d. soft
e. hard
f. rough
g. smooth
h. slippery
i. sticky
j. gritty

7. Make a treasure hunt walk outside. Find objects that are soft, hard, slippery, rough, smooth, crisp, warm, cold.

B. Teacher

1. Discuss: We must be very careful about things we taste and smell.

2. Discuss the word "sense". Discuss the extention of senses using special instruments such as thermometer, microscopes, hearing aids, etc.

3. Discuss observing as the basis for all science investigations. Emphasize using all 5 senses to observe.

4. All persons do not like the same things. Discuss "why I like" or "do not like" something.

C. Enrichment Suggestions (optional)

Keep a journal. Note daily temperature, weather conditions, time and place. Note observations and senses used to make observations.

VII. Evaluation

A. Make displays to help hearing or visually impaired understand a concept.

B. Draw pictures of animals that use 1 sense above all others. (Example - Dogs use sense of smell more than sight.) Include with drawing a story explaining use of senses by that animal and what the animal's life would be without that sense.

C. Make gelatin in class. Describe gelatin as a powder, liquid and solid using all senses.

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Title: The Matter of Relationships

Target Group: Primary

I. Student Objectives

A. Cognitive

Students will

1. Demonstrate and describe how liquids take the shape of the container which holds them, can be poured and will flow down an incline.

2. Demonstrate and describe that solids have a definite shape, do not pour and do not flow down an incline.

3. Develop a scientific vocabulary which will enable the student to describe some of the properties of matter.

   i.e.: solid, liquid, gas, heavy, light, texture, shape, size, color

4. Describe how liquids interact with different kinds of substances.

5. Predict how liquids will interact with other substances.

6. Test predictions of possible interaction between substances.

B. Affective

Student will

Become more aware of the way substances interact with each other.

Appreciate characteristics of substances that can make them useful to us.

II. Thought

Thinking Skill - Divergent Thinking - Uses inquiry approach to determine conclusions.

Thinking Skill - Analysis - Supports opinion with fact.

Communicating - Orders events serially and records data in graphic form.

Classifying - Groups objects on the basis of observed likenesses and differences.

Constructing and Using Models and Equipment - Uses equipment to perform basic process - observing, measuring. Selects suitable equipment for testing ideas.

Using Working Definitions - Distinguishes between a general and a working definition.

Experimenting - Performs simple short-term activities to answer some questions. Manipulates objects or equipment, or changes position to obtain different perspectives for observations. Helps to design and conduct simple investigations to answer questions or verify an inference or prediction.

III. Instructional Material

Books

American Book Company. Matter and Change from Science: Formulating Ideas.

Buear, Walter. Oil: Today's Black Magic, William Morrow and Company.

Houghton Mifflin. Science, Level A, Unit 2 - Exploring Matter.

Kettlelamp, L. Spinning Tops, William Morrow and Company.

Russell, Solveig. Wonderful Stuff! The Story of Clay, Rand McNally and Company.

Available Textbooks

School Library Books

Filmstrips

Chemical Change, Filmstrip House, Inc.

Finding Our How Things Change, Society for Visual Eduction, Inc.

Films

Chemical Changes All About Us, Cornet Instructional Films.

Materials

Foil pie pans
Containers
Liquids (salad oil, soap, syrup, molasses, etc.)
"Silly Putty" (silicone putty)
Hammer
Pyrex beakers
Small bottles/containers of different shapes and sizes

Many kinds of materials cut in 5 cm squares
Eye droppers and paper plates
Small paper cups
Liquids - liquid detergent, water, mineral oil, syrups, etc.
Food coloring
Baking powder or soda
Any kind of "kitchen chemicals" students want to use in exploring

IV. Content

Find out how the properties of a substance affect its interaction with other substances.

V. Questions to Be Considered by Students

A. What are the properties of a liquid?

B. What are the properties of a solid?

C. What are the properties of a gas?

D. How do we use the property of absorption or non-absorption of materials?

VI. Activities and Strategies

A. Student

1. Solid or Liquid?

a. Roll "Silly Putty" into a ball and drop it on the floor. What happened?

b. Roll into a "snake" and pull sharply on each end. What happens? Roll it up again and pull ends slowly. Does the same thing happen?

c. Roll a small piece into a ball and hit it hard with a hammer. (Solid or liquid? Have you decided?) Do this with other substances. How do they react differently?

d. Place ball of "Silly Putty" into a small box and let it stay there for ten minutes. Did it change shape?

e. Lay putty on an incline and mark the front edge of the putty mass. Check putty in 15 minutes. Has it moved?

f. Using three beakers, place into one a small ball of "Silly Putty" - in another a small wooden block. Pour water into the third. Check beakers in five minutes. What do you observe? What happened?

2. Let's See How "Things" Behave!

a. Let's see what happens to objects when they are dropped (outside activity). Observe large trays containing whole pieces of chalk, rubber erasers, candy suckers, bottle corks, containers filled with sand, water, sugar,

and potting soil. Other trays might include slice of bread, whole saltine crackers, a tennis ball, or a plastic practice golf ball.

Objects may be dropped singly. Select object to drop. Then after observing the results, discuss the following:

What did it look like?
What does it look like?
Can you describe what has happened?

"Experiment" - different heights - different surfaces

NOTE: Concepts developed as a result of these experiences:

1. Dropped objects bounce, break, spread out, build up a pile, fall flat, turn over, or don't break.

2. Similar objects act in similar ways when dropped (sand, salt, soil, sugar).

3. Different objects make different sounds when dropped.

4. Rugs prevent some objects from breaking.

5. The greater the height from which object is dropped, the more easily the object tends to break and to break into more pieces.

6. Objects with similar properties act in similar ways. Classify actions of liquid and ~~solids~~

3. Review the term matter - collect objects such as: billfold, erasers, plastic spoon, emery board, metal spoon, wristwatch, pencil. Using the following chart, name the kind of matter and describe the properties. Be sure to describe the kind of matter, not the object.

Examples:

Name of Object	Kind of Matter	Properties
pencil	rubber	reddish, dull, opaque
	metal	gold, shiny, opaque
	paint	yellow, shiny, opaque
	wood	tan, dull, grain, opaque
	lead, graphite	black, shiny, opaque
eraser	rubber	pink, dull, smooth, opaque

B. Teacher

1. Teacher preparation: Cut small squares (about 5 cm^2), of various kinds of papers and fabrics - wax paper, paper toweling, cotton, wood, nylon, "baggie paper", aluminum foil, etc., so that every child can choose several. Each child should have an eye dropper and a cup of water and a paper plate.

   Activity:

   1. Choose some material squares. Place on individual paper plate.
   2. Using the eyedropper, place drops of water on each kind of material. (Some students need to practice using the droppers.)
   3. Allow some exploring time. Then ask pertinent questions if needed. What happened to the drop on wax paper? On wool?
   4. Record descriptions on board. Use childrens' words.
   5. Make a chart to show materials and how water reacts with them.

2. Find some other different but similar materials. Allow students to find some. Tell what material previously tested they are most like. Why? How do you think water drops will act on these? Why? Test your prediction. Cut out squares and find out. This would be a good learning center activity after the first activity has been initiated.

3. Now let's change the liquid! What will happen? Find out. Use detergent, mineral oil, alcohol, corn syrup, etc. Compare with the way water acts. (These new liquids may be introduced one at a time on separate days.)

4. Put wax paper and other translucent paper over newspaper. Drop drops of water. What happens? Why do you think the drop magnifies? Do the drops magnify on all materials? Try this with other liquids? make a chart to show results.

5. Use small clean medicine vials, olive jars and other slender bottles. (Take less liquid.)

Using a small funnel or a dropper, add a small amount of mineral oil to the container. Now slowly add a small amount of water. What happened? Which do you think is heavier, water or oil? Why?

6. Add other liquids together.

a. All of these are clear but will layer - oil, water, white syrup.

b. Try adding a drop of food coloring.

c. Try vinegar, detergent, hand lotion - any liquids children want to try. Some will mix together. Others will "layer".

7. Explore: Add a pinch of soda or baking powder to your "flow" bottles; different kinds of food color, wood chips, small marbles, peas or beans, etc.

Put tops on them. Turn them upside down. Allow to settle. Shake them. Allow to settle.

C. Enrichment Activities

1. Test properties of solids - Design a demonstration to be shared with the class which will illustrate the three properties of solid matter.

2. Test properties of liquids and solids - Using various materials, have students demonstrate and describe the properties of liquids and solids. (Post properties and teach needed vocabulary words as activities are shared.)

VII. Evaluation

A. Observe and Record - Write three sentences about what happens to "Silly Putty" when dropped, pulled sharply or slowly and place your recorded observations in your science notebook.

B. Student chooses an object or material available for dropping.

1. Hypothesize about what will happen to dropped object.

2. Illustrate through movement what happened.

3. Using an expanding vocabulary, describe what was observed.

(Teacher evaluates achievement of the checklist objective and marks students' progress.)

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C. Make word charts.

Material	Description
Wax paper	Slippery, see through, etc.
Oil	

D. Fill several beakers with different kinds of clear liquid. (Examples, water, rubbing alcohol, sprite, or 7-up, ½ rubbing alcohol, ½ sprite) Drop an ice cube in each container (be sure you have marked each container). Observe differences and similarities. Attempt to draw conclusions on the results. Try with moth balls. What other materials could be combined to produce these effects?

Title: The Earth in Regions

Target Group: Primary

I. Student Objectives

A. Cognitive

Students will:

1. Locate general areas of rain forests, evergreen forests, deserts and grasslands on a globe.

2. Compare the four kinds of regions as to climate and plants and animals.

B. Affective

Students will

1. Develop an appreciation of the beauty and orderliness of nature.

2. Develop a respect for the laws of nature.

II. Thought Processes to Be Developed

Categorizing - Groups objects, people or events on the basis of common characteristics.

Communicating - Creates methods of non-verbal communication.

Constructing and Using Models - Develops three dimensional models.

Questioning and Hypothesizing - Selects observations which assist in answering questions.

III. Instructional Materials

Books:

Caldwell. Our Neighbors in Africa, Putnam.

Collins. Forest and Woodland, Creative Education.

Disney. Vanishing Prairie, Golden Press.

Goetz. Deserts, Morrow.

Kane. The Tale of A Wood, Knopf.

Morrow. See Up the Mountain, Harper.

Perkins. I Saw You From Afar, Atheneum.

Podenford. True Book of Jungles, Ch. Pr.

Posin. Man and the Desert, Lyons.

Posin. Man and the Jungle, Lyons.

Possell. True Book of Deserts, Ch. Pr.

Selsam. See Through the Jungle, Harper.

Shannon. Desert Dwellers, Whitman.

Sperry. All About the Jungle, Random.

Sutton. How and Why Wonder Book of Deserts, Grossett.

Werner. Living Desert, Golden Press.

Films:

Homes Around the World, Coronet, 11 minutes, color.

Lands and Waters of Our Earth, Coronet, 11 minutes, black and white.

Life in An Oasis, Coronet, color, 11 minutes.

Life in Grasslands, Coronet, color, 11 minutes.

Life in Hot Rain Forests, Coronet, color, 14 minutes.

Life in the Desert, EBF, color, 11 minutes.

Life in the Forest, EBF, color, 11 minutes.

Shelter, EBF, black and white, 11 minutes.

IV. Content

The student will be able to compare the regions of the earth to describe similarities and differences.

V. Questions to Be Considered by Students

What is the climate like in the different regions on the earth?

How much rainfall occurs in the different regions on the earth?

What animals live in the different regions on the earth?

What plants grow in the different regions on the earth?

What are the advantages and disadvantages to living things in different regions on the earth?

VI. Activities and Strategies

A. Student Activities

1. Make a model of the earth. You can use flour, water and fine sawdust. For each cup of flour you will need two cups of water. Add the flour slowly to the water, stirring as you do. Stir and heat the mixture until it is clear and thick. Allow the mixture to cool. Then sift the fine sawdust into it to make modeling paste stiff enough to hold its shape. Begin by making a ball just large enough to hold its shape. As the ball becomes hard, add another layer. Continue adding layers until the model is as large as you want it to be. Locate the east-west belt of rain forests on the globe. Locate and delineate the equator, north and south poles, and Northern and Southern Hemispheres.

2. Take the surface temperature of the ground beneath an evergreen tree, beneath an oak tree, and in the full sun. Compare the readings. As an independent activity, measure and record the surface temperatures of at least 5 additional locations. Then as a group record on a class chart the results. Discuss the findings. Use the following chart:

Location	Time/Day	Temperature

3. Locate the regions of evergreen forests on the globe you made.

4. Get two pans of soil. Cover the soil in one pan with a thick layer of leaves. Pour the same amount of water over each of the pans. Make the soil wet. After two days, observe the soil. Is this similar to soil in an evergreen forest?

5. Talk about why many of the animals in an evergreen forest have fur.

6. Find lichens growing on trees and rocks. Examine them with a magnifying glass.

7. Using a ball or globe, trace or draw east-west and north-south belts of varying widths.

   Using a ball or globe, trace or draw the equator and designate the North Pole and the South Pole. Then trace the belt in which the rain forests are included.

8. Identify the continents and determine which three continents have the largest total rain forest area.

9. In order to gain an understanding of the size of plants in a rain forest, mark off 65 meters on the playground and discuss the fact that some trees are this tall in a rain forest.

10. Make a bulletin board chart comparing a rain forest with an evergreen forest. Compare temperature, rainfall, plant and animal life, and soil.

11. Using a ball or a globe, trace or draw the equator. Then trace or draw the two belts where the deserts are included.

12. Draw the desert regions on the globe you made.

13. Get a large jar of water. Use a ruler to measure ten inches of rain fall per year. Have students locate on the globe several desert regions.

14. Find out in which desert the camel lives. Why is it such a useful animal?

15. Why are there fewer kinds of plants and animals in the desert than in the rain forest?

16. Collect samples of soil from the areas surrounding the school. Put each sample in a container and label each as to the type of location from which the sample was taken. Also, indicate on the label whether the plant life where the sample was taken was plentiful or scant. Try to decide if there is a relationship between soil color and soil richness.

17. Using a ball or globe, trace or draw the equator. Then trace or draw the grassland belts.

18. Color the grassland regions on the globe you made.

19. How do most of the animals of the grassland get their food? What ways of protecting themselves do the animals of the grassland have? What kinds of food do they eat? Could they survive in another region? Why or why not?

B. Teacher

1. Begin unit by explaining:

The earth's land surface is made up of different regions. Using a globe, locate the following:

a. The rain forests are found in an east-west belt around the earth along the equator.

b. The evergreen forest regions are found in an east-west belt which goes around the earth in the Northern Hemisphere.

c. Deserts are found in two east-west belts which go around the earth and are on opposite sides of the equator.

d. Most of the grasslands are found in a few east-west belts, each of which goes around the earth and is between a forest belt and a desert belt.

2. Tell students to find out about each region:

a. What is the climate like?

b. How much rainfall?

c. What animals live there?

d. What plants grow there?

e. What are its advantages and disadvantages?

Teacher Background:

Rain Forest:

The tropical rain forest regions of the earth form the most abundant woodlands.

In the rain forests, the weather is warm all year.

The rainfall is heavy and there are many trees

in a rain forest.

The number of climbing plants is very large.

There are many kinds of animals in a rain forest.

The soil is damp and poor.

Evergreen Forest:

In an evergreen forest the spring and summer are cool, and the winter is very cold.

Most of the trees in an evergreen forest are evergreen trees with needle-like leaves.

In the areas of long, cold, dry winters and short, cool summers, the trees are small.

On the shaded forest floor, few plants grow.

There are many kinds of animals, especially animals with heavy fur.

Birds and insects are also common, especially during the warmer months.

In an evergreen forest the soil is covered by a blanket of needlelike leaves.

The soil is damp and poor.

Desert Areas:

A desert is a region having less than ten inches of rain a year.

In a desert the days are hot and nights are cold.

Even the driest of deserts receives an occasional rain.

Most deserts have a spring or well. This spot is called an oasis.

The plants are small, close to the ground, and widely scattered.

Many kinds of animals live in the desert, but most are small and move only by night.

Desert plants and animals have special ways of getting water.

Grasslands:

In a grassland the warm seasons are mild and rather dry, while the cold seasons may be cold, windy and snowy.

The plants of the grassland are mostly grasses.

Some trees may be found in the wetter areas.

Many kinds of plants can be found.

Most animals which live in grasslands and other open spaces can run very rapidly.

The soil is dark and rich.

Because of the rich soil, people use much of grassland area as farmland.

Most of the grasslands are found in a few east-west belts, each of which goes around the earth and is between a forest belt and desert belt.

A large part of the central United States is covered by grasslands.

VII. Evaluation

A. Unit

1. Were the objectives met?

2. Did the unit accomplish what it was designed to do?

3. Did the students enjoy the lessons/activities?

4. In what way(s) does the unit need to be changed?

B. Student

1. Can the students apply the concepts to which they have been exposed?

2. Have the students explain how a rain forest is different from a forest he/she knows about.

3. Let each child write a few paragraphs telling why he/she would prefer to live in either a desert, a grassland, a rain forest or an evergreen forest. Why? Does everyone agree? Why?

4. Give a program about the regions of the earth. Divide the class into groups. Let each group write and perform a short play about one region.

5. Have the students investigate the region in which they live to determine climate, plant and animal life. Which of the previously studied regions most nearly describes it?

Title: Planets on the Move

Target Group: Primary

I. Student Objectives

A. Cognitive

Students will:

1. Describe the motion of the moon as an orbital path.

2. Draw a diagram of the earth-moon orbital system.

3. Construct a model of the earth-moon system.

4. Construct a solar system model and identify planets and moons.

5. Identify the orbital paths of the planets and moons.

6. Explain that the moons and planets maintain their orbits and that their number does not change with time.

B. Affective

Students will:

1. Develop an understanding of the solar system's effects on our lives.

2. Develop an appreciation of the beauty and orderliness of nature.

II. Thought Processes to Be Developed

Convergent Thinking - Arrives at one pattern out of diverse elements.

Synthesis - Recognizes and identifies relationships among a variety of ideas.

Gathering and Interpreting Data - Explains observations.

Experimenting - Performs simple activities to answer questions logically.

III. Instructional Materials

Books:

Astronomy, (Examining Your Environment Series), Minneapolis, Mn.: Winston-Press.

Daytime Astronomy, N.Y.: McGraw-Hill Book Co.

Gardner. Space Puzzles: Curious Questions and Answers about the Solar System, N.Y.: Simon and Schuster.

Jobb. The Night Sky Book (An Everyday Guide to Every Night), Boston: Little, Brown and Company.

Slote. The Moon in Fact and Fancy, Cleveland: World Publishing Company.

Utgard. Sourcebook for Earth Science and Astronomy, N.Y.: The MacMillan Company.

Weber. Solar Safari, Incentive Publications (IP 59-5).

Where Is The Moon?, N.Y.: McGraw-Hill Book Company.

APS Planetarium Guide: Introducing the Night Sky.

Films:

Solar System, International Film Bureau, color, 21 minutes.

What Do We See In The Sky, Coronet, color, 11 minutes.

Supplies:

Earth-moon model, moveable to show orbit.

Rubber or styrofoam balls in the size ratio 4:2 and others of various sizes to represent planets, ranging in size from marbles to very large balloons.

A commercial orrery with moveable planets.

Bar magnets.

A one-meter string.

A rubber ball.

IV. Content

The student will be able to explain that the earth/moon system is one which does not change but which remains constant.

The student will be able to describe the sun, planets, and moons as a system and to show that the system, though moving, remains intact.

V. Questions to Be Considered by Students

What things in your life happen in cycles?

Do planets ever wander out in space and come dangerously close to the sun?

Do planets follow the same path around the sun each year? Why?

How many planets will the solar system have next year? How many moons will the earth have next year?

VI. Activities and Strategies

A. Students

1. Demonstrate the motion which an object in circular orbit assumes when the central force is removed:

   Attach a one-meter string to a rubber ball. Weaken the string by cutting it almost, but not quite, in two. Whirl the ball around your head. When the string breaks, watch the direction the ball takes. (It does not go away from the center of the circle, but along a line which is tangent to the circle.)

2. Place a lighted candle or electric lamp on a table in a dark room. Use a white ball (8cm.) or secure a ball and paint it white. Hold the ball in your hand at arm's length with back to the light. Raise the ball above your head to allow the light to strike the ball. Note the part of the ball that is illuminated by the candle (lamp). This represents the full moon - Turn slowly from right to left keeping the ball in front of you and above your head. Observe the change in shape of the illuminated part of the ball as you make one complete turn. Do you see the various phases of the moon? Repeat the turning but stop at each one eighth (1/8) turn and have someone else draw the shape of the moon (ball) as illuminated.

3. Construct a model of the earth-moon system using modeling clay, flannel cut-outs, or styrofoam balls and move the moon in its orbital path around the earth.

B. Teacher

1. During a class discussion ask the following questions:

   Did you see the moon last night? Where was it? What did it look like? Will it look the same tomorrow night? Next week? Are there times when you can't see the moon at all? When? Why? Have you ever seen it in the daytime? Why? Does the moon really change shape?

2. Draw an elliptical path on the floor representing the orbit of the moon around the earth. One child holds earth globe at the earth position while second child, holding moon globe, walks around orbit.

   Visit the planetarium where earth and moon are described and moon is seen "orbiting the earth about once a month."

3. Using a orrery or solar system model, show that the system consists of sun and planets which are held in their orbital paths by the force of gravity.

   To visualize the attractive force of gravity, demonstrate magnetic force, being careful to explain that they are different forces but similar. (Use simple bar magnets.)

4. Demonstrate the fact that planets (and moons) have two basic motions, one motion in a straight line in space and another motion (caused by gravity) toward the sun: Place two erasers on a table near the edge. Bump them with a ruler in such a way that one just drops straight down to the floor while the other goes out several feet from the table.

   The motion of the eraser which drops straight down depicts the motion caused by the gravity of the sun pulling the planet straight toward the sun.

   The motion of the eraser which goes out away from the table is the direction the planet is trying to follow - that is, in a line which is horizontal, and parallel to the floor.

   The result of these two straight-line motions is the orbital motion of the planet.

5. Conduct a study of the definition of the word "system" and try to show how the meaning relates to the sun and planets.

6. Collect the following 10 items: 1 fresh green pea, 1 walnut, 1 slightly larger walnut, 1 dried pea (the kind you plant), 1 bean, 1 slightly smaller bean, 1 9" cabbage, 1 8" cabbage, 1 big orange, 1 grapefruit. Through a guided lesson, have the students investigate to find out which planet would be represented by which object according to size. Then have the students place the items in the order in which they would be found in the solar system. (Emphasize - these are only representative not in proportion to actual sizes as the planets relate to each other.

VII. Evaluation

A. Unit

1. Were the objectives met?

2. Did the unit accomplish what it was designed to do?

3. Did the students enjoy the lessons/activities?

4. In what way(s) does the unit need to be changed?

B. Student

1. Have the students draw and label the planets in the order that they revolve around the sun.

2. On a sheet of paper with the earth and moon labeled, ask student to draw the path of the moon.

3. With one child labeled "earth" ask a second child, the "moon" to walk around the earth in orbit.

4. Have the students participate in a group discussion of the following questions, the concepts of which should have been developed through the unit.

Ask if the planets ever come near each other or if they sometimes wander far out in space and then return again, sometimes dangerously close to the sun. (No.) Do they follow the same relative path around the sun each year? (Yes.) Why?

Ask how many planets will the solar system have next year? How many moons do you think the earth will have next year? Does the sun's "family" always have the same members? (Yes.)

5. Lead a discussion with the children about how the sun affects our planet earth. Include these points:

a. The sun is needed so that plants can manufacture food.

b. When food is manufactured, plants give off oxygen needed by all living things.

c. Animals eat the food made by plants. Other animals eat the animals that eat plants.

d. The sun is needed for light and heat. Help the students arrive at these conclusions on their own.

Title: "Weather" - Ready or Not

Target Group: Primary

I. Student Objectives

A. Cognitive

Students will:

1. Discuss changes in cloud formations.

2. Relate changes in clothing and activities to changes in weather.

3. Describe the water cycle.

4. Gather and record data from weather forecasts, predictions, and resulting statistics, then compare and contrast them and evaluate for accuracy.

B. Affective

Students will:

1. Develop an understanding of the role of weather in our daily lives.

2. Develop an understanding of how predictions can be made on the basis of past experiences.

II. Thought Processes to Be Developed

Synthesis - Recognizes and identifies relationships among a variety of ideas.

Observation - Uses instruments to extend senses.

Inference - Makes inferences about everyday experiences.

Gathering and Interpreting Data - Selects data useful to answer questions.

III. Instructional Materials

Books:

Bachert. Outdoor Education Equipment, Danville, Illinois: Interstate Printers and Publishers.

Blough. Not Only For Ducks: The Story of Rain.

Branley. Rain and Hail.

Lowery. The Everyday Science Sourcebook, Allyn and Bacon.

Stone. The Winds of Weather, Englewood Cliffs, N.J.: Prentice Hall Educational Book Division.

Tresselt. Hide and Seek Fog.

Tresselt. Rain Drop Splash.

Tresselt. White Snow, Bright Snow.

Zolotow. The Storm Book.

Mini-Climates (Examining Your Environment), Minneapolis, Mn.: Winston Press.

Materials:

Chalkboard Weather Map of U.S., Instructo Corp, Paoli, Pa. 19391 ($7.95).

Films:

Above the Horizon, Universal Education, 21 minutes, color.

Clouds: A First Film, Film Associates, 10 minutes, color.

Deserts, Gateway, 10 minutes, black and white.

Formation of Raindrops, Universal Education, 26 minutes, color.

How Weather Helps Us, Coronet, 11 minutes, black and white.

Wind at Work, Dowling, 11 minutes, color.

Wind: A First Film, Film Associates, 9 minutes, color.

My World-Water, Churchill, color, 11 minutes.

IV. Content

Weather is the result of changing conditions in the atmosphere.

The student will be exposed to a weather bureau, weather forecaster, methods of gathering data and reporting results and will be able to explain the events and procedures followed.

V. Questions to Be Considered by Students

What do you wear and how do you feel at different times of the year?

What causes changes in weather?

What kinds of things do you do in different seasons?

Why do you wear different kinds of clothes?

Where does the water go after the rainfall?

Why do you need to know about the weather?

How can you find out about the weather?

VI. Activities and Strategies

A. Students

Listen, watch or read weather forecasts on TV, radio or newspaper on a daily basis for a week or two week period. Bring the forecasts and previous day's statistics to class daily and record them on a class chart. At the end of the week/two week period compare the forecasts with the resulting statistics to determine how often they were correct.

2. Keep a record of the temperatures with an outdoor thermometer. Take the temperature reading at the same time(s) every day for a month (9:00 a.m., 11:00 a.m., 2:00 p.m.). Record results on a chart. Make a graph showing your results. Figure the average temperature for each time of day for the monthly period. Repeat this activity during the fall, winter and spring and compare the results.

3. Make a water cycle inside a transparent plastic container. Place the lid upside down on a table and inside the lid fit some well-watered pieces of green turf. Move your "miniature greenhouse" to a sunny spot. Heat will cause water inside the container to evaporate. Some water will condense to drops of water and may fall as "rain". Lead a directed-discussion with the children regarding their observations and ask them what happened and why do they think it happened.

B. Teacher

1. Take the children outside and allow them to lie down in a circle and observe clouds. Ask each child to tell about what he sees. Some may see "big and little clouds"; others may see "funny shaped clouds" or "clouds that look like circles." Some clouds may look heavy and dark, while others may look light and fluffy. Concentrate on encouraging observations that focus on shape, size, and color; thereby preparing the children to recognize the three basic cloud forms.

2. Keep a record of the types of clouds seen over a week's time. Discuss the kind(s) of weather experienced during that week.

3. In the process of this activity, teach the children the appropriate vocabulary terms: nimbus, cumulus, cirrus.

4. Discuss: People can predict what the weather will be like by observing conditions around them. (Cloud changes, wind, temperature changes and barometric reports.

5. Ask the children what they wear and how they feel at different times of the year. What kinds of things do you do in different seasons? Why do you wear different kinds of clothes? Use vocabulary cool, cold, warm, hot, rainy, stormy, windy, icy, etc.

6. Discuss in simple terms the importance of the Weather Bureau (saving lives, property, etc.) Discuss, also, the many ways we review reports of the weather; by radio, television and newspaper.

7. Plan a visit to a weather bureau where the children can see various types of weather instruments and can learn what each is used for.

8. Invite a "weatherman" to visit the classroom to discuss how he predicts the weather.

9. As a class, make your own weather instruments. Mini-Climates and Outdoor Education Equipment have excellent, clear directions for rain gauges, barometers and other instruments. Make a wind vane and place an outdoor thermometer near.

C. Enrichment Activities

1. Display a large picture or series of pictures showing the various phases of the water cycle; the evaporation of water from oceans, lakes, rivers, streams, plants, etc. Show also the condensation of this vapor into clouds, the falling rain, the drainage of water back to the oceans. Have the children discuss the pictures. Encourage them to label those phases that they know about.

2. Discuss what life would be like if there were no change of seasons. Have each child select a season and write a story about life with no season changes. Share stories with the class. Are there places in the world like each of these? Would the children themselves like to live in such a place? Why? Why not? Would you be able to find people who would choose each of the seasons?

VII. Evaluation

A. Unit

1. Were the objectives met?

2. Did the unit accomplish what it was designed to do?

3. Did the students enjoy the lessons/activities?

4. In what way(s) does the unit need to be changed?

B. Student

1. Can the students apply the concepts to which they have been exposed?

2. Evaluate student interest and enthusiasm as evidenced through analyzing student work.

Title: It's All on the Surface

Target Group: Primary

I. Student Objectives

A. Cognitive

Students will:

1. Identify natural factors that change the earth's surface.

2. Discuss how sandstone rock is formed.

3. Distinguish between different kinds of sediment.

4. Discuss how limestone is formed.

5. Name and give the characteristics of three different classifications of rocks (igneous, sedimentary and metamorphic).

B. Affective

Students will:

1. Develop an appreciation of the beauty and orderliness of nature.

II. Thought Processes to Be Developed

Inductive Reasoning - Draws inferences and makes generalizations from evidence collected.

Creative Thinking - Predicts logical conclusion based on initial information.

Inference - Makes inferences about everyday experiences. Develops inferences based on previous observations.

Communication - Describes an observation verbally or pictorially. Records observations according to a system developed for a specific problem and study.

Questioning and Hypothesizing - Selects observations which assist in answering questions.

Categorizing - Groups objects according to one characteristic. Groups objects on the basis of common characteristics. Classifies objects on the basis of results of experimental testing.

Constructing Models - Develops mental models from direct observation.

III. Instructional Materials

Books:

Bartlett. Rocks All Around, Coward.

Cramer. Soil, Follett, 1962.

Crosby. Jr. Science Book of Rock Collecting, Garrard.

DeVito. Creative Sciencing, Little, Brown and Company.

Gallob. City Rocks, City Blocks and the Moon, Charles Scribner's Sons.

Gilbert. Starting A Rock and Mineral Collection, Hammond.

Heavilon. The Beginning Knowledge Book of Rocks and Gems, MacMillan.

Parker. The Earth's Changing Surface, Harper and Row, 1967.

Ruchlis. Your Changing Earth, Harvey House, 1963.

Shuttleworth. The Story of Rocks, Doubleday.

Smithline. Answers about Rocks and Minerals, Grossett.

Sootin. The Experimenters' Workbook: Treasures of the Earth, W. W. Norton and Co.

Stone. Rocks and Rills, Prentice-Hall.

Syrochi. What Is A Rock? Benefic.

Wyler. Secrets in Stones, Scholastic Book Services.

Zim. Diamond, Morrow.

Films:

Erosion, Gateway, black and white, 9 minutes.

Glaciers, Gateway, black and white, 10 minutes.

Rocks, Gateway, black and white, 10 minutes.

Rocks and Minerals, Film Associates, color, 10 minutes.

Rocks for Beginners, Johnson-Hunt, color, 16 minutes.

Rocks That Form on the Earth's Surface, EBF, color, 17 minutes.

Rocks That Originate Underground, EBF, color, 17 minutes.

Treasures of the Earth, Churchill, color, 11 minutes.

Wind, Imperial, color, 8 minutes.

Wind at Work, Dowling, color, 11 minutes.

IV. Content

Pressure, wind, temperature and water are constantly acting on the earth's surface.

Rock formation is cyclical.

Rocks can be classified according to their physical characteristics.

V. Questions to Be Considered by Students:

A. How do people cause changes in the earth's surface?

B. What might happen to rocks when there are extreme changes in temperature?

C. Is the inside of a rock like the outside? Why?

D. What are some differences between sandstone and limestone?

VI. Activities and Strategies

*Depending upon the age and developmental level of the student, the teacher may need to record observations/results from the experiments. Older students, especially 3rd level gifted students should be able to record their results on the chart from themselves. Whenever an activity is done independently be sure that a sharing time and discussion are included.

A. Student

1. Take a walk to collect rocks. Classify the rocks. (Let students classify as they wish - size, texture, shape, color, etc.)

2. Spread the rocks collected on the rock collecting walk on a newspaper. Pick up two of about the same size, one in each hand. Do they weigh about the same? Put some of the rocks in water. Do the same things happen to each? Take them out. Do some dry faster than others? Do some have layers? If you tap them with your pencil, do they break?

3. Wrap a rock in a cloth and break it with a hammer. Is

the inside of the rock like the outside? Use a magnifying glass to examine the rock.

4. Find out about three kinds of rocks. Igneous rocks are formed from hot molten rock. Study samples of igneous rock - granite, pumice, obsidian and basalt. Record observations:

Rock	Color	Smooth or Rough	Dull or Shiny	Grainy	Weight

5. Get some sticks of sealing wax or paraffin. Look at the sticks. Feel them. Warm the wax or paraffin in a pan on a hot plate. What happens? How is sealing wax like magma? (Melts and rehardens)

6. Find out how magma can push between layers of rocks. Take a partly used tube of toothpaste. Roll up the bottom of the tube. Predict what will happen to the toothpaste. Make a small hole in the side of the tube with a pin. Press on the tube. What happens? Make a cone from a sheet of paper. Place it over the open end of the toothpaste tube. Cut the point off the cone. Squeeze the tube. What happens? How does the toothpaste act like magma? Did your observation confirm or refute your prediction?

7. Find out if air and water can enter the rocks. Put each rock into a separate container of water. What happens? Do any of the rocks float?

8. Test the samples of rocks by putting a few drops of strong vinegar or dilute hydrochloric acid on them. What happens?

9. Demonstrate how lava flows out of the earth. Shake a bottle of soda pop. Open the bottle. Notice how the soda pop comes out of the bottle. Does it foam?

10. Select a piece of lava that has several large holes. Soak the rock in water for several hours. Push small seeds, such as radish, into the holes. Place lava in a plastic bag. Add one-half teaspoon of water. Tie the bag. Observe every few days. Do the seeds sprout?

11. Grow crystals. Boil a cup of water. Add a cup of sugar until no more will dissolve. Pour the sugar solution into a jar. Suspend a string from a pencil placed across the top of the jar. Let the string stay in the sugar solution

for several weeks. Do crystals form? What shape are the crystals? Alternate Method: Dissolve salt in warm water and follow the same procedure. Watch what happens in a few days as the water evaporates.

12. Observe the effects of cooling on crystal formation. Fill two test tubes about a quarter full with alum. Add just enough water to cover the alum. Heat one test tube so that the alum is dissolved. Hang a string inside the test tube so that one end is in the alum solution, and the other end extends over the lip of the test tube. Remove the test tube from the heat and place in ice water. Heat the second tube as the first, add a string and place in a beaker of hot water to allow to cool slowly. Compare crystals. Which are longer? Why?

13. Find out what happens when soil settles. Put two spoonfuls of sand, two spoonfuls of clay, and two spoonfuls of gravel in a jar. Fill the jar with water halfway to the top. Put a lid on the jar. Shake the jar well. Put the jar on a table. Watch what happens. Shake the jar and watch the materials settle three more times. Record the observations:

	FIRST TRIAL	SECOND TRIAL	THIRD TRIAL	FOURTH TRIAL
Materials which settled first				
Materials which settled second				
Materials which settled third				

Examine the sediments. Are they in layers? Which layer is on the bottom? Why? What would happen if we let the water evaporate? Try it.

14. Use a magnifying glass to examine sand. Notice the size, shape, and colors of the sand grains.

15. Put sand in a can with the top removed and a hole in the bottom. Do this with clay. Mix one-half clay and one-half sand and put it into another can. Pour water into the can and catch underneath. Time how long it takes for the water to run through. What kind of soil holds more water longer?

16. Examine three types of <u>sedimentary rock</u>: shale, sandstone, and limestone. How are they alike?

Weigh a piece of sandstone. Soak it in water overnight, allow it to dry and weigh it again. Is the weight the same? Why? (Pieces of sandstone are in the water.)

Drop a piece of sandstone into a glass of water. Are any bubbles seen rising from the sandstone? Drop another piece of sandstone into a glass of vinegar. Are any bubbles seen? Are there more or less bubbles? Do they keep rising for a longer time? Try limestone.

Make a sample of sandstone. Use two spoonfuls of modeling plaster and six spoonfuls of sand. Mix together. Add water and stir until the mixture is like paste. Pour into a small pan or paper cup and let harden.

17. Moisten some shale. Smell it. Try the same test on the other rocks. Are any of them shale? Make a sample of shale in the same way as sandstone was made in the previous activity. Use clay or mud instead of sand.

Put a lump of dry clay into a bowl of water. Leave it there for several hours. Now stir the clay. What happens to the clay? Why?

Get two pieces of broken clay flowerpots. Put the pieces in a bowl of water. Leave them there for several hours. Stir the water. How does the water look? Is the clay soft? Why? (Baked clay will not break up as easily as clay that has not been baked.)

18. Put some limestone into some cold boiled water. Observe. Pour some soda water into a glass container. Stir until there are no gas bubbles. Add a piece of limestone to the clear soda water. Wait about ten minutes and look at the limestone. What is happening? Why do you think it happened?

Test some rocks in your rock collection to see if they are limestone. Put a few drops of strong vinegar or lemon juice on each rock. What happens to rocks that contain calcium carbonate?

Scratch a piece of limestone with a penny. What happens? Is limestone hard or soft? Try scratching other rocks with a penny.

19. Find out what <u>metamorphic</u> means. (Relate word to changes in life cycle of butterflies and frogs.) Examples of metamorphic rock are quartzite, slate and marble.

Examine a piece of slate. Find the layers. Try to split the slate. Compare the slate with a piece of shale. Which is easier to split, shale or slate? Test both for hardness. Use a nail to scratch each. Does the nail scratch the shale? Does it scratch the slate?

Test a piece of quartzite for hardness. Use the nail. Does the nail scratch the quartzite? Compare the quartzite with a piece of sandstone. Which is easier to break? Does the nail scratch the sandstone?

20. Make a hardness scale for the quartzite, sandstone, slate, shale. Put the softest rock on top of the list.

Softest 1.
2.
3.
Hardest 4.

21. Dissolve some sugar into a cup of water. Take some of the sugar syrup and heat it gently so that it turns brown or caramel color. Compare the change to that undergone by certain rocks as they are changed by heat.

22. Scrape some marble dust together by using a file. Add a few drops of strong vinegar or weak hydrochloric acid. What happens? Try the acid on other metamorphic rocks (quartzite and slate).

23. Get a soft rock like sandstone or slate and a hard stone like granite or basalt. Put each rock on a sheet of white paper. Rub each rock with piece of sandpaper. Emphasize that sandpaper represents the wind (air) carrying soil or sand.

24. Fill a cake pan with soil. Put the pan in front of an electric fan. Turn on fan. Where does the soil go? How does this apply to earth? Notice soil on floor, furniture, window, etc.

25. Get some clear glass marbles. Observe closely. Are there any cracks in them? Set one marble aside. Heat the other marbles in a pan on a hot plate for about five minutes. Drop in cold water. Compare the differences. How are they different? What caused the differences? (Heat changes cause expansion and contraction, and break up areas of the earth's surface.)

26. Place sand or dirt in plastic containers. Pour water on soil. Observe. Have students prdict outcome before conducting experiment so as to compare results. Relate this to the earth's surface when it rains. Slant the containers. Repeat activity.

B. Teacher

1. With activity Number 13, discuss: Your layers are a model of river bottom.

Background:

Sediments carried by a river are deposited at the mouth of the river. The heaviest materials, such a gravel and pebbles, usually are dropped first. Sand is dropped next and the clays and silts are deposited farther from the mouth of the river.

The sediment drops to the bottom of the ocean. Layer after layer of sediment covers the ocean floor.

Each layer pushes down all the sediments below it. The weight is tremendous. After millions of years, the layers are squeezed into solid rock.

Such rocks are called sedimentary rocks. Since there are many kinds of sediments, there are many kinds of sedimentary rocks.

2. Teacher should lead a discussion including several of the following concepts:

   Limestone is a rock. Water, flowing over limestone, contains carbon dioxide and forms a substance which, over a long period of time, causes limestone to dissolve. In some places caves are formed.

   Dissolved limestone can be carried to the ocean. There it may be consumed by shell animals and converted into animal shells.

   Shells deposited at the bottom of the ocean can form great beds of calcium carbonate. Over millions of years, these beds harden into limestone.

   These beds of limestone may be raised up to form mountains of limestone. Minerals are changed and used over and over again. Nothing is lost.

3. Find out if the minerals dissolved in ocean water may affect the way solid materials settle. Shake mixtures of water, clay, sand, and gravel thoroughly. Let some of the children pour their mixture into a jar that is half full of tap water. Let the other children pour their mixture into a jar that is half full of salt water. Describe what happens. Let the mixtures stand for half an hour. Examine each again. Describe the differences that can be seen. Let the mixtures stand over night. Examine again the next day. Explain any differences that can be noticed.

4. Take a field trip around the school yard and community. Do you see evidence of forces at work to change the earth's surface? (Erosion, cracked sidewalks, weathering, people planting, digging, paving, bulldozing, etc.)

5. Field trip to Stone Mountain or a rock quarry to observe first-hand the effects of weather erosion.

6. Have students flatten three or four diffent colors of modeling clay. Pile different colors on top of each other to make layers. Push the layers from each end; now push until they crack. How do layers look? How hard do you have to push the clay to show the different folds?

   Discuss: The earth's surfaces are constantly pushing on each other. Sometimes the pressure causes "folding" in a weak spot.

C. Enrichment Suggestions:

1. Ask children to brainstorm the following questions:

   How do people cause changes in the earth's surface?

   What changes are good?

   What changes are bad? Why?

2. What do you think might happen to rocks when there are extreme changes in temperature?

3. Find pictures of caves such as Mammoth Cave and Carlsbad Caverns. Study the limestone formations in the caves. Discuss what caused the caves to be formed.

4. As a teacher-led activity secure samples of rocks found in Georgia. On a large map of Georgia, glue samples of rocks and minerals found in the state.

5. Think of all the ways a rock can be used.

VII. Evaluation

A. Unit

1. Were the objectives met?

2. Did the unit accomplish what it was designed to do?

3. Did the students enjoy the lessons/activities?

4. In what way(s) does the unit need to be changed?

B. Student

1. Name and illustrate in pictures at least three things that cause the earth's surface to change?

2. Participate in a discussion regarding forces which change rocks into soil.

3. Make a rock collection. Divide into three classifications (igneous, sedimentary, metamorphic). Label them.

4. Have a display of the children's collections of rocks. Include an exhibit of the products we get from earth, such as building stone, lime, clay, and coal.

5. What are some differences between sandstone and limestone? (Limestone was made from shells of living things, reacts to an acid.)

6. Pretend you are a molecule of calcium carbonate. Tell the story of what happens to you.

7. Collect rocks. Try to classify and label them. How many different ways can you sort your collection?

8. Describe how three different kinds of rocks are formed.

9. Make a chart showing some sedimentary and igneous rocks that are changed to metamorphic rocks. Attach samples of each kind of rock.

10. Make a chart showing the characteristics of three kinds of rocks.

APPENDIX I

KEEPING A JOURNAL

Look up the word JOURNAL in a dictionary. You will see that in each of the meanings given there appears the word "daily". In French the word for "day" is "jour". So when you keep a journal, or diary, or log, you write in it almost every day.

This journal is for your notes on nature. Write in it what you see or think about (concerning nature) at school or at home. Always put the date at the top of each page of your journal.

Try to write every day about:

Weather	Is it raining, cloudy, snowing, sunny? Is it calm or windy (Can you find the wind speed in the newspaper?)? What is the temperature? (You can make your own observations from a thermometer outside, or you can look in the newspaper for the highest and lowest temperature of the day; the weather report will probably call it MAXIMUM and MINIMUM temperature.)
Birds	What new birds did you see? Did you see just one, or several alike? What bird activities did you note? Nesting? Singing? Fighting? Bathing in water? In dirt? Young birds learning to fly? What were the birds eating? Over near the back of the journal you should start a LIFE LIST of birds you have seen. Write where and when you first saw the bird.
Trees and Flowers	List any new flowers or flowering trees that you see blooming. If you like, you can draw the flowers and color them.
Your Tree	Adopt a tree. Observe your tree every day. Find out all about your tree. Write down the information in your journal. Draw your tree. Start a LIFE LIST of trees you learn to know.

APPENDIX II

MEASURING WIND VELOCITY

Beaufort Scale Number	Velocity in M.P.H.	Wind Name	Indication
0	less than 1	Calm	smoke rises vertically
1	1-3	light air	smoke drifts
2	4-7	slight breeze	leaves rustle
3	8-12	gentle breeze	small twigs in motion
4	13-18	moderate breeze	small branches in motion
5	19-24	fresh breeze	small trees sway
6	25-31	strong breeze	large branches move
7	32-38	high wind	whole trees move
8	39-46	gale	twigs break
9	47-54	strong gale	loose shingles tear off
10	55-63	whole gale	some trees uprooted
11	64-75	storm	severe damage
12	over 75	hurricane	widespread destruction

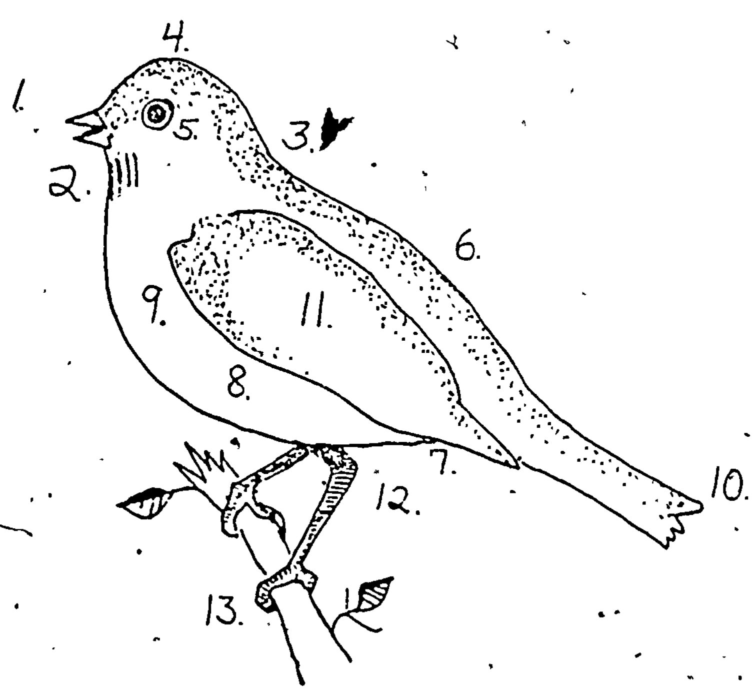
APPENDIX III

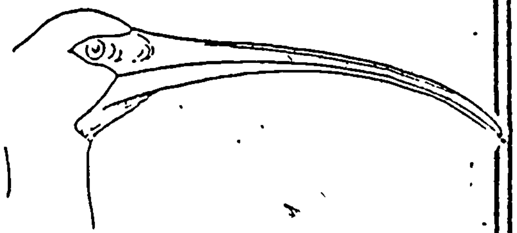
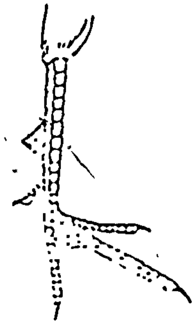
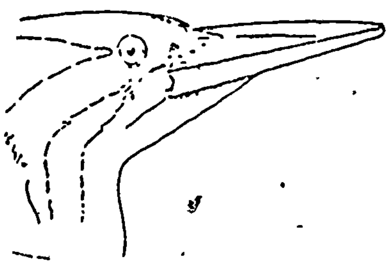
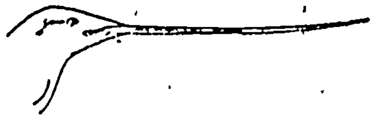
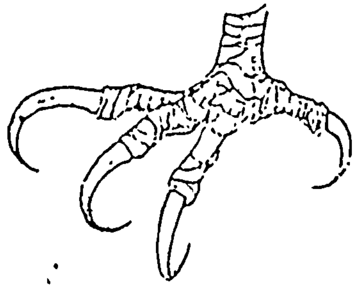
IDENTIFYING BIRDS

THINGS TO LOOK FOR

1. Coloration	Bright or dull What color? Color patches: tip of tail, rump patch Flash of color in flight
2. Habitat	What food was it eating? Place seen Nesting area Alone or in a flock? Time of year seen
3. Mannerisms	Hopping or running, frequency of change of pose, wing twitching, tail movement Quiet or nervous In flight, swift, darting, soaring, constant flapping, wings steady
4. Size and Shape	Proportions: bill to head, head to body, tail to body
5. Sound	Song, calls

1. beak
2. throat
3. nape
4. crown
5. eye color
6. back
7. rump
8. belly
9. breast
10. tail
11. wings
12. legs
13. feet



BIRD BEAKS		BIRD FEET	
			
SEED-EATER	FISHER-BIRD	PERCHING BIRD	WALKING BIRD
			
WOODPECKER	HUMMING BIRD	TREE-CLIMBING BIRD	SWIMMING BIRD
			

94-A

APPENDIX IV

APPENDIX V

CHECK LIST - BIRD OBSERVATIONS

Name ______________________ Date ______________________

Place ______________________ Length of Bird ______________________

Color

Main Color __________ Crown __________ Rump __________

Throat __________ Breast __________ Other __________

Eye __________

Tail

General Color __________

Shape - End - Square, V or Pointed __________

Size - Long or Short __________

Special Marks ______________________________

Bill

Color __________ Length __________ Shape __________

Wings

Color __________

Bars - Number __________ Size __________ Color __________

Legs

Color __________ Size __________

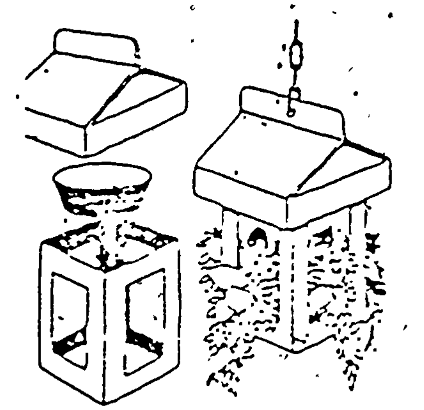
Feet

Color __________ Other Observation ______________________

THINGS TO MAKE FROM OLD MILK CARTONS

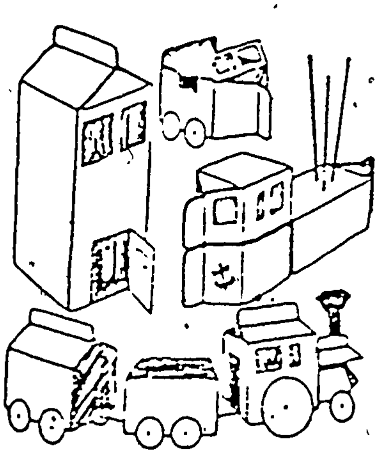
Hanging Planter

Cut the top from a half-gallon carton. Cut each corner down 1" from the top and bend back. Cut openings in four sides. For the roof, cut the gable from a gallon carton 3/4" from the gable line. Fit the two pieces together snugly and glue. Use plastic cup for the plant container. Your planter is ready to hang or use as an attractive table decoration.



Half-Pint Project

Build a village, boats, trucks or a train from half-pint, 10-oz., pint and quart cartons. Straws make good axles and derricks. Use spools, buttons or milk carton circles for wheels. Just cut openings for windows and doors. Spray with bright colored plastic paints. A cord, knotted at one end and strung through the cars of the train, will keep this pull toy "on the track".



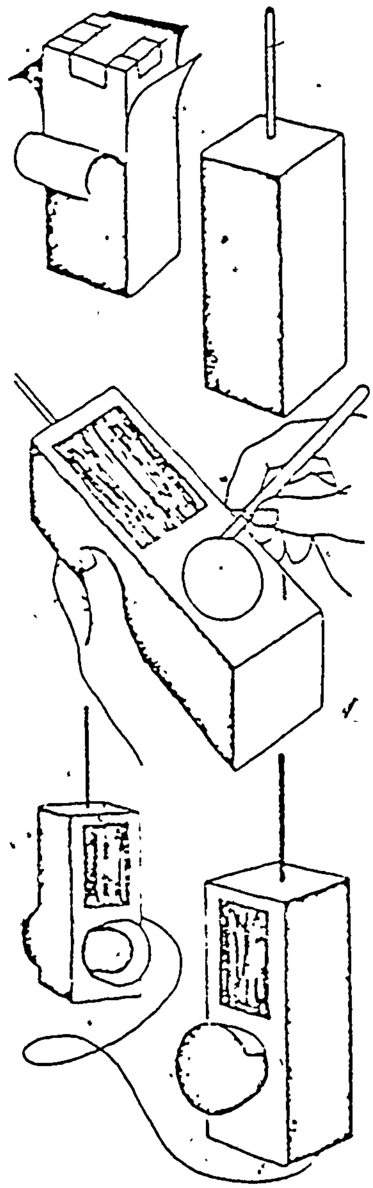
A Walkie-Talkie That Really Works

Cut the gables off two quart milk cartons. Cut two square pieces from a third carton to fit the opening and make a flat top for each carton. Seal on four sides with pressure-sensitive tape. Paint or cover with self-sticking paper.

Cut five slits 2½" long, 1/8" wide and ½" apart. Start 1" from top of carton. This is where the sound comes out. Cut the bottoms out of two small drinking cups, leaving a ½" edge. These are the mouthpieces. Cut two circles near the bottom of the carton just large enough to hold the cups, leaving about 3/4" of the cup outside the carton.

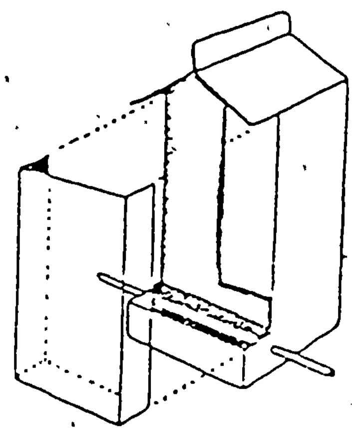
Tie a knot in one end of a long, long string. Punch a small hole in the back of one carton opposite the mouthpiece just big enough for the string to slide through. Pull the string from the inside to the outside until it reaches the knotted end. Punch the same size hole in the other carton and thread the string from the outside to the inside. Tie a knot in the second end; pull string backwards until it is stopped by the knot.

Insert one cup in each circular hole until it fits snugly. Insert a straw in the top of each carton for an antenna. The string should be slightly taut when sending and receiving.



Feed the Birds

A half-gallon carton is a comfortable size. Cut opposite sides of the carton back 1½" from the top corners along the line of the table, then down from the top to 1½" from the bottom. Trim under the gable to make the roof overhang. Milk cartons don't leak, so punch holes in the bottom of the carton to let any rain water drain out. A plastic straw or dowel makes a good perch. Punch a hole in the top and hang from a branch or eave or nail directly to a tree or post. Fill the bottom with bird seed and watch the fun.



Find an empty small glass jar with a lid.

Glue a small plastic model—such as a toy soldier—into the centre of the bottom of the glass jar, using waterproof glue.

Cut part of an empty white plastic or polythene container—such as a dishwashing liquid container—into tiny pieces to look like miniature snow.

Put a thin layer of this miniature plastic/polythene snow into the glass jar.

Fill the jar almost to the top with water.

Glue on the lid of the jar and wait for the glue to harden and so secure the lid.

If you now turn the glass jar upside down and then right way up again, it will look as if the model inside the jar is in a snowstorm, until the plastic snow either drifts to the top of the water again or sinks to the bottom.

This can make an interesting and useful paperweight.

Items needed: *small glass jar with lid; thin white plastic or polythene container such as an empty dishwashing liquid container; scissors; small plastic model such as a toy soldier; waterproof glue; water.*

GLASS PAPERWEIGHT

SHELL BOXES

Collect different types of sea shells.

Glue the shells to small cardboard boxes to form a pattern or design. If the box has a lid, glue a large shell in the centre of the lid so the lid can be more easily removed by using the large shell as a handle.

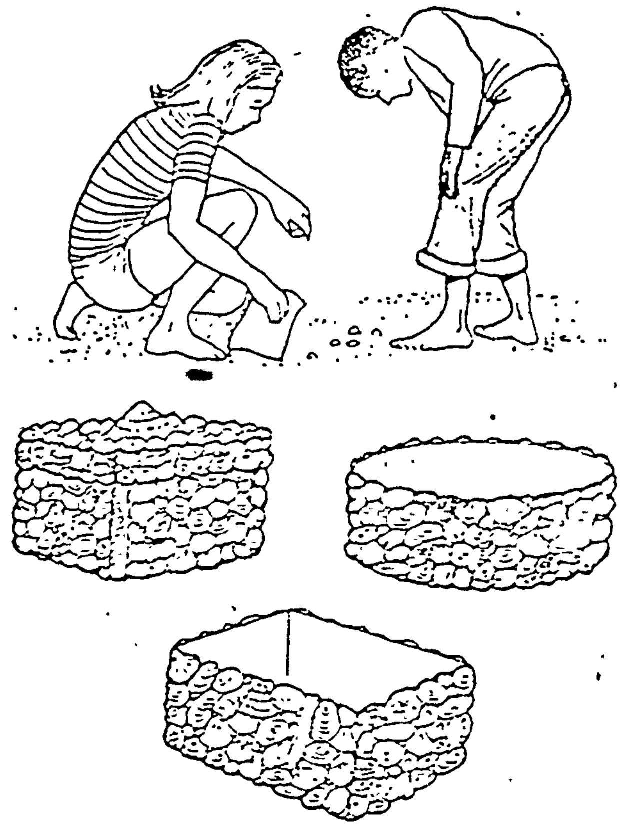
Make sure to cover the boxes with shells completely. If there are any small spaces then break bits off larger shells in order to fill these spaces.

Varnish all the shells on the boxes.

These small shell boxes make useful gifts, as containers in which to keep cufflinks and other small items of jewellery.

Items needed: *sea shells; small cardboard boxes; varnish; paint brush.*

SHELL BOXES



SNOWMAN

SNOWMAN

Remove the lid from an empty glass jam jar or simil container.

Glue an old tennis ball to the neck of the jar.

Glue pieces of cotton batten all over the jar and tennis ba until it looks like a snowman.

Using a black felt-tipped pen or a paint brush and blac paint, create the snowman's buttons, mouth and eyes.

This snowman makes an attractive Christmas decoration.

Items needed: *empty glass jam jar or similar container, ol tennis ball, glue; cotton batten; black felt-tipped pen or black pa and paint brush.*

DOOR STOP

Find an empty cookie tin or any other similar tin with a lid.

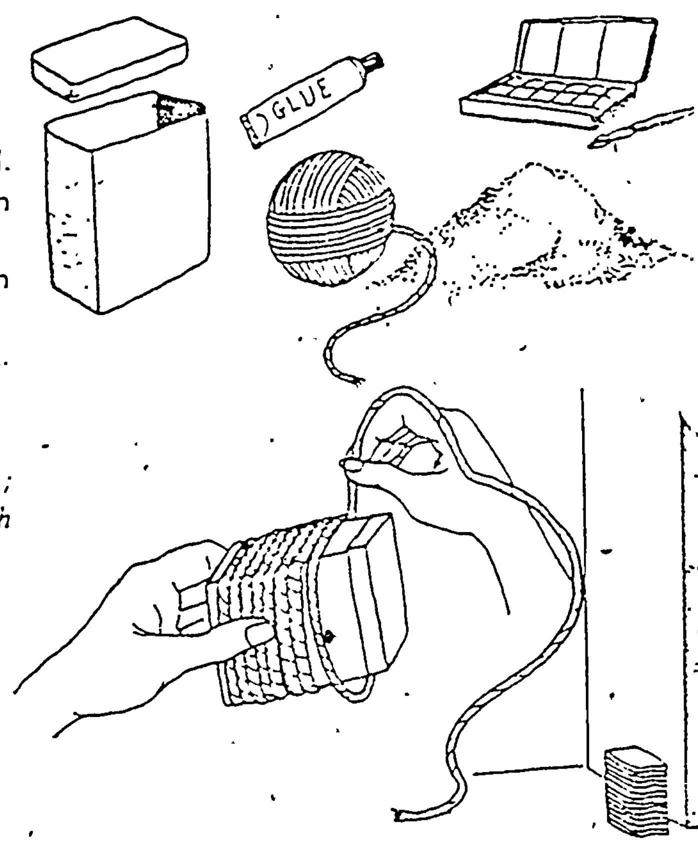
Fill the tin full of sand or earth. Glue the lid on the tin securely shut.

Wind some thick string evenly and tightly around the tin and glue each end of the string to the tin.

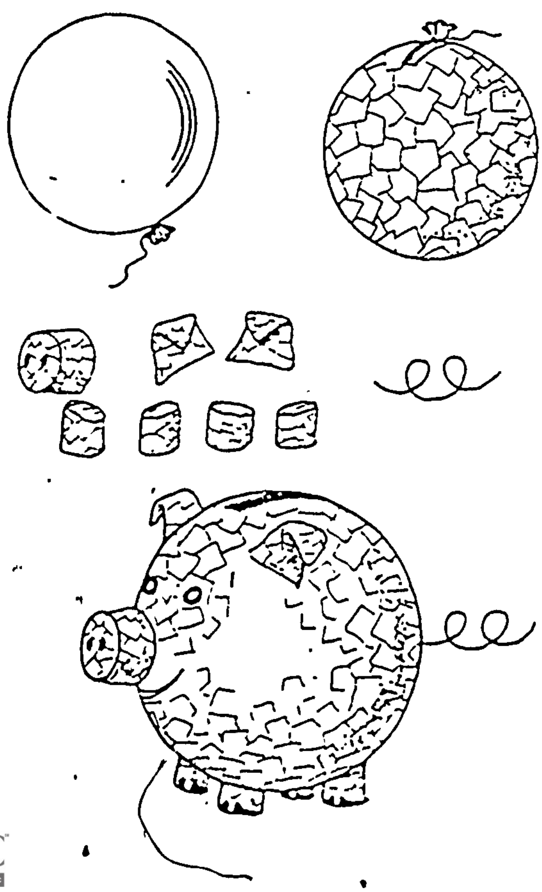
You can either leave the string as it is or paint designs on it. You now have a most useful door stop.

Items needed: *small empty cookie tin or other similar tin; glue; ball of thick string; sand or earth; paints and paint brush (optional).*

DOOR STOP



PIGGY BANK



PIGGY BANK

Blow up a small round balloon.

Tear some old newspapers into small pieces.

Paste the pieces of newspaper on to the balloon until it is completely covered except for a small slit at the top.

Build up the layers of paper on the balloon until the paper is about ten to twelve layers thick.

Using more pieces of paper and paste, carefully mould the pig's nose, ears, feet and tail, and paste them on to the balloon—or, instead of using paper for the tail, you can paste on a small piece of string.

When the paste and paper is completely dry, paint it to look like a pig.

Now burst the balloon by sticking a pin in it, and make sure that the slit at the top of the pig is open. You now have a piggy bank.

Items needed: *small round balloon; old newspapers; paste and paste brush; pin; paints and paint brush; small piece of string (optional).*

JAR GARDEN

Find a large glass jar—the larger the better—which has a lid. Put some small stones in the bottom of the jar.

On top of the stones put some moss and moisten the whole thing with warm water.

Now choose your plants. Ferns and small-leaf ivies grow very well inside glass jars—as do African violets. These violets have mauve/purple or pink or white flowers. Neanthe Bella is a miniature palm; and Kalanchoe has jagged dark green leaves and long orange flowers. Cryptanthus and Acuba will also flourish in these conditions.

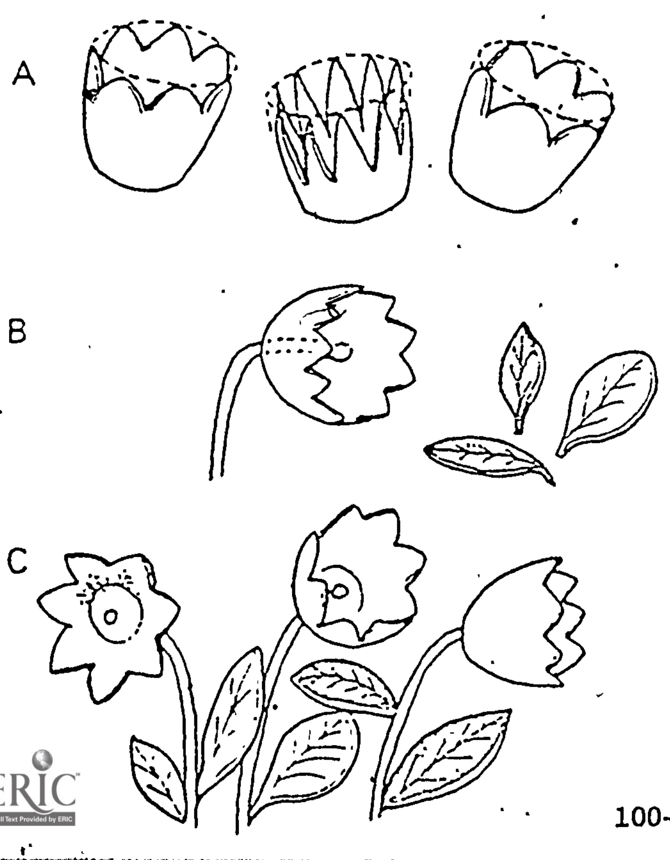
After carefully planting your chosen plants in the moss inside the jar, you can screw on the lid in order to protect the plants from dust and draughts.

It should be necessary to remove the lid only occasionally to prevent the insides of the jar from misting. The plants will seldom need watering.

Items needed: *large glass jar with lid or stopper; small stones, peat, warm water; small plants—such as African violets, small-leaf ivies, Neanthe Bella, Kalanchoe, Acuba or Cryptanthus.*

JAR GARDEN

EGG BOX FLOWERS



EGG BOX FLOWERS

Carefully cut out each segment of an empty cardboard eg. box.

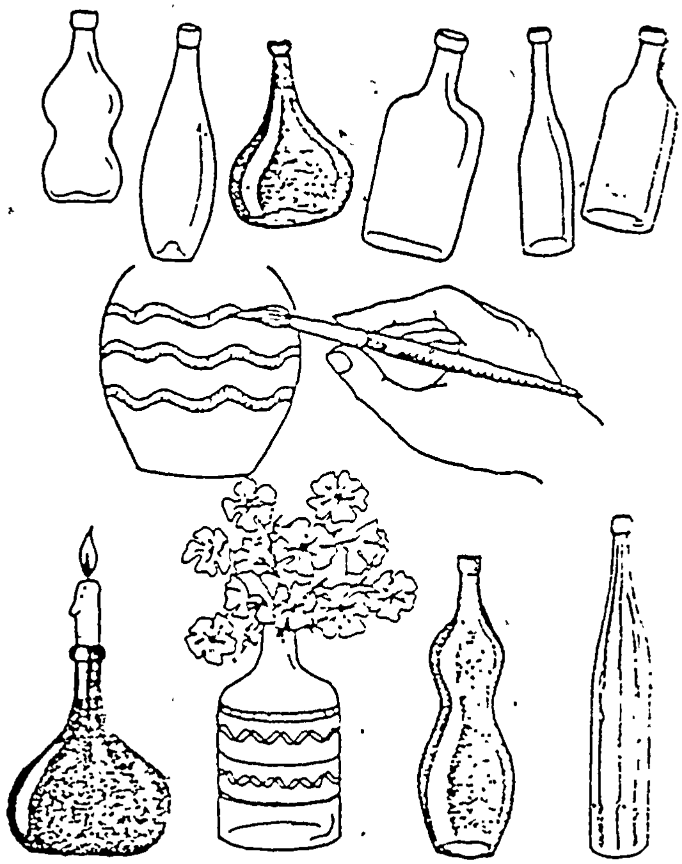
Cut around the opening of each segment to form petal shape (as shown in illustration A).

Push a pipe cleaner through each cardboard egg holder and fasten it securely by glueing it in position (as shown in illustration B).

Cut leaf-shapes from the remaining pieces of cardboard from the egg box. Glue these shapes to the pipe cleaners.

Paint the pipe cleaners, leaf-shapes, and cardboard egg holders to look like flowers and leaves.

Items needed: *empty cardboard egg box; scissors; pipe cleaners; glue; paints and paint brush.*



DECORATED BOTTLES

DECORATED BOTTLES

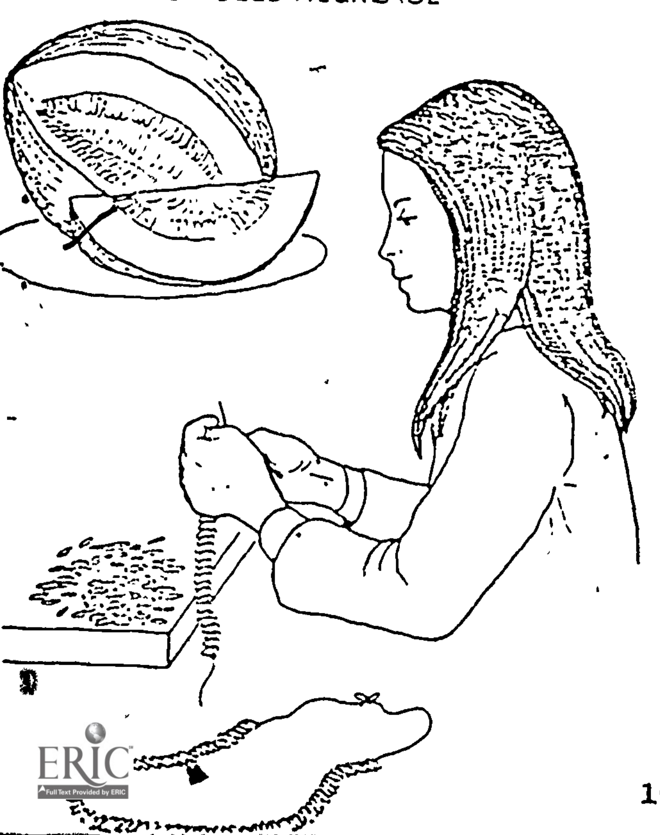
Find some old empty bottles—the more unusual the shape the better.

Wash the bottles thoroughly and leave them to dry.

Now paint a design on the outside of the bottles, using either oil paints or ordinary household gloss paint. You can paint the design on to the bottle itself, using the colouring of the glass as your background. Or you can paint the whole of each bottle one colour—such as white or black—and then paint your design over this colour.

These decorated bottles can have many uses. For example, they make good containers for bath salts, or they can be used as vases or candle holders.

Items needed: *old empty bottles such as wine bottles or any bottles with an unusual shape; kitchen sink; oil paints or ordinary household gloss paint; paint brush.*



MELON SEED NECKLACE

MELON SEED NECKLACE

If you have ever eaten a melon you might think it a pity to waste the numerous seeds inside the melon. Now you can make a necklace out of them.

First, wash the melon seeds.

Now thread a needle with some thin, strong thread, and push the needle through the end of each melon seed, stringing them on to the thread.

Join both ends of the thread together to form a necklace the size you require.

You can either leave the melon seeds as they are (which makes a yellowy-brown teeth-looking necklace) or you can paint the seeds the colour you want.

Items needed: *melon seeds; bowl of water; thin, but strong thread; scissors; needle; paints and paint brush (optional).*