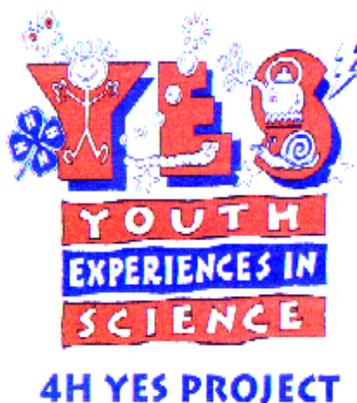


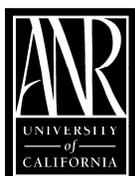
4-H Youth Experiences in Science

YES

Recruitment and Training Guide



4-H YOUTH EXPERIENCES IN SCIENCE PROJECT
UNIVERSITY OF CALIFORNIA COOPERATIVE EXTENSION
DIVISION OF AGRICULTURE
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4-H Youth Experiences in Science Project

Division of Agriculture and Natural Resources
Department of Human and Community Development

University of California
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YES Recruitment and Training Guide

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Recruitment and Training Guide

Introduction to the 4-H YES Project

A Fun Way to Learn About Science

There is currently nothing like the **4-H Youth Experiences in Science (YES) Project** for providing high-quality children's science education in after-school settings. The easily adaptable age-appropriate activities make science fun and exciting!

4-H YES uses specially trained teenage volunteers to conduct the “hands-on” science curriculum for children five- to eight-years of age enrolled in School-Age Child Care (SACC) Programs.

The *4-H YES Project* offers planned, thematically-linked science education experiences geared especially to the needs of children and child care providers. The *4-H YES* curriculum incorporated cross-age training and inquiry-based activities with cooperative learning. It focuses on learning scientific thinking processes and features the learning cycle model of instruction.

How this Guide is Organized

This training outline is designed to give you step-by-step assistance in organizing and presenting a successful *4-H YES Project*. The *margins* of each session contain a listing of handouts and resource materials needed to complete each section of the workshop, as well as helpful tips or reminders.

Camera-ready copies of each handout and form are located at the end of each section in sequential order. The text of the outline contains *discussion information* for each exercise and *directions* and *follow-up discussions* for each activity.

The format of presentation for this training guide is similar to the format used in the *4-H YES* curriculum. Each session includes the *time required*, *suggested grouping of participants*, *materials needed*, *getting ready information*, *activity directions* and *discussion suggestions*.

Recruitment and Training Guide



Teen Recruitment



*The **4-H Youth Experiences in Science (YES) Project** is an exciting, hands-on, informal science experience for five- to eight-year-olds that is delivered by specially trained teens. This section of the guide will provide you with some proven tools for recruiting interested teens as project participants.*

Some programs may have a ready pool of interested teens. Others may need to recruit additional participants, while others may wish to use the YES Project as a means of reaching a new population of teen volunteers.

What's in This Section

The following is an outline of successful recruitment procedures, including:

- ★ ***timeline***
- ★ ***recruitment planning***
- ★ ***preparation of recruitment materials***
- ★ ***preparation of application materials***
- ★ ***recruitment strategies***

Recruitment Aids Included in this Section:

- Application
- Sample Newsletter Article
- Sample News Release
- Sample Letter

Timeline

Strategies and timeline plans should be adjusted to meet the individual needs of your program and community. Each program will have additional resources and recruitment strategies to advertise and promote the *4-H YES Project*. Individual communities will also have unique needs that should be addressed early in the project planning. The following timeline gives suggestions for recruitment.

Recruitment and Training Guide

Three months before training:

- Determine number of teens you want to train*
- Determine the type of strategies to use for recruitment*
- Develop written recruitment materials (letters, flyers, posters, applications, etc.)*

Two months before training:

- Advertise through 4-H newsletter*
- Advertise through local newspaper*
- Send letter to school and other groups*
- Make phone calls and personal visits*

One month before training:

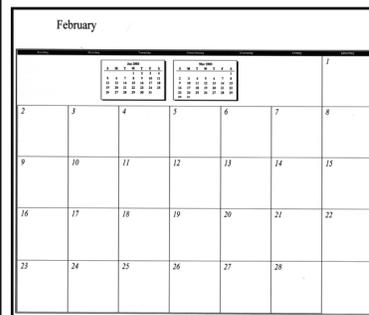
- Re-advertise and follow-up as needed*
- Review applications*
- Schedule orientation meeting*
- Send out orientation letter*

Recruitment Planning

Prior to starting the recruitment process, determine the size of the 4-H YES Project that you will be implementing. Determine the number of curricula that you will be using, the number of school-age child care programs that you will be targeting, and the timeframe for delivering the project. A review of your objectives will help you determine how many teens you will need to recruit for a successful project.

In your recruitment planning consider:

- Use of Team Teen Approach*
- Forming Teams Prior to Training*
- Number of Teens to Recruit*
- Elements of the Project*
- Teen Expectations*



Tip
Tailor the project to fit your program. Review your objectives before starting the planning process.

**Tip**

We have had best results when an adult mentor and school-age child care staff also train with the teens.

Use Teen Team Approach

Organize teens in teams around a singular thematic unit. This will provide a sufficient number of teens to carry out the hands-on aspects of a curriculum. Each unit requires considerable preparation and clean-up in its delivery, and a team approach makes the clean-up easier. The use of a team approach allows the teens the option of specializing in one activity of a curriculum and encourages peer support in leading the various elements of the units, i.e., *exploration, investigation, discussion, communication, and interaction* with the young learners.

Form Teams Prior to Training

The teams should be formed prior to the training so that they can get to know one another during the interactive session. Also, important planning strategies are built into the curriculum so teams are creating an *implementation plan* as they are trained on the theme units.

Determine the Number of Teens to Recruit

We have found that teams of teens (at least three to five per team) work best. Due to the nature of the units (at least five distinct sessions in each unit), the curriculum is delivered over at least a five day period. Because of the schedules of teens, it is important to plan for some teen absences and even attrition. Having sufficient numbers of teens on a theme unit team can prevent the cancellation of sessions if one or two teens can't make the scheduled session at the last minute.

Determine the Elements of the 4-H YES Project that Will Be Delivered

The *4-H YES Project* as it relates to curriculum delivery, includes four major elements:

-  Five or Six Session Theme Units
-  Family Science Loaner Backpacks
-  Science Discovery Centers
-  Family Science Activity Nights

Recruitment and Training Guide

Although the theme curriculum activity sessions can be delivered without the other theme elements, the overall impact of the project on five- to eight-year-olds, their families, the school-age child care staff and the teens will be increased significantly when all four elements are present.

After determining which elements will be part of your local *4-H YES Project*, you are ready to further develop timelines, recruitment materials, and teen and school-age child care staff expectations.

Teen Expectations

We have found that clearly defined expectations with tangible timeframes are essential in the recruitment of teens.

Elements to Consider in Determining Teen Time Commitments:

-  **Orientation Meeting** (*one to two hours*)
-  **Curriculum Unit Training** (*three hours pre-training, six to eight hours theme unit training*)
-  **Teen Pre-Session Planning Meetings** (*two to five hours*)
-  **Teen Pre-Session Organization and Preparation** (*one to five hours*)
-  **Family Activity Night** (*one to four hours*)
-  **Portfolio or Artifact Box Preparation** (*one to six hours*)
-  **County YES Project Meetings and Recognition** (*one to ten hours*)

Be sure to include any other expectations that you have for the teens and their participation in the project. Also consider any expectations that project collaborators or school-age child care programs may have for the teens.

Preparation of Recruitment Materials

Determine the dates, times and location of the training and the delivery of the program, prior to recruitment.



Tip

Check the dates of seasonal school schedules, community activities, and 4-H calendars prior to setting dates.

Scheduling conflicts for teens can be one of the greatest hindrances to the success of the program.



 **Tip**
We have found that the application should be as short as possible so as not to discourage teens. Other information can be obtained after the teens have been recruited.

Teen Recruitment Section 1

TEENS.....Say YES to Science

Teens have a great opportunity to participate in a fun, hands-on youth science education program sponsored by the University of California 4-H program. The YES (Youth Experiences in Science) Project will use trained teen volunteers to teach science activities to 5- to 8-year-olds in an after-school setting.

Teen volunteers will:

- participate in teen group activities
- receive 15 hours of training
- volunteer 30 hours of service
- work with groups of 5- to 8-year-olds
- teach hands-on science activities on *Bubbles, Snails, Energy, Collections, Worms, Kitchen Science, or Recycle/Reuse*
- gain important leadership skills
- help create fun science activities that will be shared nationally
- become part of a statewide 4-H YES Teen Volunteer Network
- receive a completion certificate and possible extra credit

◆◆◆◆

Training Dates: _____ Application Due: _____
 Friday evening _____
 Saturday _____ Mail to: _____

Orientation: _____
 For more information call: _____

YES ©2000 by the Regents of the University of California Recruitment Aid No. 1
Section 1, Page 11

Determine whether you will hold an **Orientation Meeting** prior to the training. (We strongly recommend this, especially if you are recruiting non-4-H teens). At this meeting, you can further explain the project and its requirements, answer questions and assign some field observations. **Section 2 of this manual gives complete details for presenting a 4-H YES Orientation.**

At the end of this section you will find sample recruitment materials. These materials can be easily adapted for your local use.

Recruitment Materials:

-  News releases
-  News articles
-  Letters
-  Flyers
-  Posters

Preparation of Application Materials

Before developing application materials, determine the dates and locations for both teen training and the 4-H YES Project delivery. It is important to communicate these dates in all of your correspondence with the teens.

Determine the information you want to obtain from the teens; consider age, grade level, experience, interest, as well as other personal data. Don't overlook the availability of teens to deliver the program. Some teens can only present sessions one day a week, others for only one week per quarter. For your scheduling and that of the SACC programs, it's a time saver to know this ahead of time. **See Recruitment Aid No. 1 for sample application ideas.**

Recruitment Strategies

Throughout the 4-H YES Project, we have tried a number of recruitment strategies. Traditional promotional strategies such as word-of-mouth, personal contact, written letters, newsletters and news releases have proven effective.

Recruitment and Training Guide

When looking for places to recruit teens, don't overlook continuation high schools, home schooled teens, and other agencies, as a source for interested teen participants.

Many high school students now must participate in annual community service projects or conduct a more intensive senior project as a requirement for graduation. A significant number of teens have been introduced to 4-H and the *YES Project* through this requirement.

Newsletters

Articles in the county 4-H newsletter have been a successful method of recruiting 4-H teen and junior leaders, as well as adult coaches. **A sample newsletter article is provided as Recruitment Aid No. 2.** The same or an adapted news article can be used in other agency newsletters.

News Articles

News releases in local newspapers, promoting the *YES Project* and the need for teen recruits, have been effective. They are also a means of publicizing the program and for recruiting school-age child care programs that are interested in participating. **A sample news article is enclosed as Recruitment Aid No. 3.**

Consider asking local newspapers to print a feature article on the project and information in upcoming events sections. Don't overlook local high school newspapers.

Personal Letters

Personal letters to high school science teachers, senior project advisors, science club and key club presidents and advisors, 4-H community club leaders, and other youth organizations can be effective recruitment tools. Along with the letter, several copies of the flyer and application should be enclosed.

A follow-up letter and phone call at two week intervals have proven most effective. **A sample letter and flyer are enclosed as Recruitment Aids No. 4 and No. 5.**

Teen Recruitment Section 1

Teens... Say YES to Science!!!



Teens have a great opportunity to deliver a science education program to 5- to 8-year-olds enrolled in after-school programs. The **4-H Youth Experiences in Science (YES Project)** incorporates cross-age teaching and inquiry-based activities to make science fun.

- **Teens will be trained in one of seven theme units:** Bubbles, Collections, Snails, Energy, Kitchen Science, Worms, or Recycle/Reuse.
- **Training will be Friday evening and all day Saturday** _____ (date).
The Friday training session will be held _____ (time/location).
The Saturday session will be held _____ (time/location).
- **Program Delivery:** Teen pairs will be teaching YES in school-age child care centers after school hours during five one-hour sessions.
- **Time Commitment:** Teens will spend approximately 30 to 40 hours, including training, presentations, and evaluation of the program.
- **Promising Future:** The **4-H YES Project** is a comprehensive program that will be used all over California and the nation teaching young children the joys of science! The **4-H YES Project** is being sponsored by the National Science Foundation and the University of California.

Attendance is mandatory for both sessions.

Recruitment Aid No. 2

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Tip

An accompanying photo can also enhance the articles submitted for publication.

Recruitment and Training Guide



NEWS RELEASE

4-H TEENS DELIVER HANDS-ON SCIENCE TO KINDERGARTEN TO THIRD GRADE YOUTH

"County teens have a great opportunity to participate in an informal science education project funded by the National Science Foundation and the University of California," reports _____ County University of California 4-H Youth Development Advisor.

The hands-on program, Youth Experiences in Science (YES) is designed to be delivered by teens to kindergarten through third grade youngsters in school-age child care settings. The teens undergo an extensive 10-hour training on the science process, developmental needs of young children and one of six experiential curricula. School-age child care staff and 4-H adult volunteers serve as coaches for the project.

"The intent of the 4-H YES Project is to stimulate children's natural curiosity, increase their awareness of the environment, improve their understanding of the world around them, and help them understand and appreciate how science literacy will improve their lives," explains _____.

The 4-H YES Project has developed seven curricula on Snails, Worms, Bubbles, Energy, Kitchen Science, Recycle/Reuse, and Collections. These units are delivered by the teens through five interactive sessions with the younger children. Science learning centers on the same topics encourage further exploration.

Families are involved in the project through their participation at Family Science Activity Nights, which allow children to teach their parents what they have learned. Additionally, families have opportunities to continue the learning at home through loaner science backpacks that can be checked out through the child care sites.

For more information on the 4-H YES Project, call _____

Recruitment Aid No. 3

Section 1, Page 14 4-H YES Project Recruitment and Training Guide

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- receive a completion certificate and possible extra credit



Training Dates: _____ **Application Due:** _____

Friday evening _____

Saturday _____ **Mail to:** _____

Orientation: _____

For more information call: _____

4-H YES

Youth Experiences in Science Teen Application



Name: _____ Phone: _____

Address: _____

Age: _____ Grade in School: _____

The 4-H YES Project will require you to volunteer in a school-age child care (SACC) program after-school. Check the days you would be available:

Mon. _____ Tues. _____ Wed. _____ Thurs. _____ Fri. _____

Are you interested in training on: ___ Snails ___ Bubbles ___ Energy
___ Collections ___ Kitchen Science ___ Worms ___ Recycle/Reuse

Would you prefer to volunteer:

_____ 5 days in a row (e.g., Monday-Friday one week)

_____ 5 days, one day a week (e.g., every Monday for 5 weeks)

_____ 5 days, staggered (e.g., Tuesday and Thursday)

List any experiences you have had working with younger children (baby sitting, camp counselor, tutoring, etc.)

Describe why you are interested in participating in the YES Project.

List any prior volunteer experience you have had.

Return by: _____

Recruitment Aid No. 1a

Teens... Say YES to Science!!!



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"The intent of the *4-H YES Project* is to stimulate children's natural curiosity, increase their awareness of the environment, improve their understanding of the world around them, and help them understand and appreciate how science literacy will improve their lives," explains _____.

The *4-H YES Project* has developed seven curricula on Snails, Worms, Bubbles, Energy, Kitchen Science, Recycle/Reuse, and Collections. These units are delivered by the teens through five interactive sessions with the younger children. Science learning centers on the same topics encourage further exploration.

Families are involved in the project through their participation at Family Science Activity Nights, which allow children to teach their parents what they have learned. Additionally, families have opportunities to continue the learning at home through loaner science backpacks that can be checked out through the child care sites.

For more information on the *4-H YES Project*, call _____.



Date:

To: County School Principals, Science Teachers,
Counselors, and High School Service Club Advisors

Re: University of California *4-H YES (Youth Experiences in Science) Program*

We are asking for your assistance in publicizing a great opportunity for teens to participate in a youth science education program. It is sponsored by the University of California 4-H program and funded by the National Science Foundation. The *4-H YES (Youth Experiences in Science) Project* will use teen volunteers, trained by *4-H YES* program staff, to teach science activities to 5- to 8-year-olds in after-school settings.

The 4-H program is part of the University of California Cooperative Extension which has local offices in _____. The mission of the program is to help youth develop into responsible, self-directed, productive citizens through research-based, learn-by-doing education.

The intent of the *4-H YES Project* is to stimulate children's natural curiosity, increase their awareness of the environment, improve their understanding of the world around them, and help them understand and appreciate how science literacy will improve their lives. These goals are accomplished through the adoption and development of *Theme Week Curricula, Science Learning Centers, Science Family Backpacks, and Parent and Child Activity Programs.*

Please review the enclosed information and distribute to interested teens. Teens selected for the *4-H YES Project* will become part of a *YES Teen Volunteer Network* and will play an important role in creating a national informal science education curriculum. Adults are also needed as team coaches for this program.

We also encourage you to offer extra credit or other incentives to those students who complete this volunteer project.

We truly appreciate your assistance. For more information, please call _____.

Sincerely,

Recruitment and Training Guide



Teen Orientation



Materials Needed

- Additional applications
- Pencils/pens
- Nametags
- Flipchart and paper
- Water
- One cup measure, 1 per 4 teens
- One pound box of cornstarch, 1 per 4 teens
- Large mixing bowl, 1 per 4 teens
- Newspaper (to protect surfaces)
- Refreshments, *optional*
- Orientation Aids No. 1 through No. 7

Teens, adult coaches, and school-age child care staff benefit from an orientation to the 4-H YES Project. A brief introduction provides a good overview of the goals and objectives of the project, an opportunity for questions and answers and a chance to involve the teens in active, hands-on science activities similar to ones they will be doing in the 4-H YES Project.

Time Required: One hour

Group Size: Large group

Getting Ready

- ① Gather all the needed supplies, making sure you have enough for all attendees.
- ② Reproduce the applications, observation sheets, and other informational or promotional material.
- ③ Determine an area for the lecture part of the orientation and the hands-on experimentation.
- ④ If you choose to serve refreshments (we strongly recommend...any time of day!) prepare in advance.

Background Information

In the orientation, teens, adult coaches and school-age child care staff will be introduced to the 4-H YES Project. They will have an opportunity to get acquainted with other participants. Then they will have a chance to “mess about” as they learn first hand about science activities and processes that are a part of the 4-H YES Project.

Recruitment and Training Guide

Action Directions: *Project Overview*

1. As participants arrive, ask them to sign-in, pick up any handouts, and complete a nametag. If you are serving refreshments, have them available as teens arrive. **See Orientation Aid No. 1.**
2. Introduce yourself. Then ask the teens to introduce themselves and tell why they are interested in volunteering for the project. *We have found the teen responses very enlightening.* Don't forget to include the adult coaches and SACC staff, although you may want to have them introduce themselves after the teens.
3. Give a brief overview of the project and explain the project objectives. **The "Day in the Life of 4-H YES," Orientation Aid No. 2, gives a narrative overview of the project.**
4. Emphasize the key elements of the project and any requirements you have for the participants. Be sure to go over the time frame, the number of hours for required training, the minimum number of hours for preparation and teen leading, and any further dates for follow-up meetings. **Use Orientation Aid No. 3 to determine teen curriculum choices if you haven't yet obtained this information.**
5. If you will expect the teens to complete a portfolio or an artifact box, discuss this requirement or option at the orientation. **See Orientation Aids No. 4 and No. 5.**

Activity Discussion

Ask teens about any requirements they may have for senior projects or community service projects. *You may need to meet individually with teens that have specific requirements.*

Recruitment and Training Guide

 **4-H YES**
Sign-In Sheet

Date: _____ Event/Activity: _____

	Name	Phone Number
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		
16.		
17.		
18.		
19.		
20.		

Section 2, Page 22 Orientation Aid No. 1



Tip

It is helpful to have sample portfolios and artifact boxes available for the teens to review.

Sample descriptions of the portfolios and artifact boxes are included as Orientation Aids No. 4 and No. 5. Add your own questions or requirements.

**Tip**

We have found that it is very important for teens to observe the sites where they will be training. This forms the first step in their relationship with the staff and children. It also makes their first teaching session much less stressful.

Action Directions: *Project Elements*

1. Discuss the need for teens to understand five- to eight-year-olds and the school-age child care environment.
2. Ask them from their experience, how they think they can best learn more about these subjects (*i.e., first-hand observation*). Then share with teens the ***School-Age Child Care Observation Sheet, Orientation Aid No. 6.***
3. Explain that you would like each of them to visit a SACC site and observe the children, staff, environment, resources, materials, and other relevant items.
4. Ask the teens to return the *Observation Sheets* to you before the training, so you will have a sense of what the teens observed.
5. Discuss with teens the *learning cycle* and *science processes* as important elements to the *4-H YES Project*. ***Refer to Section 3 for mini-posters on the science processes and the learning cycle.*** Always encourage questions.

More Action Directions

Oobleck: An Introduction to Youth Experiences in Science

This science experience is one of the activities found in the ***YES Wee-cyclo-saur-us*** curriculum. It provides an interesting and engaging way to introduce the teens to a hands-on approach to science that encompasses the *4-H YES Project*.

Getting Ready

- ❶ Prepare areas for four to six teens to work together on this activity.
- ❷ Gather all the needed supplies.

Recruitment and Training Guide

Action Directions

1. Tell the teens that they now will have an opportunity to explore just like the youngsters with whom they will be working.
2. Divide the group into teams of four to six teens. Provide each team with a workplace and supplies (*cornstarch, water, bowl, measuring cup, newspaper*). Explain to the group that you are only going to give them limited instructions and you want them to explore and experiment.
3. Now direct each team to mix one cup cornstarch and 1/2 cup water in the bowl. Encourage participants to put their hands into the mixture.
4. Encourage the teens to experiment by adding more water and/or cornstarch. Ask: *Is it is a solid, liquid, or gas? Can you form it into a ball? Can you break it?*
5. When interest and experimentation begin to wane, bring the group back together.

Further Discussion

- ✓ What did you find out?
- ✓ How did you conduct your exercise?
- ✓ What changes occurred?
- ✓ Was it what you expected?
- ✓ Did all teams have the same results?
- ✓ What did you learn about the states of matter?
- ✓ Is this matter a liquid, solid, or gas?

If questions remain, or if some teams didn't appear to observe all the changes, allow them to experiment and explore further.

Materials Needed

- Water
- One cup measure, 1 per every 4 teens
- One pound box of cornstarch, 1 per every 4 teens
- Large mixing bowl, 1 per every 4 teens
- Newspaper



Tip

Make sure to encourage questions and encourage the teens to find the answers.



Discuss with teens how this activity relates to both the *learning cycle* and *science processes*. Ask the teens to briefly explain how they used each of the four processes (*observing, communicating, comparing, and organizing*) in their exploration.

Also, discuss how they think five- to eight-year-olds would respond to this open-ended, hands-on activity. ***Add you own questions!***

Wrap-up

Complete the orientation by answering any questions, and passing out information on the dates, locations, and times for the training. Allow time for individual discussions with teens, parents, coaches, and SACC staff.

Follow-up

A sample follow-up letter for teens is enclosed. ***See Orientation Aid No. 7.***

Other Notes



4-H YES Sign-In Sheet

Date: _____ **Event/Activity:** _____

Name	Phone Number
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	
11.	
12.	
13.	
14.	
15.	
16.	
17.	
18.	
19.	
20.	Orientation Aid No. 1

A DAY IN THE LIFE OF...

How 4-H YES will look in a SACC setting

Each school day the bell rings at approximately 2:30 p.m., sending 5- to 8-year-old students from their classrooms to activities that will fill their after-school hours. For millions of students, this means heading out across the playground to a portable building on the school site. They will spend the next 3 to 4 hours of their day participating in a school-age child care program called 4-H YES.

A glimpse at a typical day in a SACC program participating in the 4-H YES Project.

School children have been picked up by a SACC staff member and have walked across the playground to the SACC center that sits on a corner of the schoolground. Maria, a first-grade student, is wearing a **4-H YES Science Family Backpack** (a part of the **Collections** unit the group has been studying) that she has been using at home for the past week. After a snack and a brief recreational time, Maria and the rest of the children are ready to begin their 4-H YES theme week activities.

Trained teen volunteers deliver YES activities

Amy, a 4-H YES teen volunteer who works at the center two days a week, asks the children to gather in a circle where they will begin their science activities. Amy asks Maria to open the **YES Project Family Science Backpack** to show and tell about her family activities and the seed collection they have been making over the past several days. Maria points out to the group that she gathered seeds from many places in and around her home. She shares the pepper seeds from her spice cabinet, the seeds from a cucumber and apple in her refrigerator, the seeds from flowers in her neighborhood, and pine seeds she found in a pine cone her brother had in his room. Maria is very proud of her collection and exclaims that her whole family added seeds to it. Amy asks Maria and the group how they could sort the seeds. Suddenly, the entire group is involved in explaining their methods of sorting.

Age appropriate theme units

After the sharing of Maria's **YES Project Family Science Backpack**, Amy leads the students in a 4-H YES theme week group activity. She gives each pair of children a plastic bag with an assortment of seed and non-seed items. She instructs the teams of students to empty the contents of their bag on the table and to sort the things anyway they want.

The children eagerly sort and arrange their things. Then they are instructed to sort them again in a different way. And again, to think of a third way to sort their items. After three attempts, the children are asked to share one of their sorting methods with the entire group. Their methods range from size or color to things you can eat and cannot eat, or things that will grow and things that will not grow. The activity ends with the students telling what they would like to know about the things in their bag. Their responses are recorded by another teen volunteer for later use.

Recruitment and Training Guide

Learning Centers provide for more investigation and exploration

The group lesson breaks up, and many of the children move on to new activities. Some choose to work at the **4-H YES Science Learning Center**, where they can choose one of several child-directed (with teen and/or SACC staff supervision) activities available for them to explore. One of the activities is to set up a lima bean growing cup to observe over time; another is to dissect and observe (and record observations) of three different lima beans that have been soaked in water for 1 day, 3 days, and 5 days; another is to choose several seeds to plant in a recycled paper pulp cup; another is to measure and record on a chart the height of the sweet potato plant each day; another is to grind up peanuts and make peanut butter.

Learning continues at home through loaner 4-H YES Science Family Backpacks

Before parents begin to arrive at the end of the day, the SACC staff and Amy, the teen volunteer, ask which children would like to take home the **4-H YES Science Family Backpacks**. They talk about the contents of each backpack (seed collections, seed-related story book, supplies to plant seeds at home, recipes for cooking at home, and some craft application projects) and then sign out backpacks to individual students. As the parents pick up their children, the staff and volunteers spend a few minutes explaining the family activities and offer any assistance or advice necessary. They remind the students and parents that the backpacks are due back in one week. The students leave with their parents.

Beyond the day: Science Family Activity Nights make learning fun for the entire family

Once each month, parents and siblings are invited to stay for a special **YES Science Family Night** that involves the entire family in more hands-on activities. These special evenings have been planned with the realities of today's busy families in mind. Parental and family involvement will also be encouraged in advance of the *Science Family Nights* by staff and volunteers who have the advantage of seeing most parents twice a day at sign-in times. This regular, personal contact will be maximized to promote parental participation. Furthermore, *Science Family Nights* will be scheduled from 4-6 p.m., when most parents pick up their children. Instead of picking up their children, feeding them and returning to the center, parents can participate at this convenient time.

This month's *Science Family Night* will focus on the children's application of the **Collections** lessons. The children will show their families the displays of experiments on measuring plant growth, classification and sorting of seeds and other group and individual projects. Tables have been set up with activities that allow families to make peanut butter, sample bean sprouts grown by the children, taste snacks made from other seed products, and view a craft project that features beans and seeds, and view several games with the plant science theme.

Beyond the site: Community Activities apply learning to real-life settings

SACC staff have created opportunities for children to explore and discover beyond the walls of the SACC program. In conjunction with the primary-grade teachers, the staff have made arrangements for the SACC students to share an experiment with their classmates during school hours. In turn, the classroom teachers have asked the SACC children to take the responsibility of caring for the class gardens in the Life Lab during Spring recess. Later in the year, the SACC staff will arrange with the 4-H Office for children to tour a pumpkin farm, where they can further extend their learning out of the classroom and SACC site.

Orientation Aid No. 2a



Teen Curriculum Choices

You will have an opportunity to receive training in one of three areas. Please rank your choice of the following curriculum (1 = most; 3 = least). We will make every effort to assign teens to their first choice; however, due to the size of the group this may not always be possible.

- | | | |
|--------------------------|------------------------------|--------------------|
| _____ Bubbles | _____ Energy | _____ Worms |
| _____ Snails | _____ Kitchen Science | |
| _____ Collections | _____ Recycle/Reuse | |

Volunteer Hours

The curriculum will be delivered at 4-H school-age child care sites after school, usually between 3 to 5 p.m. The lessons usually last 40 to 60 minutes, and require about ½ hour of set-up and clean-up. The five main lessons can be taught everyday for five days or one or two days per week. Check which method will best meet your schedule at this time.

- _____ One full week (5 days in a row)
- _____ One day per week (list which day _____)
- _____ Two days per week (list which days _____)
- _____ Spring Break Week (list week _____)
- _____ Other

_____ Signed



What is a 4-H YES Portfolio?

There are many definitions of portfolios. Here are a few statements that define 4-H YES portfolios.

- ◆ A 4-H YES portfolio is a structured collection of artifacts (concrete objects) that, taken together, describe what you and the kids (1) actually did, and (2) learned through participating in YES.
- ◆ A portfolio is not the container (the box, binder, or whatever), but the YES-related materials that are in the container.
- ◆ A portfolio contains things that were collected at different times. Therefore, the portfolio usually describes changes that occur in what you and the kids do as your YES work progresses.
- ◆ A portfolio is a communication tool. It tells what you and the kids did in YES and what was accomplished as a result of your YES work. For example, a portfolio might show what the kids learned in YES and present evidence of that learning. A portfolio could also tell what you learned as a teen leader in YES and present evidence of your own learning.

What goes into a 4-H YES Portfolio?

First of all, there is no right answer to this question. ***The portfolio should include whatever you think will tell your story best.*** You will probably want to select some things to include and will not want to include other things. It will usually help to ask yourself, "Why am I including this? How does it help to tell the story I want to communicate?" Even though there will be some choices about things to include, here is a (partial) list of things that might go in:

- ◆ information about the kids you worked with (whom, where, when...)
- ◆ descriptions of what you did together
- ◆ statements of goals and objectives
- ◆ a story of how you were trained to do YES
- ◆ photographs or videos of events
- ◆ interviews with kids, adult volunteers, etc.
- ◆ examples of things the kids made
- ◆ your thoughts and reflections on your "early" and "late" experiences leading YES
- ◆ statistics, graphs, or charts
- ◆ selections from a journal you keep about YES
- ◆ an essay about what you are learning in YES
- ◆ a newspaper clipping about your project
- ◆ anecdotes or testimonials about YES from parents and others
- ◆ anything that makes sense to you and helps to tell the story

What might a 4-H YES Portfolio look like?

While this will depend on your specific purposes and the items you decided to include, it is important to think about the structure of the portfolio. You might organize it chronologically (place things in the portfolio according to when they occurred), or group it by project goals, kind of work, etc. The physical structure might be a binder, a box, a videotape, a poster, or some combination of forms. The portfolio will usually have a table of contents or some sort of information that will help your audience understand what is included.

A 4-H YES Portfolio			
Written Goals	→	←	Table of Contents
Photos	→	←	Videotape
Letters	→	←	Newspaper clippings
Audiotapes	→	←	Sample of kids work
Drawings	→	←	Notes from meetings
Thank you notes	→	←	Journal entries
List of participants	→	←	Thoughts about the project
Planning ideas and notes	→	←	Lesson plans
→		←	
Lots of other materials			

When are items collected for a 4-H YES Portfolio?

It's best to collect items as you go along. When something interesting happens and you think of an item that could go into the portfolio, then collect it at that time. Sometimes, you might request that one of the kids or an adult volunteer make something especially for your portfolio. Ordinarily, however, you will use things that are part of YES in the first place.

Why is 4-H YES requesting that you create a Portfolio?

YES has two reasons for this request. *First, we believe that by creating a portfolio based on your work in YES, you will increase what you learn about leadership, which will help you in other leadership activities.* Building the portfolio and presenting it will provide an opportunity for you to review what you have done and have your accomplishments acknowledged by others. It will also allow you to see what other teen leaders have done and acknowledge their efforts. *Second, YES can use your portfolios to build a "big portfolio" for YES itself to tell others in 4-H and in the broader community what YES is accomplishing with kids learning science and teens developing leadership skills.*

Orientation Aid No. 4a

4-H YOUTH EXPERIENCES IN SCIENCE TEEN LEADER ARTIFACT BOX

What is a teen leader artifact box?

Each team of teen leaders in *4-H YES* is asked to keep on hand a box (e.g., 12"x28"x8"- the exact size doesn't really matter) in which to keep papers, notes, photos, information, letters, and samples of children's work. The box is added to as the activities are planned, done at the centers, and talked about afterwards.

The purpose of the box is for teen leaders to keep information about what was planned, what happened, and what people (children, teens, parents) thought about it. These materials eventually tell a story about what happened as you did your work. The *artifact box* is in place of a final report, evaluation, or portfolio. It is a way of documenting what happened without adding a great deal of work to the main task of leading and enjoying the *YES* activities.

An *artifact box* is not really a *portfolio*. A portfolio is organized, usually bound into a book, and has a "show-off" purpose. An artifact box also tells the story of *4-H YES*, but in a more informal way. The *artifact box* is less organized, stores materials, collects ideas, and has a purpose of working on the program.

What goes into a teen leader artifact box?

Many different kinds of things can go into an *artifact box*. There are no right and wrong contents. Teen teams should decide what materials best represent what happened. This following list contains *possible* papers, documents, records and objects that *might* be included in an artifact box:

- information about children worked with (who, where, when, how many)
- notes, plans, cards that you prepared to lead the activities
- entries from your diary or journal
- lists of suggestions you have to improve the activities
- descriptions of what you did together as teen leaders, and with kids
- statements of goals and objectives
- materials from your *YES* training
- photographs or videotapes of events
- interviews with kids, parents, teachers

- examples of things kids made
- your thoughts on "early" and "late" experiences leading 4-H YES
- stories about community service
- statistics, graphs, charts
- newspaper clippings
- letters, announcements
- anything else that you think is important

As soon as you recognize that your materials may be worth storing, put them in your box. **The more, different kinds of things you collect, the better!** It is a good idea to collect almost everything at first; later you can take out things that don't really mean much. Multiple copies of materials are not needed; just one will keep the information. (A few teams may need to use more than one box.)

Who is responsible for the box?

Each team should keep its own box until they are done with the project. Usually, it is best for one teen to be chosen by the team to be primarily responsible for adding to and keeping the box. Everyone on the team needs to keep getting materials, documents, objects, and papers for the box.

Who will see the box? What will be done with it?

Many of the best ideas in the 4-H YES activities and material that you will use came from past teen leaders who kept their plans, notes, records, letters, and photos in activity portfolios and share them with the 4-H YES office.

People who design and set up the 4-H YES activities will look through the box for ideas, problems to solve, and information about how well the YES program is working.

Teen Observation Sheet for School-age Child Care Programs



Site Observed: _____

Dates of Observations: _____ **Times:** _____

Number of Staff in Attendance: _____

Number of Children: _____ **Approximate Ages:** _____

The Program Setting: Briefly describe the program setting. Include things such as space, tables, access to water, available supplies, equipment, games, bulletin boards, display space, etc.

The Children's Activities: Check the following activities that you observed children doing: _____ **indoor activities** _____ **outdoor activities** _____ **playing games/puzzles** _____ **doing homework** _____ **eating snacks** _____ **singing** _____ **building objects** _____ **performing drama** _____ **listening to music** _____ **recreational activities** _____ **reading** _____ **doing art projects** _____ **doing science projects** _____ **doing cultural projects.**

List other activities that you observed:

Program Relationships: Check the following you observed children participating in: _____ **working in small groups** _____ **working in large groups** _____ **working individually** _____ **working one-on-one with staff** _____ **staff-led activities** _____ **child-led activities** _____ **free time or free choice activities.**

General Comments: _____

_____ **Signed**



Date:

Dear 4-H YES Participant:

What a great response at the recent **4-H YES Orientation Meeting!** Your enthusiasm will certainly help this program meet its expectations. Following are several reminders for the project:

OBSERVATIONS

Please plan time in your busy schedules to complete the *Teen Observation Sheet for School-age Child Care Programs*. Please contact _____ with the date and location where you plan to observe. We will then call the site director to let her know you are coming. A self-addressed envelope is enclosed for your convenience in returning the completed form. We need the observation sheets by _____.

TRAINING

The mandatory training dates are: _____.

The training will be held from _____ to _____ at _____ (map enclosed.)

If you are not able to meet this commitment, please notify us at your earliest convenience. We look forward to your input as part of the 4-H YES team.

Sincerely,

Enclosures: Self-addressed envelope
Map to training

Recruitment and Training Guide



Introductory 4-H YES Training



Training Aids Included in this Section

- Overview
- Get Acquainted Riddle Game
- Learning to Learn: A Bottle and Balloon Experience
- Peanuts, Peanuts and More Peanuts!
- Remembering When You Were Five-to Eight-Years-Old

Overview

The *4-H YES Project* differs from many other youth science activities in that it is experiential, uses the Learning Cycle in presenting inquiry-based activities, incorporates the science processes with content learning and adheres to *developmentally appropriate practices* for five- to eight-year-old youth.

An introduction and understanding of these important educational strategies is essential for successful teen performance. We have found that a three hour overview on this prior to the specific curriculum training significantly enhances the teens ability to deliver the program.

This section provides a suggested outline for conducting the introductory training. Presenting this training element on a Friday evening (6:00 to 9:00 p.m.) prior to a Saturday full day (8:00 a.m. to 4:00 p.m.) training on the curriculum units is both time sensitive and effective.

We have had best results holding this training at a school-age child care site or at a participating school. Teens can informally learn about the SACC facilities, equipment and resources, as well as other indoor and outdoor resources.

We strongly suggest that a dinner meal be incorporated into this introductory training. Pizza and sandwiches have been favorites with the teens. Serving the meal at the beginning of the agenda allows for latecomers to join the group before training begins.

Introductory YES Training

We also strongly suggest that both the adult mentors and SACC and agency staff be included in the training. Make sure they are made to feel like important participants in the training. Arrange the seating and room layout so that teens and adults are co-mingles for the training.

Training Aid No. 1 provides a suggested 4-H YES Training Agenda for this element of the training. The remainder of this section is a step-by-step plan for implementing the *Training Agenda*.

Preparation Notes



4-H YES Training Agenda



Friday Evening

6:00-6:15 p.m.	Dinner and Registration
6:15-6:30 p.m.	“Getting Acquainted” Riddle Game
6:30-6:40 p.m.	<i>YES Project Overview</i>
6:40-7:20 p.m.	“Learning to Learn” A Bottle and Balloon Experience
7:20-7:25 p.m.	<i>Break</i>
7:25-8:05 p.m.	“Peanuts, Peanuts and More Peanuts!” An Introduction to the Science Processes
8:05-8:45 p.m.	“Remembering When You Were 5- 8-Years Old!!” Understanding Young Children
8:45-9:00 p.m.	Closing, Further Instructions on Next Steps in the Training

Saturday

8:00-8:25 a.m.	Continental Breakfast/Get Together Review on Friday Night, Overview of Today
8:30-12:00 noon	Training in One of Three Curricula
12:00-12:30 p.m.	<i>Lunch</i>
12:30-3:30 p.m.	More on Curriculum
3:30-4:00 p.m.	Come Together “Where Do We Go From Here?” Wrap Up, Farewell

Get Acquainted Riddle Game

Use the Egg Riddle Activity as a means of creating a group environment and of introducing participants to each other.

Time Required: 15 to 25 minutes

Suggested Grouping: Large group and pairs

Getting Ready

- 1 You will need to have the exact number of pairs of eggs to match the number of participants. Cut the riddle questions and answers into separate pieces. Place one question or answer into each plastic egg. **See Training Aids No. 2 and No. 2a.**
- 2 Store matched pairs of eggs in egg cartons until all participants are present. Then empty the number of eggs you need into a basket to distribute.

Action Directions

1. After a brief welcome and introduction, explain that as part of the get acquainted exercise the entire group will be doing an activity that would be enjoyed by five- to eight- year-olds.
2. Explain that you will be passing out plastic eggs. Inside each egg will be a *riddle question* or a *riddle answer*. The participants' task will be to find the person who has the match to their riddle or question. When they find the person, the next step is to learn the person's name and why they were interested in joining the *4-H YES Project*. After all pairs have been matched, each person will introduce their riddle partner.

Materials Needed

- One plastic egg for each participant, or plastic film canisters
- *Agenda Training Aid No. 1*
- *Trainings Aids No. 2 and No. 3*
- List of riddles cut into questions and answers
- One egg carton for egg storage
- Basket or container for egg distribution

**Tip**

If you did not conduct a separate 4-H YES Project Orientation, use this time to introduce the project.

Refer to Teen Orientation Section 2 for suggestions on how to introduce the 4-H YES Project goals and expectations.

3. Pass out the eggs following the instructions above. Allow about five minutes for mixing and getting acquainted.
4. Bring the group back together and ask each pair introduce themselves and share why they joined the 4-H YES team.
5. After each team is introduced, instruct them to put their questions and answers back into the eggs. Then pass the egg carton and ask them to place the matched pairs of eggs, side-by-side in the egg cartons.

Discussion

Before moving on to the next activity, discuss how riddles are appropriate developmentally, for five- to eight-year-olds. *(Children 5 -to 8-years-old are beginning to develop a sense of humor and enjoy entertaining their peers and others with these jokes and riddles. They also learn better when actively involved.)*

Preparation Notes

Get Acquainted Egg Riddle Activity

The clock strikes 13, what time is it?	Time to fix the clock.
Why is the rabbit's nose always shiny?	Because he has the powder puff on the wrong end.
What do you call bull that's sleeping?	A bulldozer.
What country do you become on a cold morning?	Chile.
I have four legs, yet only one foot. What am I?	A bed.
Why is a bride unlucky on her wedding day?	Because she didn't marry the best man.
What is worse than finding a worm in an apple?	Finding half a worm.
What did the porcupine say to the cactus plant?	It that you, Mama?
What did Paul Revere say at the end of his long ride?	Whoa!
Why was the little strawberry worried?	Because his mother and father were in a jam.
What starts with a T, ends with a T and is full of T?	A teapot.

Get Acquainted Egg Riddle Activity (continued)

What state is a father?	PA (Pennsylvania)
What runs all around the yard, yet never moves?	A fence.
What did the big toe say to the little toe?	Don't look now, but there's a heel following us.
Which month has 28 days in it?	They all do.
What would a cannibal be who ate his mother's sister?	An aunt eater!
If two is company and three is a crowd, what are four and five?	Nine.
I can run, but can't walk. What am I?	A stream.
Why is a heart like a police officer?	It has a regular beat.
When is coffee like a soil?	When it is ground.
What is it that will go up a chimney down, but won't go down the chimney up?	An umbrella.
What is the best way to find someone out?	Go to their house when they aren't in.
What is the best way to keep fish from smelling?	Cut off their noses.

Learning to Learn...a Bottle and Balloon Experience

Time Required: 40 minutes

Suggested Grouping: Large group demonstration

Background Information

This activity introduces the *Learning Cycle* instructional model, which is utilized in each of the 4-H YES units in the presentation of the science experiences. The *Learning Cycle* model is composed of three instructional components: *exploration*, *concept development* and *concept application*. In the Bottle and Balloon Activity, teens learn more about this important educational concept. Teens will first “mess about”, that is they will have a chance to **explore** and manipulate the materials and then create their own questions and answers.

Then, the teens will be involved in the **concept development**. Here, they will pose a question for further study or answers. (In this activity, the presentation of the attributes of a chemical reaction and finding evidence of a chemical reaction.)

The third part of the learning cycle, **concept application**, refers to applying the learning to some new life situation.



Materials Needed

- 12 oz clear glass beverage bottle, 1 per 2 participants
- 8" - 10" round balloons, 1 per 2 participants
- Tablespoons, 1 per 8 participants
- Baking soda, 1 8 oz. box per 8 participants
- Vinegar, 1 cup per 2 participants
- Funnels, 1 per 8 participants
- 1/4 cup measuring cup, 1 per 8 participants
- Chalkboard and chalk or flipchart and markers
- Buckets
- Tape
- *Learning Cycle Training Aid No. 3*

Introductory YES Training

The Learning Cycle in 4-H YES**The Learning Cycle**

The instructional model used in presenting the inquiry-based activities is an adaptation of Kolb's Learning Cycle. This instructional format has been found effective in working with youth to develop reasoning abilities in science. Researchers have found it to be particularly effective when used in combination with other instructional interventions such as inquiry labs, peer-led discussions and Socratic teaching methods.

Activities based on the Learning Cycle involve three distinct phases:

- **Exploration** - introductory activities presented by teams. These activities are the foundations upon which conceptual understanding can be built. The youth learn through their own actions and reactions with minimal guidance or expectation of specific accomplishments.
- **Concept Development** - led by teams. This phase begins with a discussion of observations made during the exploration. Then it moves into a discussion leading to the development of a concept principle related to the activity or unit - e.g., evidence of a chemical reaction or concentration. The concept principles lead the younger youth to apply new patterns of problem finding and problem framing, their experiences.
- **Concept Application** - a family activity or neighborhood or community service activity. This phase extends the range of applicability of the new concept. It provides additional time and experiences for stabilization and cognitive consolidation of the new concepts and reasoning patterns. An assumption in 4-H YES is that we are not only focusing on providing youth with more information, but rather our emphasis is developing scientific thinking skills and decision-making through the family community service applications of what is being learned. Application activities provide increased relevance and connection between what is being learned and the world by focusing on high intrinsic topics chosen by the participants themselves.

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Introductory YES Training Aid No. 3
4-H YES Project Recruitment and Training Guide

Getting Ready

- ❶ Obtain all necessary materials. Prepare in advance one bottle and balloon for every pair of students.
 - Use the funnel to pour 1 to 2 tablespoons of baking soda into each balloon.
 - Fill each bottle with about 2 inches of vinegar.
 - Place the lip of the balloon over the bottle lip, being careful not to let any of the baking soda spill into the bottle. Set aside until after the introductory discussion.
- ❷ Set up flipchart.
- ❸ Reproduce *Training Aid No. 3*.

Action Directions

1. Explain to the participants that you are now going to give them a chance to explore, *hands-on*, with a science activity. (*Keep the introductory discussion brief; the first focus should be on exploration.*)
2. Before passing out the balloons and bottles, ask several questions that cause the participants to make several observations and predictions.

Ask questions like these:

- ✓ Can you describe what is in the bottle?
 - ✓ What do you think the liquid is?
 - ✓ What type of substance do you think is in the balloon?
 - ✓ Add your own questions
3. Next, pass out an assembled bottle and balloon to each team. Instruct the teams **not** to shake the bottle or cause the substance in the balloon to spill into the bottle.



Introductory YES Training

4. Ask the participants to work with a partner to do this activity. Explain that they must follow your directions, one step at a time.
5. Now ask the participants to pinch the lip of the balloon on the bottle lip with one hand.
6. Explain that on the count of three, they are to simultaneously lift their balloons allowing the powder inside to mix with the liquid in the bottle.
7. Count to three.
8. Watch the balloons inflate.

Activity Discussion (*Concept Development*)

1. Ask for descriptions of what they observed.
2. Lead a discussion of what happened. Ask the group to use their senses in discussing the chemical reaction that they observed. (sight, touch, smell, and hearing are senses to use)
3. Ask: *What they think the liquid was? Why?*
4. Ask: *What was the substance in the balloon? Why?*
5. Ask: *What caused the reaction?*
6. Add your own questions!

More Action (*Concept Application*)

1. Now, ask each pair of participants to experiment with ways they can use the materials to inflate their balloon larger.
2. Provide buckets for the participants to empty the contents of the bottles.
3. Allow about ten minutes for each team to replicate the experiment.

More Activity Discussion

1. Bring the group back together and ask each pair of participants to share their balloon, describing what they did to inflate the balloon and why they chose those particular methods. *(If you have a large group, you may choose to select only a sampling of the teams to report).*
2. Next, put six or eight of the inflated bottles and balloons on the table in the front of the group. Lead a discussion on how the group can further its observation of the bottles by comparing and sorting them.
3. First, ask for a few comparisons (which is largest, smallest, tallest, etc.)
4. Next, ask for a volunteer to sort the bottles and balloons according to some characteristics.
5. Ask the group to identify how the balloons were sorted.
6. Ask for another volunteer to sort the bottles and balloons according to their chosen characteristics.
7. Repeat as many times as the time permits and that participants show an active interest.
8. Pass out “*The Learning Cycle in 4-H YES*” handout, **Introductory YES Training Aid No 3.**

Preparation Notes

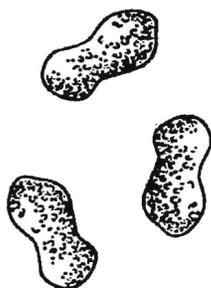
The Learning Cycle in 4-H YES

The Learning Cycle

The instructional model used in presenting the inquiry-based activities is an adaptation of Karplus' Learning Cycle. This instructional format has been found effective in working with youth to develop reasoning abilities in science. Researchers have found it to be particularly effective when used in combination with other instructional interventions such as inquiry labs, peer-led discussions and Socratic teaching methods.

Activities based on the Learning Cycle involve three distinct phases:

- **Exploration** - introductory; activities presented by teens. These activities are the foundations upon which conceptual understanding can be built. The youth learn through their own actions and reactions with minimal guidance or expectation of specific accomplishments.
- **Concept Development** - led by teens. This phase begins with a discussion of observations made during the *exploration*. Then it moves into a discussion leading to the development of a concept principle related to the activity or unit - e.g., evidences of a chemical reaction or concentration. The concept principles lead the younger youth to apply new patterns of problem finding and problem framing their experiences.
- **Concept Application** - a family activity or neighborhood or community service activity. This phase extends the range of applicability of the new concept. It provides additional time and experiences for stabilization and cognitive-consolidation of the new concepts and reasoning patterns. An assumption in 4-H YES is that we are not only focusing on providing youth with more information, but rather our emphasis is *developing scientific thinking skills* and *decision-making* through the family community service applications of what is being learned. Application activities provide increased relevance and connection between what is being learned and the world by focusing on high intrinsic topics chose by the participants themselves.



Peanuts, Peanuts, and More Peanuts!

This training activity will introduce the participants to the science processes. Through the hands-on experience, teens and adult mentors will apply each of the four elements of the science process appropriate for five- to eight-year-old children: observing, communicating, comparing, and organizing.

Time Required: 40 minutes

Suggested Grouping: Large and small groups

Background Information

The 4-H YES Project utilizes the scientific thinking process adapted from the **1991 California State Science Framework** which identifies seven processes that relate to learner developmental stages from sensory motor to formal operational. Four of the seven processes are appropriate for five- to eight-year-olds. (**See Training Aids No. 11 and No. 11a.**)

These processes include *observing* (seeing, hearing, touching, tasting, smelling); *communicating* (silent, oral, written, pictorial); *comparing* (sensory, relative, linear, weight, capacity and quantity comparisons); *organizing* (data gathering, sequencing, grouping, classifying, and ordering).

Getting Ready

- ➊ In advance of the training, gather three different types of unshelled peanuts (salted, unsalted, and raw). Mix the three types together in a large bag or bowl.

Materials Needed

- Raw, unshelled peanuts
- Salted, unshelled peanuts
- Unsalted, unshelled peanuts
- Flipchart and paper
- Seven colors of felt tip markers
- Masking tape
- Science Processes mini-posters *Training Aids No. 4 through No. 8*
- Science Processes *Training Aids No. 9 through No. 11b*

Introductory YES Training

- 2 Set up the flipchart.
- 3 Reproduce **Training Aids No. 4 through No. 11a.**

Action Directions

1. Again, provide only a brief introduction to this activity. The inquisitive, self-directed, exploration of the first part of the activity should be encouraged. Explain to the participants that through this activity they will learn about the four science processes that are relevant to the children with whom they will be working: five- to eight-year-olds.
2. As a large group, ask the participants to take on the role of a scientist and to carefully observe a peanut. Pass out a peanut to each participant.
3. Instruct the participants to observe their peanut as an individual. Allow a minute or two for this. If time permits, ask the participants to write down their observations.
4. Next, ask the participants to find a partner. Instruct them to continue their observations.
5. Now, instruct the pairs to form small groups (2 to 4 pairs depending upon the size of the group). Instruct the small groups to continue their observations and share their results.

Discussion

1. Bring everyone back into the large group. Ask the participants to share their observations. Use the different colored markers (**red** for sight observations, **blue** for touch observation, **green** for taste, **purple** for sound, and **orange** for smell).
2. After recording the observations, ask the group to tell you what they noticed about how their responses were recorded. (*i.e., the five different colors represent the five different senses used to make observations.*)



Tip
Do not give any direction or instruction about using their five senses. This is part of the discovery!
Again, do not give instructions about how to continue the observations.



Tip
It is best to have another person record the responses while someone else questions the group.

3. Use this time to introduce the *science processes*. Explain that what the group just completed, *observation*, is the first of the science processes. As you introduce the other three processes, *communicating, comparing, organizing*, put the mini-posters on a wall to emphasize the science processes. **See Training Aids No. 4 through No. 8.**
4. Add your own questions.

More Action Directions

1. Extend this activity further by using the other science processes.
2. Divide the larger group into three smaller groups.
3. Give each group several sheets of paper and several colored markers.
4. Give the following instructions to each group.

Group One: *Communicating*

- Ask the group to first identify all the ways that were utilized by the various groups to **communicate their observations** (*silent, oral, written, pictorial, etc.*)
- Instruct the group to prepare a presentation that demonstrates at least two methods of communicating.
- Pass out the Group 1 card with further instructions and suggestions. **See Training Aid No. 9.**

Group Two: *Comparing*

- Ask the group to first identify all the ways that were utilized by the various groups to **compare their observations** (*senses, weight, size, length, color, etc.*)
- Pass out the Group 2 card with further instructions and suggestions. **See Training Aid No. 9.**

Introductory YES Training

Group Three: *Organizing*

- Ask the group to first identify the methods used in the various groups to **organize their observations** (*data gathering, grouping, sorting, classifying, ordering, etc.*).
- Instruct the group to prepare a presentation to the larger group that demonstrates at least two methods of organizing.
- Pass out the Group 3 card with further instructions and suggestions. **See Training Aid No. 10.**

More Activity Discussion

1. Give the groups about five minutes to complete their assignment. Next, have each of the groups report their findings. As the groups report, point to the mini-poster for the process being used.
2. Suggest other methods that may not have been covered by the groups in their presentations.
3. Explain that in the *4-H YES* curricula, the science activities utilize these various science processes in the delivery of the program.
4. Again, refer back to the mini-posters. **See Training Aids No. 4 through No. 8.**
5. Pass out the **Training Aids No. 11 and No. 11a.**



THE SCIENCE PROCESSES



Observing



Communi- cating



Comparing



Organizing

Card One

Science Processing: Communicating

In science we can describe and picture what we have observed in a number of ways. This can be done by:

- **telling about it**
- **writing about it**
- **drawing about it**
- **charting about it**
- **graphing about it**

Instructions

- * ***Over the next five minutes, identify two ways that information observed about the peanuts can be “communicated” (tell something, write something, draw something, etc.)***
- * ***Using the peanut observations, prepare a one-minute presentation to give to the group about the science process of communicating.***

Card Two

Science Processing: Comparing

In science process of *comparing* builds on the first process of observing. It compares the similarities and differences between two or more objects. We can learn about the attributes of one object (its color shape, size, weight, etc.) by *comparing* the attributes of those of another.

It is important to *compare* items in the science process to develop more complex concepts and better understand what has been observed.

Instructions

- * ***Over the next five minutes, identify as many attributes as you can that can be compared in the peanuts.***
- * ***Prepare a one minute presentation to the group about the similarities and differences you compares in the peanuts.***

Card Three

Science Processing: Organizing

In science we can organize what we know and what we have observed through ordering and categorizing information into broader, more general groupings.

***Ordering* is the process of putting objects, events or information into a linear format through *seriation* (ordering from the largest to smallest, softest to loudest, etc.) or sequencing (from first to last).**

***Categorizing* is the process of putting the objects, events or information together through sorting, grouping or classifying (i.e., putting all items together that have the same shape, color, texture, etc.)**

***Organizing* information is important so that it can be compared and communicated.**

Instructions

- * Over the next five minutes, identify several ways to order or categorize the peanuts. Prepare a one-minute presentation for the group on how you have organized the information that you have learned about peanuts.***

Descriptions of Processes Shown on the Chart

★ *Observing*

The main route to knowledge is through **observing**, using all the senses. This process is a distinct one by which people come to know about the characteristics of objects and their interactions.

★ *Communicating*

Objects are named and events described by people so that they can tell others about them. **Communicating** is a fundamental human process that enables one to learn more about a greater range of information than could be learned without this process.

★ *Comparing*

Comparing is a distinct process by which people systematically examine objects and events in terms of similarities and differences. By comparing the known to something unknown, one gains knowledge about the unknown. All measurements are forms of comparing.

★ *Organizing*

Knowledge of principles and laws is gained only through the systematic compiling, classifying, and ordering of observed and compared data. Bodies of knowledge grow from long-term **organizing** processes.

★ *Relating*

Relating is a process by which concrete and abstract ideas are woven together to test or explain phenomena. Hypothetical-deductive reasoning, coordinate graphing, the managing of variables, and the comparison of effects of one variable on another contribute to the attainment of the major concepts of science.

★ *Inferring*

The processing of realizing ideas that are not directly observable is the process of **inferring**. The process leads to predictive explanations for simple and complex phenomena.

★ *Applying*

Use of knowledge is the **applying** of knowledge. Inventing, creating, problem-solving, and determining probabilities are ways of using information that lead to gaining further information.

In working with primary-age children (K-3rd grade), you will only be using the first four processes: observing, communicating, comparing, and organizing.

THE PROCESSES OF SCIENCE FOR PRIMARY AGE CHILDREN



OBSERVING

Seeing; Hearing; Touching; Tasting; Smelling



COMMUNICATING

Silent; Oral; Written, Pictorial



COMPARING

Sensory comparisons; Relative positive comparisons; Linear comparisons; Weight comparisons; Capacity comparisons; Quality comparisons



ORGANIZING

Ordering; Sorting, Grouping; Classifying

Remembering When You Were Five- to Eight- Years-Old!

This activity will help teens and adult mentors better understand how five- to eight-year-old youth think, feel, and act. This will be extremely important for the teens as they begin delivering the 4-H YES activities. Knowledge of these principles will help teens solve many behavioral issues they may encounter working with this age youngster.

Time Required: 40 minutes

Suggested Grouping: Large group and four smaller groups

Background Information

Middle childhood, ages five to eight, is an exciting time for children. It is often the time when childhood memories are made and when much development occurs.

During this time, children are maturing in many ways; physically, mentally, emotionally, and socially. To be successful, children must acquire new skills, knowledge, and abilities. It is also during this period that children begin to branch out socially and build new or additional relationships.

Individual development during this time is not the same from one child to the next, nor is it consistent within developmental domains, even within a single child. All children grow and develop at their own rate.

Materials Needed

- Developmental Characteristics for 5-6 year olds and 7-8 year olds *Training Aids No. 12 through No. 19*
- Developmental Characteristics Role Playing Cards *Training Aids No. 20 and No. 21*
- Developmental Stages *Training Aids No. 22a-22e*
- Scissors
- Flipchart, note cards or overhead for introduction
- Markers
- Paper

Getting Ready

- ❶ Reproduce the **Training Aids No. 20 and No. 21, Developmental Characteristics of Children 5-6 years olds and 7-8 year olds Role Playing Cards** cut into eight squares. (There should be four cards for each age group.)
- ❷ Set up a flipchart to record responses.
- ❸ Reproduce **Training Aids No. 22a - No. 22e**, as handouts.
- ❹ Reproduce **Training Aids No. 12 through No. 19**, as overhead transparencies. (*Optional*)

Action Directions

1. To introduce the topic to the teens and adult mentors use the *Developmental Characteristics Training Aids No. 12 through No. 19* on **Physical, Mental, Emotional, and Social Development for Five- to Eight-Year-Olds and the Implications for these Developmental Stages** in non-formal educational programming.

Note: *This can be done through a mini-lecture, using the Teaching Aids as notes. The sheets can also be replicated on flipchart paper or made into overhead transparencies.*

2. Instruct the group that they are to design a short vignette which dramatizes some of the characteristics of the children listed on the card. The vignette should be no longer than one minute in length. Give the group about five minutes to prepare their skit.

After introducing the topic, divide the teens and adult mentor into eight groups. Give each of the groups one of the eight **Developmental Characteristics Role Playing Cards**.

3. Next, have each group present its skit to the entire group. Reinforce the information presented with

Introductory YES Training

further discussion. Relate the presentations to possible situations that the teens may encounter in delivering the science experiences to primary age children in informal school-age child care settings.

4. Add your own questions.
5. Remind the teens to review the *Developmental Characteristics Training Aids No. 22a - No. 22e* as they prepare their sessions to take to the school-age child care programs. Also, encourage the teens to refer to these handouts if they encounter behavior problems in working with children.

Preparation Notes

Physical Development of Five- to Eight-Year-Olds

CHARACTERISTICS

- ◆ **Generally slow and steady**
- ◆ **Mastering physical skills**
 - ◇ **Large Muscle - Learning to catch a ball**
 - ◇ **Small Muscle - Holding a pencil,
learning to write**
- ◆ **Work in short spurts of energy**
- ◆ **Physically active**

Physical Development of Five- to Eight-Year-Olds

IMPLICATIONS

- ◆ **Activities that promote practice**
- ◆ **Open-ended activities**
- ◆ **Projects that use more large motor skills**
- ◆ **Projects that don't require perfection or detail**



Cognitive Development of Five- to Eight-Year-Olds

CHARACTERISTICS

- ◆ **Moving from stage of initiative to industry**
- ◆ **Concrete thinkers**
- ◆ **Difficult to draw conclusions or develop theories**
- ◆ **More interested in process than in products**
- ◆ **Like to sort and classify**
- ◆ **Development of humor**

Introductory *YES* Training Aid No.14

Cognitive Development of Five- to Eight-Year-Olds

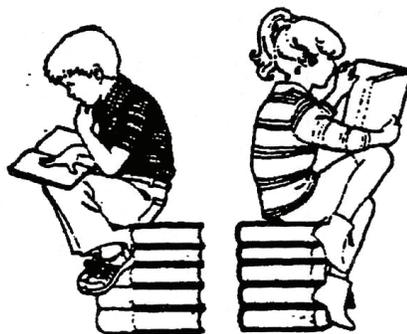
IMPLICATIONS

- ◆ **Activities need to have lots of movement**
- ◆ **Activities should be hands-on and use all senses**
- ◆ **Need to focus on *doing* things rather than finishing products**
- ◆ **If end product is needed-needs to be short and simple project**
- ◆ **Focus on experience and exploration rather than written or verbal lessons**
- ◆ **Emphasize projects like collections**

Emotional Development of Five- to Eight-Year-Olds

CHARACTERISTICS

- ◆ **Egocentric - wrapped up in themselves**
- ◆ **Unable to imagine what others are thinking and feeling**



Introductory YES Training Aid No.16

Emotional Development of Five- to Eight-Year-Olds

IMPLICATIONS

- ◆ **Dramatic play helps to learn about others**
- ◆ **Cooperative games/play rather than competition**



Introductory YES Training Aid No.17

Social Development of Five- to Eight-Year-Olds

CHARACTERISTICS

- ◆ **Beginning to explore world outside of home**
- ◆ **Establishing relationships with adults outside of parents**
- ◆ **Still dependent on adult approval**
- ◆ **Developing friendships**
- ◆ **Likes to help**

Social Development of Five- to Eight-Year-Olds

IMPLICATIONS

- ◆ **Small groups work better than large groups**
- ◆ **Adult involvement is necessary and wanted**
- ◆ **Adults can model socially acceptable behaviors**
- ◆ **Want to do things that are helpful**

**DEVELOPMENTAL CHARACTERISTICS OF CHILDREN
ROLE PLAYING CARDS**

CHARACTERISTICS

***Physical Development
Children Ages 5 to 6***

- ✎ Physical growth is slower than during infancy.
- ✎ Muscular coordination and control is uneven and incomplete. Large muscles are easier to control than small muscles.
- ✎ Able to handle tools and materials more skillfully than during preschool years.
- ✎ Can throw different-sized balls better than they can catch them. Most cannot bat well.
- ✎ Most can learn to snap their fingers, whistle, and wink.

CHARACTERISTICS

***Emotional Development
Children Ages 5 to 6***

- ✎ Sensitive to criticism; doesn't accept failure well.
- ✎ Strong desire to affection, and likes adult attention.
- ✎ Cooperative and helpful; they want to please.
- ✎ Get upset with changes in plans and routine.
- ✎ Say what they think and feel, e.g., "you stink"; "you're ugly."

CHARACTERISTICS

***Mental Development
Children Ages 5 to 6***

- ✎ Asks questions and answers them in literal terms.
- ✎ Can distinguish their own left and right, but not in other people.
- ✎ Define things by their use, e.g., pencil is for writing.
- ✎ Most are just learning letters and words. By six, most can read words or combinations of words.
- ✎ Short attention span.

CHARACTERISTICS

***Social Development
Children Ages 5 to 6***

- ✎ Developing cooperative play. Prefer to work in small groups 2 or 3. Still like to focus on own work and play.
- ✎ May begin to pair up to have a *best friend*; however, the *best friend* may change frequently.
- ✎ Mother (or parent) is still social focus as prime caregiver; however, may "fall in love" with kindergarten teacher.
- ✎ Can engage in group discussions.
- ✎ May have need to be *first*, to *win*, to be the *best*, and may be *bossy*.
- ✎ Can be unkind to others, but extremely sensitive to criticism of self.

Introductory YES Training

**DEVELOPMENTAL CHARACTERISTICS OF CHILDREN
ROLE PLAYING CARDS**

CHARACTERISTICS

***Physical Development
Children Ages 7 to 8***

-  Period of slow, steady growth.
-  Learn best if physically active.
-  Still inept at some activities using small muscles, but have improved large muscle activities like riding a bike, skating, or jumping rope.
-  May need or want to repeat an activity over and over to master it.

CHARACTERISTICS

***Emotional Development
Children Ages 7 to 8***

-  Increased awareness to themselves, more sensitive to others.
-  Enjoy being part of the family.
-  Worry about failure or being criticized.
-  Will try themselves out on others to see how they are accepted.
-  May claim tasks are too hard rather than admit being scared.

CHARACTERISTICS

***Mental Development
Children Ages 7 to 8***

-  May spend more time alone doing projects, watching TV, or day dreaming.
-  Begin to take in perspective of others.
-  Humor takes on new meaning.
-  Enormous curiosity and delight in discovery.
-  Are able to *collect, sort, organize, and classify*.
-  Can recognize some similarities and differences.
-  Can do some abstract thinking, but learn best through active, concrete methods.

Introductory YES Training Aid No. 21

CHARACTERISTICS

***Social Development
Children Ages 7 to 8***

-  May be moody, but less likely to direct negative feelings toward others.
-  Have high expectations of parents and adults; are critical when parents “mess up.”
-  Value adult interaction and may actually be more polite to adults.
-  Begin to internalize adult feelings toward religion, ethnic groups, and money.
-  Begin to develop friends that involve sharing secrets and possessions.
-  Begin to see choice of same-sex playmates and development of play groups.

Remember When you Were Five- to Eight-Years-Old!

The middle childhood years, ages five to eight, are exciting times for children. It is often the time then first childhood memories are made and when much development occurs. During this time period, children are maturing in many ways: physically, mentally, and emotionally. To be successful, children must acquire new skills, knowledge, and abilities. It is also during this period that children begin to branch out socially and build new or additional relationships.



Development during this time frame is not the same from one child to the next, nor is it consistent within developmental areas, even within a single child. All children grow and develop at their own rate. Some children may acquire certain capabilities earlier than their peers, while others may physically outpace their classmates, but be behind in other developmental areas.

During the middle childhood years, adults and teens can greatly assist in children's development by guiding children's involvement in projects and enriching their learning experiences. This is done through listening to children's ideas, responding to their questions, engaging them in conversations, and challenging their thinking.

The following information is meant to be a guide that outlines the general characteristics and capacities of children ages five to six and seven to eight. *The left hand column lists physical, mental, emotional, and social characteristics. The right hand column lists important implications for using this information in an after school, school-age child care program.*

This outline is not intended to be used as a criterion for assessing development, but rather as a guidepost for selecting activities that will promote the healthy development of middle childhood children. **Remember, each child is unique and will mature in a unique way!**

Adapted from "4-H Leader's Guide for Working with K-3rd Grade Youth". University of California Cooperative Extension, 1993.

Introductory YES Training Aid No. 22a

CHARACTERISTICS AND IMPLICATIONS FOR CHILDREN AGES FIVE TO SIX

Characteristics

Implications

Physical Development

- ✎ Physical growth is slower than during infancy and early childhood.
 - ✎ Muscular coordination and control is uneven and incomplete. Large muscles are easier to control than small muscles.
 - ✎ Able to handle tools and materials more skillfully than during preschool years.
 - ✎ Can throw different-sized balls better than they can catch them. Most cannot bat well.
 - ✎ Most can learn to snap fingers, whistle, and wink.
- *Plan activities that use large motor skills and introduce fine skills, one at a time.*
 - *Plan lots of physical activity with each meeting.*
 - *Introduce new physical activities that require coordination, such as roller skating, bike riding, jumping rope, and simple outdoor games.*
 - *Provide projects that don't require perfection.*

Mental Development

- ✎ Ask questions and answer them in literal terms.
 - ✎ Can distinguish their left and right, but not in other people.
 - ✎ Define things by their use, e.g., pencil is for writing.
 - ✎ Most are just learning letters and words. By six, most can read words or combinations of words.
 - ✎ Short interest span.
- *Give instructions verbally and visually. Don't expect them to read.*
 - *Avoid a lot of paper and pencil activities that require writing.*
 - *Plan a series of small activities, with physical exercise in between, rather than one longer more intense session.*
 - *Plan active learning around concrete objects.*
 - *Provide lots of materials and mediums for learning, e.g., paper, paint, brushes, glue, building blocks, manipulatives.*

CHARACTERISTICS AND IMPLICATIONS FOR CHILDREN AGES FIVE TO SIX

Characteristics

Implications

Emotional Development

- | | |
|--|--|
| <ul style="list-style-type: none"> ✎ Sensitive to criticism; doesn't accept failure well. ✎ Strong desire for affection and like adult attention. ✎ Get upset with changes in plans and routine. ✎ Say what they think and feel, e.g., "you stink"; "you're ugly." ✎ Can throw different-sized balls better than they can catch them. Most cannot bat well. ✎ Most can learn to snap their fingers, whistle, and wink. | <ul style="list-style-type: none"> • <i>Provide lots of encouraging words for effort.</i> • <i>Provide lots of opportunities for adult interaction with children.</i> • <i>Provide opportunities for children to help in "adult-like" ways, such as setting up for an activity.</i> • <i>Give clear description of what your activity or schedule will be and stick to it.</i> |
|--|--|

Social Development

- | | |
|---|---|
| <ul style="list-style-type: none"> ✎ Developing cooperative play. Prefer to work in small groups of 2 or 3. Still like to focus on own work and play. May begin to pair up to have a "best friend"; however, the "best friend" may change frequently. ✎ Mother (or parent) is still social focus as prime caregiver; however, may "fall in love" with kindergarten teacher. ✎ Likes being part of and around family. ✎ Can engage in group discussions. ✎ Can be unkind to others, but extremely sensitive to criticism of self. ✎ Likes to practice different roles. | <ul style="list-style-type: none"> • <i>Organize projects and activities that involve two or three children. If there is a larger group, break activities into sections so that only two or three are involved at one time.</i> • <i>Help children develop friendships through learning to share, taking turns, following rules, and being trustworthy (not tattling).</i> • <i>Organize activities with high adult/child ratios.</i> • <i>Develop projects and activities that involve or focus on the family.</i> • <i>Avoid competition or activities that select a single winner or "best person."</i> • <i>Use imaginary play that involves real-life situations (playing store, house).</i> |
|---|---|

CHARACTERISTICS AND IMPLICATIONS FOR CHILDREN AGES SEVEN TO EIGHT

Characteristics

Implications

Physical Development

-  Period of slow, steady growth.
 -  Learn best if physically active.
 -  Still inept at some activities using small muscles, but have improved large muscle activities like riding a bike, skating, or jumping rope.
 -  May repeat an activity over and over to master it.
- *Will have difficulty with some fine motor projects, such as gluing, cutting, hammering nails, bouncing balls, etc.*
 - *Will be able to throw ball better than able to catch ball.*
 - *Provide opportunities to practice skills, but use projects that can be completed successfully by beginners.*

Mental Development

-  May spend more time alone doing projects, watching TV or day dreaming.
 -  Beginning to take in perspective of others.
 -  Beginning to tell time.
 -  Humor takes on new meaning.
 -  Enormous curiosity and delight in discovery.
 -  Are able to collect, sort, organize, and classify.
 -  Can recognize some similarities and differences.
 -  Can do some abstract thinking but learn best through active, concrete methods.
- *Give instructions verbally and visually. However, most children will be able to read and comprehend simple art instructions.*
 - *Can introduce some written assignments and activities. However, most children will prefer to be active.*
 - *Activities that require sorting, organizing, or classifying will be enjoyed.*
 - *Encourage children to develop or make collections.*
 - *Encourage projects that can be done over and over in different ways.*
 - *Use lots of activities that require the children to participate in a hands-on way.*
 - *Guide children in reflecting on their learning experiences.*

CHARACTERISTICS AND IMPLICATIONS FOR CHILDREN AGES SEVEN TO EIGHT

Characteristics

Implications

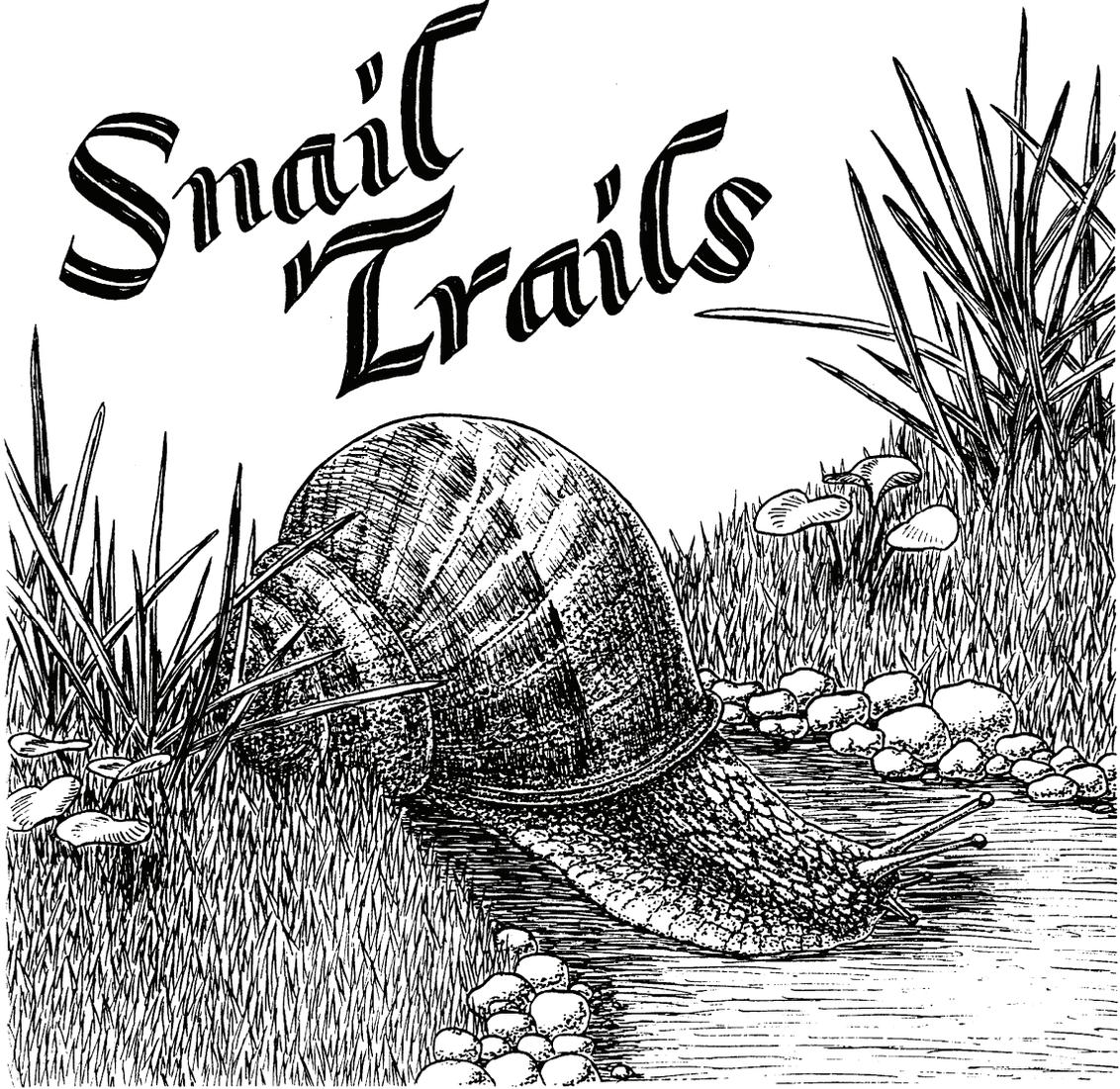
Emotional Development

- | | |
|--|--|
| <ul style="list-style-type: none"> ✎ Increased awareness of themselves, more sensitive to others. ✎ Enjoy being part of the family. ✎ Worry about failure or being criticized. ✎ Will try themselves out on others to see how they are accepted. ✎ May claim tasks are too hard rather than admit being scared. | <ul style="list-style-type: none"> • <i>Enjoy making gifts for family.</i> • <i>Involve children in doing things for others.</i> • <i>Provide lots of adult encouragement and praise.</i> |
|--|--|

Social Development

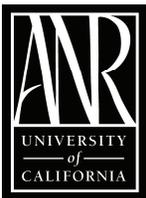
- | | |
|--|---|
| <ul style="list-style-type: none"> ✎ May be moody, but less likely to direct negative feelings toward others. ✎ Have high expectations of parents and adults and are critical when parents “mess up.” ✎ Value adult interaction and may actually be more polite to adults. ✎ More outgoing, curious, and talkative. ✎ Begin to internalize adult feelings toward religion, ethnic groups, and money. ✎ Begin to develop friendships that involve sharing secrets and possessions. ✎ Begin to see choice of same-sex playmates and development of play groups. | <ul style="list-style-type: none"> • <i>This is time to introduce the “art of social graces.” Teaching of table manners and other social niceties will be more accepted.</i> • <i>Activities will be more successful if children can be grouped in same-sex groups.</i> • <i>Select activities that involve the child’s curiosity and creative abilities.</i> • <i>Children will enjoy naming their group or activity and coining phrases to describe their activities.</i> • <i>Promote social activities that appreciate and emphasize diversity of families and lifestyles.</i> • <i>Use lots of songs, rhythms, fairy tales, and comics to help socialize the group.</i> • <i>Provide learning activities that stimulate conversation.</i> |
|--|---|

Snail Trails



4-H YOUTH EXPERIENCES IN SCIENCE PROJECT
UNIVERSITY OF CALIFORNIA COOPERATIVE EXTENSION
DIVISION OF AGRICULTURE
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Snail Trails: The Adventures of *Helix Aspersa*

by

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Welcome to the 4-H Youth Experiences in Science Project!

There is nothing like the **4-H YES Project** for providing high-quality children's science education in after-school settings. **4-H YES** uses specially trained teenage volunteers to conduct the hands-on science curriculum for children 5 to 8 years of age enrolled in school-age child care programs.

Each **YES** Theme Unit contains five or more 1- to 1½- hour sessions. Each session contains three or more activities that build on the session's theme.

The session instructions provide an **Overview of the Day's Activities**, **Background Information** on the session's subject, **Materials You Will Need** to conduct the session and a detailed outline on **Getting Ready**, the **Action** required, and specific **Sciencing** questions. When reading the curriculum, be sure to look for the **Tips** in the side column. They give valuable information on setting up and conducting the activities. At the end of the curriculum is a listing of all the supplies needed to conduct each activity.

The **YES** Curriculum incorporates inquiry-based activities with cooperative learning. It focuses on learning the scientific thinking processes and features the learning cycle model of instruction.

The **Scientific Thinking Processes** are built into each of the sessions. The processes of **observing**, **communicating**, **comparing**, and **organizing** are most commonly used in this curriculum aimed at younger children. The processes are indicated in small bold type after the **Action** and **Sciencing** sections of each activity.

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***HELIX ASPERSA* FOR THE TEEN LEADER: AN INTRODUCTION TO THE YES SNAIL ACTIVITIES**

The ***Snail Trails*** directions and suggestions are written for you, the teen leader, to use when planning and conducting the *Helix aspersa* “snailing” activities. The *Helix aspersa* unit is made up of six sessions that will average about 45-90 minutes each. The sessions are made up of individual activities of varying length.

The YES “snailing” activities provide children with an opportunity to watch a wild animal go about the business of living. While caring for their own snails and observing them, the children will probably ask many questions, find answers to some of them, and begin to see something of how an animal lives, grows, and reproduces. They will do much more than just learn biology. Children will probably become attached to their snails as they observe many animal characteristics in great detail. They will also learn to care for and protect a living creature.

The instructions, experiences, and activities in this *YES Snail Activity Guide* involve terrestrial snails—*Helix aspersa*—the common brown garden snail. These snails are found in most states in the U.S. and are considered pests by many gardeners. Snails are also available through biological supply stores such as NASCO for a fee. Before ordering snails, check with your county agricultural commissioner regarding how to dispose of snails after your “snailing” activities. If the snails are easy to find in your area, you may want to collect them locally.

Snails are easy to handle. They require fairly common and easy-to-obtain food, and their life cycle is such that they will probably reproduce every few months. An excellent publication about caring for snails is *Keeping Minibeasts: Snails and Slugs*, listed in the bibliography. *Keeping Minibeasts* describes simple procedures for raising snails. It also offers suggestions to help you collect your own supply of snails. An article published in *Scientific American* (1975), “*The Pleasures and Problems of Raising Snails in the Home*,” gives many suggestions for keeping and observing snails. This article is listed in the bibliography.

Background Information for Keeping Snails

All plants and animals live in certain areas for a reason. Where they live is called their *habitat*. In their habitat the animals can usually find all they need to survive. They get food, find shelter and water, and can reproduce.

Snails can live almost anywhere. Although snails are easy to keep, their homes should be designed to avoid problems such as escaping snails. They need air to breathe, so a screen covering is preferable. The homes should be easy to clean, because they can become “gross” due to trails of slime and excrement. *The snail home must be cleaned frequently (at least twice a week) to keep the snails healthy.* There should be a thin layer of fallen leaves, a lettuce leaf or a piece of carrot and a twig or two, and maybe a small container of soil. These materials appear to stimulate snails by providing a varied environment in terms of smell and taste. Keep the soil container moist, but not too wet, and the snails will lay their eggs in it.

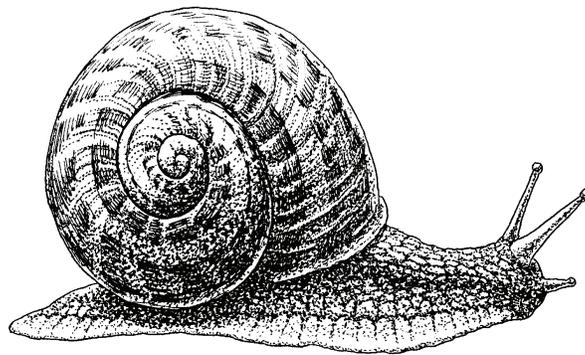
Helix aspersa (your land snail) is not a fussy eater. Snails will eat a wide variety of plants and other material, so it can be fun for you and the children to investigate the snails’ food preferences. We have seen snails eat modeling clay! The snails seem to develop individual food preferences. Their diet should include some cereals such as dry oatmeal flakes, or even egg shells since calcium is essential for building their shells.

By using the activities provided in this guide, or modifying them slightly, children can experiment to find answers to things they wonder about, such as “Do snails have teeth?” “Will my snail lay eggs?” “What can I feed my snail?” By bringing in snails they have found, the children will have the opportunity to observe them in their native habitat and then as part of the YES activities.

The activities you will prove in YES will encourage the children to observe the day-by-day changes in the development and behavior of the snails. What the children notice and are curious about will help you determine the direction and pace of the activities. You will learn that in working with animals, there are times when little seems to be happening.

As you present *Snail Trails* you may want to explore some of the questions and ideas that you and the children have about snails. In past sessions, children have created new activities such as dances to represent

snail behavior, writing poems and stories about snails, and representing observations of snail's physical and behavioral characteristics on graphs and drawings. Who knows what the children working with you will create to tell the snail's story?



MEET *HELIX ASPERSA*

Approximate Time Required for Session: 1 hour

Purpose

- To begin investigating snails and snail behavior.
- To begin to use science processes such as observing, communicating, and comparing through investigations with snails.

Overview of the Day's Activities

Today you will be introducing the children to snails. You and the children will be watching the snails “making a living” as the snails eat and move about the table top and maybe over the edge. You will be reading a story to the children. This session begins the process of learning about our guests—the snails.

Background Information

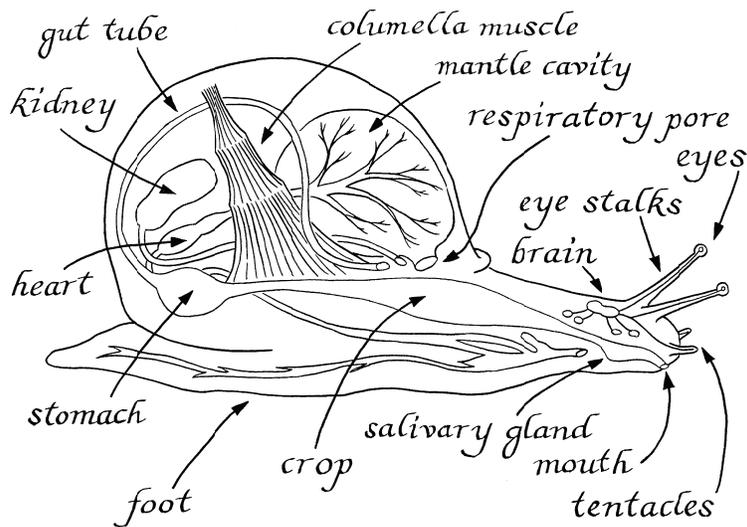
This snailing unit will use common (garden-type) brown land snails—*Helix aspersa*. Garden snails are found in most areas in the United States and are often considered pests by gardeners and the U.S. Department of Agriculture.

Useful publications about caring for snails are “*Keeping Minibeasts: Snails and Slugs*” and “*The Amateur Scientist: The Pleasures and Problems of Raising Snails in the Home*,” Scientific American (1975).

Snails are remarkable animals! In this unit, you and the young children will get to know some of the unique and interesting habits of land snails. For example, they become dormant under a number of unfavorable conditions, such as when they are too hot, too dry, or too cold. Land snails are easy to observe and care for. Although snails are easy to keep, their homes (and the “hotels” you build in *Session 4*) will need to be cleaned often.

Snails build their shells as they grow. Calcium is the main ingredient of the snail's shell. The shell is built by the snail by secreting a calcium-rich substance at the shell opening. You will notice that there are rings on the snail shell where it has been built, similar to the growth rings on trees. In the wild, snails get calcium from leaves, egg shells of birds, and other sources. Snails eat a wide variety of things, from spinach to paper, and sometimes modeling clay, charcoal, and even plastic bags. You and the children may want to keep a record of what your snails have eaten.

Snails are an invertebrate animal in the mollusk family. Of the 80,000 species of mollusks that have existed, about half still survive. Probably the two most obvious parts of a snail that you and the children will notice first are its shell and its foot. The foot is the long extension of the body of the snail. The snail seems to glide along on its foot. The snail's mouth is at the front of its foot and can be observed through letting the snail crawl on glass or plastic. You and the children will learn more about snail anatomy as you watch your snail and during *Session 5*.



ACTIVITY A

GETTING TO KNOW *HELIX ASPERSA* (YOUR SNAIL)

Time Required
40 minutes

Suggested Grouping
large group, sitting
in circle

Materials You Will Need

- Snails, live – 1 per child and a few extra
- Newsprint pad – large
- Different colored markers – 4 to 5
- Lettuce

Getting Ready

- ➊ Obtain all necessary materials - enough for this session.
- ➋ Place snails on central table area with lettuce scattered about for snails to crawl around and investigate.
- ➌ Make a *Snail Safety Rules* Chart beginning with the three rules listed in #7 in the *Action* section of this activity.
- ➍ Make a chart labeled *Snails: Things We Know*.
- ➎ Make a chart labeled *Snail Observations*.

ACTION: OBSERVING AND COMMUNICATING

1. Tell the group that today everyone is going to observe (watch) and communicate (talk)

SNAIL SAFETY RULES

- ◆ KEEP THE GUESTS OUT OF DANGER—DON'T LET THEM FALL.
- ◆ TREAT THE GUESTS WITH RESPECT AND CARE, ALL OF THE TIME.
- ◆ KEEP GUESTS IN A CONFINED ENVIRONMENT.

about a very small, wild animal—*Helix aspersa*, the common brown garden snail.

2. Take the group to the table where the snails will be able to move about. Ask everyone to gather around and watch the “wild” animals. Put the snails on the table. Tell the children that they will just be using their eyes and ears right now.
3. Ask the children how many snails are on the table. Count them together. Allow time for questions and observations.
4. Ask the children: “What did you see happening on the table?” Record the responses on the newsprint chart.
5. Ask the children what they already know about snails.
6. Record the items mentioned by the children on the *Snails: Things We Know* chart as either physical or behavioral.
7. Tell the children we will be talking about the snails being our “guests.” Read the rules from the *Snail Safety Rules Chart*. Some of the rules we will follow include:
 - *Keep the guests out of danger—don’t let them fall.*
 - *Treat the guests with respect and care, all of the time.*
 - *Keep guests in a confined environment.*
8. Tell them they may want to make up new rules later, as they think of them. The space left at the bottom of the chart is for their rules.



Tip
To feel more comfortable with your presentation, you may want to make notes and practice out loud what you will say after each Action item listed.





Tip
Your observation chart might be written words (for 7- to 8-year-olds) to describe size, shape, color, and/or texture, or both drawings and words (for 5- to 6-year-olds, non-readers, and ESL (English as a Second Language) children).



Tip
Establish a routine for cleanup.

9. Explain to the children that they are to go to the table and observe the guests. Allow the children time to observe the snails roaming on the table. Ask them to try and locate the same snail they watched last time. As they are observing, listen to their comments, ask questions and encourage them to observe and talk as much as they can about snails and what the snails are doing.

After the children have had time to make observations, have them help with cleanup and place the snails back in their container. Count the snails to find out if any “wild” animals have escaped. Save the leftover lettuce in a plastic bag to use in the next session.

10. Return to the circle and review the chart (what they observed about snails). Are there new things to add? Discuss what they learned about snails today.

SCIENCING: OBSERVING AND COMMUNICATING

Ask the children about:

- what the snails ate
- how they moved
- what else they noticed about the snails

Observing

- looking at wild animals (snails)
- watching the snails perform

Communicating

- talking about their snail observations
- discussing what they know about snails

ACTIVITY B**A SNAIL STORY**

Time Required
20 minutes

Suggested Grouping
large group

Children will learn about a snail that wanted the “biggest house in the world.”

Materials You Will Need

- Children’s book *The Biggest Little House in the World* by Leo Lionni
- Drawing paper
- Markers or crayons

Getting Ready

- ❶ Read the book *The Biggest Little House in the World* several times prior to this activity so you are familiar with the story and the words.
- ❷ Gather the needed supplies.

ACTION: OBSERVING AND COMMUNICATING

1. Gather the children to listen to the story after cleanup from *Activity A* or while eating a snack.

Presentation Notes



Tip
The most common mistake is reading too fast.



Tip
Be sure to stop at each page and show the pictures to the entire group.

Tips for Successful Oral Reading

- **Setting the stage** - Have the children sit in a semicircle with your chair slightly higher. Ask some brief questions to build enthusiasm and encourage responses. Keep the book face down or out of sight.
- **Presenting the book** - Show the book so the cover is clearly visible. Make sure the children can see the pictures easily. Tell them the name of the book, the author, and the illustrator. Discuss the illustrations.
- **Reading the book** - Use plenty of expression. Adjust your voice and speed of reading to fit the story. Keep children involved by asking “What do you think is going to happen?” Read slowly enough for the children to build mental pictures.

2. Read the book *The Biggest Little House in the World* by Leo Lionni to the children. After several pages, pause and ask what the book is about and how they predict it will end. Discuss the book briefly at the conclusion.

Other questions

MORE ACTION: COMMUNICATING

1. After reading, ask the children to draw pictures about the story or to create their own picture of a special snail house (shell).
2. Allow time for each child to share their artwork with the group. Hang the pictures on the wall for all to see.

SCIENCING: OBSERVING, COMMUNICATING, AND COMPARING

1. Ask the children questions that relate the story to some of their own discoveries thus far in observing snails.
 - Have you seen snails or people's houses that look like or reminded you of those made by the boy in the story?
 - How were the snails' shells or houses alike and different from the ones in the story?

Follow-Up

1. Ask the children to look around their homes for places they think snails live.
2. Have children look for objects that look like snails or ways people are similar to snails. Ask them to bring the list back for the next session, (either written or remembered) to share with the group.
3. Have the children look for things that have the same color or shape as a snail.

NOTE

Be sure to save all the charts from this session to discuss with the children next time.

**Tip**

For this age group it is helpful if you put the opportunities for the at-home assignment on a piece of paper for the children to take home to share.

SNAILS, SPIRALS, AND THE FIVE SENSES

Approximate Time Required for Session: 1 hour

Purpose

- To identify the five senses
- To explore the senses of observation such as **feeling, touching, listening,** and **smelling**
- To use the science processes such as **observing, organizing, communicating, comparing**
- To introduce the word *spiral*
- To begin comparing spirals
- To identify spirals in our lives

Overview of the Day's Activities

Today you will be encouraging the children to make more observations of the snails, and to notice how they are alike and different. You will also be introducing the idea of a spiral.

Background Information

SENSES: The five senses we use for observing are:

- seeing
- feeling
- hearing
- tasting
- smelling

SPIRALS: There are many items in the universe that have a spiral design or element to their character. According to Webster's Dictionary, a **spiral** is the following:

Noun - "the path of a point in a plane moving around a centered point while continuously receding from or approaching it" or

Verb - "to go or to move and especially to rise or fall in a spiral course, to wind in a spiral manner."

This session includes several interesting and fun activities involving snails.

ACTIVITY A

LEARNING ABOUT SNAILS THROUGH THE SENSES

Time Required

20 minutes

Suggested Grouping

pairs

Materials You Will Need

- Snails, live — 1 per child, and a few extra
- Lettuce, cabbage, or chard — 1 head or bunch
- Clear, 6-oz plastic cup — 1 per child
- Empty paper lunch bags — 4 bags for each pair of children
- Colored markers — 1 per pair of children
- Snail shells (escargot from supermarket) and broken land snail shells — 35 to 40
- Newsprint pad
- Charts made during *Session 1*

Getting Ready

- ❶ Label one of the lunch bags in each set with a picture of an **ear** and the word **HEAR**.
- ❷ Label one of the lunch bags in each set with a picture of an **eye** and the word **SEE**.
- ❸ Label one of the lunch bags in each set with a picture of a **nose** and the word **SMELL**.
- ❹ Label one of the lunch bags in each set with a picture of a **hand** and the word **TOUCH**.
- ❺ Place two or three empty shells in each bag and fold shut.



Tip

As you gather your materials

for each Activity, use the list to check off the items.



Tip

In case you forget for a moment,

the 5 senses are TOUCH, SMELL, TASTE, HEAR, and SEE!

 <p>See</p>	 <p>Hear</p>
 <p>Touch</p>	 <p>Smell</p>

⑥ Use four pieces of paper with picture of each bag sense listed. Make sure there is enough room for the children’s recording (one set for each pair).

⑦ Place one live snail in each cup (at the site).

ACTION: OBSERVING, COMMUNICATING, AND COMPARING

1. Ask the children to sit in a circle and review the charts made in the last session. Ask them to share if they found snails at home as part of the follow-up in *Session 1*. As the children share, record their observations on newsprint:

- List places where they found snails and places where they didn’t find snails.
- List objects that are similar to snails.
- List the items that the children observed that were the same color as *Helix aspersa* (snails).
- List the children’s observations of items they found that are shaped the same as snails.
- List the ways the children think people are similar to snails.
- Use cutouts or drawings for younger children.

2. Have the children form pairs. Explain that they are now going to do an activity called “*Think, Pair, Share.*”

- First, they will *think* about the task,
- Second, as a *pair* they will *do* the task;

- Third, they will *share* their findings with their partner.
 - Ask the group if they know what the five senses are. List them as they are said.
3. Show the children a set of the three bags (hear, touch, and smell) you prepared. Explain that they will each take a turn holding one of the bags and investigating the contents with the sense that is written on the front of the bag. Tell them to try to remember what they observe.
- Give each pair a piece of paper and a marker to record their findings with pictures or words next to the picture of the *sense* bag they investigate.
 - Tell the children that when they feel in the bag with their hand, or listen with their ears, or smell with their noses, they should close their eyes.
 - Ask them to record their findings after they explore each bag. (Each sense should have a comment/finding next to it from each child.)
 - After everyone has completed the three bags, pass out the fourth (see) bag with the eye and have each child look carefully into the bag and record their observation/s.
4. Have each child share their recording on the papers with their partner. Keep a list at the main chart with pictures or words (use them only once). Discuss the observations briefly. Collect all of the bags and recording papers.



Tip
If they have difficulty, point to a part of your own body that helps them identify the five senses.



Tip
Make a sample recording sheet for them to use.



Tip
Some 5- and 6- year olds will have difficulty with the drawing and recording. If this occurs, have them partner up and do the activity. They can share with their partner and then meet as a group and collectively make a chart with pictures and words.

SCIENCING: OBSERVING AND COMMUNICATING

Using the first three senses: touching, smelling, and hearing:

- What observations could they make?
- Which sense gave them the most information?

Presentation Notes

ACTIVITY B

HELIX ASPERSA
SONG AND DANCE

Time Required
20 minutes

Suggested Grouping
large group, sitting
on the floor

Materials You Will Need

- Words and song about snail (see page 21)
- Newsprint
- Markers
- Cassette player and snail song on tape, *optional*

Getting Ready

- ❶ Learn snail song and copy words on large newsprint or blackboard.
- ❷ Sing the words to a tune similar to “Rain, Rain, Go Away” or any other tune familiar to children. (See page 21.)
- ❸ Know the meaning of spiral. (See background information at beginning of chapter for definition and description.)

ACTION: OBSERVING, COMMUNICATING, AND COMPARING

1. Ask the children to stand in a circle. Sing the snail song one time through for them.
 - Teach the children the words to the snail song, one line at a time. Repeat the song by singing one line of the words and have the group repeat after you.

SNAIL SONG



Snail, Snail,
 Go around, around,
 around.

- Sing the song slowly again and have the group sing with you. Repeat this again until everyone knows the song.
2. Tell the children to stand and have them join hands in a circle. Break the circle at one point and make a line, still holding hands. The teen becomes the leader of the line.
- Begin to walk, continuing to hold hands. Move the line around the room and finally return to an area where the group can make a spiral.
 - Suggestion on how to make a spiral: Slowly wind the line up tight around the stationary person. After all are wound up tight, the leader turns, changes direction and all follow, retracing their steps. *See the diagram below.*

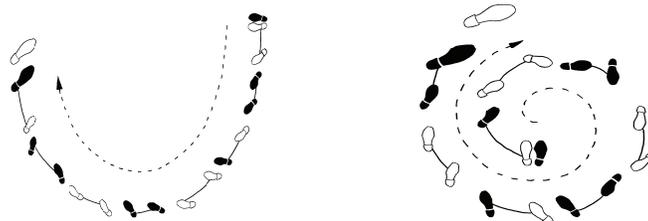
Tip
 Here is a diagram of the spiral dance, showing you how the children move in and out of a spiral shape together.

NOTES ABOUT HOW THE SPIRAL WILL BE MADE:

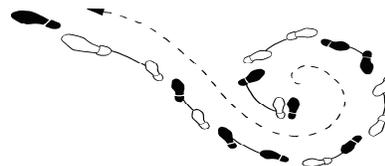
Start.



Then reverse, and uncoil as you sing the song.



You may want to do this once or repeat it a couple of times.



- Ask the end person to stand still. Ask everyone to begin singing the snail song, while the leader begins to spiral around the end person. Continue singing and spiraling until the group forms a large spiral; sing the song, one last time.
3. After singing the song, discuss spirals.
- How did it feel making a spiral?
 - Undoing the spiral?
 - Besides our spiral, what others have you seen?
 - How are spirals different than circles?
4. Ask the children to look for spirals tonight at home and other places. Ask them to make a list of the actual items and to bring it tomorrow. Give a few examples to look for, e.g., water going down a drain, woodscrew, or seeds. Identify a spiral table or floor area for the collected items.

SCIENCING: OBSERVING, COMMUNICATING, AND COMPARING

Talk with the children about the science processes they've used:

Observing

Snail shells and using the senses

Communicating

Recording findings and sharing with a partner

Comparing

Size of shells, smells



Tip
Give instructions for cleanup as a team, and then repeat the directions.

ACTIVITY C***HELIX ASPERSA***
OBSERVATIONS

Time Required
20 minutes

Suggested Grouping
individuals or pairs

Materials You Will Need

- Snail, live — 1 per child
- Clear, 6-oz plastic cup — 1 per child
- Lettuce (wash and drain)
- Hand lens — 1 for each pair of children
- Charts from the previous activities

Getting Ready

- ❶ Place one live snail in each plastic cup at the site.
- ❷ Place all cups in one location on a table.
- ❸ Tear up lettuce into small pieces.
- ❹ Prepare a chart for the snail *Lettuce* activity.

ACTION: OBSERVING, COMMUNICATING, AND COMPARING

1. Review the chart about snails (words and pictures). Review the *Snail Safety Rules* from *Session 1* before beginning this activity.
 - Ask children if there are any additional rules they think should be added.
 - Ask each child to go to the table and select one cup with a snail to observe.



Tip
Wash and reuse materials such as plastic cups, pie plates, etc.; use recycled materials whenever possible.

- Tell them to sit by themselves or with a partner, on the floor or at a table.
 - Ask the children to take two or three pieces of lettuce. Take a few minutes for the children to watch the snail in the cup and to notice whether it moves. Offer them hand lenses to observe more closely.
 - Ask them to examine the snail for a spiral. Have them *very gently* take their finger and trace and feel the spiral on the shell.
 - After a few minutes, ask the children to taste a piece of lettuce. Then tell them to take a lettuce sample and share it with their snail. Did they like the lettuce? Did their snail eat the lettuce?
2. Let the children take a few moments to observe their snails again. Then ask them to bring their cups, snails, and leftover lettuce to the table. Ask each child to place their snail back in the carrier.



Tip
If snails are not coming out of their shells, give them a quick dunk in a warm water bath or sprinkle them with warm water.



Tip
For this
age group
it is

helpful if you
put the
opportunities
for the at-home
assignment on
a piece of
paper for the
children to
take home to
share.



Tip
Discuss
the
amount of

food to bring.
It should be a
small amount.
***Ask why it**
should not be a
big amount?
****“Did the snail**
eat a large
amount
today?”

SCIENCING: OBSERVING, COMPARING, AND COMMUNICATING

Talk with the children about the ways they used the science processes.

Observing

Watching snails eat, watching children sing and spiral. Were there other senses used?

Communicating

Recording observations, singing. Were there other ways they communicated?

Comparing

Ate or did not eat, liked or did not like lettuce. How were the snails alike? Different?

Further Exploration

Ask the children to bring in a snack for the snails for the next session. Some examples would be vegetables, fruit, or other things from their kitchen or garden.

Snail Song



Snail, Snail

Game: Children form a line. One end player stands still, and the player at the other end moves in a wide circle, slowly winding the line up tight around the stationary person. After all are wound up tight, the outer coil wheels sharply in a contrary direction and all follow, retracing their steps.

SNAIL EDIBLE ART

Approximate Time Required for Session: 1 hour

Purpose

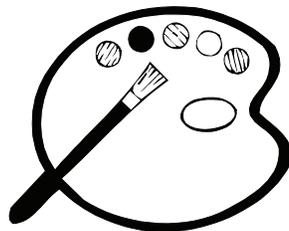
- To apply the science processes through art
- To investigate more spirals
- To observe snails' preference on various snack items

Overview of the Day's Activities

Today the children will be exploring snail spirals, snacks, and their artistic abilities. This should be a fun set of experiences for you, the children, and the snails. *But be careful. It could get messy.*

Background Information

Many different objects contain spirals. Food can also be formed into spirals. Many fruits and vegetables have spirals of seeds or other spiral designs. *Helix aspersa* can be used to assist a child with a number of art tasks, such as paintings, poems, etc.



ACTIVITY A**SNAIL SHELL SPIRALS*****Time Required***

30 minutes

Suggested Groupingup to 12 children per
cookie sheet***Materials You Will Need***

- Purchased packages of refrigerated cinnamon rolls – enough so each child can form one roll,
or
- Packages of frozen bread dough (thawed) or rolls – 1 roll per child
- Cookie sheets – 3 or 4 depending on size of group
- Access to an oven or toaster oven
- Paper towels – 1 roll
- Raisins – 1 package
- Potholders – 4
- Flat toothpicks – 1 box
- Spatulas – 2
- Aluminum foil or wax paper – 1 roll
- Newsprint pad – 1
- Colored markers or crayons

Getting Ready

- ❶ If your site doesn't have an oven, you may need to bring a toaster oven.
- ❷ Gather all the supplies.
- ❸ If you're using frozen dough, thaw before use.
- ❹ Grease cookie sheets, if necessary.
- ❺ Preheat oven to recommended temperature before beginning the action.

ACTION: OBSERVING, COMMUNICATING, AND COMPARING

1. Have children place their snack items on a central table. Review the charts from *Session 2*. Ask if the children found any more spirals at home or school. Chart their responses in a spiral, on a piece of newsprint.
2. Explain that today they are going to continue the spiral theme by creating a spiral roll to eat as a snack. Ask each person to wash their hands before working with the dough.
3. Provide each child with a roll or a piece of dough. Tell them to roll their dough on a piece of foil or wax paper to make a rope; or they may use their dough to design a spiral to resemble a snail shell. They may also use the raisins to decorate (or make a design on) their dough.
4. After they have completed their design, have them place their spiral creation on the greased cookie sheet. Then with a toothpick or small knife, mark their initials on the dough to help them find it after it is cooked. See package directions for baking time.

After everyone has completed this task, have the children go to the preheated oven and watch while you place the cookie sheets in the oven. Set a timer (or note the time and let the spirals bake.)

5. Have the children return to a location away from the stove and have them form a circle. Tell the children they will be singing the snail song again. Appoint a leader and have that person break the hand circle and then sing the snail song from last session and do the spiral dance while the snail shell spirals are baking. Change leaders several times.



Tip
Example of charting in a spiral:

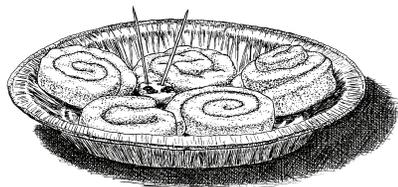


I found spirals at:



Tip
Discuss the heat and temperature of the oven and why a hot pad or mitt is used.

 **Tip**
If you have extra time, you may want to sing the snail song and make a spiral again.



 **Tip**
You may also want to try another spiral game or song.

6. When the spirals are baked, remove them from the oven and place them on aluminum foil or waxed paper to cool slightly before giving them back to their designer. Have each child describe their spiral snacks to a partner. Have them compare their spirals. Allow the children to eat their spiral snacks.
7. Clean up anywhere that the cooking and eating took place. If children have spiral leftovers, have them wrap them in foil to put in a safe place so they can take them home, or eat them later.

SCIENCING: OBSERVING, COMMUNICATING, AND COMPARING

Ask the children about the ways they used the science processes to learn about spirals.

Observing

Watching and looking for spirals, smelling pastry cooking, tasting.

Communicating

Discussing observations, following directions, talking, singing the snail song.

Comparing

Different spirals, how we made spirals and where spirals can be found. What did they learn about cooking?

Presentation Notes

ACTIVITY B

SPIRALING DOWN

Time Required
20 minutes

Suggested Grouping
large group

Materials You Will Need

- Children's book, *The Snail's Spell* by Joanne Ryder and Lynne Cherry
- Drawing paper
- Markers or crayons

Optional:

- Tape player
- Cassette tape of soft background music

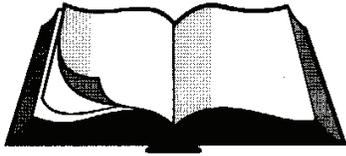
Getting Ready

- ❶ Make sure you have the book, tape player, and tape ready. The tape and player are optional.
- ❷ Read through *The Snail's Spell* and practice reading aloud, like you did in *Session 1*.

ACTION: OBSERVING, COMMUNICATING, AND COMPARING

1. Have the children get into a circle to make a spiral. Play the tape softly and begin to read *The Snail's Spell*. Read the story. You may want to ask for predictions on pictures and a possible ending.





Tips for Successful Oral Reading

- ***Setting the stage*** - Have the children sit in a semicircle with your chair slightly higher. Ask some brief questions to build enthusiasm and encourage responses. Keep the book face down or out of sight.
- ***Presenting the book*** - Show the book so the cover is clearly visible. Make sure the children can see the pictures easily. Tell them the name of the book, the author, and the illustrator. Discuss the illustrations.
- ***Reading the book*** - Use plenty of expression. Adjust your voice and speed of reading to fit the story. Keep children involved by asking “What do you think is going to happen?” **The most common mistake is reading too fast.** Read slowly enough for the children to build mental pictures.

2. Ask the children to investigate their own homes. Can they compare them to hotels? Ask them to identify three things that are the same in their homes and hotels. Three things that are different. Have them bring these ideas to tomorrow’s session.
3. Ask the children to look for snails again, and to remember what they find for your next meeting.

MORE ACTION: COMMUNICATING

1. After reading, ask the children to draw pictures about the story or to create their own picture of a child becoming a snail.

2. Allow time for each child to share their artwork with the group. Hang the pictures on the wall for all to see.

**SCIENCING: OBSERVING,
COMMUNICATING, AND COMPARING**

1. Ask the children questions that relate the story to some of their own discoveries, such as: How does a snail eat? How does it move?

Presentation Notes

ACTIVITY C

SNAIL FOOD PREFERENCES

Time Required
20 minutes

Suggested Grouping
partners or groups of
three children

Materials You Will Need

- Charts from *Sessions 1 and 2*
- Live land snail – 1 for each child and a few extras
- Clear, 6-oz plastic cup – 1 per child
- Snail Food Preference* – 1 sheet per child
- A variety of snail snacks (apple, chard, celery, banana, etc.) and whatever the children brought
- Colored markers – 4 or 5
- Newsprint pad
- Paper plates – 1 per child

Getting Ready

- ❶ Place one snail in each cup at site.
- ❷ Cut up about six to eight samples of snail food.
- ❸ Arrange the snacks for children's snails on paper plates.
- ❹ Arrange the snacks for your snail on plates.
- ❺ Tape the charts from the previous sessions to the wall near where you and the children will be working.

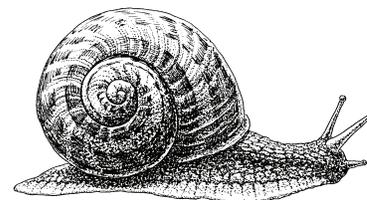
ACTION: OBSERVING AND COMMUNICATING

1. Discuss the chart of words and pictures from *Session 1* on snails. Ask if there are any new observations. Add these to the chart.
2. Make a list on newsprint of all the snack items available. After all items are listed, review the list out loud.

Tell the children that they are now going to do an experiment with their guest snails, but first they should predict (guess) which snack items they think their snail will prefer. Record the predictions on the list chart with a check mark. *(While they are investigating with their snails, count the number of marks and record the total after each item.)*

3. Ask each child to select a cup and snail. Have them choose an area to do their investigation. Suggest that it be a flat surface where the snails will be comfortable and safe.
4. Distribute one copy of the *Snail Food Preference* chart to each child. Ask each group to watch their snails in the cup while you invite a group up to the table to select four snack items to investigate. Allow enough time for inquiry and exploration.

After everyone has investigated, ask the group to share their snails' food preferences. Record them on the chart with a different color of marker. Add up the totals for each food and then compare the prediction number to the preference number. Discuss the difference in snail food preferences. Ask the children if they have different food preferences.





Tip
If a child finishes sooner than the others, challenge him or her to tempt their snail with other snack items.

5. Have all of the children help with the cleanup and place their leftover snack items in a ziplock bag. Have each child return their cup and snail to the table and then carefully place their snail back in the container. Give cleanup directions:

- Everyone helps
- Put the snails away
- Put leftover snacks away

SCIENCE: OBSERVING AND COMMUNICATING

What science processes did children use to learn about snails?

Observing

Watching snails eat different snack items

- Did the snails eat the snacks children thought they would?
- Which snail snacks would the children have eaten first?

Communicating

Recording and sharing snail snack preferences, making charts

ACTIVITY D

A POEM ABOUT *HELIX ASPERSA*

Time Require

20 minutes

Suggested Grouping

individual with four
groups to share supplies

Materials You Will Need

- Light construction paper (pastel) — 1 for each child
- John Drinkwater's *Snail Poem* — 1 copy for each child
- Glue stick — 1 for each child
- Scissors — 1 for each child
- Colored marking pens — 4 sets
- Cardboard cutout of snail (see page 39)
- Optional:* cut out several cardboard copies of snails for children to trace if they can't draw

Getting Ready

- ❶ Copy the *Snail Poem* for each child.
- ❷ Make one copy of the *Snail Spiral Worksheet*.
- ❸ Make cardboard snails, if necessary.

Presentation Notes



Tip
The Snail Poem
appears on
page 38.
Photocopy as
many copies as
your group needs.

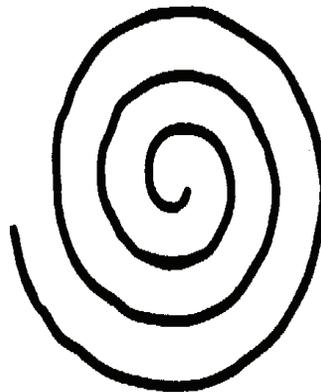
Sample of Activity

SNAIL POEM (page 38]

- 1 Snail
- 2 by John Drinkwater
- 3 Snail upon the wall,
- 4 Have you got at all
- 5 Anything to tell
- 6 About your shell?
- 7 Only this, my child—
- 8 When the wind is wild,
- 9 Or when the sun is hot,
- 10 It's all I've got.

SNAIL SPIRAL WORKSHEET

(page 39)



ACTION: OBSERVING AND COMMUNICATING

1. Distribute one sheet of construction paper to each child. Have them sit in an area or at a table where they are comfortable cutting, pasting, and drawing.

Read the poem by John Drinkwater. Tell the children they will be making a snail poem.
2. Ask each child to draw or trace an outline of a snail on their paper. Tell them that they should make the spirals big enough for the poem to fit inside the outline.
3. Distribute one copy of the poem to each child.
4. Ask each child to carefully cut out the first line of the poem. (*Demonstrate and show example, if necessary.*)
5. After everyone has cut out the first line, have them paste it inside the outline of their spiral. Suggest that they can do this in a straight line or in a spiral or whatever, but that they should be able to start at line one and progress onward.
6. Explain that they may now cut out each line and paste it inside the outline. After this is complete, have them write their names on the front corner or have a helper write their names.
7. Have children share their snail poem with a partner.
8. Explain that at the next snail session they will continue with this project, with the assistance of their snail guests. Collect all of the papers and poems. Make certain that the child's name is on the paper.

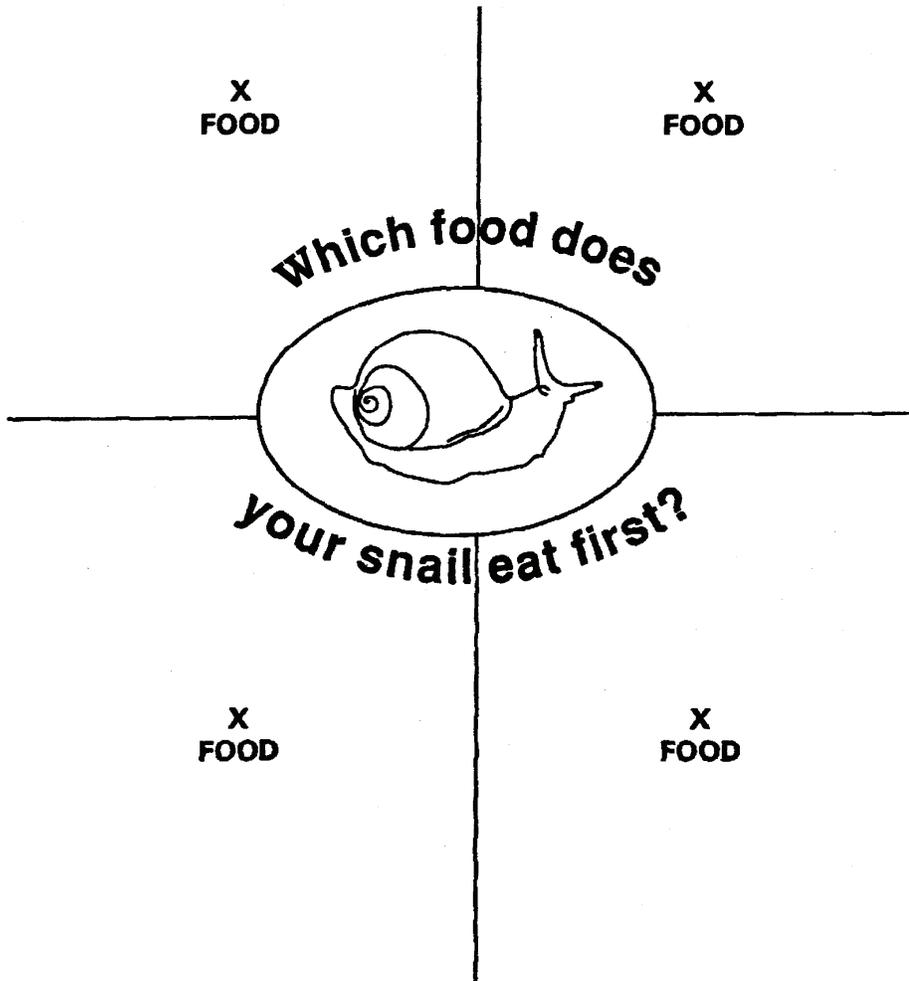



Tip
Cut out several cardboard copies of snails for children to trace if they can't draw.


Tip
Assist explorers with cutting or have a partner help if they can't cut.

9. Explain clean up and then repeat instructions.
10. Ask the children to bring in items that are spirals or ideas to share at your next meeting.

SNAIL FOOD PREFERENCE



SNAIL POEM

1 SNAIL

2 BY JOHN DRINKWATER

3 SNAIL UPON THE WALL,

4 HAVE YOU GOT AT ALL

5 ANYTHING TO TELL

6 ABOUT YOUR SHELL?

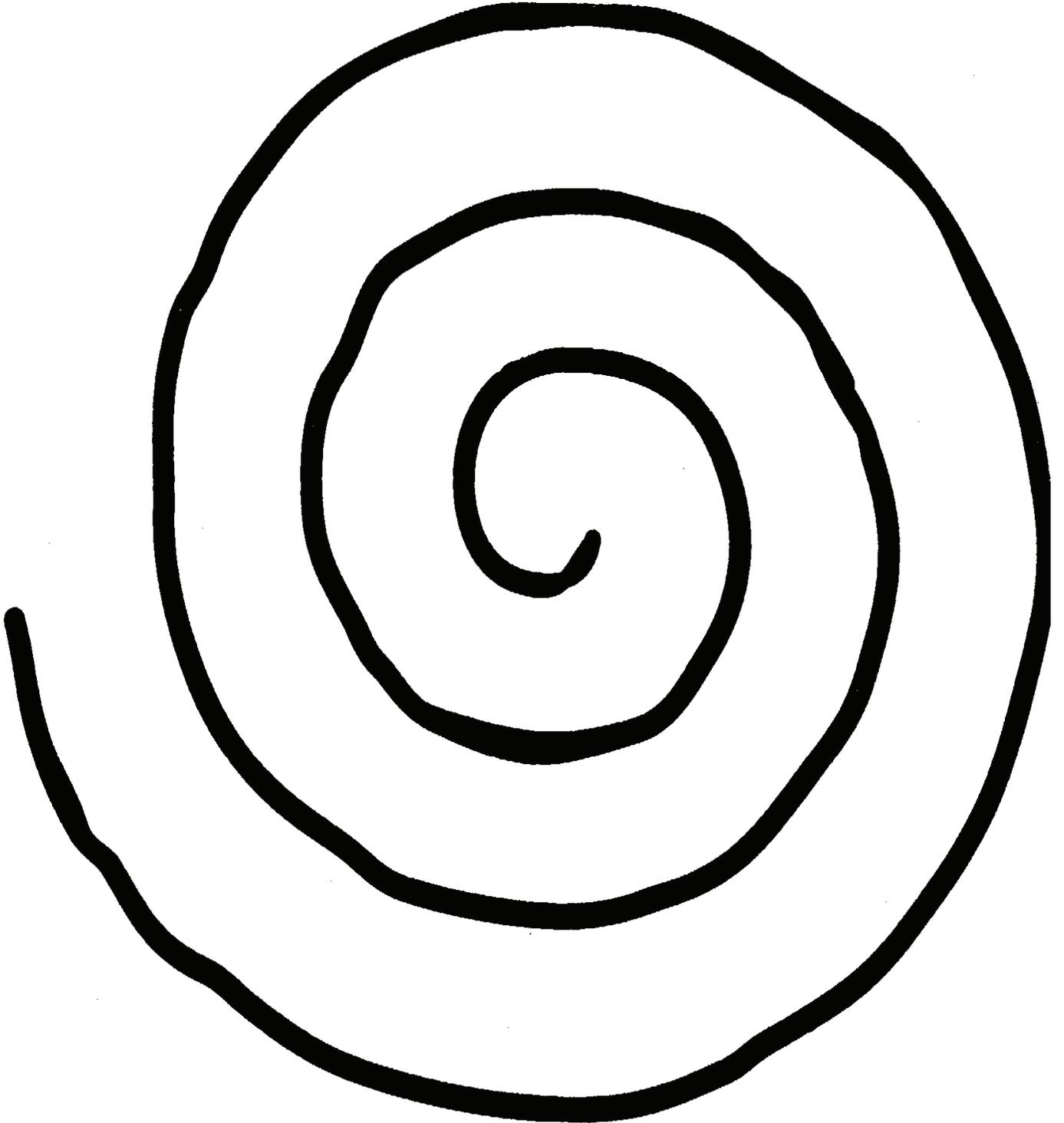
7 ONLY THIS, MY CHILD—

8 WHEN THE WIND IS WILD,

9 OR WHEN THE SUN IS HOT,

10 IT'S ALL I'VE GOT.

SNAIL SPIRAL WORKSHEET



HOME SWEET (SNAIL) HOME

Approximate Time Required For Session: 60 minutes

Purpose

- To have snails create some “art”
- To begin to explore snail habitats
- To apply the processes of observation, communication, and comparing in making a snail home
- To further investigate snail behavior

Overview of the Day’s Activities

In this session, you and the children will be encouraging the snails to create some pieces of art. In the second activity, you and the children will be building a “home” for the snails using what you’ve learned about snail preferences.

Background Information

All plants and animals live in certain areas for a reason. The place they live is called their habitat. Here they can find all they need to survive. They get food and water, find shelter, and can reproduce.

Snails can live almost anywhere. Although snails are easy to keep, their homes should be designed to avoid problems. The homes should be easy to keep clean, as their homes can become “gross” due to trails of slime and excrement. *The home must be cleaned frequently to keep the snails healthy.* There should be a thin layer of fallen leaves, a lettuce leaf or piece of carrot and a twig or two, and maybe a small container of soil. These materials appear to stimulate these snails by providing a varied environment in terms of smell or taste. Keep the soil container moist but not too wet, and snails will lay their eggs in it.

Helix aspersa (your land snail) is not a fussy eater. Although snails will eat a wide variety of plants and other material, it can be fun for you and the children to investigate their food preferences. As mentioned in the introduction, we have seen snails eat modeling clay. The snails seem to develop individual food preferences. Their diet should include some cereals such as dry oatmeal flakes. Calcium is essential for building their shells.

Review

Discuss spirals with the children and ask if anyone found spirals at home or school. If they have an idea to share, have them draw a picture on the paper. Encourage the children to look for more spirals and when they find them, to add them to the table.

Encourage the children to visit the table and observe the items. Challenge them to compare the items, then sort them into groups. Ask if any of the children found anything that moves like snails. Have them share these findings and record them on the snail chart in words or pictures.

ACTIVITY A

SNAIL VAN GOGH

Time Required

30 minutes

Suggested Grouping

large group with surfaces
for each child's snail team
to do individual art work

Materials You Will Need

- Poem papers from last activity
- Live land snail – 1 for each child
- Food coloring – 4 or 5 colors
- Aluminum pie plates – 6
- Clear, plastic 6-oz cups – 1 for each child
- Water for food coloring, if needed
- Flat toothpicks – several for each child
- Yarn
- What We Learned from Snails Chart*

Getting Ready

- ❶ Mix food coloring and water - 1 color per plate.
- ❷ Place the pie plates on the work table, so that the children can place their snails in them for color.

Presentation Notes

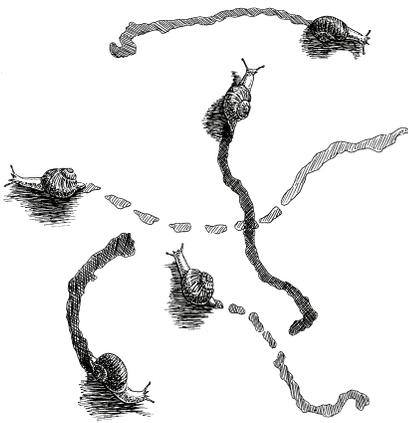


Tip

Be sure to cover the work surface with newspaper so that color does not harm the table.



Tip
Show the children how to work with the snails before they start.



Tip
If the snail does not move, how will the children encourage it to move? You can suggest a snail snack or let children experiment, reminding them to be gentle if they handle the snails.

ACTION: OBSERVING, COMMUNICATING, AND COMPARING

1. Explain to the children that today they are going to finish their snail poem pictures, working with a snail “partner.” Discuss “partners” behavior briefly. Explain that the snails must remain safe and comfortable while they work with them.

Ask children to observe how the snails move across the paper. Hand out their poem papers from the last activity and give them a few toothpicks to use with the snail art projects.

2. Ask the children to choose their snail partner for today. After everyone has a snail partner, instruct the children to begin their snail artwork. Have them dip the snail in their color of choice and place it on paper. Children can watch their snail partner make a design. Snails can be rinsed off and placed in another color, and the crawling process repeated several times.

After the children have created a “masterpiece,” have them rinse off their snails and return them to the carrier or cup. The children may now take a toothpick or two and create some additional art with the colors.

3. Have the children clean up the work areas. When the artwork is dry, display it around the room.
4. Make up a chart asking, “*What did you learn from the snail—and from each other?*”
5. Record the responses to questions.

Optional

Have the children dictate or write a short story about the snail's travels in creating the artwork, for example, "the snail sailed a boat around an island."

SCIENCING: OBSERVING, COMPARING, AND COMMUNICATING

Talk with the children about using the science processes to learn about snail art.

Observing

Watching snails create art. What parts of the snail's body did it use to create it's art?

Communicating

Telling, writing what we've learned. What did the snail art remind you of?

Comparing

How different snails made their art masterpiece.
How were the snail art masterpieces the same?
How were they different?

Presentation Notes



Tip

Have the children work in

teams of three or four to make multisnail art.

Lay short pieces of colored yarn on a sheet of paper to trace each snail's path. When you finish, it will be an image of the combined path/art of the snails!

ACTIVITY B**THERE'S NO PLACE
LIKE HOME**

Time Required
20 - 30 minutes

Suggested Grouping
groups of five or six
children depending on
number of containers

Materials You Will Need

- Plastic, 2-liter, clear soda bottles or 1 gallon jars with lids – several
- White chalk
- Leaves, grass, piece of apple, several small rocks, pieces of bark, twigs, small sticks – a variety
- Moist soil
- Live snails from previous activities
- Spray bottle mister and water
- Newsprint pad
- Markers

Getting Ready

- ❶ If using jars, be sure to punch holes in the lids to provide air for the snails.
- ❷ If using screen for covers, cut the screen to size so that it fits over the opening securely. (You may need to secure the screen with tape, string, or a rubber band.)
- ❸ Collect all necessary materials.
- ❹ Make a chart titled *About Snails*. (See page 49.)
- ❺ Make a chart titled *Where do Snails Live?*

ACTION: OBSERVING, COMMUNICATING,
COMPARING, AND ORGANIZING

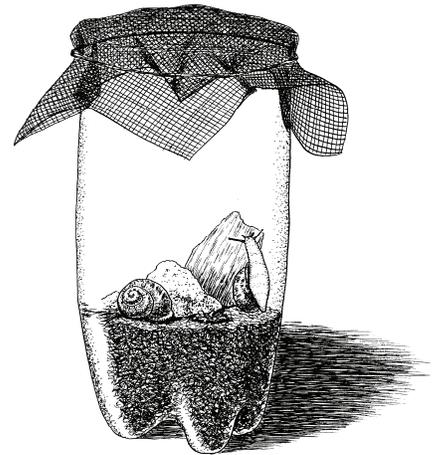
1. Ask all of the children to gather around the work table where you have all of the materials. In this activity the children are going to use everything they have learned so far about the snails to create a hotel for them. Explain that that they are going to be architects of a snail hotel.
2. Place the children in groups of five or six. Add responses to the *Where Do Snails Live?* chart about the places or situations where the children have found snails. Discuss the chart. (Save this chart for use in *Session 5*.)
3. Give each group a container. Ask the group how they can make this into a snail hotel.

Ask what they think they should put on the bottom of their hotel. Discuss their ideas. **If they don't suggest the soil first, make that suggestion.**

4. Assist the children's groups with the soil and putting it in the bottom of their hotels. To make a good home for snails they must know what snails need to live.

Explain to the children that the snails will stay in the hotel for a time, then they will be returned to the place where they were collected. Tell them they will do this because snails are "wild" animals and have things to do in the wild, and they are not really "pets."

5. Ask each group to first develop a plan. Then with one container in front of each group, have the children discuss what they will do to make this a safe hotel for their visiting snails.



6. Have one member from each group pick up the items to place in the hotel. Then tell each group to begin planning to build their hotels.
7. Ask each child to design and build the inside of the snail hotel.
8. After they have completed their hotels, tell the child to mist the inside of the hotel and plants so all is slightly damp. Have each group member select a snail or two to occupy their hotel. If they are making a smaller home, put 2 to 4 snails inside. A hotel can contain 10 to 20 snails.

Have each group of children describe their hotel to the entire group. This might best be done by having the whole group move around the room, or table, from one hotel to the next.

9. Ask each group to observe their snails as they settle into their hotel. If time permits, have each group name their hotel and design a small sign for the outside. After about 5 minutes, have children clean up the work area. Place all of the hotels in the center of the table.
10. Using your snail chart, ask questions about snail habitats and snail behaviors. Use the chart on page 50.

SCIENCING: OBSERVING, COMMUNICATING, COMPARING, AND ORGANIZING

Use the science process to learn more about snail behavior.

Observing

Watching snails in their hotels. What did children notice? Where did the snails go to sleep in the hotel?

Communicating

Discussing and recording observations of the snails in their hotels.

Comparing

How are snails different? How are they alike?

Organizing

Grouping the hotels into sizes, shapes, colors, etc.

HOME SWEET (SNAIL) HOME		SESSION 4	
ABOUT SNAILS			
		APPEARANCE	BEHAVIORS
KNOW			
DON'T KNOW			
<small>Page No. 50</small>		<small>4-H Youth Experiences in Science</small>	<small>Snail Trails: The Adventures of <i>Helix aspersa</i></small>

ABOUT SNAILS

APPEARANCE BEHAVIORS

KNOW

**DON'T
KNOW**

HELIX ASPERSA

ANATOMY

Approximate Time Required for Session: 60 minutes

Purpose

- To investigate further about snails
- To identify parts of the snail
- To observe where these parts are located on a snail and make a model of internal organs
- To use the science processes for further exploration

Overview of the Day's Activities

Today you will help the children learn about the anatomy of a snail using a felt board and a set of cutouts of internal organs. The children will make their own paper model of a snail.

Background Information

Snails are *mollusks*. We don't want to cut them up or harm them, so we will make a model to show all of their body parts. Children are usually very interested in parts of a snail's body. You will have to pay attention to the children's interest level. When they start to get bored, you can try simplifying the descriptions or move on to other topics. It's a good idea to keep things simple. You may want to introduce some of the snail anatomy by comparing it to human anatomy, such as asking what they think the brain is for. If they don't know, you can tell them that it tells the rest of the snail's body what to do.

The two most obvious features of a snail are its *shell* and its *foot*, which is the long extension of the body on which it moves. The *mouth* is at the front of the foot, and can be seen by looking at the snail from beneath as it moves over glass or plastic. The *mouth* is a round hole when it is open, or a T-shaped slit when it is closed. The snail has a *tongue* (called a *radula*) with tiny sandpaper like bumps on it that scrapes food into the snail's mouth. If you and the children are very quiet, and listen carefully, you may be able to hear a scraping noise as the snail eats crisp foods such as carrot, apple, or crisp lettuce.

The *columella muscle* holds the snail's shell and foot together, and helps the snail retract into its shell. The *kidney* serves the same function for snails as the human kidney: it cleans the blood. The snail's *crop* acts like our stomach, and helps digest the snail's food. The *mantle* cavity of the snail serves the same function as our lungs.

Review

Chart the following items:

1. Graph the responses to the question "Did anyone find snails at home?" If so, describe where they found them. Children who looked but didn't find them may share where they looked. The descriptions should be included on the chart "Where Do Snails Live?" that you made during the last session.
2. Have children share the three comparisons between their homes and the snail hotels.
3. Did anyone find more spirals for the spiral table chart? Have them share if they did.

ACTIVITY A

DISCOVERING PARTS OF *HELIX ASPERSA* (YOUR SNAIL)

Time Required

20 minutes

Suggested Grouping

large group, individual,
then large group

Materials You Will Need

- Hand lenses
- Clear, plastic 6-oz cups — 1 for each child
- Snails — 1 for each child, and a few extra
- Flashlights — several
- Paper — 1 piece for each child
- Pencils or pens — 1 for each child

Getting Ready

- ❶ Obtain all necessary materials

ACTION: OBSERVING, COMMUNICATING, AND COMPARING

1. Begin by telling the children that today they are going to learn about different parts of the snail body. They will begin by looking carefully at the snails, using hand lenses to make the snail parts look bigger so they can learn more. Then they will use what they have learned about snails and what scientists have learned about snails to make their own snail model.
2. Instruct each child to take a snail from their hotel and place it in a clear cup. Give each pair of children a hand lens so that they can see their snail better. Explain that they can



Tip
Begin the discussion by asking the children how they think a snail's shell helps it.

also use the flashlight to shine light on their snail's head area and look for the snail's tongue.

Have the children make drawings of their snails or trace models so that they can talk about the snail parts during the next activity.

3. After approximately 5 minutes, get a new piece of newsprint and chart responses and ideas. Have children use the body senses to think about the snail's body. Discuss. Ask them to try to imagine what might be inside the snail's shell and inside the snail's foot where they cannot see without hurting the snail.
4. Have the children place their snail carefully back in their cup. Place the cup in front of them and clear a space to work in.

SCIENTIFIC: OBSERVING, COMPARING, AND COMMUNICATING

Talk with the children about how they used the science processes to learn more about the snails body.

Observing

How to investigate a snail and its parts, and then watching the snail. What parts of a snail have you seen?

Communicating

By discussing and recording the observations about the snails.

Comparing

The parts of one live snail to those of another live snail. What parts of a snail are like your body? Which parts are different?

ACTIVITY B

ANTENNAE MOVEMENT

Time Required

10 minutes

Suggested Grouping

large group

Materials You Will Need

None

Getting Ready

- Have the children gather into a circle, ready to listen to your directions.

ACTION: COMMUNICATING AND COMPARING

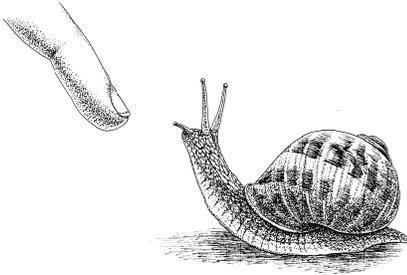
Begin by telling the children that they are going to pretend they are snails and that they will use their arms as if they were the snail's tentacles. Remind them that the snail has its eyes on its upper tentacles, while the lower ones are used for touch.

Instructions for Children:

1. Stretch your arms out slowly in front of you. When you pretend to touch something, pull your hands back slightly and quickly. Then pull both arms back as if recoiling from something you don't like.
2. Walk slowly in different directions, investigating with your antennae-arms.
3. After 5 minutes, have the children return to a circle to discuss their exploration.



Tip
If there is not enough space for all of the "snails" to move freely, let half of the group watch as others move, then switch groups.



SCIENCING: OBSERVING, COMPARING, AND COMMUNICATING

Observing

What could you observe or learn using your arms as snail tentacles?

Communicating

How did it feel gathering information about tentacles? Did you feel comfortable observing as a snail? Do you think you would get better at observing as a snail with more practice?

Comparing

How was observing like a snail different (or the same) as observing like a human?

Presentation Notes

ACTIVITY C

MAKING A PAPER MODEL OF *HELIX ASPERSA* (YOUR SNAIL)

Time Required

30 minutes

Suggested Grouping

large group

Materials You Will Need

- Snail parts handouts – (see pages 62 to 72) on the designated colors of paper – 1 copy per child - place a complete set of pre-cut parts in an envelope for each child
- Paper, white (11" x 14") – 1 per child
- Scissors – 1 per pair of children
- Glue sticks – 1 per child
- Envelopes – 1 per child

Getting Ready

- ❶ Make sure you have the outline and internal parts for your *Snail Model for Anatomy Presentation* ready to use.
- ❷ Copy all parts of the snail on the designated colors of paper.
- ❸ Precut all internal parts for the *Personal Snail Model* and put full sets of parts in envelopes.

ACTION: OBSERVING, COMMUNICATING, AND COMPARING

Begin by asking the children what they want to know about the inside of a snail. Make a chart of their questions titled "What we want to know"



Tip
Assembly for snail model:
Read the part or organ. Show the children the color paper piece. Explain that when you have finished telling them the name and location, they will then glue the back of the piece and place it on to the outline.



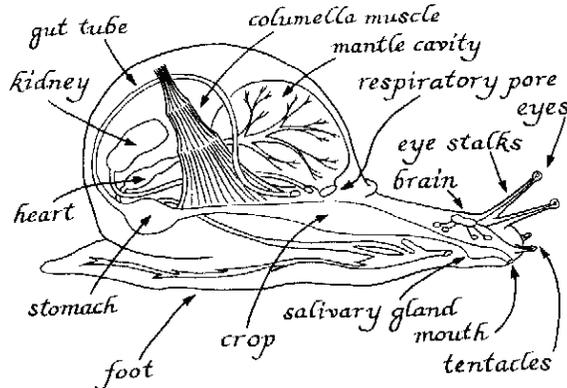
Tip
Glue sticks seem to work best for gluing the parts on the snail.

about what is inside a snail.” Use these questions to guide the discussion at the end of the activity.

Each child will have a piece of paper with an outline of the snail. There will be cutouts on different colors of paper representing the different organs and body parts.

The leader(s) will name the organ/part, tell a little about what that organ/part does, and have the children place the cutout part on their snail outline. Children may want to work with partners on this task to help others locate parts.

1. Instruct the children that they are now going to be scientists and create a paper model of a snail. As they are creating their paper model, remind them to look at their live land snails in the cup in front of them. Have them imagine that the paper model is the same as their live snail.
2. Pass out a snail envelope and outline of the snail paper to each child. Give each child a glue stick. Discuss how to use the glue stick. Ask if everyone has used one before. (You may need to help children learn to use them properly.)
3. Have the children put their snails together in the order you describe. They glue their model together as you use your *Snail Model for Anatomy Presentation* to explain the location and function of each part. You will find some useful descriptions of the parts in the *Background Section* of this session.



•**BLUE PIECES:** *Circulatory system* and *brain* (heart, kidney, mantle, and brain).

The **heart** pumps the snail’s “blood” to parts of the body.

Note: Ask the children what color they think a snail’s blood might be. Remind them that we are not going to damage snails to find out; we will guess. After putting the heart piece on the outline have the children draw veins to the different parts of the snail’s body.

The **kidney** cleans the snail’s blood.

The **mantle** has two jobs:

- It secretes a mucus that helps build the snail’s shell as the snail grows.
- It acts as a *lung* and allows the snail to breathe.

The **brain** sends messages to the other parts of the snail’s body to help the parts work together. It also receives messages from the other parts of the body and helps the snail to understand its environment.

•**PINK PIECES:** *Columella muscle* holds the snail’s body to the shell. This is very important for the snail’s survival.



Tip
The Snail outline for the Anatomy Presentation (end of session) is on 11”x14” paper. DO NOT REDUCE. You may use 8½” x 11” paper for the children’s Snail model.



Tip
Give the children enough time to finish each task before beginning the next part or organ. Assist anyone with gluing or location if needed.



Tip
Ask the children to see if they can find the mouth opening and if they can see the slime being produced.

•**GREEN PIECES: Digestive system** (mouth, crop, stomach, and long gut tube to the anus.)

The **mouth** includes a tongue (radula) that has rows of tooth-like formations that act like sandpaper, scraping food into the snail’s mouth. Behind the mouth is a gland that secretes a slimy substance that allows the snail to travel more easily.

The **crop** is a sack where the snail’s food is softened for digestion.

The **stomach** is a sack where the snail’s food is stored while it is being digested.

The **long gut tube** and anus are how the digested food travels from the snail’s stomach and how waste products are removed from the snail’s stomach and from the snail’s body.



Tip
Ask the children where the waste from the clean blood might go.

•**TAN OR DECORATED WHITE PAPER: Shell** acts as protection for the snail’s soft body. It is an outside skeleton for the snail. Color the shell to match one of the snails, and staple it to the top of the model snail you have just completed. Have each child print their name in the lower corner of their model. Assist any child who needs help writing.



Tip
The snail shell and outline of the snail should be on white paper.

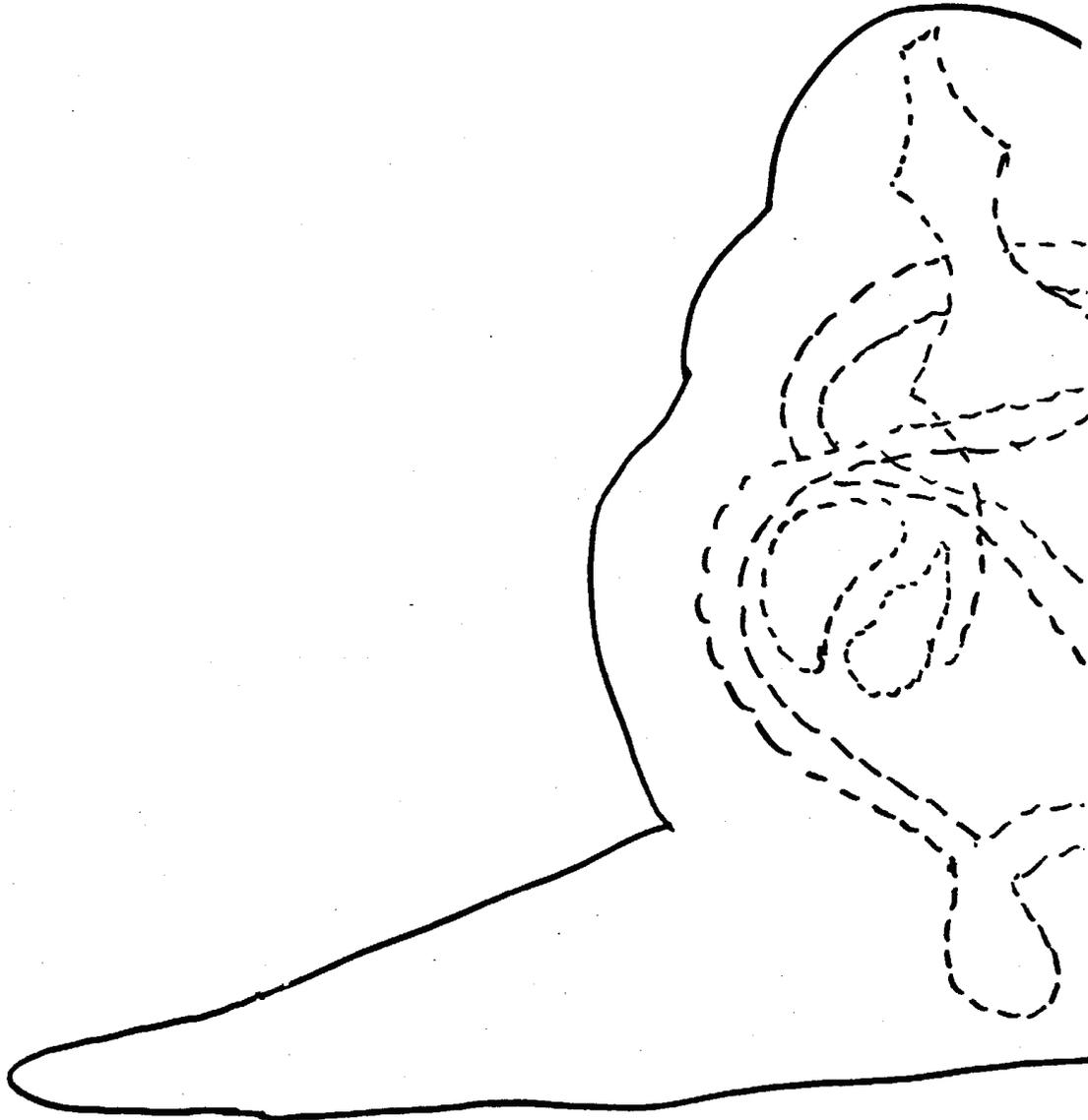
After the children have assembled their models, ask them to take their live snails and look for the mantle (breathing hole), anus, mouth, and reproductive openings of the snail. As each child locates the correct parts, have them share with the rest of the group by showing them on their snails.

Have the children return their snails to their hotels. Assign cleanup and then repeat the directions. Display the models of snails around the room. Have each child take their models home to share with their family.

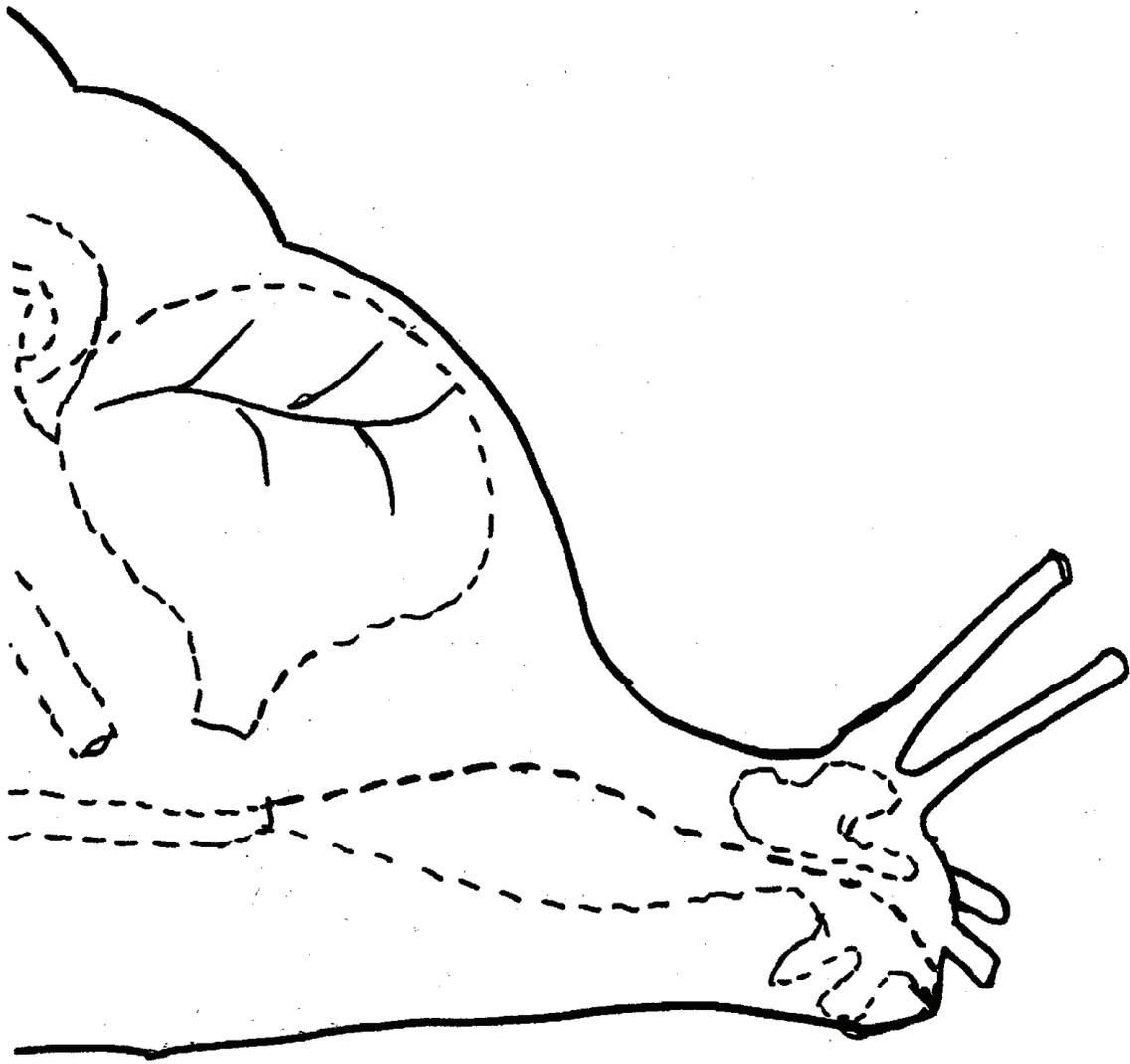
Ask children to look for more spiral shapes. Invite the children to bring in snail snack foods to give to their snails in the hotels. Discuss the small amount of snack food needed.

SNAIL MODEL FOR ANATOMY PRESENTATION

(Illustrator's Diagrams pages 62-72)

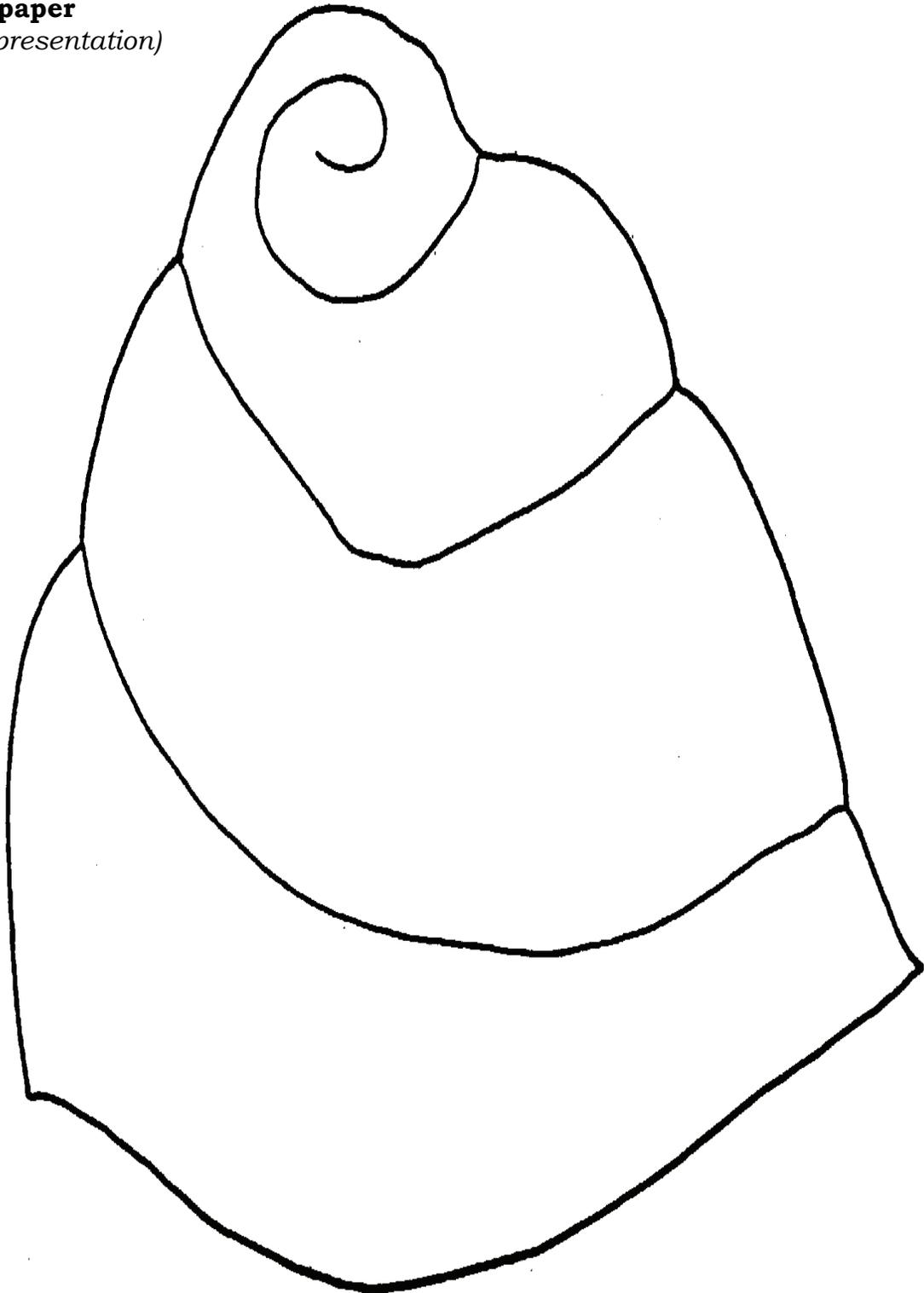


SNAIL MODEL FOR ANATOMY PRESENTATION (continued)



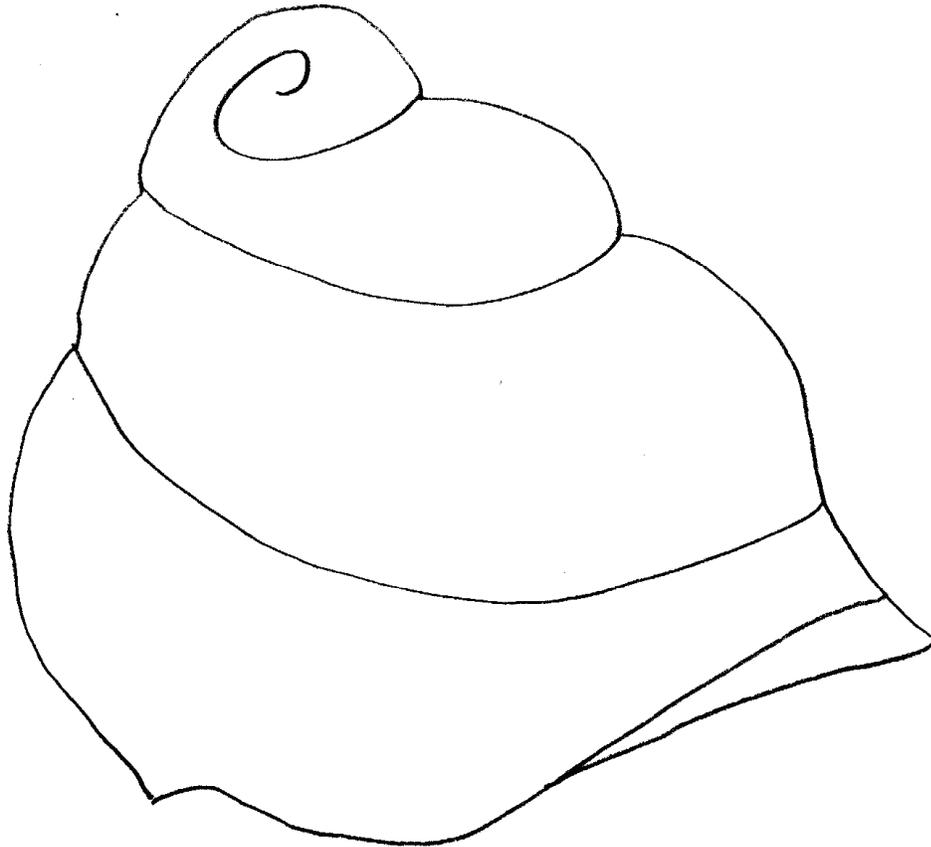
**reproduce on
tan paper**
(for presentation)

Snail Shell

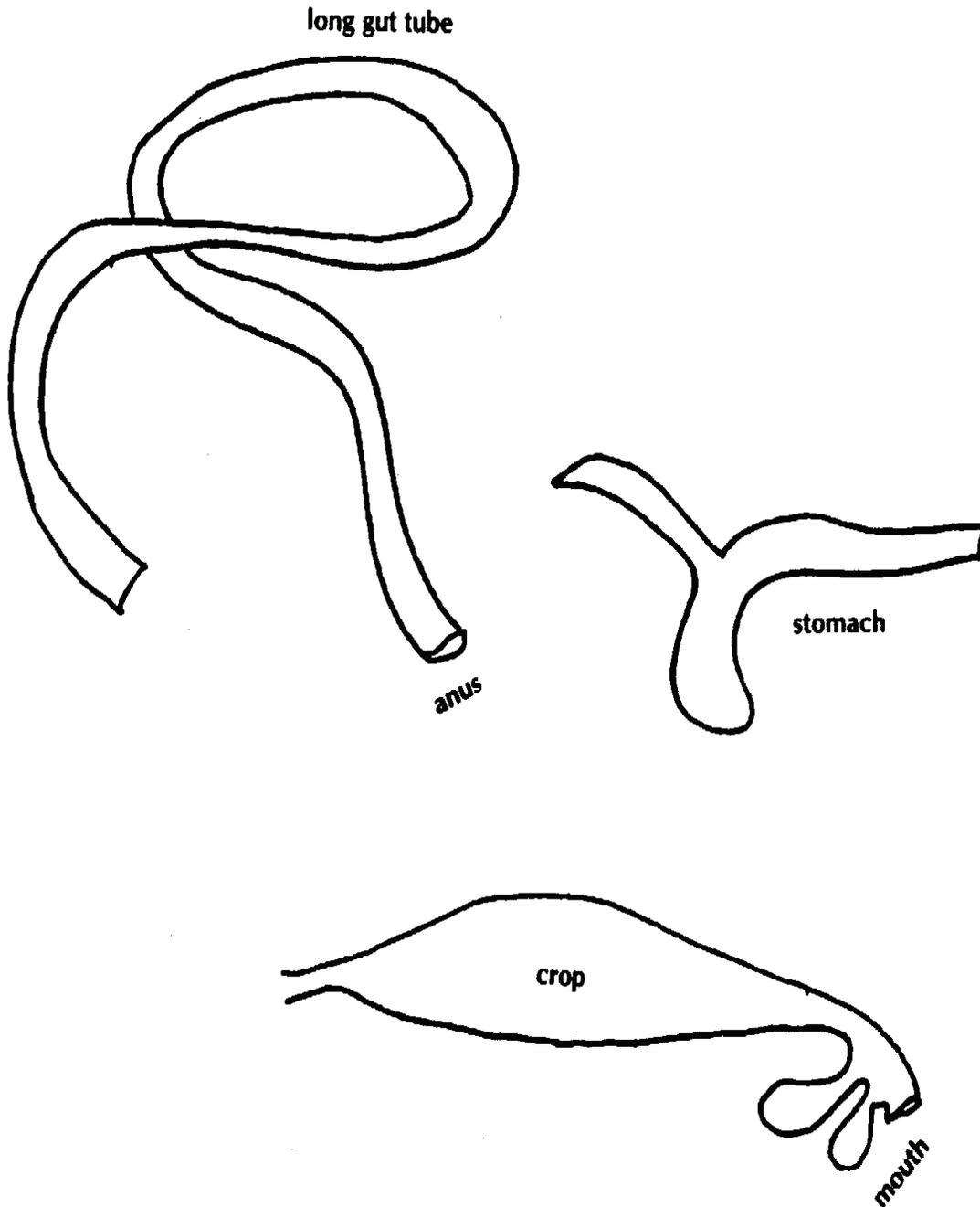


reproduce on tan paper *(for personal snail models)*

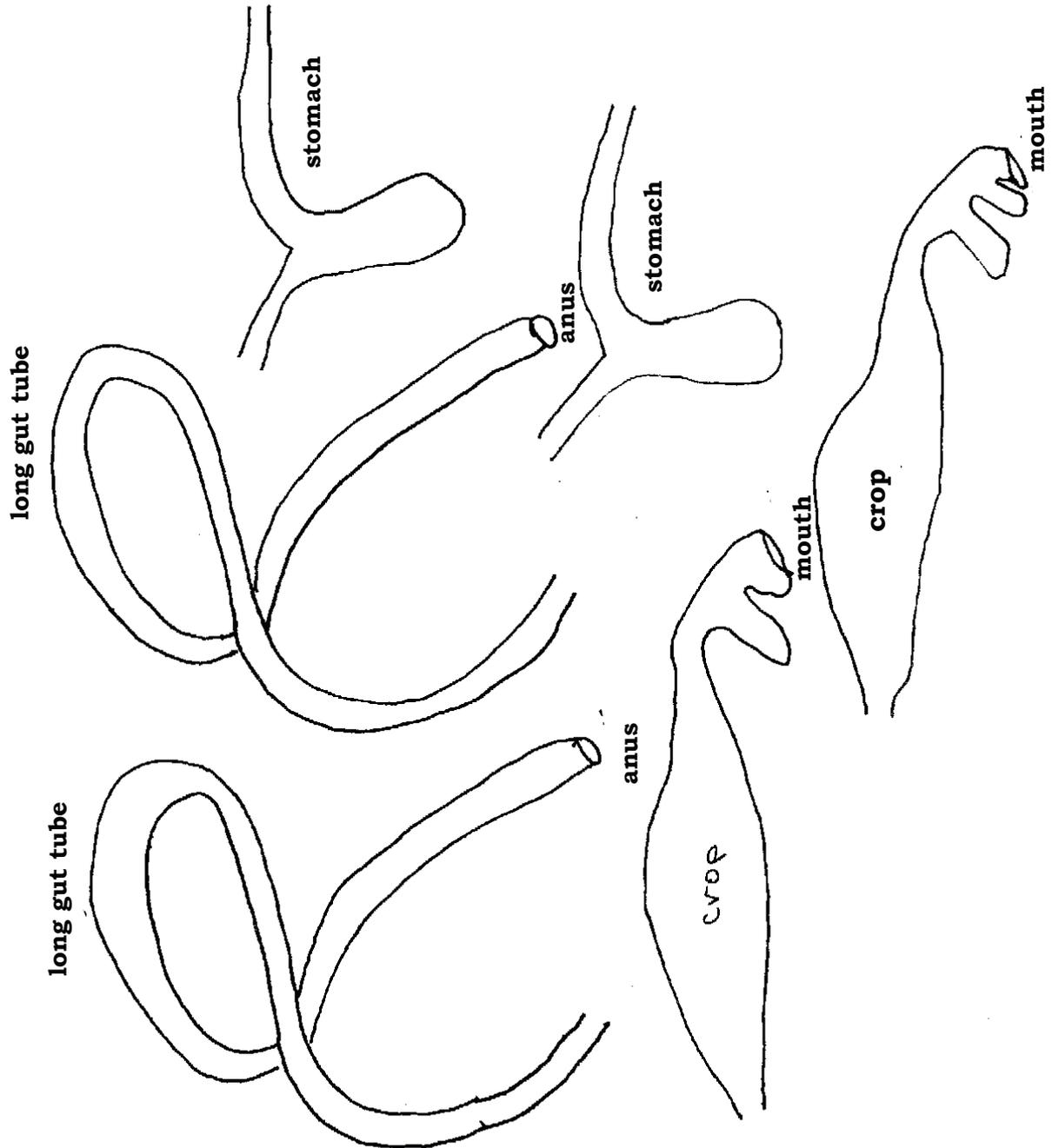
Snail Shell



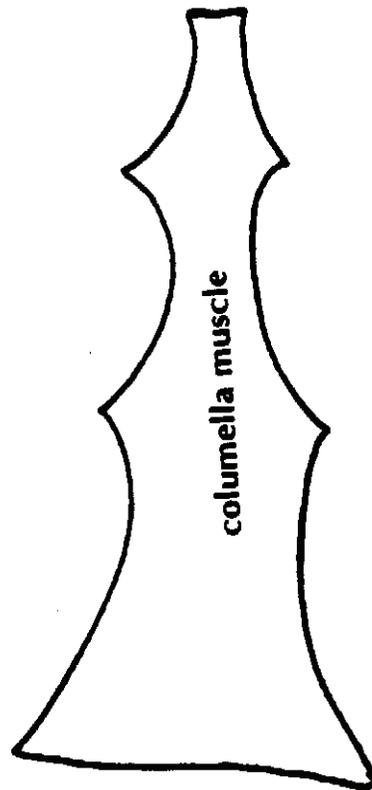
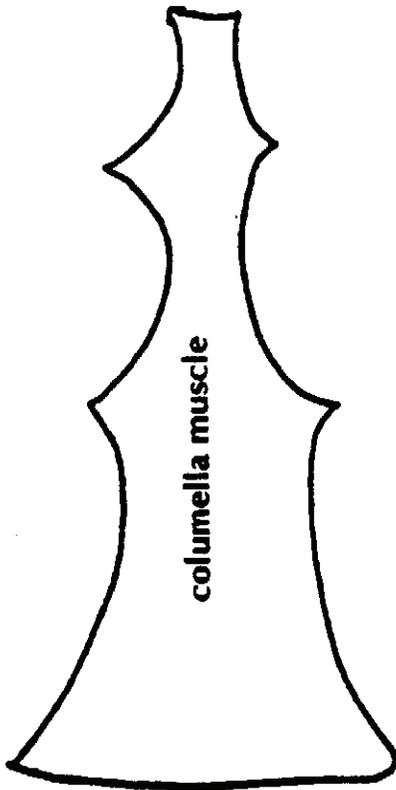
reproduce on green paper (for presentation)



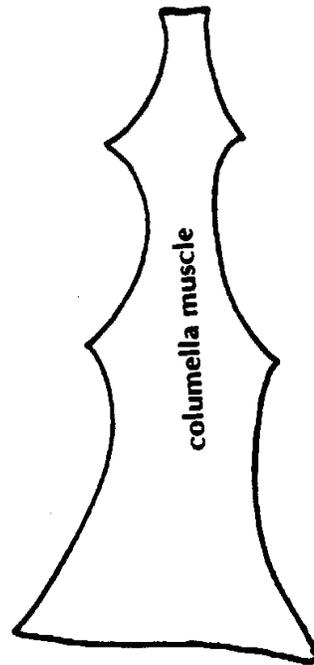
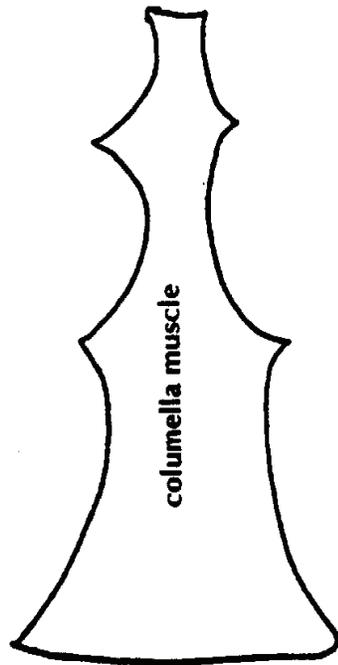
reproduce on green paper *(for personal snail models)*



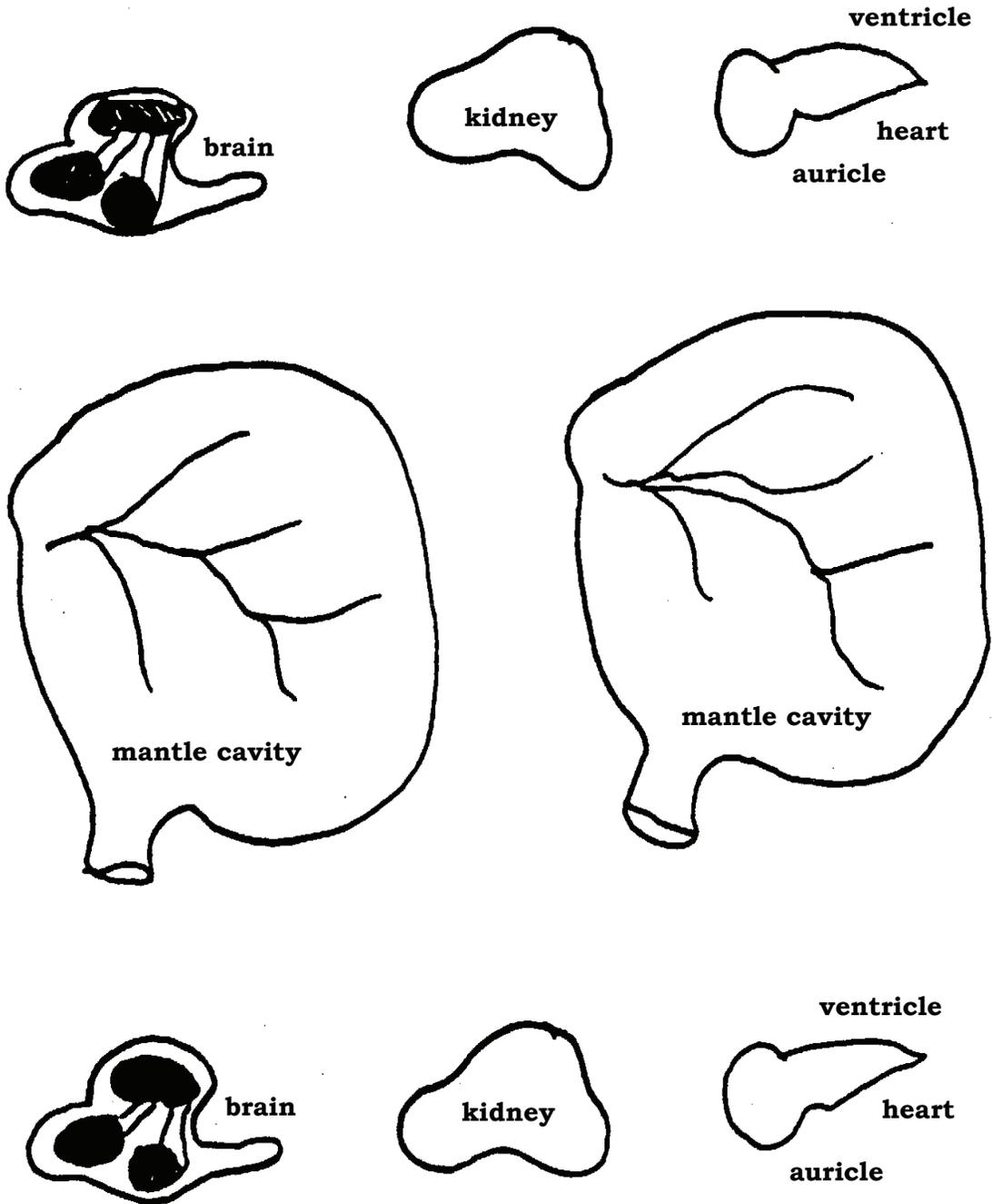
reproduce on pink paper *(for presentation)*



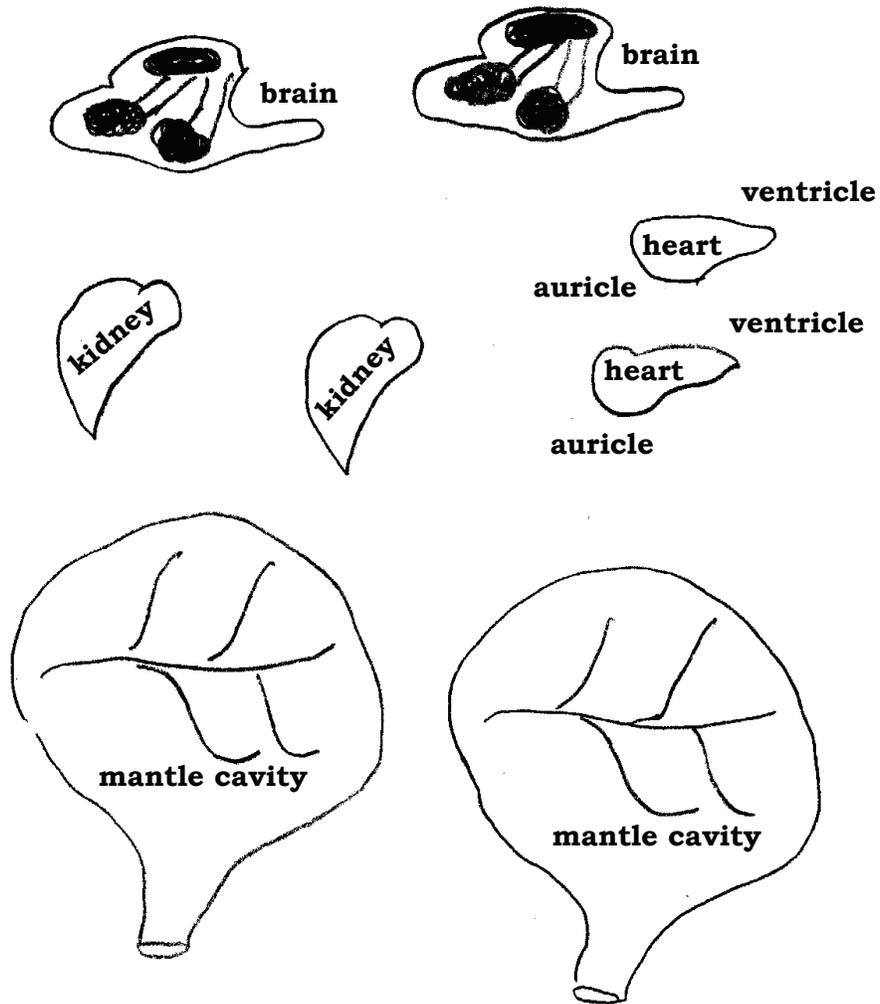
reproduce on pink paper *(for personal snail models)*



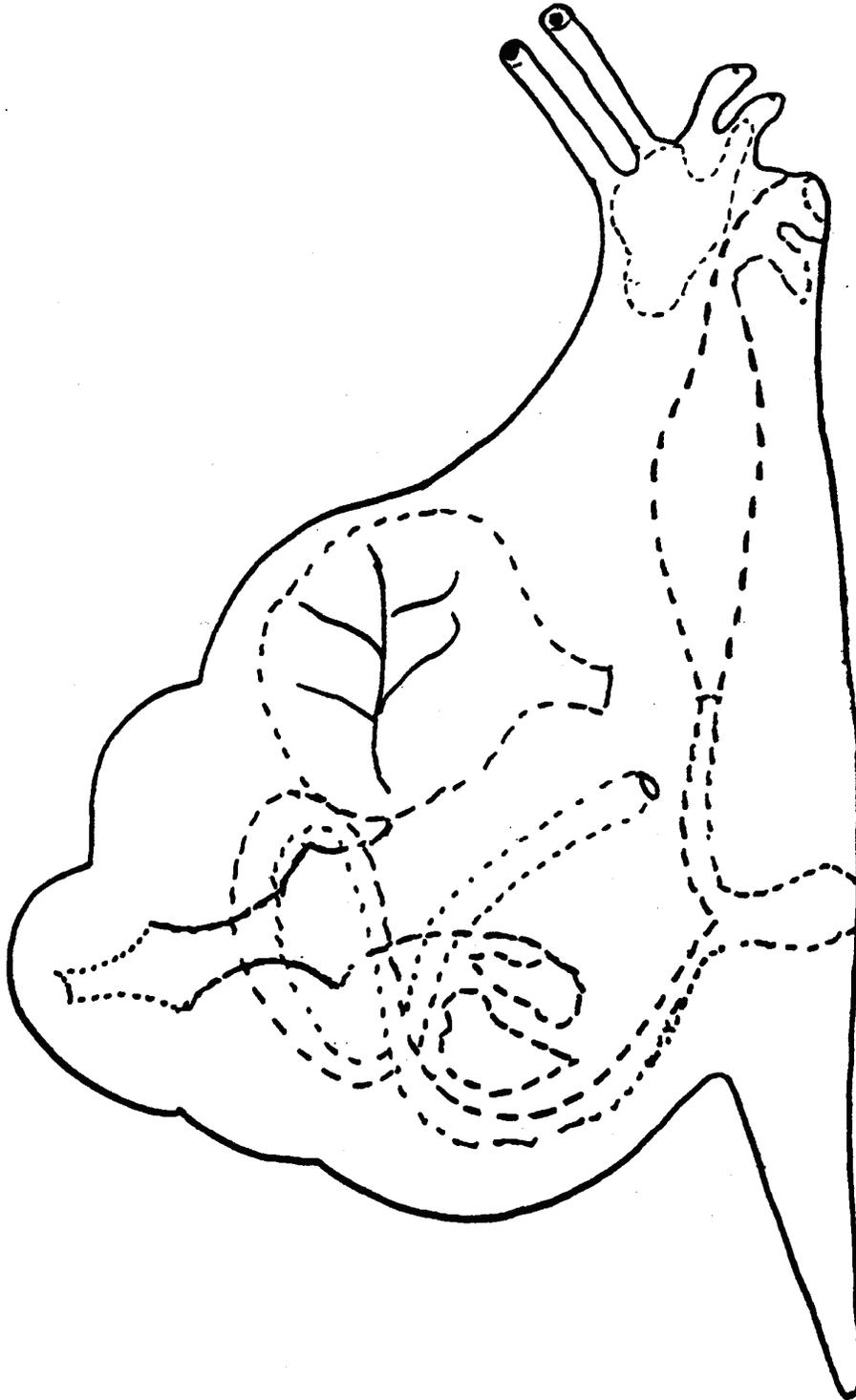
reproduce on blue paper (for presentation)



reproduce on blue paper *(for personal snail models)*



PERSONAL SNAIL MODEL (optional) for coloring, cutting



SNAILS AT PLAY

Approximate Time Required for Session: 90 minutes

Purpose

- To investigate through the use of the science processes
- To compare snail feats
- To explore the snail's abilities with numerous activities
- To inquire into any changes children may have noticed in their snail since the beginning sessions
- To see just how strong a snail is
- To observe a snail walking a tightrope

Overview of the Day's Activities

This session is an opportunity for you and the children to celebrate what they have learned from the snails by building a "snail circus" for their, and the snails' enjoyment. The children will also learn more about snail behavior and a snail's physical abilities.

Background Information

Snails have exhibited the ability to accomplish many different activities. It is important to not challenge the snails with any activities that may cause them injury or death. The *Snail Safety Rules* should be reviewed with the children before beginning these activities.



Tip
Activities in
this session
have been
successful at
parent—family
science evenings.

Review

On a chart, write or draw pictures of responses to the following questions:

1. Has anyone changed their mind about snails? What has changed their mind about snails?
2. Have children observed anything new about snails since you put together the snail hotels?
3. Ask if any children have made any drawings of snails. Has anyone made up any snail tales?
4. Did anyone find and bring new spirals for the spiral chart?
5. Did anyone bring snail snack items? Collect them for today's activities.
6. Did anyone share their model snails with their family? What did they say about them?

Presentation Notes

ACTIVITY A

HELIX ASPERSA

AT THE CIRCUS: SNAILS UNDER THE BIG TOP

Time Required

45 minutes

Suggested Grouping

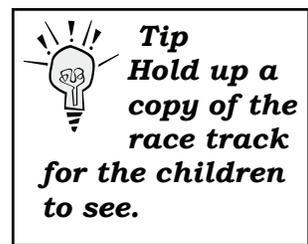
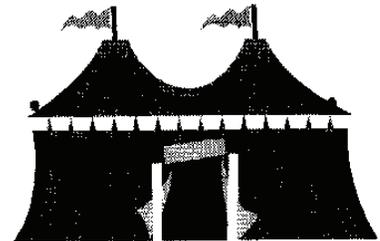
small groups

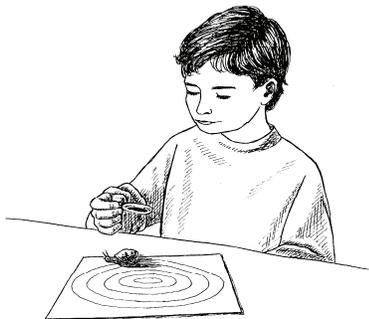
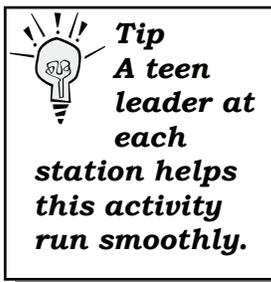
Materials You Will Need

- Snails – 1 for each child and a few extra
- Snail Race Track* handout – 1 for each child (page 84)
- Clear, 6-oz plastic cups – 1 for each child
- Newsprint pad
- Colored markers – 4 or 5 colors
- Paper, white (8½" x 11") – 50 sheets
- Cord or rope, ¼" – several lengths about 3' long (for tightrope)
- Chart titled *Tightrope Predictions*
- Toy cars – 8 to 10
- Chart titled *Pulling Car Predictions*
- String, 18"-lengths – 8 to 10 pieces (for pulling toy cars)
- Snail jails – pieces of wood with nails hammered into them (See diagram on page 115.)
- Snail sleds – pieces of tagboard with a hole at one end to tie a string
- Paper clips – 4 boxes

Getting Ready

- ❶ Cut the rope and string in the correct lengths.
- ❷ Copy the *Snail Race Track*.





- ③ Connect one piece of string to each toy car and each sled.
- ④ Tie the cord or rope between two stationary objects (*the backs of chairs work well*).
- ⑤ Set up the activities in a learning station format with the materials arranged around the room. This allows the children to move around the room searching for the amazing things that the snails can do.

ACTION: OBSERVING, COMMUNICATING, AND COMPARING

Amazing *Helix aspersa* feats

1. Have all of the children take a clear cup and then take a snail from one of the hotels. Instruct them to move slowly like a snail and remind them to handle the snails carefully. Ask the children to sit in a spiral on the floor in front of you with their snails.
2. Tell the children to watch and listen very carefully while you now move around the room and explain each station.
3. Walk around the room and explain each station. The children need their snail and a copy of the *Snail Race Track*. With the children's help, point and count together the number of circles on the paper.
4. **SNAIL RACES:** Instruct children to place their *Snail Race Track* paper on a safe and comfortable surface and then to put their snail in the center circle. Watch and count how many circles their snail crosses in 5 minutes or just have their snail race a partner's snail. (*A leader will have to keep track of the time.*) Have

a chart to record each child's name and how many circles their snail crossed in the time allowed.

- 5. SNAIL TIGHTROPE:** Each child needs their snail and a piece of paper. The child will hold the foot of their snail against the tightrope until the snail begins to crawl. They must hold the piece of paper under the snail as a safety net, so the snail doesn't get hurt if it falls.

Demonstrate this after explaining it. Have a chart titled *Tightrope Predictions*. Have the children put their initials under a **"yes, they can"** column or a **"no they can't"** column.

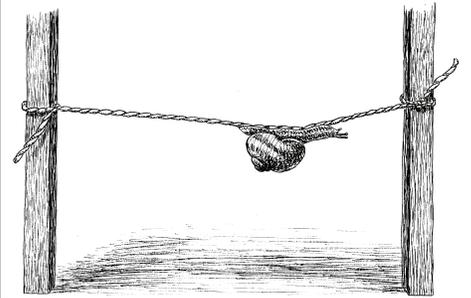
- 6. STRONG SNAIL:** Each child needs his or her snail. Say: *You make a harness for the snail by forming a loop in the piece of string and placing the loop over the snail's shell. The other end of the string is tied to a toy car that the snail will attempt to pull along.*

Have a chart that predicts if the snail can pull the car. Draw a picture of a snail pulling a car and then the same picture with a red circle and line through it (like the *not* symbol).

Have the children put a smile under the prediction they make.

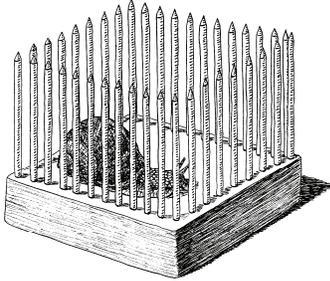
The snail sleds are to see how many paper clips a snail can pull. Predict how many paper clips can be piled on the sled that a snail pulls before it gets tired.

- 7. SNAIL JAIL:** Ask the children if they think the snail can escape from the *Snail Jail*. Record their predictions. Carefully put the snail in the jail and see if it can escape.
- Explain to the children that they will now have time to visit each circus area with their snail





Tip
Move
around
the room
as the children
investigate;
watch the
entire room
and keep the
children on
task.



and have their snail explore the activities. This entire event should take about 30 minutes.

9. After everyone has visited the entire circus, have the children bring their snail in the cup and sit down in one location. Take time now to review the prediction chart from each station.
10. **SNAIL RACES:** Check the numbers to find the most circles traveled. Have the child raise his or her hand if it was their snail. Have the fastest and slowest snail held up by their child. Have the others examine their sizes. Discuss.
11. **SNAIL TIGHTROPE:** Hold up the chart. Ask how many children predicted their snail would cross and how many predicted theirs would not. Count the predictions for *yes* and *no*. Ask how many snails crossed right-side-up. Ask how many snails crossed upside down? Ask if anyone found something different from what they predicted. Discuss.
12. **STRONG SNAILS:** Have everyone look at the chart. Have everyone count the smiles under each column. Discuss the different numbers.

SCIENCING: OBSERVING, COMMUNICATING, AND COMPARING

- What “super” abilities did you observe in your snail?
- What did you learn about snails? Record these answers on your snail chart from *Session 1*.
- Ask other questions based on the children’s observations.

Have the children set their snails in a safe place. Discuss cleanup and repeat directions. Then clean up.

Presentation Notes

ACTIVITY B

SNAILS GO TO THE PLAYGROUND

Time Required
30–45 minutes

Suggested Grouping
small groups of two or three children

Materials You Will Need

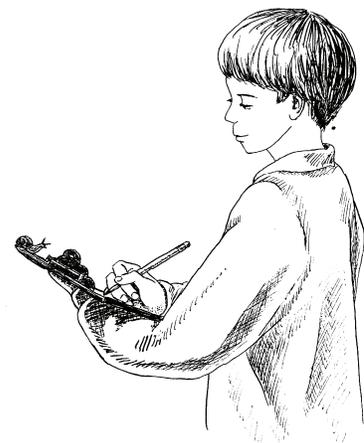
- Snails in cups – 1 for each child
- Popsicle sticks – 1 box
- Scraps of wood
- String – 1 ball
- Glue
- Rubber bands – 2 handfuls
- Paper
- Cardboard pieces
- Transparent or masking tape
- Newsprint
- Colored markers – 4 or 5 different colors
- Snail snacks: assorted fruits and vegetables such as lettuce, apples, and carrots
- Paper plates, large – 50
- Paper clips
- Recyclables from site: egg cartons, toilet paper tubes, berry baskets, orange juice cans, plastic containers and lids, foam trays, etc.

Getting Ready

- ❶ Assemble all the materials and place them in one location.

ACTION: OBSERVING, COMMUNICATING, AND COMPARING

1. Have all of the children sit in groups of two or three. Ask: *Does anyone still have any questions about snails? (Write questions on the chart.)*
2. Begin a discussion about playgrounds. Tell the children that they will create a playground for snails. Record with pictures or words where appropriate. Ask what the children do when they go to a playground.
 - Do they play on any fun pieces of equipment? What kinds?
 - Do they go to the playground with friends?
 - What is their favorite thing to do at a playground?
3. Ask the children to take their snail in the cup for a short snail crawl. Have them offer their snail a small snack in the cup after the crawl is completed. Ask if anyone has named their snail.
 - What are some of those names?
 - Do any of the names have special significance? Record these on the chart.
4. After the children have had time to do these things, bring them together to discuss what it must be like to be a snail and how it is different from being a human. Record the observations and comparisons on a chart.
5. Have the children discuss what sorts of things they think would be fun for snails to play on.
 - What types of structures would be the most fun for snails to crawl on?





Tip
Assist
any
children
that need to
join or make
a group.

Snail	Human
1 foot	2 feet

- Would there be any snail snack stands?
 - What sort of food would they have?
 - How would snails get from one playground area to another?
 - Would there be any rides?
6. Ask each group to take a piece of paper to draw and describe their ideas for making a *Snail Playground*. Have each group share their design.
 7. *Constructing the playground for snails:* This project is one that the children can do in their group or individually for their own snail. It could be left as an independent work station that the child could work at for a day or two.
 8. Before asking the children to begin constructing, ask what they enjoy doing when they are playing with their friends. What do they enjoy in the playground? If they were snails, what sort of playground equipment do they think would be fun?
 9. Display the various materials to construct the playground. Explain that they may add materials to this collection. Have the children clear a space for constructing and let them begin.
 10. The children may want to continue building the snail playground for a few days, but this is the end of the *YES Snail Trails* unit. You may want to keep the snail material around for a while longer as a learning center. Invite the children to do art, writing, math, drama, and more science learning with their snails.
 11. Discuss clean up and repeat the directions.
 12. Assemble all of the charts and posters for the snailing unit. Add one piece of heavier paper that is plain to the front. Staple them together

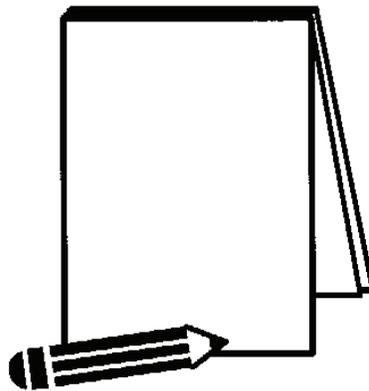
on the left hand side several times from top to bottom to make a book.

Invite the children to trace their handprint, write their name, draw a snail picture, or whatever to be creative and have everyone make an addition to the cover. Label the book with a catchy title. On the cover, write the dates from the beginning to the completion of the snail unit. Take wide masking tape and bind the left edges together (*front and back*), trying to cover the staples.

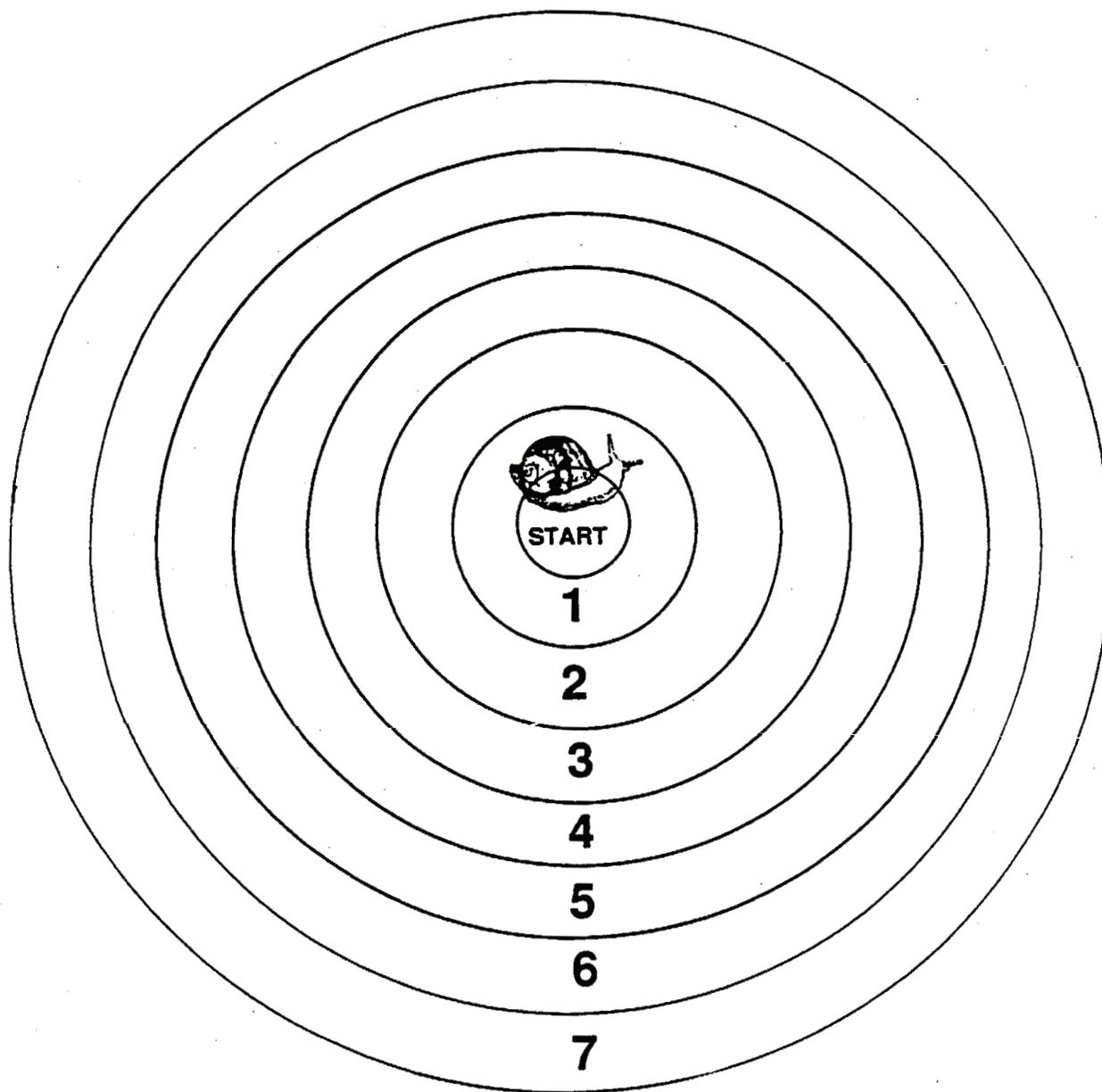
This is now part of a portfolio of your snailing unit. It acknowledges you — and the children’s explorations and learning about snails. You can leave it with the explorer group to read and play with for a while. If you have more than one group, these portfolios will also be a group memory for activities and discussions that have occurred.



Tip
Laminating
the pages
will protect
the book and
make it last
longer.



SNAIL RACE TRACK



SNAIL TRAILS BIBLIOGRAPHY

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SNAIL TRAILS: THE ADVENTURES OF *HELIX ASPERSA* SUPPLY LIST

This materials list is for a typical group of 20 children. If you have fewer, you may want to reduce the amounts accordingly. If you have more children you will probably need to increase the materials. When gathering materials, separate them into two lists: “Things to Collect from Friends and Neighbors” and “Things to Purchase.”

Session 1 MEET HELIX ASPERSA

Activity A - Getting to Know *Helix aspersa* (Your Snail)

Snails, live – 1 per child and a few extra
Newsprint pad – large
Different colored markers – 4 to 5
Lettuce

Activity B - A Snail Story

Children’s book *The Biggest Little House in the World* by Leo Lionni
Drawing paper
Markers or crayons

Session 2 SNAILS, SPIRALS, AND THE FIVE SENSES

Activity A - Learning About Snails Through the Senses

Snails, live – 1 per child, and a few extra
Lettuce, cabbage, or chard – 1 head or bunch
Clear, 6-oz plastic cup – 1 per child
Empty paper lunch bags – 4 bags for each pair of children
Colored markers – 1 per pair of children
Snail shells (escargot from supermarket) and broken land snail shells – 35 to 40
Newsprint pad
Charts made during *Session 1*

Activity B - *Helix aspersa* Song and Dance

Words and song about snail
Newsprint
Markers
Cassette player and snail song on tape, *optional*

Activity C - *Helix aspersa* Observations

Snail, live – 1 per child
Clear, 6-oz plastic cup – 1 per child
Lettuce (wash and drain)
Hand lens – 1 for each pair of children
Charts from the previous activities

Session 3 SNAIL EDIBLE ART**Activity A - Snail Shell Spirals**

Purchased packages of refrigerated cinnamon rolls – enough so each child can form one roll, **or**
Packages of frozen bread dough (thawed) or rolls – 1 roll per child
Cookie sheets – 3 or 4 depending on size of group
Access to an oven or toaster oven
Paper towels – 1 roll
Raisins – 1 package
Potholders – 4
Flat toothpicks – 1 box
Spatulas – 2
Aluminum foil or wax paper – 1 roll
Newsprint pad – 1
Colored markers or crayons

Activity B - Spiraling Down

Children's book, *The Snail's Spell* by Joanne Ryder and Lynne Cherry
Drawing paper
Markers or crayons

Optional

Tape player
Cassette tape of soft background music

Activity C - Snail Food Preferences

Charts from *Sessions 1 and 2*
Live land snail – 1 for each child and a few extras
Clear, 6-oz plastic cup – 1 per child
Snail Food Preference – 1 sheet per child
A variety of snail snacks (apple, chard, celery, banana, etc.)
Colored markers – 4 or 5
Newsprint pad
Paper plates – 1 per child

Activity D - A Poem About *Helix aspersa*

Light construction paper (pastel) — 1 for each child

John Drinkwater's *Snail Poem* — 1 copy for each child

Glue stick — 1 for each child

Scissors — 1 for each child

Colored marking pens — 4 sets

Cardboard cutout of snail

Optional: cut out several cardboard copies of snails for children to trace if they can't draw

Session 4 HOME SWEET (SNAIL) HOME

Activity A - Snail Van Gogh

Poem papers from last activity

Live land snail — 1 for each child

Food coloring — 4 or 5 colors

Aluminum pie plates — 6

Clear, plastic 6-oz cups — 1 for each child

Water for food coloring, if needed

Flat toothpicks — several for each child

Yarn

What We Learned from Snails Chart

Activity B - There's No Place Like Home

Plastic, 2-liter, clear soda bottles or 1 gallon jars with lids — several

White chalk

Leaves, grass, piece of apple, several small rocks, pieces of bark, twigs, small sticks — a variety

Moist soil

Live snails from previous activities

Spray bottle mister and water

Newsprint pad

Markers

Session 5 HELIX ASPERSA ANATOMY**Activity A - Discovering Parts of *Helix aspersa* (Your Snail)**

Hand lenses
Clear, plastic 6-oz cups — 1 for each child
Snails — 1 for each child, and a few extra
Flashlights — several
Paper — 1 piece for each child
Pencils or pens — 1 for each child

Activity B - Antennae Movement

None

Activity C - Making a Paper Model of *Helix aspersa* (Your Snail)

Snail parts handouts — on the designated colors of paper — 1 copy per child
Paper, white (11" x 14") — 1 per child
Scissors — 1 per pair of children
Glue sticks — 1 per child
Envelopes — 1 per child

Session 6 SNAILS AT PLAY**Activity A - *Helix aspersa* at the Circus: Snails Under the Big Top**

Snails — 1 for each child and a few extra
Snail Race Track handout — 1 for each child (page 84)
Clear, 6-oz plastic cups — 1 for each child
Newsprint pad
Colored markers — 4 or 5 colors
Paper, white (8½" x 11") — 50 sheets
Cord or rope, ¼" — several lengths about 3' long (for tightrope)
Chart titled *Tightrope Predictions*
Toy cars — 8 to 10
Chart titled *Pulling Car Predictions*
String, 18"-lengths — 8 to 10 pieces (for pulling toy cars)
Snail jails — pieces of wood with nails hammered into them (See diagram on page 98.)
Snail sleds — pieces of tagboard with a hole at one end to tie a string
Paper clips — 4 boxes



Activity B - Snails Go to the Playground

Snails in cups — 1 for each child

Popsicle sticks — 1 box

Scraps of wood

String — 1 ball

Glue

Rubber bands — 2 handfuls

Paper

Cardboard pieces

Transparent or masking tape

Newsprint

Colored markers — 4 or 5 different colors

Snail snacks: assorted fruits and vegetables such as lettuce, apples, and carrots

Paper plates, large — 50

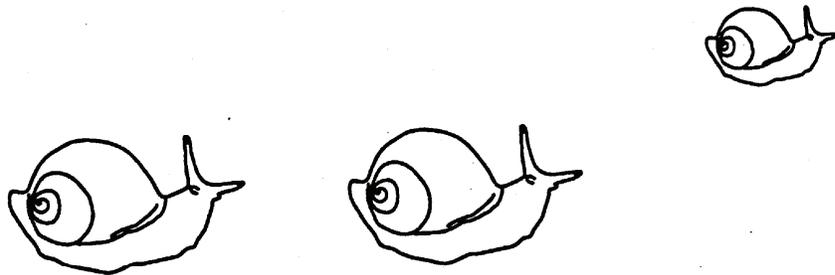
Paper clips

Recyclables from site: egg cartons, toilet paper tubes, berry baskets, orange juice cans, plastic containers and lids, foam trays, etc.

YES PROJECT

HELIX ASPERSA

Appendix A

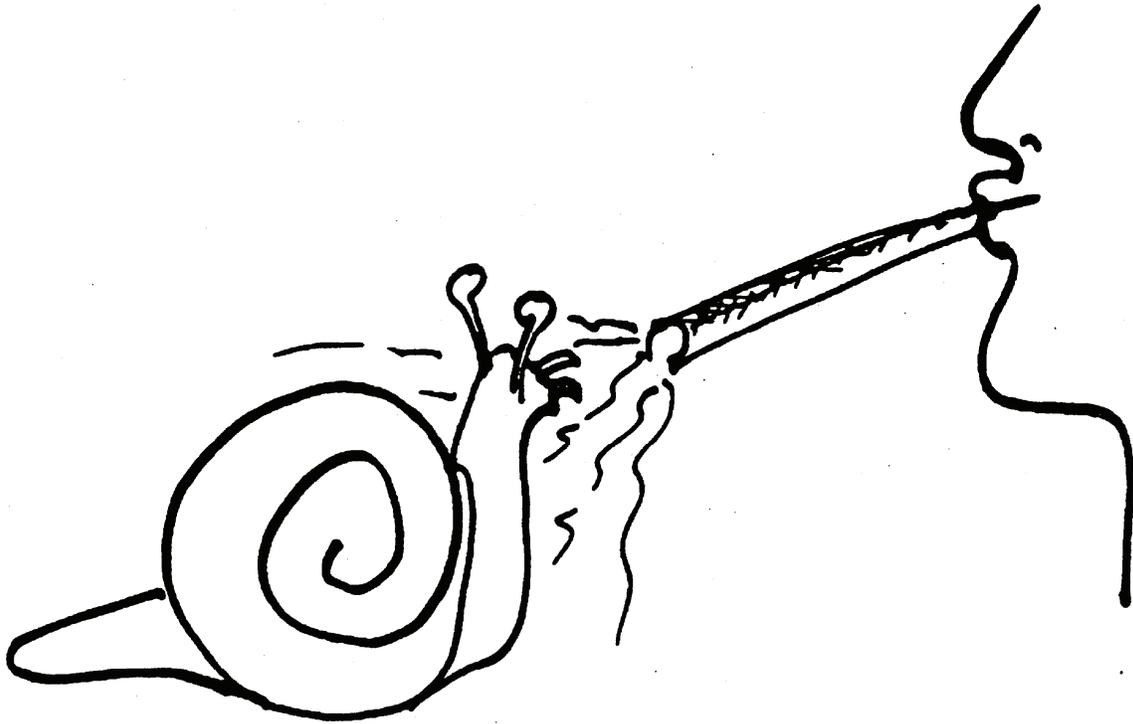


**FURTHER ADVENTURES AND
EXPLORATIONS**

FOR CURIOUS EXPLORERS

My Snail Looks Like

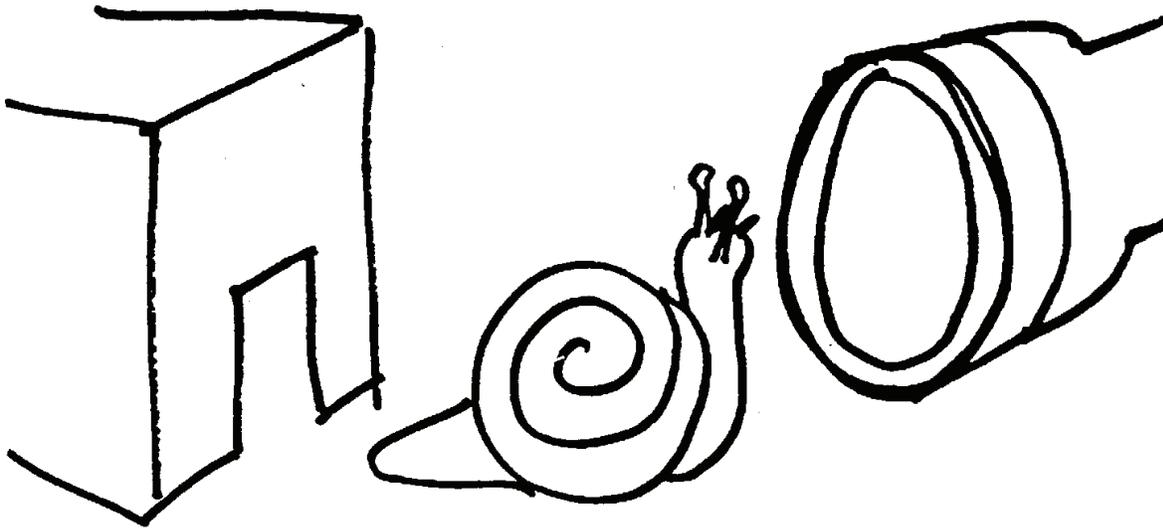
Puff of Air



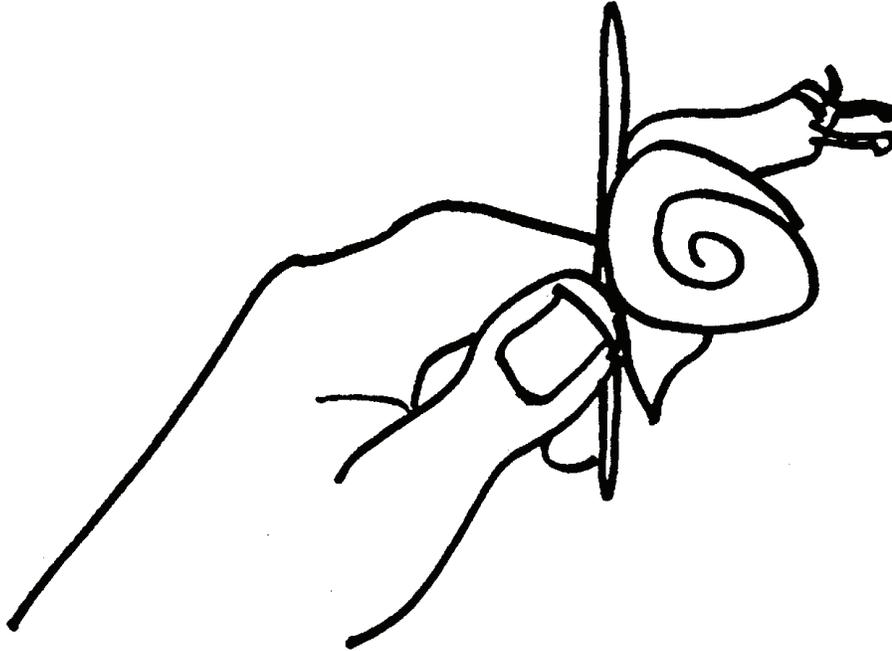
My Snail Likes

Dark

Light



Toothpick

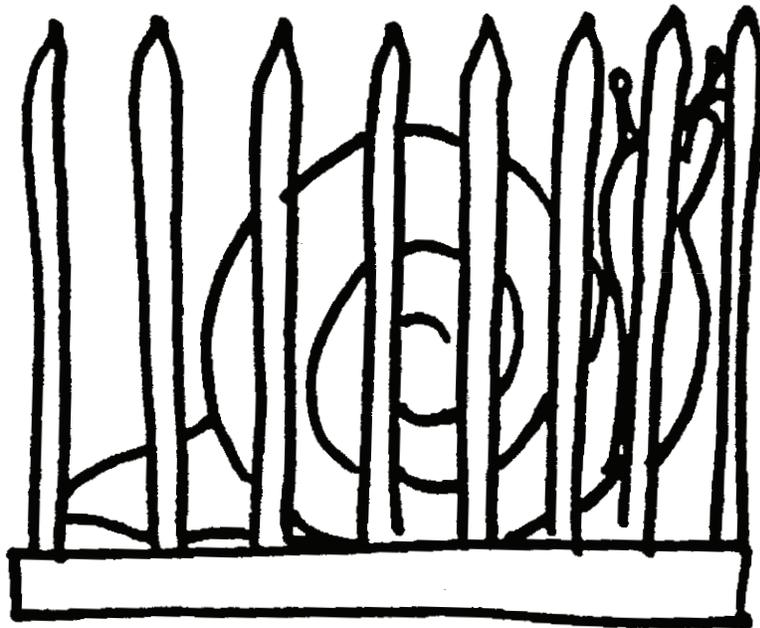


***Can your snail climb a
toothpick?***

. Yes

. No

Snail Jail



Can your snail get out of jail?

. Yes

. No



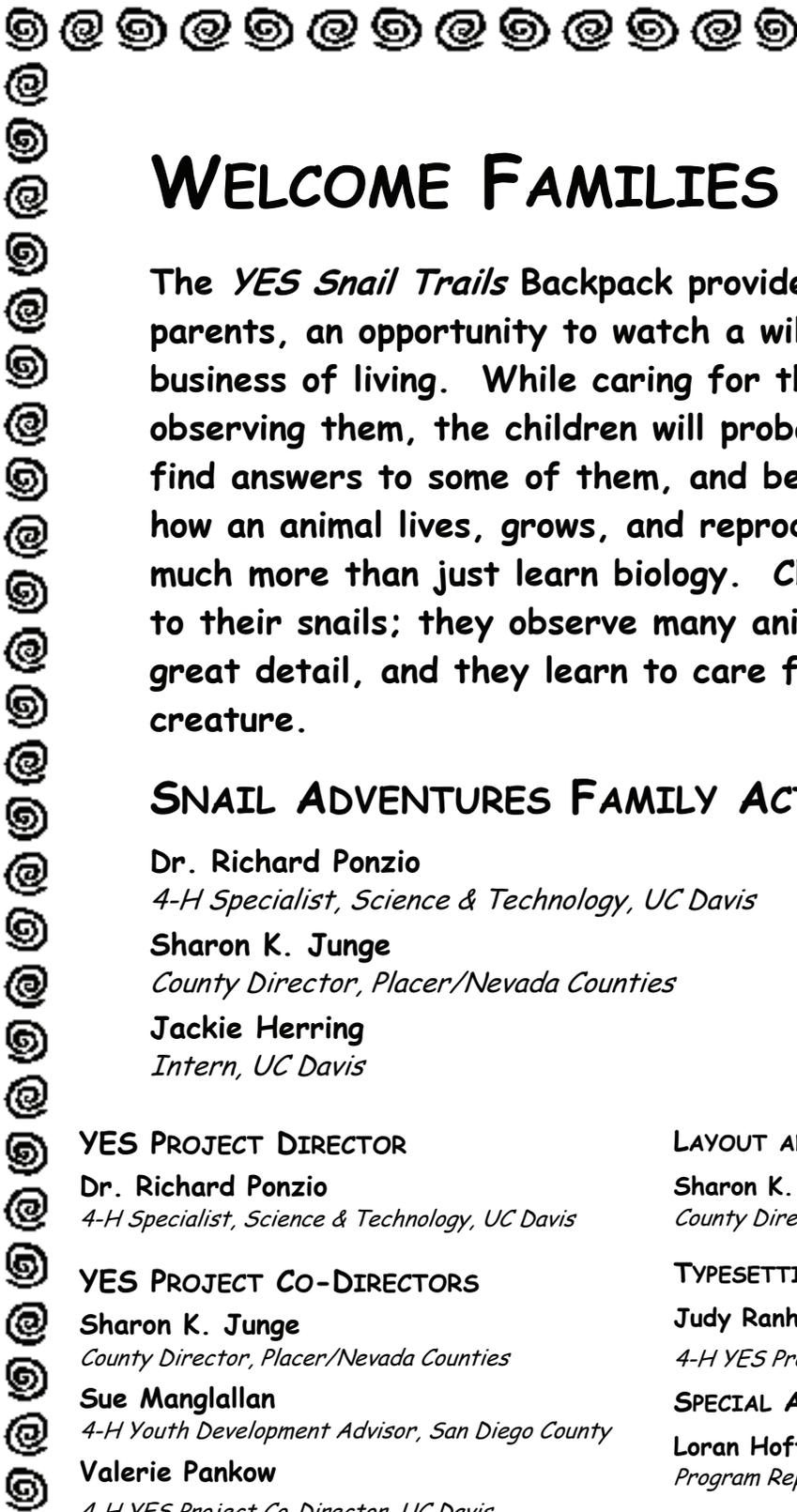
YES Project
Family Science
Backpack

**SNAIL
TRAILS**
ACTIVITY BOOKLET



4-H YOUTH EXPERIENCES IN SCIENCE PROJECT
UNIVERSITY OF CALIFORNIA COOPERATIVE EXTENSION
DIVISION OF AGRICULTURE AND NATURAL RESOURCES
Publication 3411-1





WELCOME FAMILIES

The *YES Snail Trails Backpack* provide children, and their parents, an opportunity to watch a wild animal go about the business of living. While caring for their own snails and observing them, the children will probably ask many questions, find answers to some of them, and begin to see something of how an animal lives, grows, and reproduces. They will do much more than just learn biology. Children become attached to their snails; they observe many animal characteristics in great detail, and they learn to care for and protect a living creature.

SNAIL ADVENTURES FAMILY ACTIVITY BACKPACK BY

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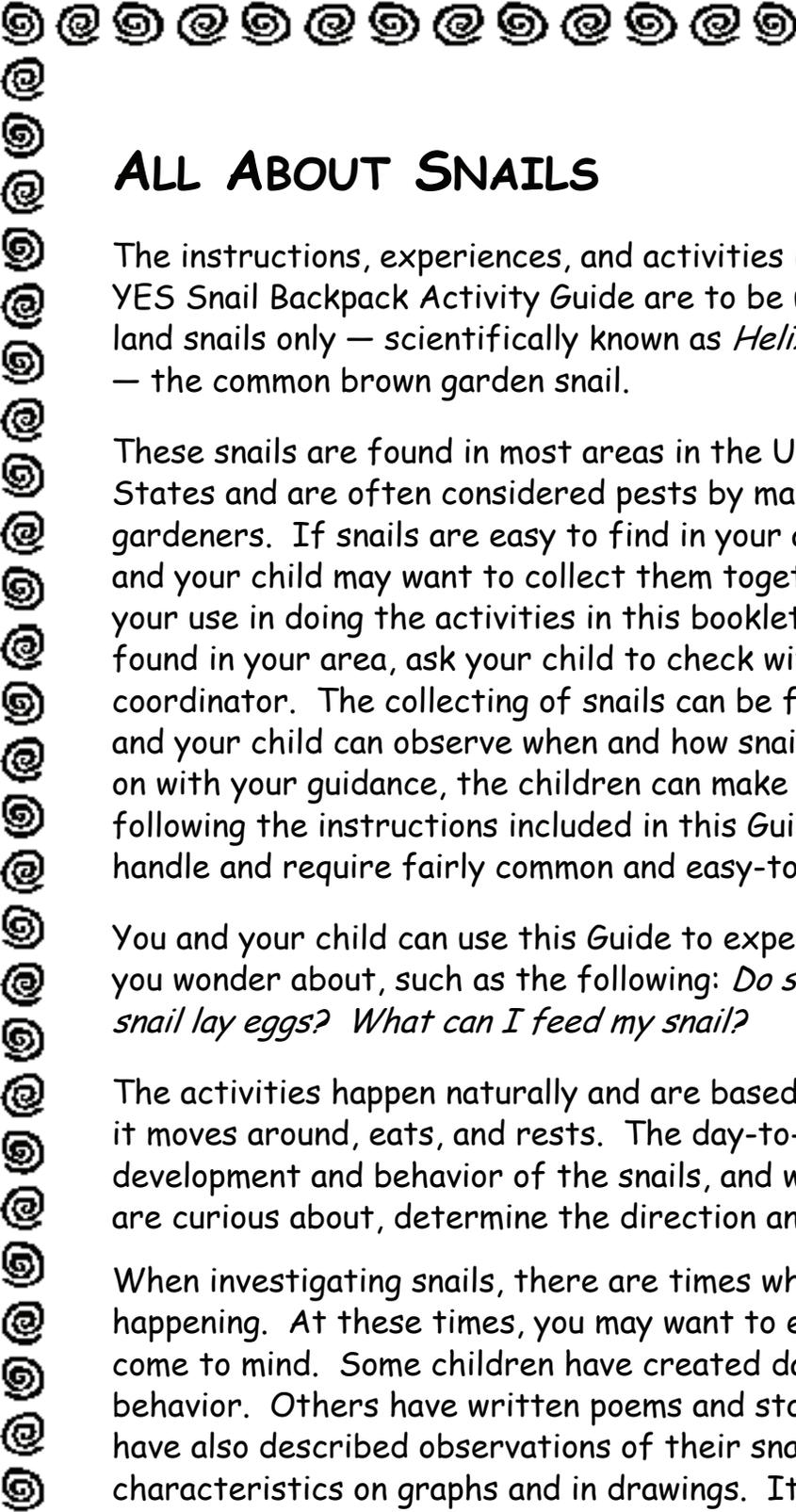
Publication 3411-1



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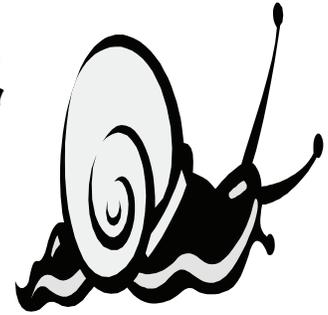




ALL ABOUT SNAILS

The instructions, experiences, and activities in the YES Snail Backpack Activity Guide are to be used with land snails only — scientifically known as *Helix aspersa* — the common brown garden snail.

These snails are found in most areas in the United States and are often considered pests by many gardeners. If snails are easy to find in your area, you and your child may want to collect them together for your use in doing the activities in this booklet. If snails are not easily found in your area, ask your child to check with the teens or the site coordinator. The collecting of snails can be fun and educational. You and your child can observe when and how snails live “in the wild.” Later on with your guidance, the children can make a “hotel” for the snails by following the instructions included in this Guide. Snails are safe to handle and require fairly common and easy-to-obtain food.



You and your child can use this Guide to experiment and answer things you wonder about, such as the following: *Do snails have teeth? Will my snail lay eggs? What can I feed my snail?*

The activities happen naturally and are based on the snail's daily life as it moves around, eats, and rests. The day-to-day changes in the development and behavior of the snails, and what the children notice and are curious about, determine the direction and pace of the activities.

When investigating snails, there are times when little seems to be happening. At these times, you may want to explore other ideas that come to mind. Some children have created dances to represent snail behavior. Others have written poems and stories about snails. They have also described observations of their snail's physical and behavioral characteristics on graphs and in drawings. It's hard to predict what your child will create to tell the snail's story.



YES SNAIL CARE AND SAFETY

The snail's body needs to be kept cool and damp; snails are usually found in dark, damp places, clinging to leaves or hiding near rocks. You will need to have leaves and soil for the snails so they can survive comfortably while they are your guests.

Investigating snails can be fun and educational because snails are living creatures. You should talk with your child about safe behavior before you begin doing the activities. Ask your child to think of some rules for protecting the snail. Be sure to emphasize the following:



-  *Remember to wash your hands before and after doing the activities with the snails.*
-  *Treat the snails with respect and care at all times, remember they are living creatures and are our "guests."*
-  *Remember to keep the snails out of danger. Don't let them fall because their shell is fragile.*
-  *Keep the snails in an enclosed area.*
-  *When you are finished with your activities for the day, help in the cleanup of all the materials and put any live snails safely back in the Snail Hotel. If you worked on something that can't be thrown away, be sure to wash it when you're done.*
-  *Salt is very harmful to snails.*
-  *If you found your own snail and you are finished with all of the snail activities, please release the snail back in the area where you found it!*



SNAIL INFORMATION

To help you and your child understand a little more about snails, here are a few facts about these wild animals. This information will be helpful as you and your child explore snails.

What is a snail?

A snail is a member of a large group of animals called *mollusks*. Mollusks have soft bodies, do not have an inner skeleton, and most have a hard shell on the

Where do snails live?

Because the snail's body needs to be kept cool and damp, snails are usually found in dark, damp places, clinging to leaves or hiding near rocks.

What do snails eat?

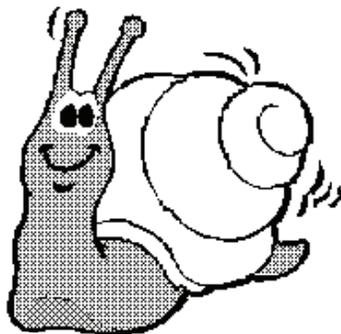
Garden snails often like to eat plants, but they can also eat paper. Your child can investigate what other things it can eat.

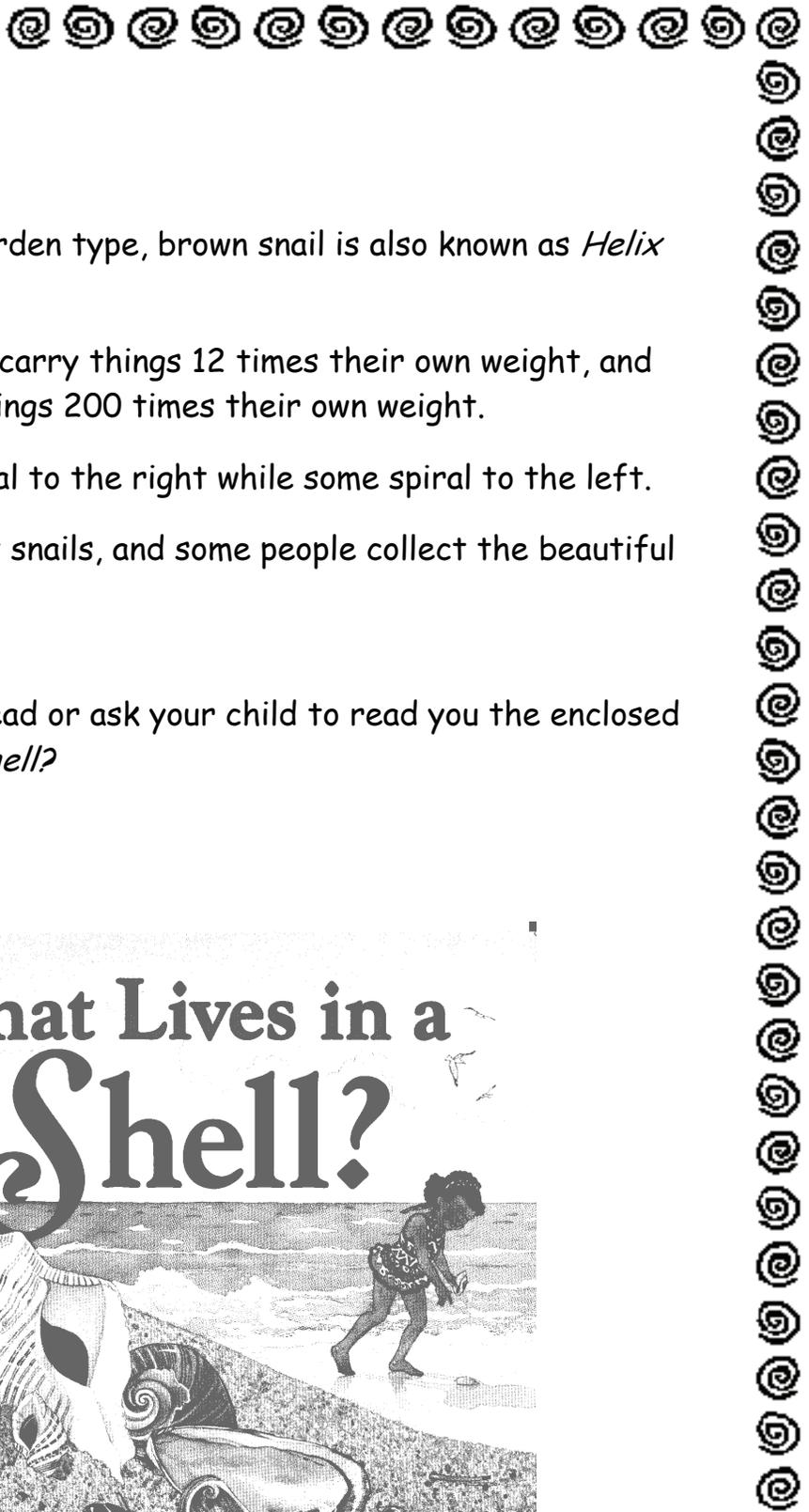
How do snails eat?

A snail has lots of tiny, sharp teeth on its tongue, which is called a *radulla*. The snail uses its tongue to rub against its food and scrape off little pieces of food into its mouth.

How do snails move?

Snails produce a slimy substance that helps them move. The slime helps the snail to slide along, and the slime is not dangerous.

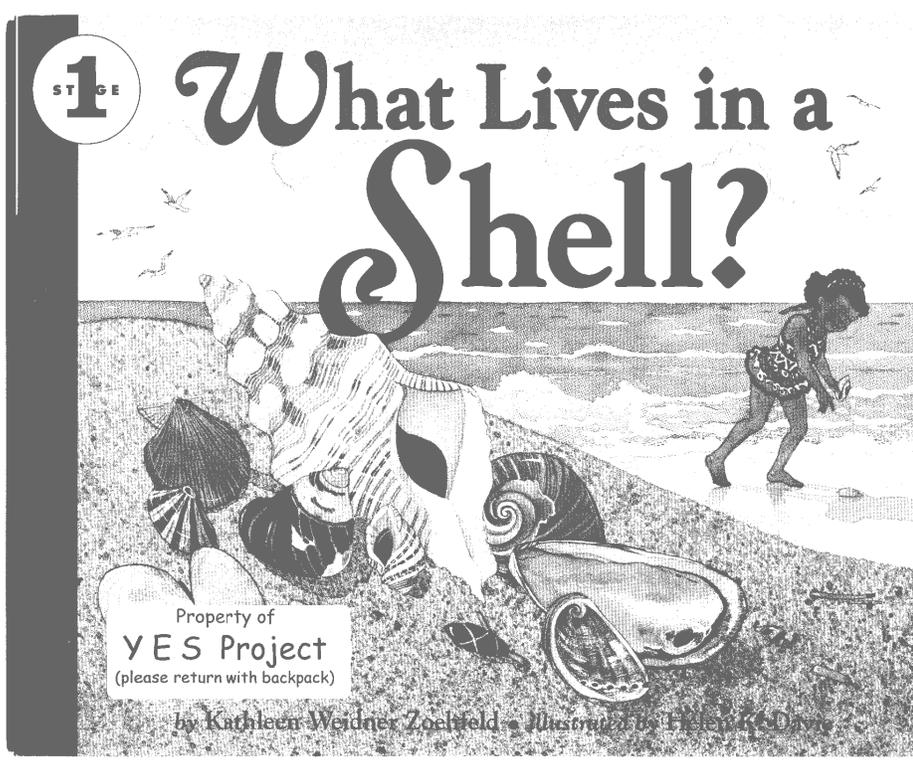


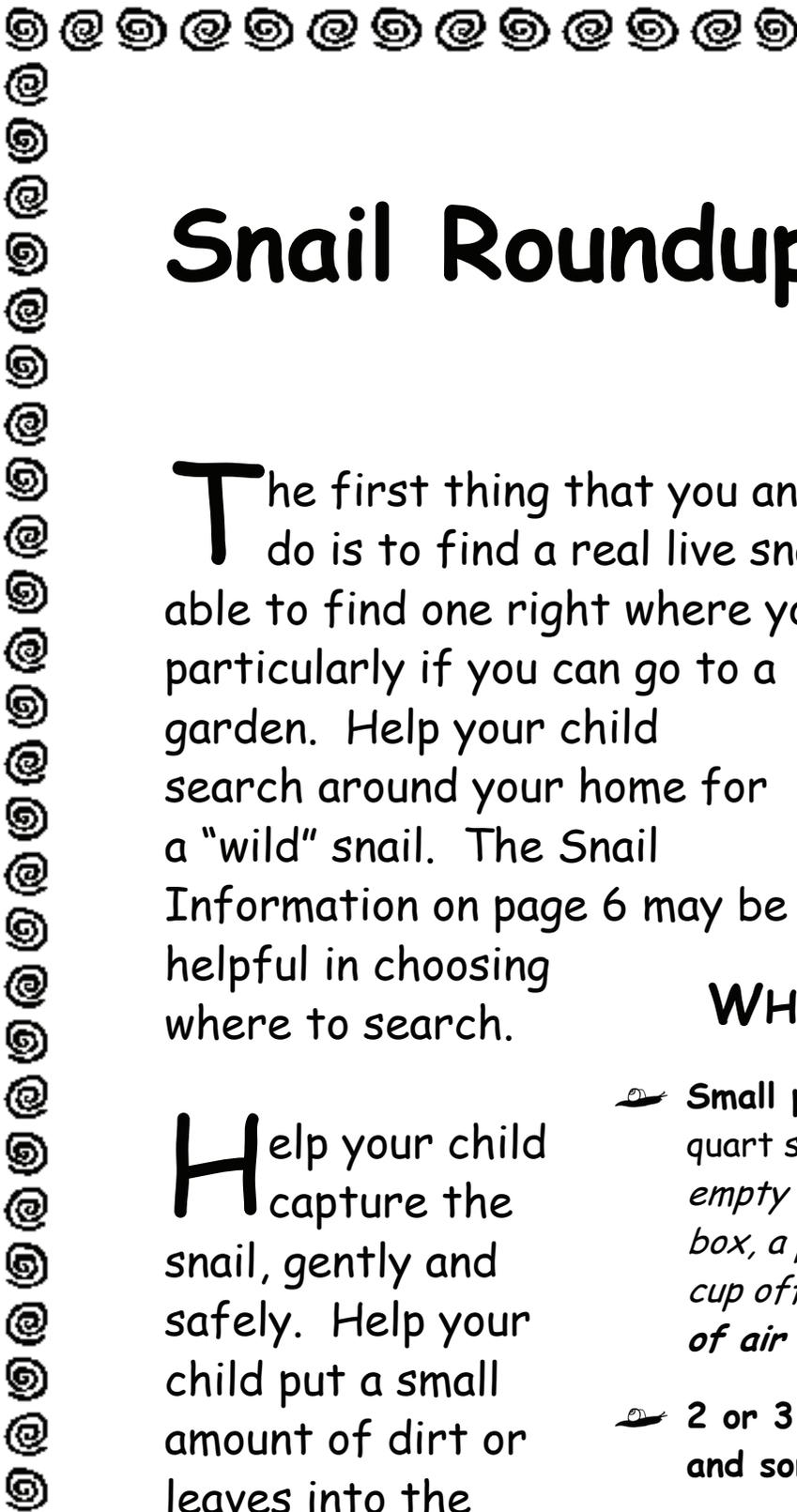


DID YOU KNOW?

-  The common, garden type, brown snail is also known as *Helix aspersa*.
-  Some snails can carry things 12 times their own weight, and some can pull things 200 times their own weight.
-  Most shells spiral to the right while some spiral to the left.
-  Some people eat snails, and some people collect the beautiful snail shells.

For more information, read or ask your child to read you the enclosed book, *What Lives in a Shell?*





Snail Roundup

The first thing that you and your child can do is to find a real live snail. You may be able to find one right where you live, particularly if you can go to a garden. Help your child search around your home for a "wild" snail. The Snail Information on page 6 may be helpful in choosing where to search.



Help your child capture the snail, gently and safely. Help your child put a small amount of dirt or leaves into the container.

WHAT YOU NEED

-  Small plastic container, about quart size — *for example, an empty milk container, a small box, a plastic bottle with the top cup off. Be sure to have plenty of air holes!*
-  2 or 3 cups of dirt and some leaves
-  Plastic hand lens
-  One or more snails





HOW TO DO IT

-  Help your child put a small amount of dirt into the container. It can be a small box, a plastic bottle with the top cut off, or anything that you can keep your snail in to transport it home.
-  Go to an area where you think you can find snails. Look around and see if you can find a snail. Encourage your child to explore and search as well. You can usually find them on plants in the late evening, or in early morning. You can often find them attached to the base of plants, stuck to the base of fences, or on the sides of rocks in shady, damp, or moist places. You can use the hand lens to magnify the spot where you are looking, and to magnify the snail.
-  Once you've spotted a snail, help your child to carefully pick it up and put it in the dirt filled container.
-  Make sure the snail has enough air to breathe!

QUESTIONS TO ASK YOUR CHILD

Ask open-ended questions that encourage further exploration by your child.

-  *Where do you think you should look to find a snail?*
-  *Will you look inside or outside of your home?*
-  *Will you look in bright, sunny places or in dark places?*
-  *Why do you think you found the snail where you did?*
-  *Did you find the snail in a place where it could find food?*
-  *What do you think was around where you found your snail that it might like to eat?*





Constructing a Snail Hotel

Now that you have found a snail, build it a temporary home. You and your child can have hours of fun doing these activities and watching how the snail moves, grows, eats, and sleeps.

We suggest that you only keep the snail for a little while and then release it back into the area where you found it.

WHAT YOU NEED

-  A plastic 1 gallon milk container, or a 1-liter plastic soda bottle
-  Some leaves, grass, some small rocks and twigs, piece of apple
-  A little moist soil and small branches
-  Spray bottle mister
-  Live snails from Snail Roundup Activity
-  Screening or cheesecloth
-  String or rubber band



HOW TO DO IT



-  Cut off the top of your container to create a large opening.
-  Use the soil, leaves, and rocks to cover the bottom of the container.
-  Mist the inside of the container so everything gets moist.
-  Put your live snails in the container.
-  Cover opening with screening (or cheesecloth) and secure it with string (or rubber band).



QUESTIONS TO ASK YOUR CHILD

Ask open-ended questions that encourage further exploration by your child.

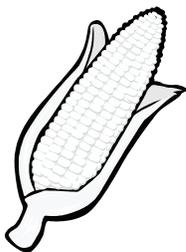
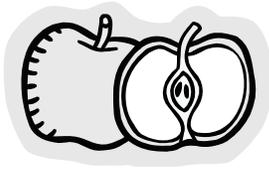
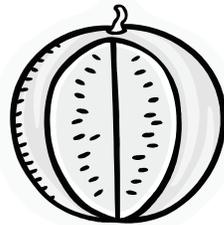
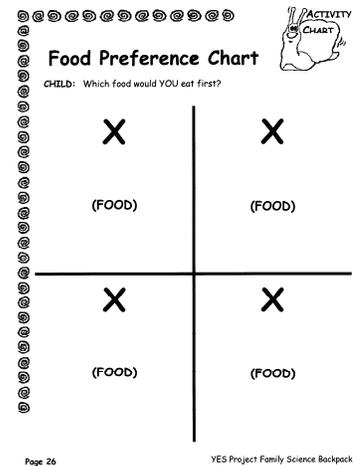
-  *What things should we put in the snail's house? Discuss where the snails live outdoors and what type of habitat they like.*
-  *Ask why the snails will only stay in this new home for a short time. Explain that snails are wild animals, not pets.*
-  *Discuss what types of food to place inside.*





Snail Snack

This activity is tasty, and fun. Using the enclosed *Food Preference charts*, this activity compares human food preferences to those of a snail.



WHAT YOU NEED

-  Assortment of 4 vegetables or 4 fruits, cut into small pieces
-  Live snail
-  3 *Food Preference Charts* — page 26—28
-  Plain piece of paper



HOW TO DO IT

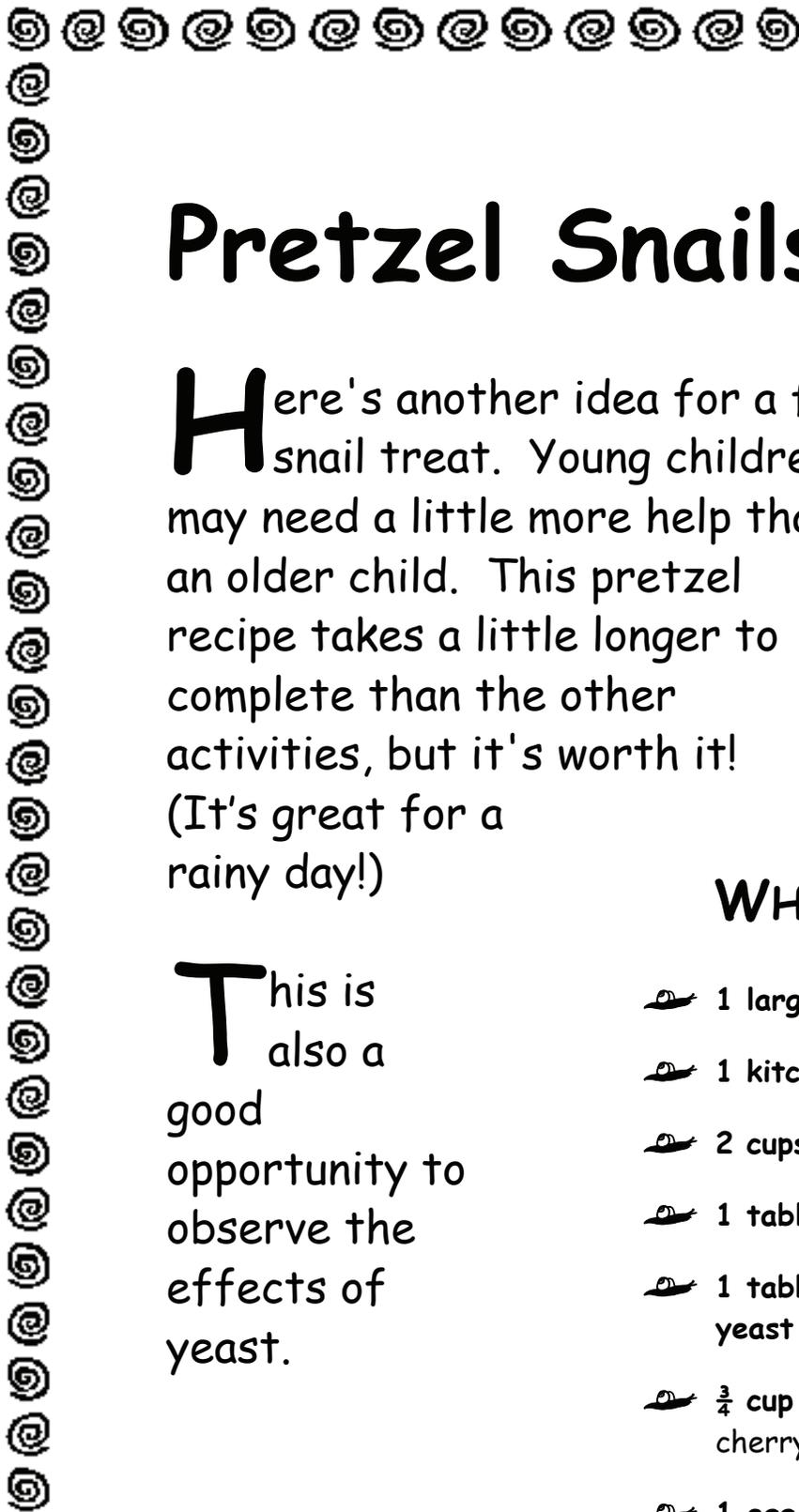
-  Help your child divide the foods you've chosen (*4 vegetables or 4 fruits*) into three piles — one for you, one for your child, one for the snail.
-  Next, help your child arrange the vegetables or fruits on the **Food Preference Charts**, making sure that there is a different food in each area.
-  Ask your child: *Which food will the snail like best?* Record the prediction on the piece of plain paper.
-  Place the snail in the center of the chart, watch and record which food the snail eats first.
-  Then you and your child sample the vegetables or fruits and choose your favorite. Record your choices on the plain piece of paper.

QUESTIONS TO ASK YOUR CHILD

Ask open-ended questions that encourage further exploration by your child.

-  *Was your prediction correct? Why? Why not?*
-  *Did we like the same food as the snail?*
-  *How much do you think a snail eats? How could you find out?*
-  *What other foods do you think the snail would like? (Try some and find out!)*
-  *What are some of your favorite foods?*
-  *Would the snail like any of those foods? Why? Why not?*





Pretzel Snails

Here's another idea for a fun and tasty snail treat. Young children may need a little more help than an older child. This pretzel recipe takes a little longer to complete than the other activities, but it's worth it! (It's great for a rainy day!)



This is also a good opportunity to observe the effects of yeast.

WHAT YOU NEED

-  1 large bowl
-  1 kitchen brush
-  2 cups whole wheat flour
-  1 tablespoon vegetable oil
-  1 tablespoon (1 package) active dry yeast
-  $\frac{3}{4}$ cup lukewarm fruit juice (apple, cherry, or orange)
-  1 egg
-  Pretzel salt (*optional*)



HOW TO DO IT

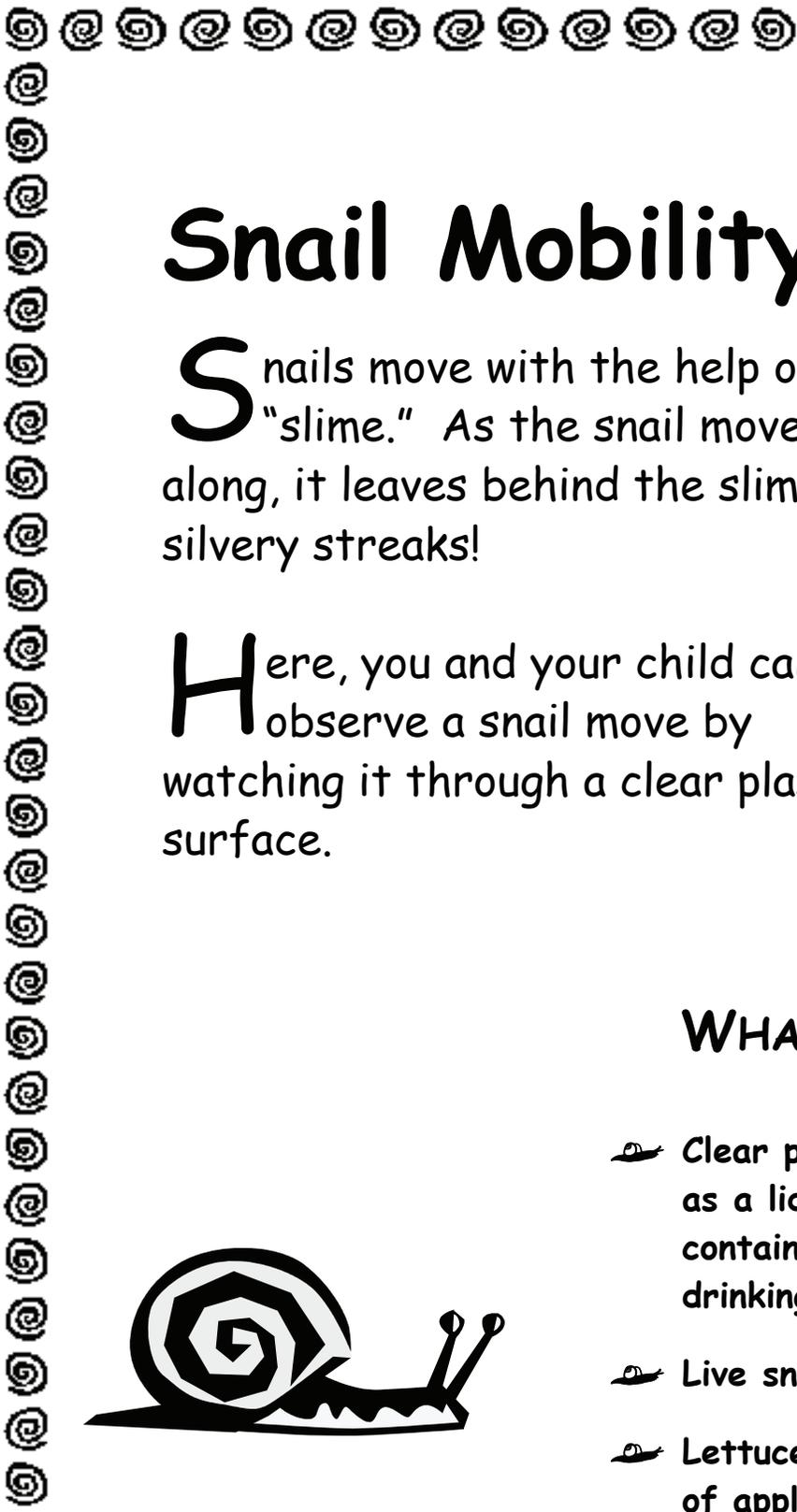
-  Help your child put the flour, oil, yeast, and juice in a large bowl. Mix it all together and then knead it by pushing, pulling, and punching it. If the pretzel dough is sticky, add more flour. This is where a young child might need some help!
-  Demonstrate how to tear off a piece of dough and use the palms of your hands to roll it into a long roll. You can shape your dough into a spiral snail and roll another small piece for the foot. Be creative! Encourage *your child* to be creative!
-  When you have the shapes you like, put them on a lightly oiled cookie sheet. Let the dough rise for 30 minutes in a warm place.
-  Preheat the oven to 450° F. Then have your child beat the egg and brush it over the pretzels. Add salt if you want.
-  Bake the pretzels for 15 minutes, or until golden brown. Let them cool. Then enjoy!

QUESTIONS TO ASK YOUR CHILD

Ask open-ended questions that encourage further exploration by your child.

-  *What happened to the dough as you mixed it together? And you spent more time kneading it?*
-  *How did the dough change after it had set for 30 minutes?*
-  *What other shapes could you make out of this pretzel dough?*
-  *How is the shape of the pretzel similar or different to a snail?*

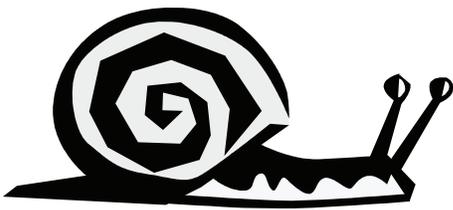




Snail Mobility

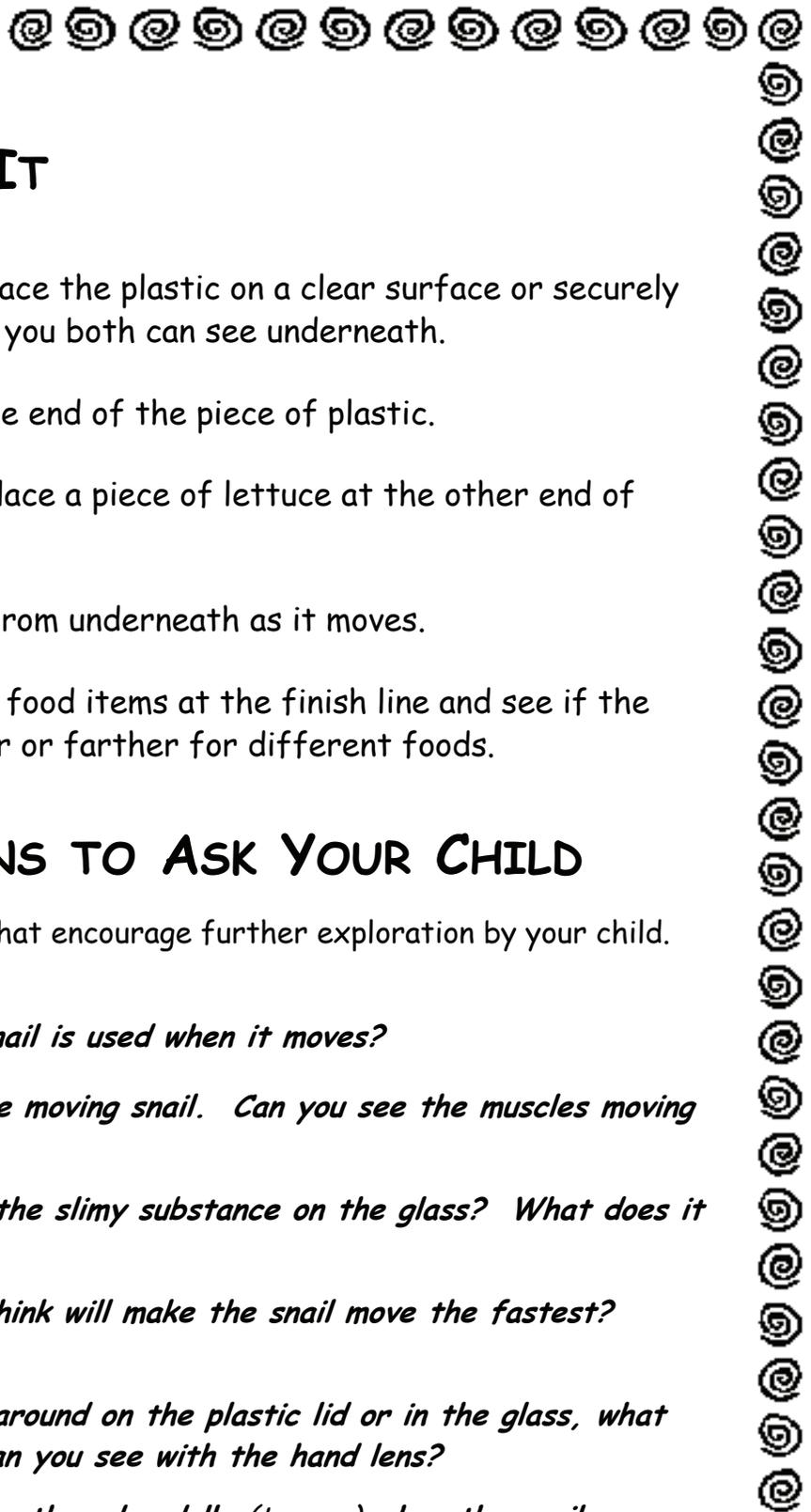
Snails move with the help of "slime." As the snail moves along, it leaves behind the slime in silvery streaks!

Here, you and your child can observe a snail move by watching it through a clear plastic surface.



WHAT YOU NEED

-  Clear piece of plastic, such as a lid from a food container or a clear plastic drinking glass
-  Live snail
-  Lettuce, green leaves, piece of apple



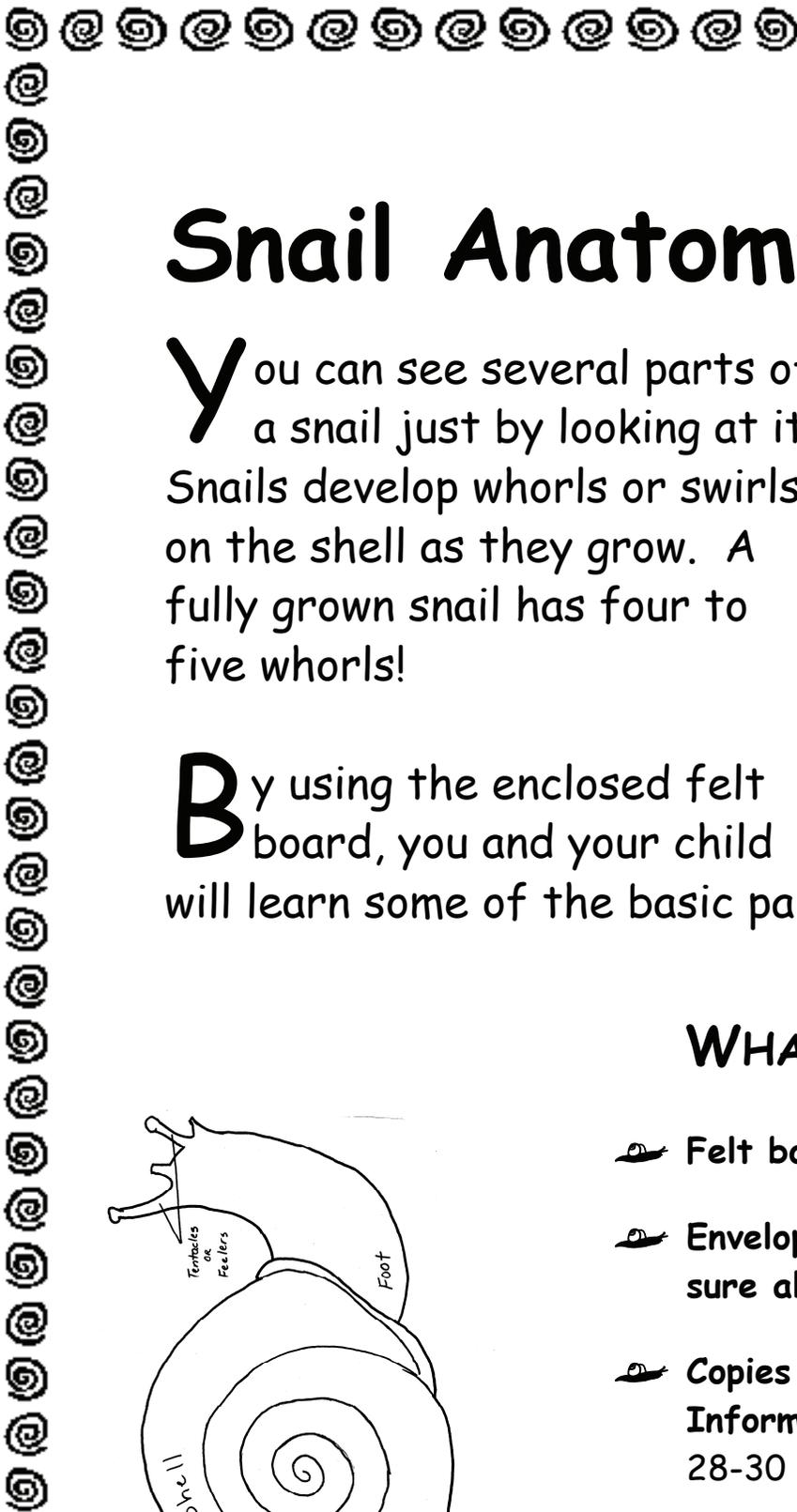
HOW TO DO IT

-  Help your child place the plastic on a clear surface or securely hold it up so that you both can see underneath.
-  Place a snail at one end of the piece of plastic.
-  Have your child place a piece of lettuce at the other end of the glass.
-  Watch the snail from underneath as it moves.
-  Try placing other food items at the finish line and see if the snail moves faster or farther for different foods.

QUESTIONS TO ASK YOUR CHILD

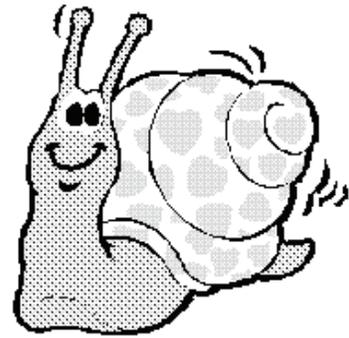
Ask open-ended questions that encourage further exploration by your child.

-  *What part of the snail is used when it moves?*
-  *Look carefully at the moving snail. Can you see the muscles moving in small waves?*
-  *Can you see any of the slimy substance on the glass? What does it look like?*
-  *What food do you think will make the snail move the fastest? The farthest?*
-  *As the snail crawls around on the plastic lid or in the glass, what parts of the snail can you see with the hand lens?*
-  *Could you see the mouth and radulla (tongue) when the snail was eating?*



Snail Anatomy

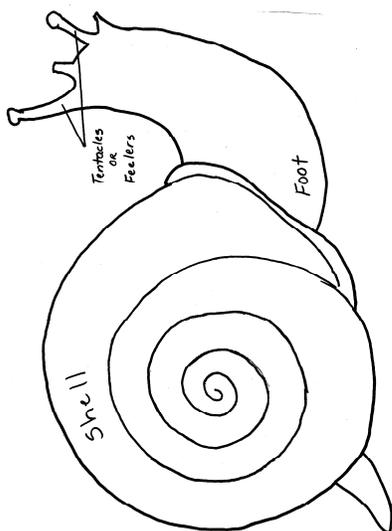
You can see several parts of a snail just by looking at it. Snails develop whorls or swirls on the shell as they grow. A fully grown snail has four to five whorls!



By using the enclosed felt board, you and your child will learn some of the basic parts of a snail.

WHAT YOU NEED

-  Felt board (enclosed)
-  Envelope of felt pieces (make sure all pieces are there)
-  Copies of Snail's Anatomy Information sheets — pages 28-30





HOW TO DO IT

-  Organize the felt pieces with the handouts so that you can identify each part of the snail's anatomy.
-  Choose a part and label it, ask if your child knows the function of the part, (or read the Activity Information printed to the right).
-  Then have your child place the part on the felt board in the appropriate place. Use the enclosed Anatomy References on pages 28 thru 30 for help, if necessary.
-  Compare this activity with a real snail. You can use the snail, the plastic hand lens, and the plastic lid or glass from the previous activity.

ACTIVITY INFORMATION

<i>Tentacles</i>	Used to touch, smell, and taste; help the snails find food and feel for objects.
<i>Eyes</i>	Used to see light and dark; not all snails have eyes.
<i>Foot</i>	The part of the snail's body that is pushed out of the shell; at the front of the foot is the head.
<i>Shell</i>	Acts as protection for the snail's soft body.

QUESTIONS TO ASK YOUR CHILD

Ask open-ended questions that encourage further exploration by your child.

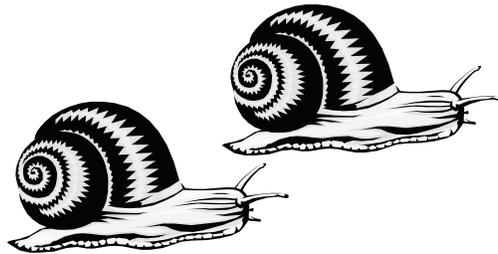
-  *Can you find the same parts on your real snail? Remember not to hurt the snail while you are looking.*
-  *How does the snail's shell help keep the snail safe? How many whorls does it have?*
-  *Does your snail have eyes? What do you think it sees?*





Snail Races

Here's an activity to see how far your snail can go in 5 minutes.



By racing two snails at one time, you can compare the difference in the distances.

WHAT YOU NEED

-  Two square or rectangular pieces of plastic, the lids from large plastic food containers or pieces of wax paper.
-  Two snails – one for the child and one for the parent
-  Snail Races Activity Chart – see page 27
-  Small piece of lettuce
-  Watch or clock



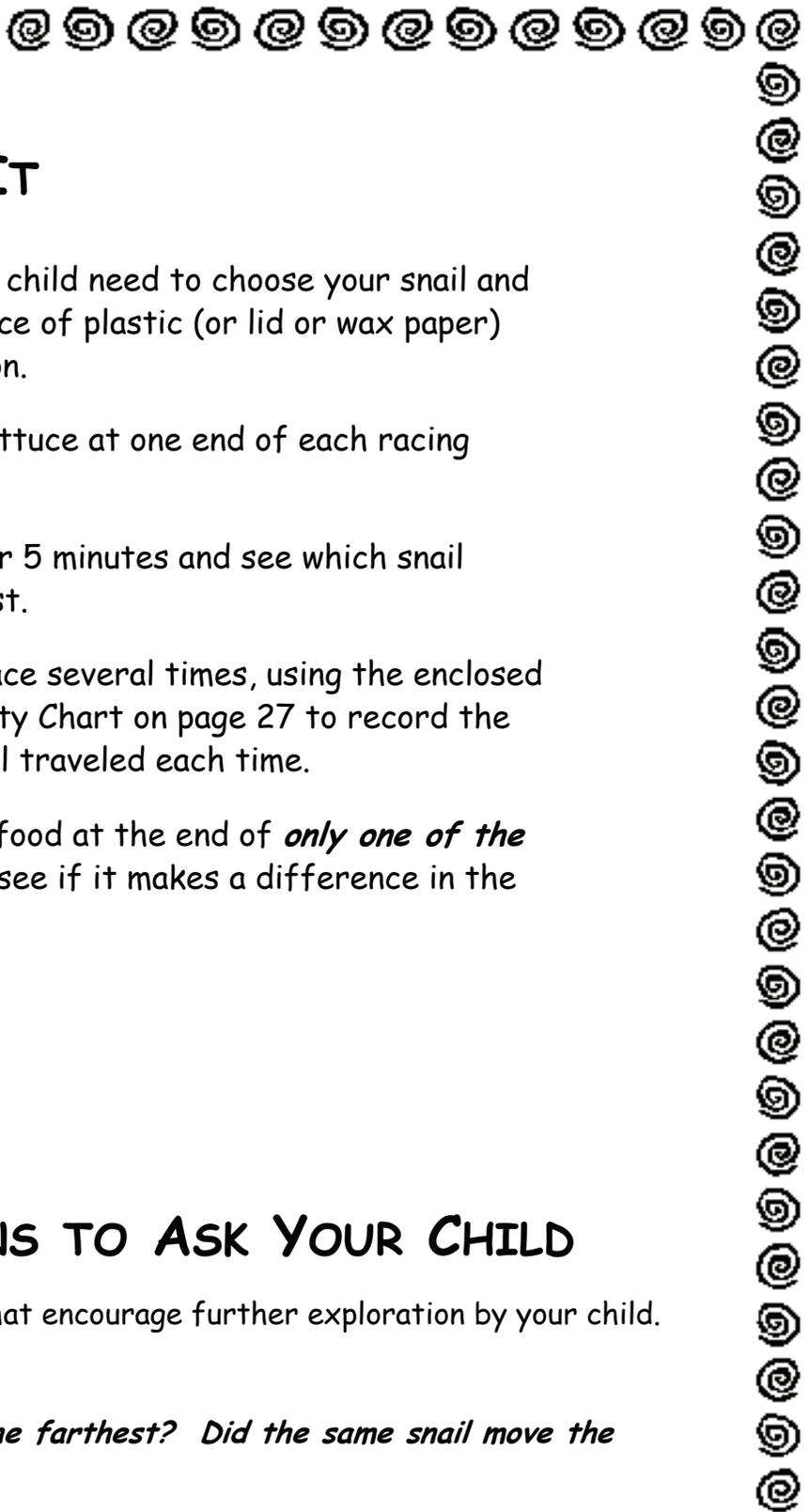
Snail Races Chart

How did your snail do in the race(s)? Measure with a ruler, and record on this chart, how far your snail moved.

CHILD'S NAME:

PARENT'S NAME:

RACE	DISTANCE (Write the number of inches moved.)	DISTANCE (Write the number of inches moved.)
#1		
#2		
#3		
#4		
#5		



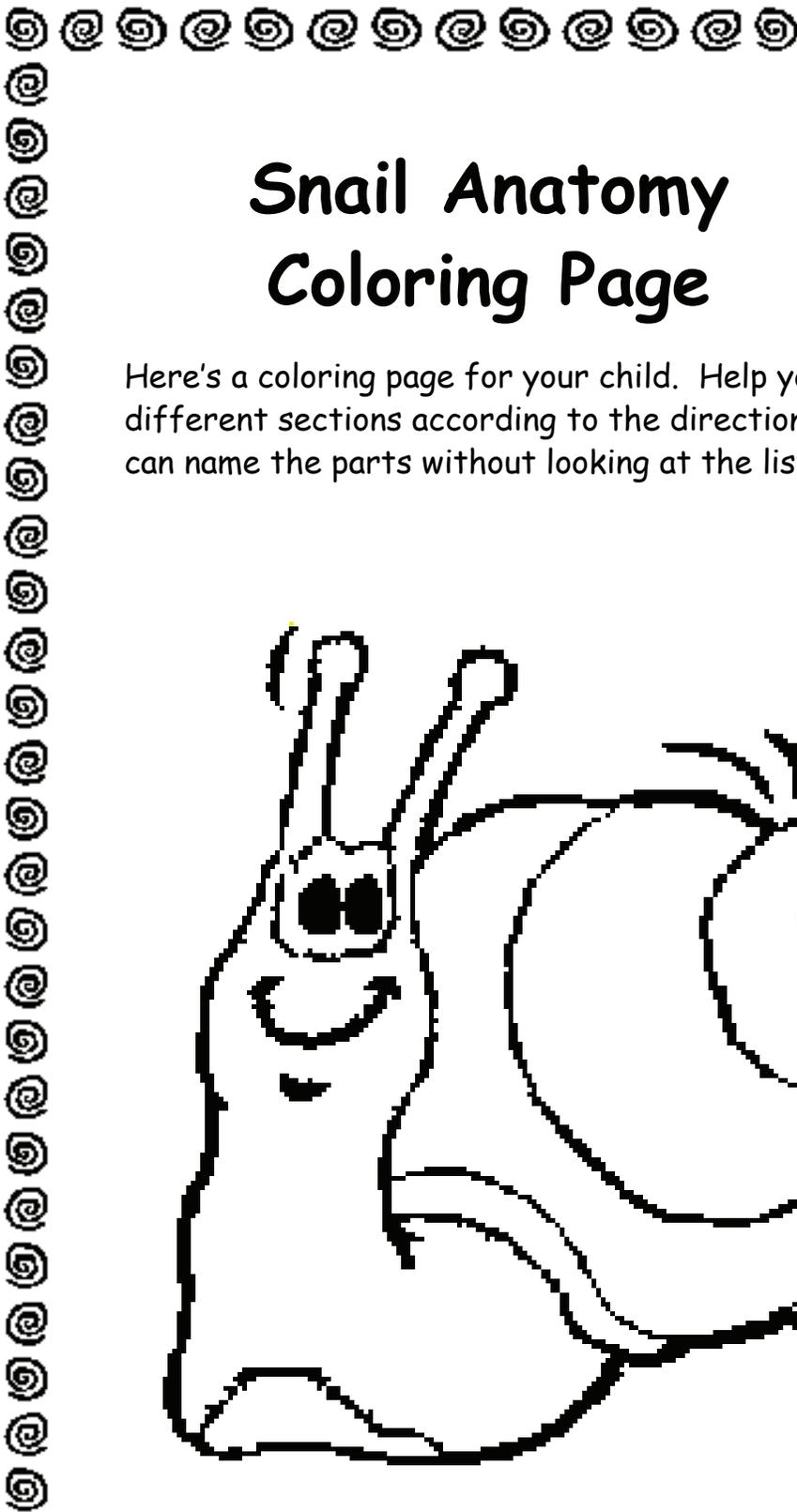
HOW TO DO IT

-  Both you and your child need to choose your snail and place it on the piece of plastic (or lid or wax paper) you want to race on.
-  Place a piece of lettuce at one end of each racing surface.
-  Time the snails for 5 minutes and see which snail moves the farthest.
-  You can run the race several times, using the enclosed Snail Races Activity Chart on page 27 to record the distance each snail traveled each time.
-  Try putting some food at the end of *only one of the race courses* and see if it makes a difference in the distance traveled.

QUESTIONS TO ASK YOUR CHILD

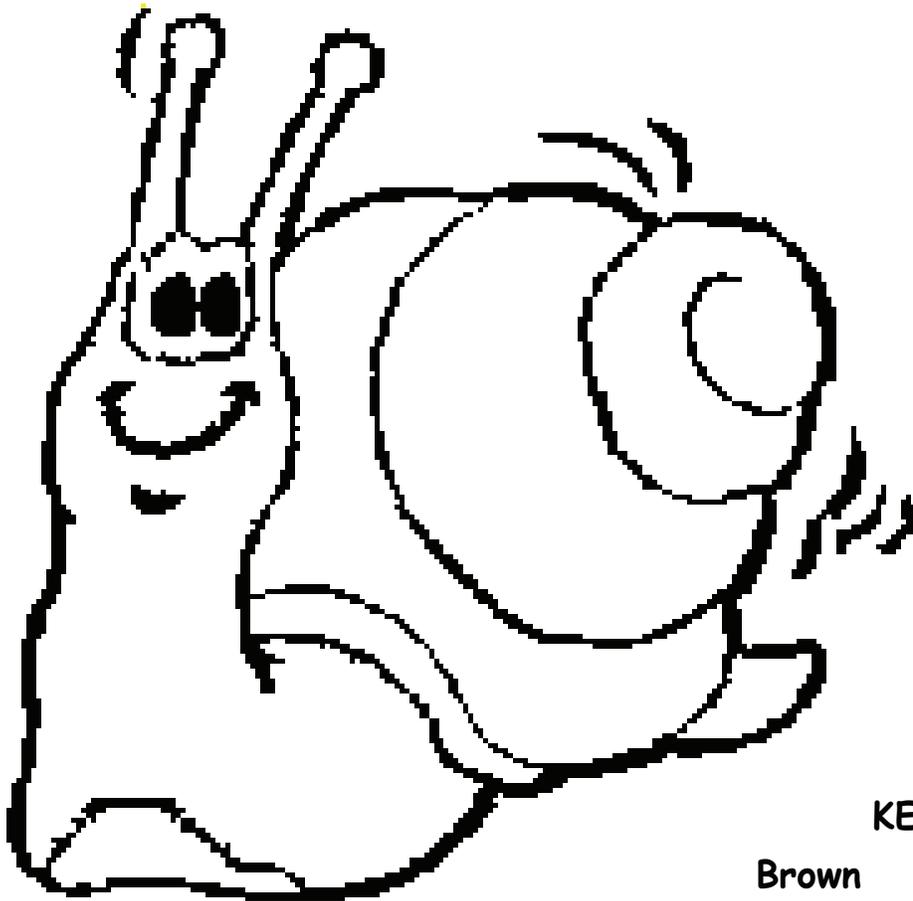
Ask open-ended questions that encourage further exploration by your child.

-  *Which snail moved the farthest? Did the same snail move the farthest each time?*
-  *Did having food or not having food at the end of the racing surface make any difference in how far the snail moved?*



Snail Anatomy Coloring Page

Here's a coloring page for your child. Help your child color in the different sections according to the directions below. See if you can name the parts without looking at the list.



KEY

- | | |
|---------------|----------------------|
| Brown | Tentacles or feelers |
| Yellow | Foot |
| Gray | Shell |



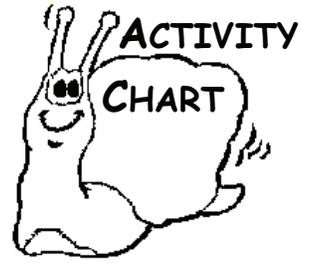
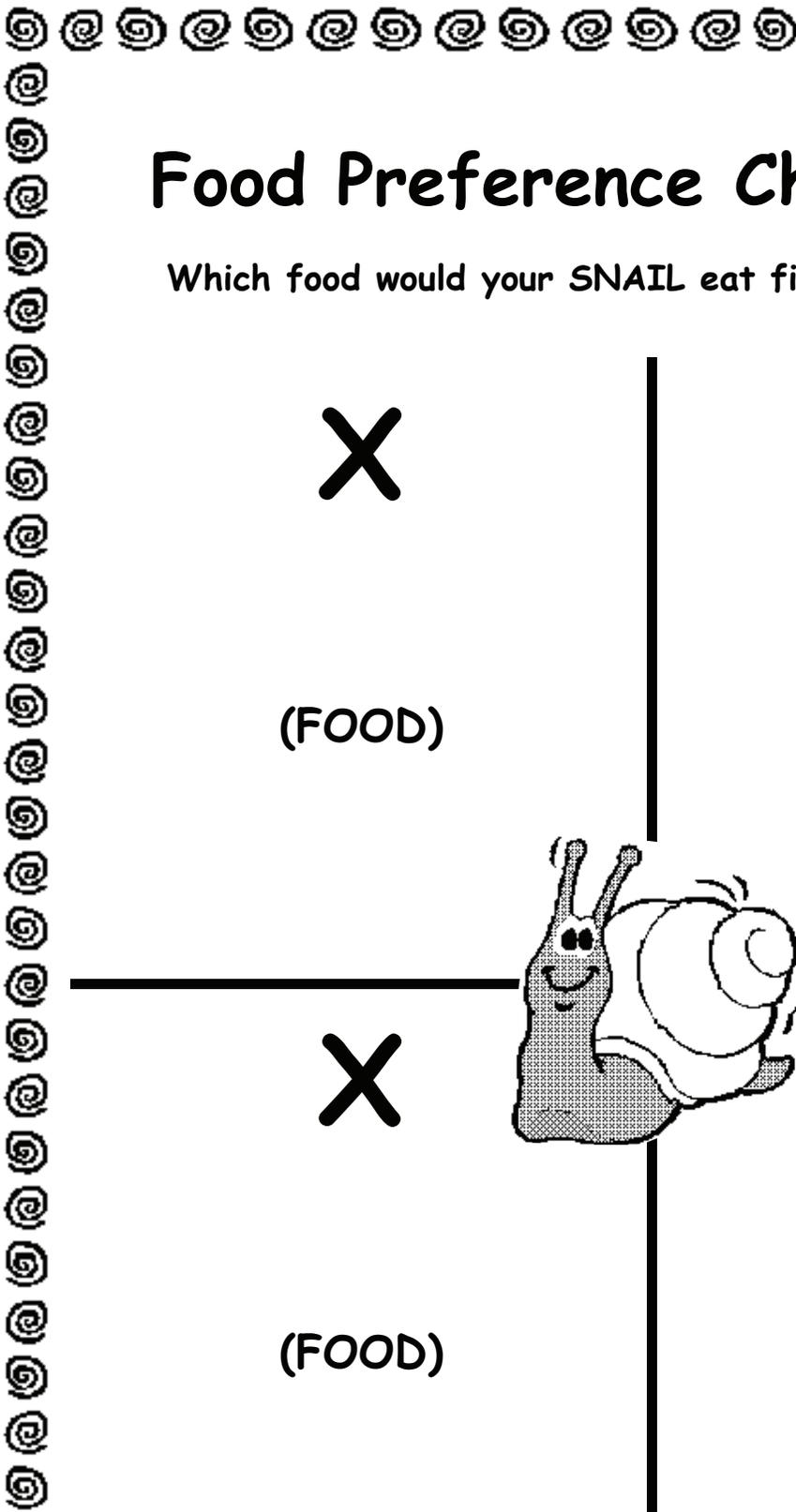
Snail Rhymes

Together, you and your child read the enclosed book, *How Snails Live*. Spend time looking at the pictures and discussing the exciting information you will learn about snails.

Then assist your child in drawing a line between the word in Column A and the word that rhymes with it in Column B. You may need to sound out some words with your child. If necessary, help your child find the words in the book.

<u>COLUMN A</u>	<u>COLUMN B</u>
Trees	Trail
Sun	Shell
Snail	Cool
Smell	Tongue
Pool	Leaves

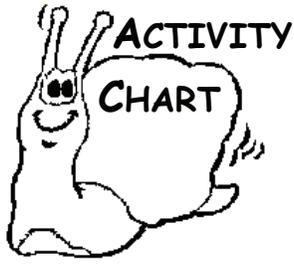




Food Preference Chart

Which food would your SNAIL eat first?

X	X
(FOOD)	(FOOD)
X	X
(FOOD)	(FOOD)

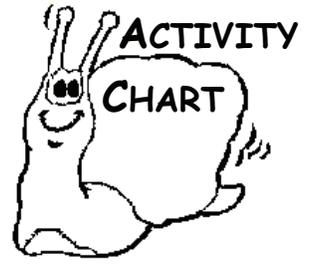
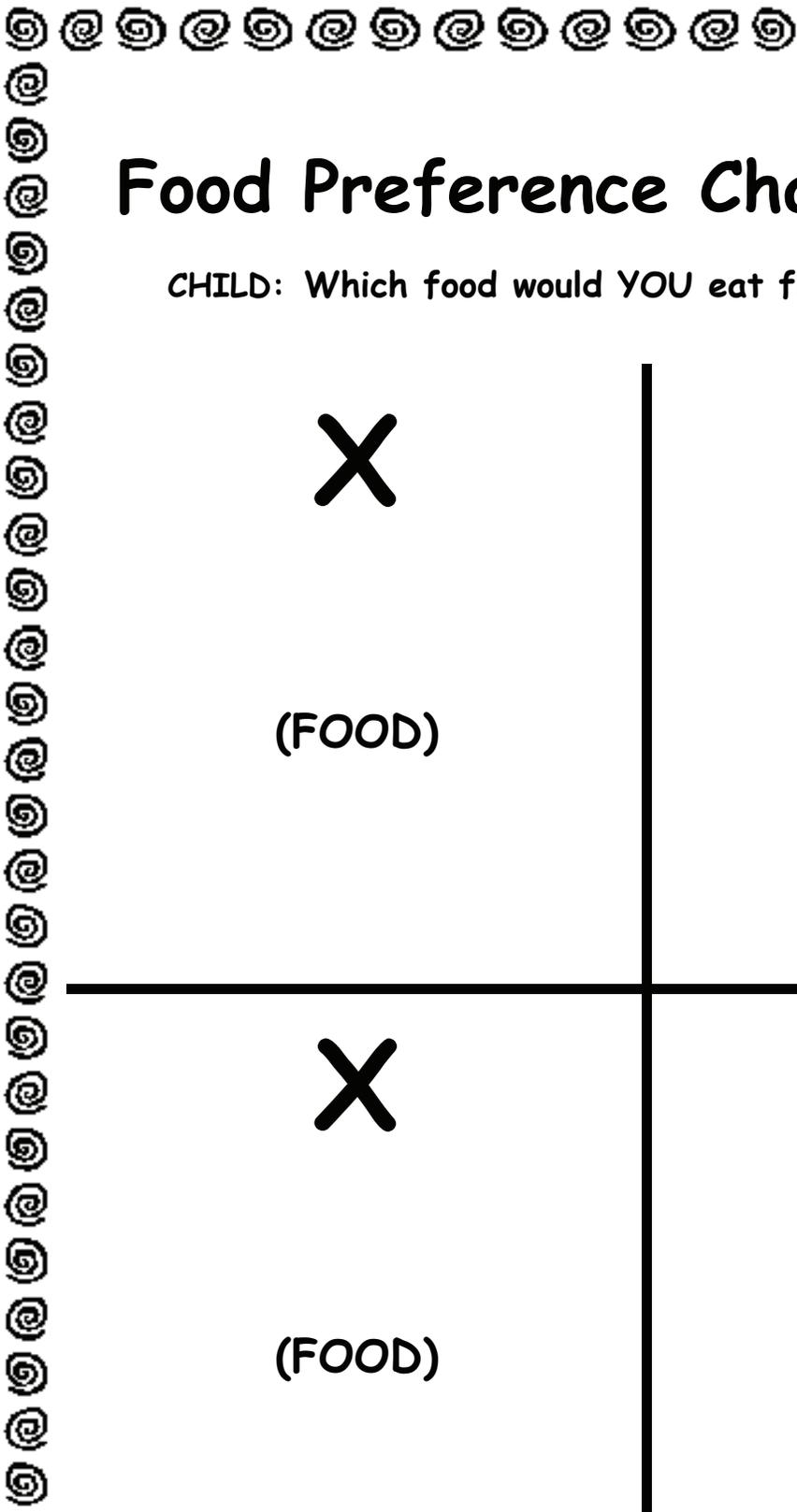


Food Preference Chart

PARENT: Which food would YOU eat first?

X (FOOD)	X (FOOD)
X (FOOD)	X (FOOD)





Food Preference Chart

CHILD: Which food would YOU eat first?

X

(FOOD)

X

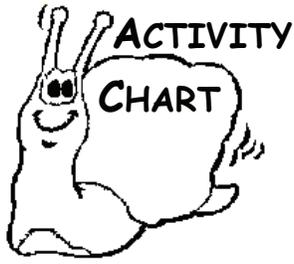
(FOOD)

X

(FOOD)

X

(FOOD)



Snail Races Chart

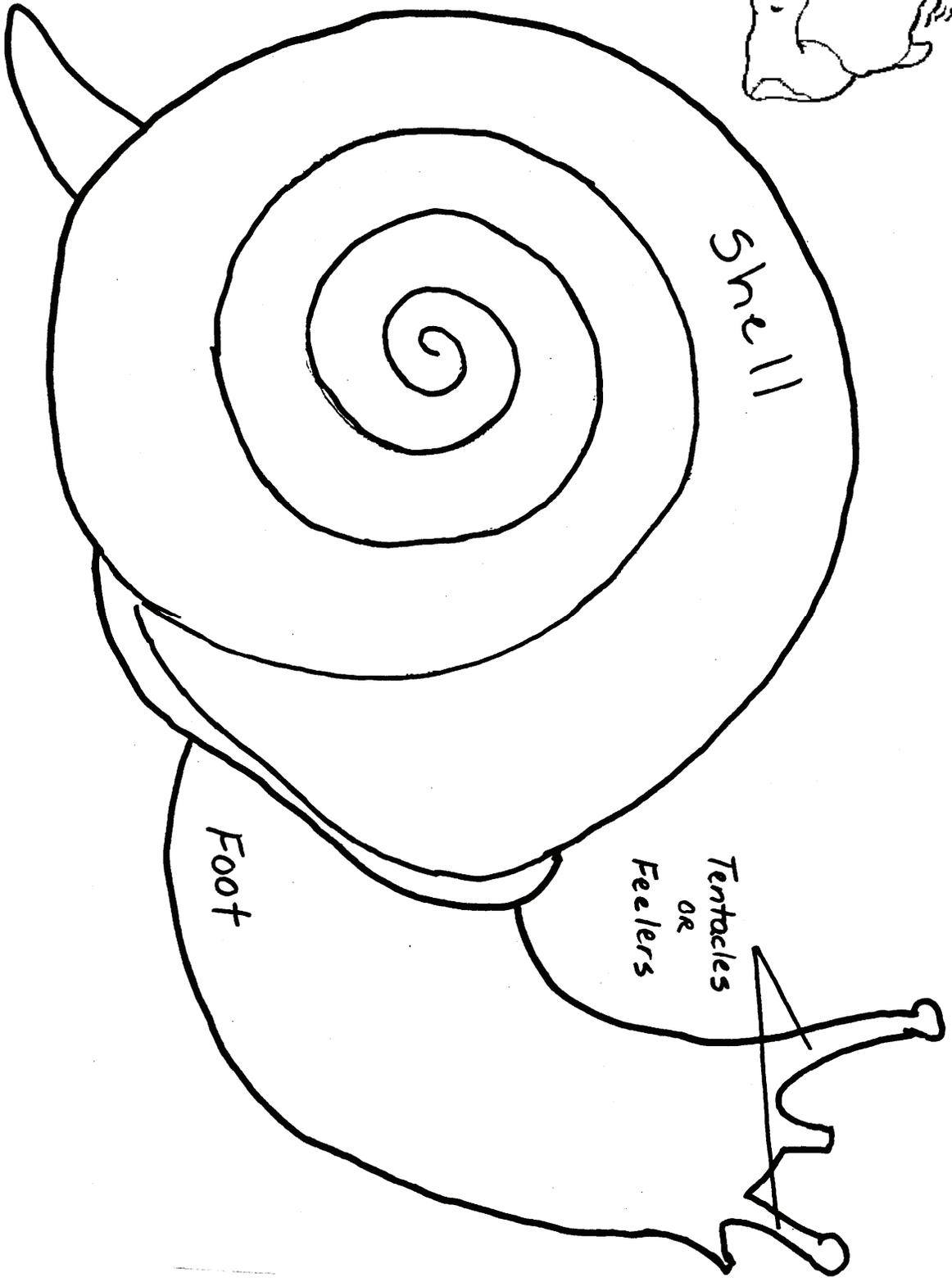
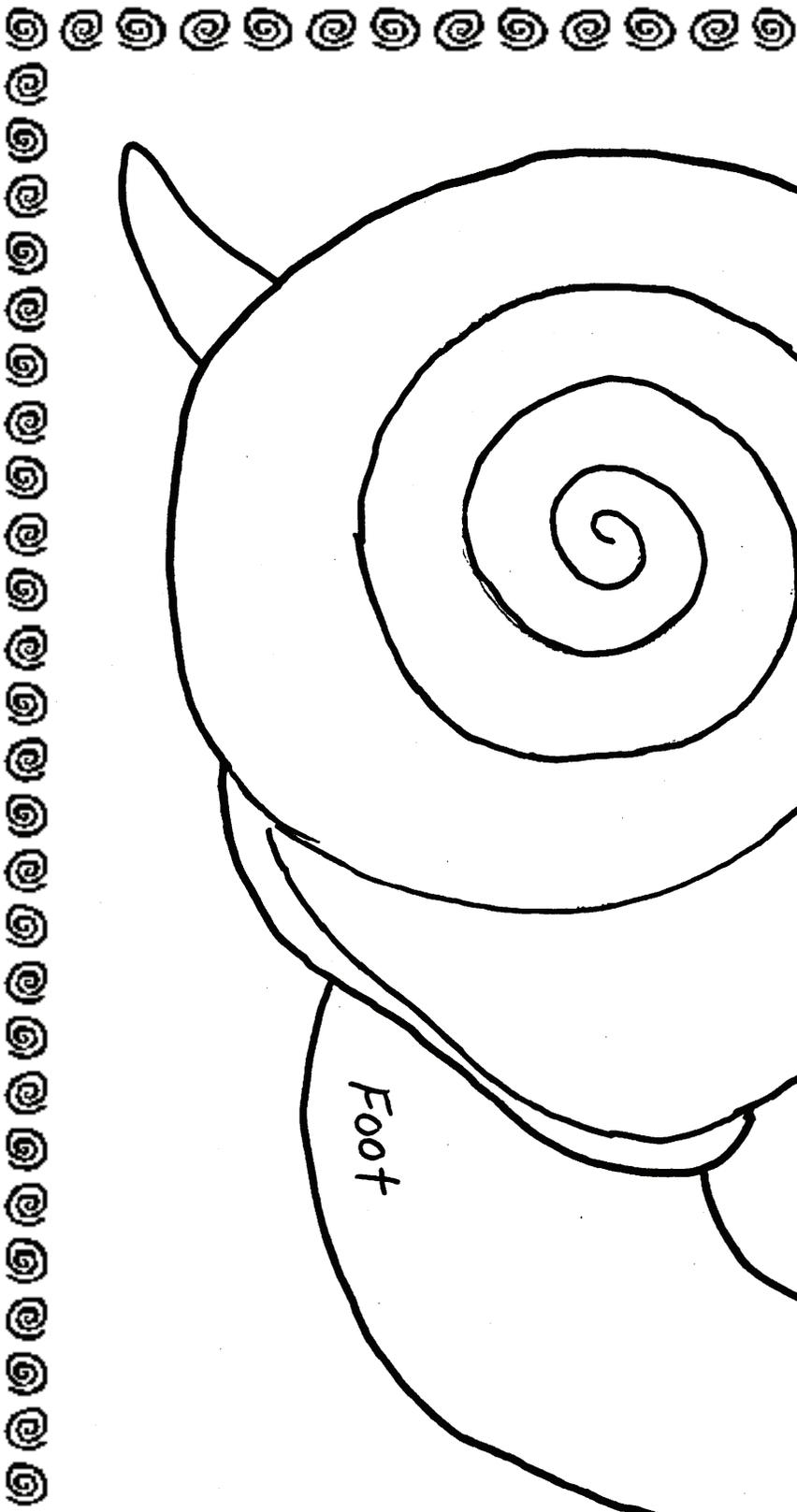
How did your snail do in the race(s)? Measure with a ruler, and record on this chart, how far your snail moved.

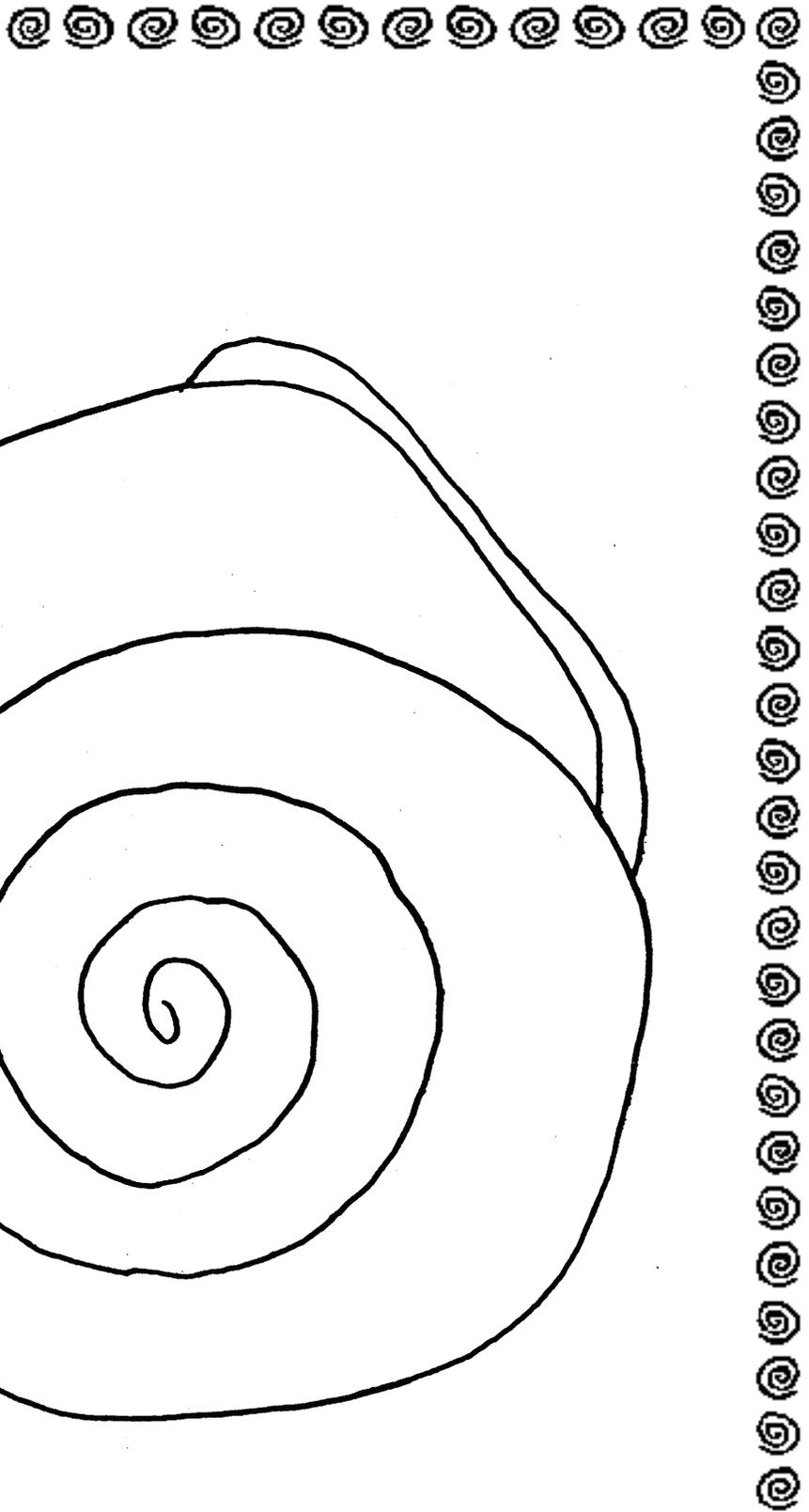
CHILD'S NAME

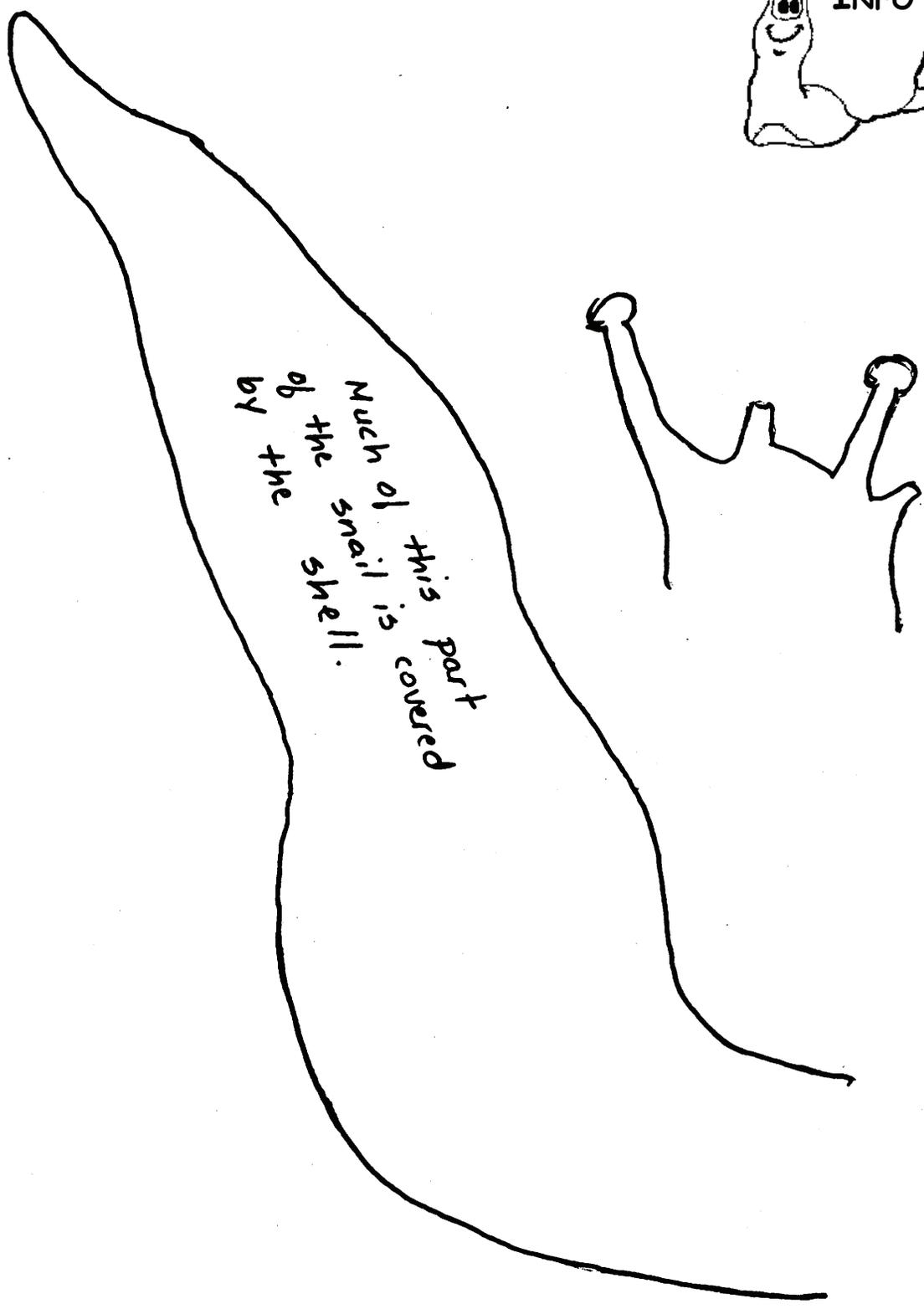
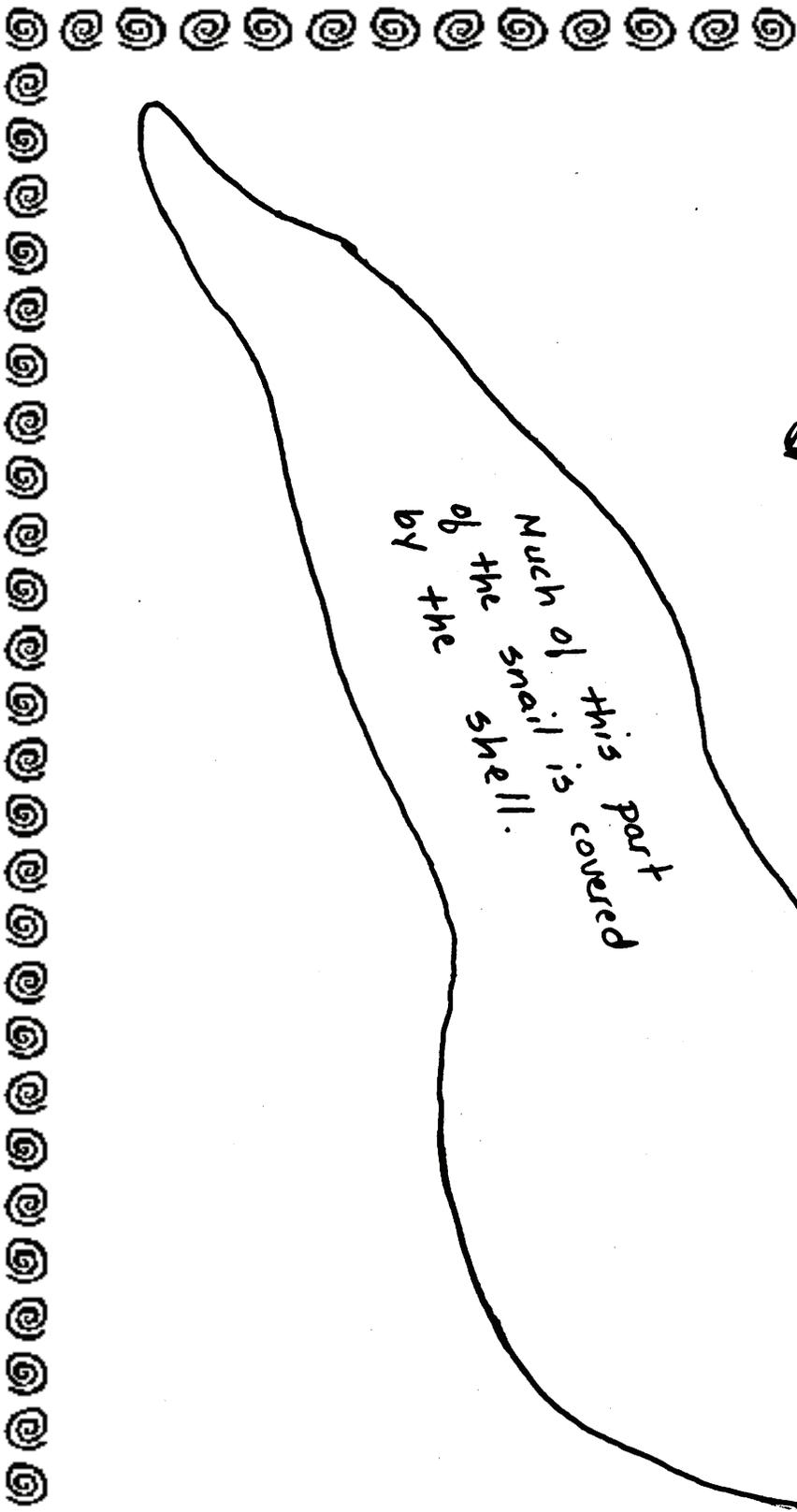
PARENT'S NAME

RACE	DISTANCE (Write the number of inches moved.)	DISTANCE (Write the number of inches moved.)
#1		
#2		
#3		
#4		
#5		











MORE BOOKS TO READ ON SNAILS

Hooray for Snail

Written & Illustrated by John Stadler
Harper Publishers: 1984

Snail Saves the Day

Written & Illustrated by John Stadler
Harper Publishers: 1984

How Snails Protect Themselves

Written by Chris Brough
The Wright Group: 1995

The Life Cycle of a Snail

Written by Chris Brough
The Wright Group: 1995

Why Snails Have Shells

Retold & Translated by Carolyn & Jay Han
University of Hawaii Press: 1993

Life of the Snail

Written by Theres Buholzer
Carolrhoda Books, Inc: 1987

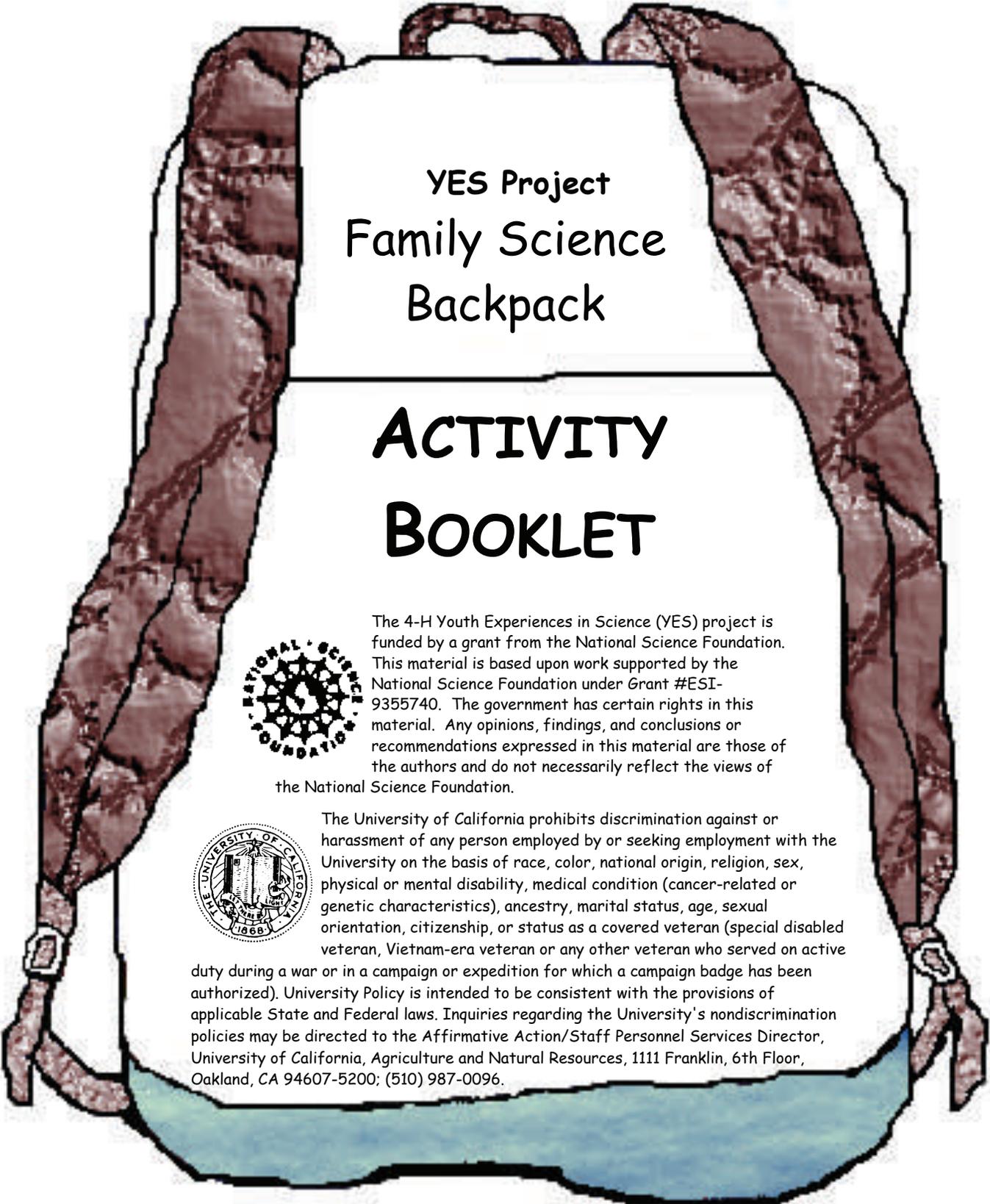
The Biggest House in the World

Written by Leo Lionni
Dragonfly Books: 1968

The Snail's Spell

Written by Joanne Ryder
Puffin Books: 1988





YES Project Family Science Backpack

ACTIVITY BOOKLET



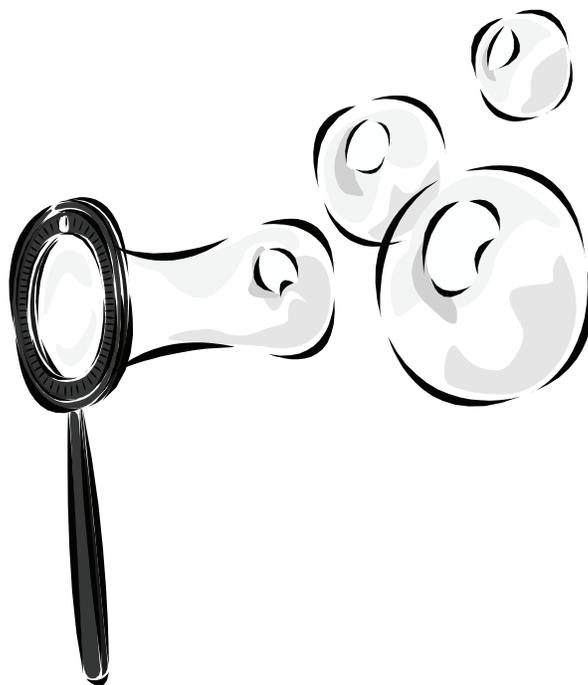
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Magic Bubbles

Teen Guide



4-H YOUTH EXPERIENCES IN SCIENCE PROJECT
UNIVERSITY OF CALIFORNIA COOPERATIVE EXTENSION
DIVISION OF AGRICULTURE
AND NATURAL RESOURCES

PUBLICATION 3404



Magic Bubbles

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Welcome to the 4-H Youth Experiences in Science Project!

There is nothing like the **4-H YES Project** for providing high-quality children's science education in after-school settings. *4-H YES* uses specially trained teenage volunteers to conduct the hands-on science curriculum for children 5 to 8 years of age enrolled in school-age child care programs.

Each *YES* Theme Unit contains five or more 1- to 1½- hour sessions. Each session contains three or more activities that build on the session's theme.

The session instructions provide an **Overview of the Day's Activities**, **Background Information** on the session's subject, **Materials You Will Need** to conduct the session and a detailed outline on **Getting Ready**, the **Action** required, and specific **Sciencing** questions. When reading the curriculum, be sure to look for the **Tips** in the side column. They give valuable information on setting up and conducting the activities. At the end of the curriculum is a listing of all the supplies needed to conduct each activity.

The *YES* Curriculum incorporates inquiry-based activities with cooperative learning. It focuses on learning the scientific thinking processes and features the learning cycle model of instruction.

The **Scientific Thinking Processes** are built into each of the sessions. The processes of **observing**, **communicating**, **comparing**, and **organizing** are most commonly used in this curriculum aimed at younger children. The processes are indicated in small bold type after the **Action** and **Sciencing** sections of each activity.



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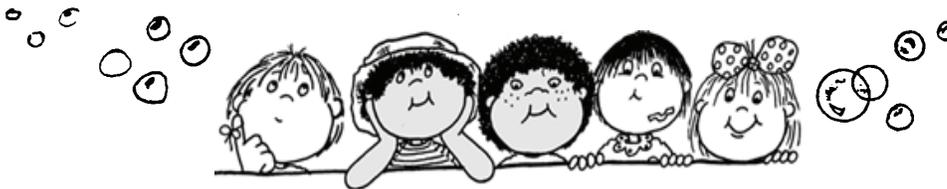
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MAGIC BUBBLES INTRODUCTION



Bubbles provide a fun and interesting way for children to learn the processes of science. In this unit, children will have an opportunity, through hands-on experiences, to

- ***observe***
- ***communicate***
- ***compare***
- ***organize information about bubbles***

As a teen leader in this project, you will have lots of opportunity to assist in each child's learning. Through exploration, you will be providing opportunities for the children to create the foundations upon which scientific understanding is built. The children, through their own actions, interpretations, and reactions to bubbles, will be creating a new base of knowledge and questions.

You will be introducing science concepts and principles about bubbles each session. The children will learn more about these concepts through their further exploration and “messaging about.”

You will be tempted many times to tell the children *what, how, and why something is happening. Resist this temptation.* It is important for the children to find these answers on their own. You can, however, greatly assist and direct some of the discovery through the questions that you ask.

Ask open-ended questions (that is, questions that don't have an easy *yes* or *no* answer). Ask questions that help the children compare. Ask questions that help them put the information they are learning in some order. For example: *What did you do first? When did the bubble pop?*

General Bubbleology

What is a bubble? *A bubble is a thin layer of liquid, or covering, with air inside.* There are all kinds of bubbles: ○ soap bubbles ○ soda bubbles ○ yeast bubbles ○ packaging bubbles ○ bubble gum. Maybe you can think of a few more? By the time you and the children complete the activities, you will see bubbles everywhere!

Much of the experimenting you will be doing will be with soap bubbles. In a soap bubble, there are actually three layers:

- 1) a layer of soap film
- 2) a layer of water
- 3) an additional layer of soap film

This film is extremely thin, about one-millionth of an inch!

What makes bubbles pop? Soap bubbles usually pop because they touch something dry. The liquid covering evaporates, or the liquid in the top of the bubble drains to the bottom making the top too thin to hold the weight of the solution.

What makes bubbles last longer? Reducing evaporation can lengthen the life of bubbles. *Hygroscopic* (which means holds water) substances, such as glycerin and sugar, evaporate slowly, and are often found in bubble solutions.

Bubbles also last longer when they are created in certain environments. Soap bubbles are sensitive to environments that hasten evaporation. You will have greater success when making bubbles indoors. Sunlight and wind are obstacles to creating lasting bubbles. Optimal conditions for making bubbles outside require a still, overcast day. If this isn't possible, look for a sheltered, shady area; however, you will probably have the greatest success inside.

Bubble Shapes

In your experimenting you will find that many different shapes of bubbles can be created, but when they return to a free state, they become a *circle* or *sphere*. This is because a sphere is the shape with the least surface area for any given volume of air. When bubbles are blown on a flat surface, they create *domes*. Again, this shape has the least surface area. You will find that the bubbles often sag slightly as the liquid drains to the bottom.

Bubble-Makers

In the *4-HYES Bubbles* activities, you will want children to learn that there are lots of everyday materials that they can use to make inexpensive bubbles. You can help with this by finding everyday household items that the children can explore. We suggest things like *slotted spoons, berry crates, six-pack plastic holders, clothes hangers, straws*, etc. A fun activity would be to encourage the children to create their own bubble makers with recycled items.

Bubble Trouble!

The following list of hints can help you if the children are having difficulty with any of the bubble exploration activities.

- **Check your bubble solution.** We offer several bubble recipes. For example, if glycerin, corn syrup, or sugar is added to the solution, the children will have more successful experiences.
- **Check for foam on the top of the solution.** Foam (even though it is made up of bubbles) can prevent larger bubbles from forming. This is especially important when conducting the *Kids in the Bubble* activity.
- **Check to see if the children are blowing too hard.** Younger children may have a tendency to blow or wave the wand or bubble maker too hard, forcing too much air through the frame.
- **Check to see if the children's hands and instruments are wet with solution.** In fact, in one of the activities, children will explore this important concept.

Bubble Safety

This unit is full of fun and messy activities. Because the bubbles are very wet and slippery, children should be taught safe behavior in advance. Ask the children to brainstorm what they think safe behavior includes. Make sure they identify the following points.

- Wipe up big spills immediately.
- Don't run in wet areas.
- Don't blow bubbles into the face or eyes of others.
- Keep bubble solution out of mouth and eyes.
- If bubble solution gets in eyes or mouth, tell an adult or teen.

Bubble Cleanup

Cleaning up bubbles can be a chore. When possible, you may want to do activities outside where the spills can be hosed off and left to evaporate. When making bubbles inside, the easiest way to cleanup is to have good set-up practices. Cover the work surfaces with plastic or newspapers. Place newspaper, towels or tarps on the floor. **(Plastic doesn't work well on the floor because it increases the chances that children will slip and fall.)** A vinegar-water solution helps to cut the soap film. Used in a squirt bottle, it can quicken cleanup. Remember to involve the children in the cleanup process whenever possible.

Bubble Solutions

Several bubble solution recipes are provided below and on the next two pages. You will want to experiment with several of the solutions as part of the discovery process. Most solutions get better over time, so you'll want to make them in advance of the activity. You may want to have the children help make the solutions on the first day and see if they observe any improvement over time. Also, because the solution improves with age, make sure that all solution is saved after each experiment.

BUBBLE RECIPE #1

Materials

- Water - 4 gallons
- DAWN or JOY® dishwashing detergent - 4 cups
- Glycerin - ½ cup (purchase at a pharmacy)

Directions

- 1) Mix the detergent, water, and glycerin in a large container. (Mix the bubble solution near the place it will be used, if possible. Remember that water weighs 8 lbs. per gallon!)

Source: *Bubbleology, Teachers Guide*. GEMS Lawrence Hall of Science, University of California.

BUBBLE RECIPE #2

Materials

- DAWN or JOY® dishwashing detergent - 4 tablespoons
- Light corn syrup - 1 tablespoon
- Container with tight-fitting lid - 8 oz. size (to mix and store your bubble solution)
- Warm water (enough to fill the container)

Directions

- 1) Measure detergent and pour into container.
- 2) Measure light corn syrup and pour into container.
- 3) Fill container slowly with warm water. Stir gently (try not to make too much foam).

BUBBLE RECIPE #3

Materials

- DAWN or JOY® dishwashing detergent - 1 cup
- Glycerin - 2 to 3 tablespoons (purchase at a pharmacy)
- Warm water - 1 gallon
- Container with a lid to store this amount of mixture

Directions

- 1) Measure detergent and pour into container.
- 2) Measure glycerin and pour into container.
- 3) Add water and stir gently being careful not to make too much foam.

**If possible, make this mixture a few days before you need to use it.
The older the mixture, the better the bubbles!**

Source: 3,2,1 *Contac*. CTW, 1990.

BUBBLE RECIPE #4

Materials

- Clear dishwashing detergent (DAWN, JOY, or AJAX®)
- Warm tap water
- Clean, empty, gallon jug with cap or lid
- Glycerin - 2 tablespoons (purchase at a pharmacy)

Directions

- 1) Pour $\frac{2}{3}$ cup dishwashing liquid into gallon jug.
- 2) Fill nearly to top with warm water.
- 3) Add 2 tablespoons glycerin to mixture. You may need more.
- 4) Replace cap and shake gently. Let solution set awhile.

Source: *Copy Cat*. September/October 1994.

BUBBLE RECIPE #5**Materials**

- JOY dishwashing detergent - 2 cups
- Water - 6 cups
- Clear corn syrup - 3/4 cup

Directions

- 1) Mix detergent, water, and corn syrup.
- 2) Combine, shake, let settle for 4 hours.
- 3) Store covered in refrigerator and allow to warm before using.

Source: *Carson-Dellosa Publication*. CD-7304.

BUBBLE RECIPE #6**Materials**

- Water - 1 gallon
- DAWN® dishwashing detergent - 2/3 cup
- Glycerin - 1 tablespoon (purchase at a pharmacy) (optional)
- Container - 2 gallon size

Directions

- 1) Mix the detergent, water, and glycerin in a big bucket or dishpan. (If you make it the day before you want to use it, you'll get bigger, stronger bubbles, but it's pretty good right away, too.)

Source: *Blowing, Bouncing, Bursting Bubbles*. The Exploratorium, San Francisco.

BUBBLE-MAKERS

Approximate Time Required for Session: 1 hour

Purpose

- In this session children will be introduced to bubbles and will have the opportunity to explore the wonder and science of bubbles.
- Children will also experiment with a variety of bubble-makers as an introduction to the technology of making bubbles.

Overview of the Day's Activities

In this first session of *Magic Bubbles*, you will lead children in a fun day of bubble discovery. Children will learn that all types of household items, including slotted spoons, berry baskets, and clothes hangers, can be used to make bubbles. Children will delight in the discovery that they can even make bubbles with their fingers and join with a friend to make a “buddy bubble”!

Background Information

There are limitless ways to make bubbles. To create bubbles, however, there are three basic elements needed:

- a frame to hold the bubble solution
- a source of air
- a passageway for the bubbles to escape

Bubbles can be created with many household items that have the three elements listed above. Bubbles can even be created by making a circle with your fingers.



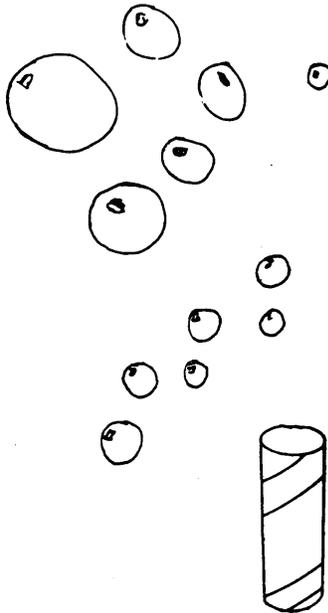
ACTIVITY A

BUBBLE-MAKERS

Time Required
20 minutes

Suggested Grouping
groups of 4 to 6

In this first activity, you will introduce the concept of “bubble-makers.” Children will have lots of time to explore the bubble solution. They will be amazed by all of the ways that they can make bubbles!



Materials You Will Need

- Plastic covering for the Bubble Table, or several large garbage bags
- Brown, grocery-size paper bags
- Shallow pans (*suggest at least 12” x 24”*) – 1 per table or group of 4 to 6 children
- Towels or cardboard boxes – 1 to cover each shallow pan
- Slotted spoons – 1 for each group of 4 children
- Plastic fruit baskets – 1 for each group of 4 children
- Paper towel rolls – 1 for each group of 4 children
- Drinking straws – at least 1 per child
- Other items of your choice for blowing bubbles
- Bubble solutions of your choice – 1 or more
- Bubble-Makers Rating Sheet* – 1 per child
- Pencils – 1 per child
- Chart paper
- Marking pens

Tip
You will need bubble solutions for all five lessons. Refer to the introduction for several different recipes.

Getting Ready

- ❶ Prepare one of the *Bubble Recipes* found in the *Introduction*, a day or two in advance. (The solution is stronger if it sits for a few days or even weeks!) You will need 1 to 2 gallons of

solution per group of four to six children.

Remember to save the solution after each activity.

- 2 Place the household items from the supply list that will be used as bubble-makers, in a brown paper bag. Add a few of your own.
- 3 Make the two charts *What We Observed* and *Our Favorite Bubble-Makers*. See the *Sciencing Section* of this activity for sample charts.
- 4 Make a *Bubble Safety Chart*.
- 5 Reproduce the *Bubble-Makers Rating Sheet*, one per child.
- 6 Since this will be your first day with the children, you may want to set aside some time for introductions or have the children prepare name tags. Gather supplies needed for the name tags. A quick "mixer" activity might also be helpful.
- 7 A clean, smooth table top that can be wiped off works best for this activity. If working on a rough or wooden surface, it should be protected. Cover the table or work surface with plastic. You can cut open a garbage bag.
- 8 In advance of children's arrival, prepare several table work areas; the number will depend on the size of your group. (One table for every four to six children works best.) Place the shallow pan full of bubble solution in the center of each bubble table. Cover the pan with the towel or cardboard box. (This will discourage any early exploration!)



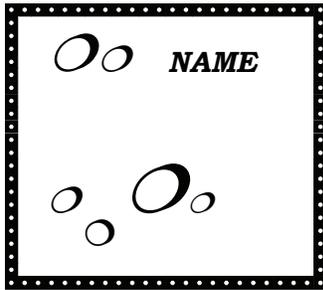
Tip

Before the meeting, plan an activity that helps you learn the names of the children.



Tip

Teens have found that laminated or plastic name tags work best because of the wet activities.



ACTION: OBSERVING, COMMUNICATING, COMPARING, AND ORGANIZING

1. Gather the children in a circle. Introduce yourself and make name tags. Play a mixer game or activity of your choice.
2. While still in a circle, one by one, remove the bubble-makers from the paper bag, starting with those items that are used for other household purposes.
 - Ask the children if they know what each of the items is used for.
 - Ask them if they know of any other uses for the items. If they don't see a relationship between the items, encourage their discovery/thinking with questions and hints.

Other Questions

 **Tip**
 Remember to encourage lots of exploration. Avoid answering questions directly. Ask another question to help the children discover their own answer.

3. Tell the children that they will be scientists today, exploring and discovering what kinds of items can make bubbles.
4. Discuss the importance of safety around bubbles. Use the *Bubble Safety* Chart that you have prepared. Ask the children to think of other rules of safe behavior when exploring with bubbles. List the children's ideas on the *Bubble Safety* Chart.

5. Next, divide the children in groups of four or five to experiment with the bubble-makers. Move the children to the tables that you have set up with bubble solutions. Allow room for easy access to the solution. Let the children experiment and explore for at least 5 to 10 minutes at the tables, depending on the number of children and the number of different bubble-makers.

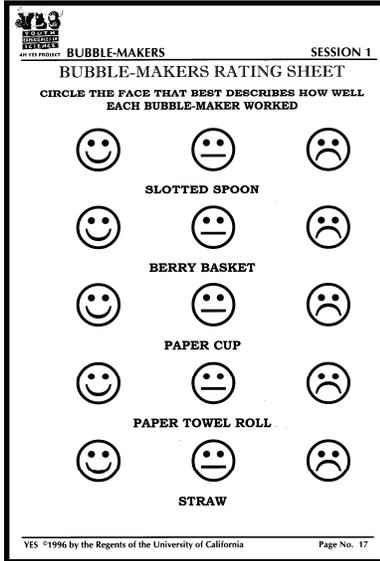
SCIENCING: OBSERVING, COMPARING, AND COMMUNICATING

1. When interest in the exploring activity appears to be lessening, move the children from the table and cover the bubble solution. Have the children sit on the floor in a Bubble Circle. Ask them what the circle reminds them of (*a bubble!*).
 - Tell the group you now want them to share what they observed. Going clockwise in a circle, ask each child to describe one thing they observed. If they don't want to share, tell them they can say "pass."
 - Encourage the children to share what they saw, felt, smelled, or heard with their senses.
 - Record the responses on flip-chart paper. Use the *What We Observed* chart to record the children's responses.
 - Ask questions that require children to use their senses such as the following.
 - ◊ How did the bubbles look?
 - ◊ Could you feel the bubbles?
 - ◊ Did anyone hear a bubble?

BUBBLE SAFETY

- ◊ WIPE UP BIG SPILLS IMMEDIATELY
- ◊ DON'T RUN IN WET AREAS
- ◊ DON'T BLOW BUBBLES INTO THE FACE OR EYES OF OTHERS
- ◊ KEEP BUBBLE SOLUTION OUT OF MOUTH AND EYES
- ◊ IF BUBBLE SOLUTION GETS IN EYES OR MOUTH, TELL AN ADULT OR TEEN

WHAT WE OBSERVED



See page 14

2. Next, collect a set of bubble-makers from an exploration table and bring them to the inner part of the circle. Hold up one bubble-maker at a time. Encourage discussion about how each bubble-maker performed. Help the children to again use their senses in describing what they observed.

3. Pass out the *Bubble-Makers Rating Sheet*. Now, ask the group to rate how well each bubble-maker worked by raising their hand and then marking on their Bubble-Makers Rating Sheets.

4. Using a pre-made chart that features a picture of all of the bubble-makers, ask the children to draw a circle next to the bubble-maker that they thought made the best bubbles. This chart and the children's sheets can become part of your *Bubble Bulletin Board*.

Use this note section to record ideas for presenting this first activity.

Presentation Notes

A large empty rectangular box for taking notes.

ACTIVITY B

GIVING BUBBLES A HAND!

Time Required
10–15 minutes

Suggested Grouping
groups of 2 to 4

Using the information the children discovered in the first activity, they will now apply it to making bubbles with their hands.

Materials You Will Need

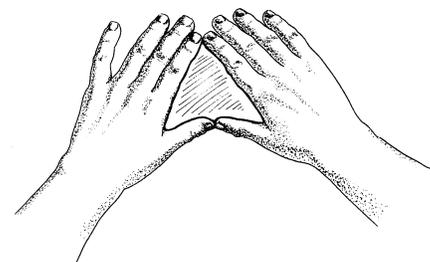
Same as *Activity A*

Getting Ready

- ❶ The setup requires the same materials and table arrangements as *Activity A*.
- ❷ Prepare the *Can I Make a Bubble With My Hands?* chart in advance.

ACTION: OBSERVING AND COMMUNICATING

1. Invite the children back to the table. Remember to have the bubble solution covered with a towel or cardboard box.
2. This time, ask the children if they think they can use their hands to make a bubble. Count the number of **YES** and **NO** responses. Record the response numbers on the chart that you prepared.
3. Ask the children what shape they think their hands and fingers should form in order to create a bubble. Invite them to experiment with the solution, dipping their hands and fingers directly into it.



Can I Make a Bubble with My Hands?	
YES	_____
NO	_____



Tip
If some children are having a difficult time making bubbles, ask if they can make them by shaping their pointer finger and thumb into an "O" or by shaping their two hands together to form a larger circle.

4. Ask the children if they think they can make "buddy bubbles"? (*Two friends create a bubble together.*) Give them a few minutes to experiment with several methods. Most will come up with a way.

If children are having difficulty, show how each child forms a circle with his/her hands. Place one child's hand on top of the other and dip into the solutions. Lift the two hands out of the solutions and both blow into the circle. **Voila! A buddy bubble!**

Presentation Notes



SCIENCING: OBSERVING, COMPARING,
AND COMMUNICATING

1. Again, move the children to the *Bubble Circle*. Ask the children to describe the bubbles they made.
 - How were they surprised?
 - What worked the best?
 - What could they do differently?
 - What did they try that worked?
 - What didn't work?
 - How did it feel to make a *buddy bubble*?
 - How were the bubbles made by their hands and fingers? The same or different from the bubbles made in *Activity A*?

2. From their experiences with the two activities, ask the children if they discovered what it takes to create a bubble. Remember to emphasize:
 - a frame to hold bubble solution
 - a source of air
 - a way for bubbles to escape

Record their responses.

Optional

Ask the children if they can think of places where they have seen bubbles. If time permits, ask them to draw a picture of places or things that have bubbles (*ocean, bathtub, glass of milk, boiling water, kitchen sink, etc.*)



Tip

Remember to ask questions that encourage children to use their senses.

ACTIVITY C**BUBBLE RELAYS**

Time Required
10–20 minutes

Suggested Grouping
2 teams

Children will enjoy playing the two-bubble relay races outlined in this activity.

Bubble Relay One**Materials You Will Need**

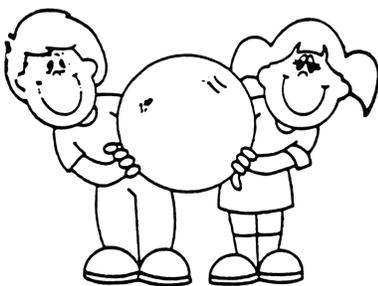
- Bubble solution – 2 containers
- Bubble-makers – 2 identical (*coat hangers and berry baskets work well*)

Getting Ready

- ❶ Mark off a start and finish line for each team (*about 10 to 20 feet apart, depending on the ages of the children.*)
- ❷ Select identical wands or bubble-makers for each team.

ACTION: OBSERVING AND COMMUNICATING

1. Move the children to the area you have prepared for the *Bubble Relays*. Instruct the children that the object of the game is to create a bubble and blow it to the other end of the team line before it pops.
2. If the bubble pops, they must go back and create another bubble. When they get to the end, they pop the bubble, run back, tag the next teammate and give him/her the bubble wand.



3. The game is over when all the players on a team have successfully completed the task.

Bubble Relay Two

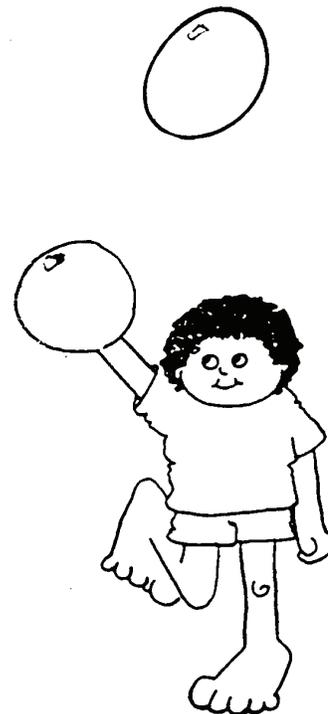
Materials You Will Need

- Balloons – 10 to 20 (enough for 2 teams)
- Permanent marker
- Baskets or containers for holding the balloons – 2
- Stop watch, watch with a second hand or counter, or other timekeeper

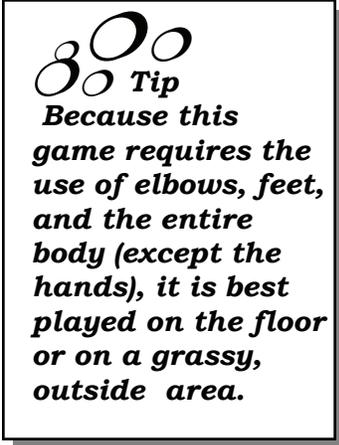
Getting Ready

- ❶ Before the relay, blow up the balloons and mark two each with numbers *1* to *10*.
- ❷ Place the balloons in the center of the room or play area.
- ❸ Place a basket at the opposite side of the room. (If time permits, you can involve the children in blowing and marking the balloons; however, most will have a difficult time tying the balloon.)

Presentation Notes



Tip
Permanent markers work best for marking numbers on the balloons.



Tip
Because this game requires the use of elbows, feet, and the entire body (except the hands), it is best played on the floor or on a grassy, outside area.

Team A	Team B

ACTION: COMMUNICATING

1. Divide the children into equal teams. Explain that the object of the game is to score the most points by placing the balloons into the baskets, without using their hands!
2. Each teammate will be given a set period of time (*usually 15 to 20 seconds*) to score by putting the balloons into the basket. Then the next person on the team tries until all have had a turn.
3. The points from landing the balloons in the baskets are then added up.
4. Have the children develop new rules for the game, such as only using your feet; then replay the game.
5. After the game is finished, discuss it with the children. Ask them to describe the problems they had to solve (*e.g., getting the balloons without using their hands*). Next, ask how they solved the problem (*e.g., used their feet in different ways, used their head*).

Follow-Up

As a summary for the day, ask the children to bring other items from home that can be used as bubble-makers. Encourage the children to invent their own bubble-makers by putting several items together. Ask them to bring these, or other related items, to the program during the week to share with the group.

BUBBLE SAFETY

- ◆ **WIPE UP BIG SPILLS IMMEDIATELY**
- ◆ **DON'T RUN IN WET AREAS**
- ◆ **DON'T BLOW BUBBLES INTO THE FACE OR EYES OF OTHERS**
- ◆ **KEEP BUBBLE SOLUTION OUT OF MOUTH AND EYES**
- ◆ **IF BUBBLE SOLUTION GETS IN EYES OR MOUTH, TELL AN ADULT OR TEEN**

BUBBLE-MAKERS RATING SHEET

Circle the Face that Best Describes How Well Each Bubble-Maker Worked



SLOTTED SPOON



BERRY BASKET



PAPER CUP



PAPER TOWEL ROLL



STRAW

TINY BUBBLES

Approximate Time Required for Session: 1 hour

Purpose

- Children will learn that *foam* is formed by many, many tiny bubbles.
- Foam can be created in a lot of ways.
- Foam can be observed, discussed, and compared.

Overview of the Day's Activities

In this ***Tiny Bubbles*** session, children will have fun creating several kinds of bubble foam. First, you will lead the children in making bubble foam in a dishpan with a variety of “foam-makers.”

Next, the children will explore the tiny bubbles found in shaving cream. Later, children will have a chance to use some of their bubble foam to create a bubble art picture.

Making the *Bubble Cups* will be a highlight for the children. The *Bubble-Foam Game* will give the children a chance to apply some of what they have learned about foam in a lively outdoor game.

Background Information

Children will enjoy creating their own bubble foam. Foam is created by hundreds, even thousands, of tiny bubbles. As foam is formed, it creates clusters that have very distinctive patterns. Children will have an opportunity to create and observe foam in several ways.

ACTIVITY A

LOTS OF BUBBLES

Time Required
15 minutes

Suggested Grouping
teams of 2 to 4

Bubble foam will be the focus of this activity. Children will have fun creating different sizes of bubbles with wire whisks and egg beaters.

Materials You Will Need

For each team of two to four:

- Smooth table surface or plastic table covering
- Wire whisk – 1 for each team
- Hand egg beater – 1 for each team
- Dishpan
- Bucket
- Styrofoam cups – 1 for every 2 children
- Shaving cream – 1 can
- Hand lens (magnifying) – 1 for every 2 children
- Mop
- Paper towels – 1 roll per team
- Bath towel or cardboard box – 1 per team
- Newspapers
- Bubble Safety Chart*
- Bubble solution (use from Session 1 or prepare according to a bubble recipe listed in the *Introduction*)

Getting Ready

- ❶ Gather and organize the supplies at the stations for your children to explore together.
- ❷ Post the *Bubble Safety Chart*.
- ❸ This activity can get quite messy, so if you cannot conduct it outside, make sure you cover the work area with plastic and the floor with newspapers.



Tip

Make sure you have enough supplies for each team. The supplies listed are what is needed for ONE team of four.

- 4 For each team of four children, prepare an exploration area that includes a dishpan, wire whisk, egg beater and bubble solution. Cover the bubble solution and equipment with towels or a cardboard box.

ACTION: OBSERVING, COMMUNICATING, AND COMPARING

1. Gather the children into the *Bubble Circle*. Before starting the day's activity, ask the children if they want to share anything that they learned in *Session 1*. If they brought an item from home to use as a bubble-maker, allow time for exploring its use.
2. Explain that today they will be learning more about bubbles. Today they will be making lots (hundreds, thousands, maybe even millions) of tiny bubbles. Review the *Bubble Safety Chart*.
3. Ask the children if they have ever made bubbles with a whisk, or if they think they know how to make bubbles with the whisk and beater. Explain that they will take turns beating the soap solution. After one child has done the beating, another child can scoop out the excess bubbles into a bucket with their hands or a cup.
4. Explain that this activity requires teamwork and that each child will have an opportunity to try both the whisk and the egg beater. Ask if the children have any questions before taking them to the *Bubble Exploration Tables*.
5. Divide the children into groups of four and assign them to a *Bubble Exploration Table*. Remove the towels or cardboard boxes covering the dishpans and supplies.
6. Encourage the children to begin exploring following your instructions for teamwork.




Tip

As the children explore, remember to answer their questions with instructions that will help them find answers to their own questions.





7. As the activity begins to slow, pass out hand lenses. Ask the children to observe the bubbles through the lens (magnifier).
8. Ask the children to predict how many bubbles are in a handful of foam. Can they count all of the tiny bubbles?

SCIENCING: OBSERVING, COMPARING, AND COMMUNICATING

1. After the children have each had a turn or two at using both the whisk and beater to make the foam, ask them to come and sit down in your *Bubble Circle*.
2. Ask each team to share what they did. Then ask them to share what they observed. Keep asking until all answers are shared. One of the teens may want to record the answers on a sheet of paper. Remember again to encourage the children to use their senses in sharing what they observed.
3. Introduce the word *foam*, if the children haven't used it.
 - Write the word *foam* on a sheet of paper. Ask the children: "What is foam?"
 - Ask them what the foam looked like through the hand lens. Could they count the bubbles? How many bubbles could they hold in their hand? In the cup?
 - How did the foam feel? Could they feel the bubbles popping? Could they hear anything?
4. If the children don't describe that they were able to make larger and smaller bubbles, introduce this concept by asking about it.

FOAM

Also, ask the children if the foam changed when they beat faster or slower, or when they used the whisk or beater.

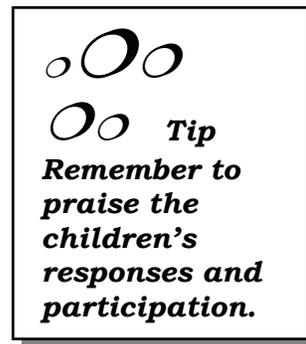
5. Ask the children if they know of other things in their home or school that have foam. On a chart, draw a picture of these items under the heading *Foam*.

FURTHER ACTION

1. Invite the children back to the work stations. Give them a few minutes to explore with the beater and whisk to find answers to some of their questions. If there are no questions, continue.
2. Provide a can of shaving foam for each table. Ask the children if they know what it is and how it is used. **Allow each of the children a chance to spray some shaving foam on their table area.** Let them feel the cream and compare it to the bubble foam. Encourage them to use their hand (magnifying) lens to examine the shaving foam.

SCIENTING: OBSERVING, COMPARING, AND COMMUNICATING

1. While still at the table, ask the children a few questions.
 - What did they observe in the foam?
 - How did it feel?
 - Did it smell different from the soap foam?
 - What did it remind them of?



What We Observed	


 **Tip**
Children will enjoy spraying the can of foam almost as much as observing the foam.

2. Ask the children to compare the shaving foam with the bubble foam they made earlier. Record their observations.
3. Ask the children to clean up their work area before moving on to *Activity B*.

Other Questions

ACTIVITY B

BUBBLE ART

Time Required
20 minutes

Suggested Grouping
small groups

Children will use the foam bubbles they made in Activity A to create bubble art.

Materials You Will Need

- Construction paper – 1 or 2 sheets per participant
- Powdered tempera paint in a shaker can
- Supplies from *Activity A*
- Very shallow pans or dish pans
- Plastic tablecloth or large plastic garbage bag
- Paper towels
- Water for cleanup
- Smocks or aprons for children, (old large- size shirts from home), *optional*

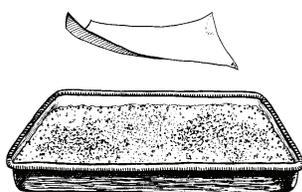
Getting Ready

- ❶ If children need a break, now would be a good time for it.
- ❷ Use this time to gather the supplies needed for *Activity B, Bubble Art*.
- ❸ Tempera paint can stain or be messy, so this activity should be done outside in an area that can be cleaned easily.

ACTION: OBSERVING, COMPARING, AND COMMUNICATING

1. Explain to the group that they are going to create an art project using their foam.





2. Explain that this project can be messy and that the paint can stain their clothes. Ask that they be especially careful today.
3. Explain that they will be using the dishpan full of bubble foam they created earlier. They will be shaking powdered tempera paint over the bubbles in this dishpan. Then they will carefully lay their paper over the bubbles and gently lift it off. Afterward, they will place their *Bubble Art* paper in a sheltered area to dry!
4. Now, move the children to the work area you have prepared. Let each child choose their own paper for the *Bubble Art*.
5. Conduct the activity following the instructions given in number 3 above.
6. Continue the process until all children have a chance to create their own art.
7. One teen can clean the work area while another assists the children in washing their hands.

SCIENCING: OBSERVING AND COMMUNICATING

1. Have children return to the *Bubble Circle*.
2. Ask the children to describe the steps in making the *Bubble Art*.
3. Ask them what they saw happening to the bubbles when they added the paint.
4. Ask them what they think will happen to bubbles on their paper.



Tip
After each child has made their bubble art, there may be a need to have the children whisk up the bubbles again or shake more powdered paint over the bubbles.

ACTIVITY C

BUBBLE CUPS

Time Required
10–15 minutes

Suggested Grouping
entire group

Children will be amazed by the bubble foam they can create with the bubble cups made from drinking straws and Styrofoam cup.

Materials You Will Need

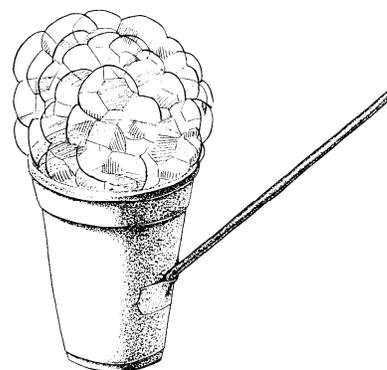
- Masking tape – 1 roll
- Styrofoam cups – 1 per child
- Sharpened pencils – several
- Plastic drinking straws – 1 per child
- Bubble solution (*at least 1 gallon for every 20 children*)
- Measuring cup for pouring bubble solution
- Crayons, *optional*

Getting Ready

- ❶ Gather the supplies and set them aside until you are ready to start the activity.
- ❷ Determine how many children will be at each *Bubble Exploration Table* and place the exact supplies at each table.
- ❸ Before the session, make a *Bubble Cup* to show the children.

ACTION: OBSERVING, COMPARING, AND COMMUNICATING

1. Explain that you will be showing them how to make their own *Bubble Cup*. Show the group a bubble cup that you have made in advance.





Tip
If the children wish to decorate their cup or put their name on it, they should decorate it prior to inserting a straw.

2. Show them how to make the *Bubble Cup*. Show how to use a pencil to punch a hole at an angle in one side of the cup approximately 2" from the bottom.
3. Demonstrate how to insert a straw into the hole at an angle. You will probably need to help the children attach the straw with a small piece of masking tape to keep it from leaking.
4. Provide markers or crayons for the children to decorate their cups. (*Do not use felt tip markers to decorate the cups, because the ink color may run when wet.*)
5. Move children to the *Bubble Exploration Tables* and assist them in making the bubble cups according to the directions outlined above. When all children are finished, ask them to take their *Bubble Cups* outside.
6. Let each child pour a small amount of bubble solution into the cup and begin blowing. Allow plenty of time for exploration and play.
7. Encourage the children to take their cups home and share what they have discovered.



Tip
Another bubble art project is to tint the bubble solution with tempera paint, create foam by blowing through a straw or beating the solution and lay the paper over the tinted bubbles.

SCIENCING: OBSERVING, COMPARING,
AND COMMUNICATING

1. Either outside or back in your *Bubble Circle*, ask the children to share some of their experiences with their *Bubble Cups*.
2. Ask questions that help the children use their senses in describing the exploration with the *Bubble Cups*.
 - What did the bubbles look like?
 - Did they listen to the *Bubble Cup* foam? What did it sound like?
 - What did the *Bubble Cup* foam feel like?
 - What did the *Bubble Cup* foam smell like?
3. Ask questions that help the children compare their observations with those of others.
 - How were the *Bubble Cup* bubbles like other bubbles they have made? Different?
 - How do the bubbles look like other shapes they have observed?

Presentation Notes

ACTIVITY D

BUBBLE-FOAM GAME

Time Required
10 minutes

Suggested Grouping
entire group

This active game is played outside. Children will get a lot of exercise as they move around the playground trying to connect with other “bubbles.”

Materials You Will Need

None

Getting Ready

- ❶ Remove furniture for a large open space or play outside within a confined circle.
- ❷ Determine the game playing boundaries.

ACTION

1. Explain to the children that they are going to play a game in which they are the bubbles! This game starts with lots of foam bubbles. Each foam bubble is created by a group of three children, who are holding hands in a circle.
2. The object of the game is for the bubbles to remain moving all the time without touching any other bubble groups.
3. When one bubble touches another, they must join hands creating a larger bubble foam circle. Again, they must continue to move in a circle, trying not to touch other bubbles. They also must remain within the designated playing area.



Tip
The Bubble-Foam Game can be played at the end of the lesson or as a break between Activity A and Activity B.

4. When all of the bubbles have been touched and one large bubble is created, the entire bubble falls to the ground with a loud pop!
5. Play the game once or twice according to the directions above.

Follow-Up

1. Allow more time to explore the bubble-makers brought from home. Remember to ask questions about how they work and what kind of bubbles they make.
2. Remind the children that they can continue to bring bubble-makers or create their own bubble-maker inventions to share with the group. If children are willing, let them add their bubble-maker to the Bubble Science Center for other children to try.
3. Ask the children to bring items from home that have tiny bubbles or foam in them. Tell them that the next session will focus on bubbles in food.



Tip
Encourage the children to change the rules or object of the game to create their own version of the Bubble-Foam Game.

BUBBLES IN FOOD

Approximate Time Required for Session: 1 hour

Purpose

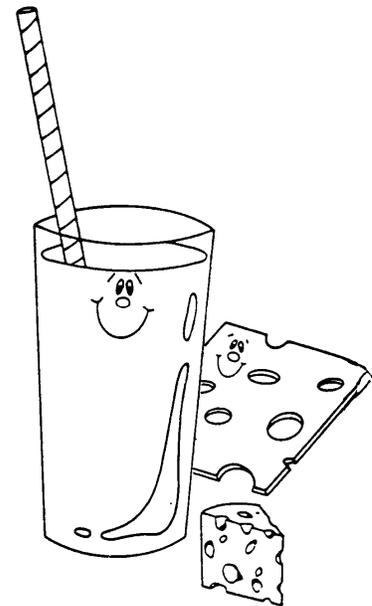
- Children will learn about the relationship of bubbles to their own everyday life experiences, especially in the food they eat!

Overview of the Day's Activities

In this session, you will lead activities that will help children discover bubbles in the food that they eat. *Egg-Foam Meringue* helps children build their explorations in *Session 2*. After discovering the bubbles in the egg meringue, the children will observe bubbles in yeast and bread. The *Dancing Raisins* activities use soda to test the effects of bubbles. Finally, children will end the day by snacking on their meringues and blowing bubbles in their milk!

Background Information

Using everyday items, especially food, is a way for children to work directly with materials that will help them learn about bubble science. Bubbles are all around us. Today's lesson will encourage the children to explore with these familiar items and to view these items in a different way.



ACTIVITY A

EGG-FOAM MERINGUE

Time Required
20 minutes

Suggested Grouping
teams of 2 to 4 children

Children will make bubbles in egg whites in this activity. By adding sugar and cream of tartar, they will create egg-foam meringue that they will eat as a snack later in the day.

Materials You Will Need

- Eggs — 1 for every 4 children
- Deep, narrow bowls for mixing
- Styrofoam cups — 1 for every 4 children
- Wire whisk
- Hand eggbeater
- Electric mixer, *recommended*
- Sugar — 3 cup for every 4 children
- Cream of tartar — 1 can
- Measuring cup — 3 cup size for each work station
- Egg separator, *optional*
- Measuring spoon — c teaspoon size
- Mixing bowl — large
- Cookie sheet
- Oven or toaster oven
- Vegetable oil
- Hand (magnifying) lens — 1 for every 2 children
- Paper towels

Getting Ready

- ① *Activity A* requires several pieces of equipment. Therefore, you may want to divide the children into three groups of four and rotate their groups between *Activities A, B, and C* simultaneously. This way, you won't need so many utensils.



Tip
Today's activities can be set up with a station for each activity, if you have at least one teen to supervise each station.

- 2 Check materials lists for all activities and gather the supplies needed for each table.
- 3 Pour the sugar into a bowl so the children can easily measure it.
- 4 Grease the cookie sheets; set aside.
- 5 Make the *Bubbles in Food* Chart.
- 6 This activity requires cracking eggs. You may want to practice this ahead of time.

Review

Start off the day reviewing with the children any items they brought from home that had bubbles or foam in them. Let each child share their discovery. Place all the items on a *Bubble Activity Discovery Table* for the rest of the children to explore.

ACTION: COMMUNICATING, OBSERVING, AND COMPARING

1. In your *Bubble Circle*, explain to the children that today they will be learning more about bubbles. Tell them they will be exploring bubbles in food. Ask if any of them can name a food that has bubbles in it? Write down their answers on chart paper or a chalkboard.
2. Explain to the children that they will be making egg foam in *Activity A*. Briefly go over how they will do it. The children will be tempted to taste the egg whites. **Caution them not to because of possible salmonella poisoning.**
3. Help the children break and separate an egg and place the egg whites in a deep, narrow bowl. Place the yolks in the Styrofoam cups.



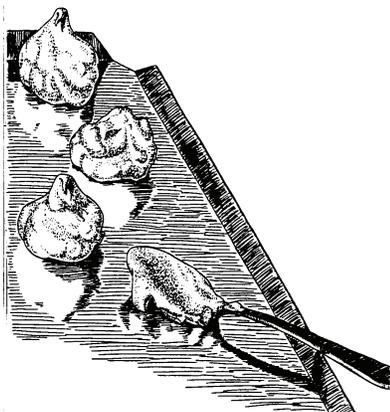
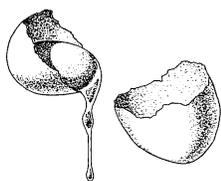
Tip
Be sure to let each interested child use the electric mixer if they choose. Encourage teamwork in your instructions.

Bubbles in Food

Our List



Tip
Have children wash their hands with soap to prevent the spread of germs or bacteria when working with foods.



Tip
 Do not add the sugar or cream of tartar until the peaks form.

The children will need help keeping the yolk out of the egg whites. (*Use 1 egg for every 4 children.*)

4. Show the children the wire whisk and the eggbeater. Ask the group which they think will beat the egg whites faster. Record the responses.
5. As the children are beating the egg whites, ask the group to observe what is happening. Between turns, encourage them to observe the whites with the hand lens.

The children may tire of beating the eggs before the egg whites are stiff. You may want to have an electric mixer on hand to beat the egg whites further.

6. When peaks in the egg whites begin to form, have the children measure 1/4 cup of sugar and 1/8 teaspoon of cream of tartar to add to the egg whites. Continue beating until stiff peaks form.
7. Have the team of children spoon mounds of the egg whites onto a slightly greased cookie sheet.
8. Cook the meringues in a preheated 250° F oven, or toaster oven, for 20–25 minutes, or until lightly brown and easily removable from the sheet. *Teens should do the work around the oven.*

**SCIENCING: OBSERVING, COMPARING,
AND COMMUNICATING**

1. Ask the children to describe the steps in making the meringue.
2. Ask what happened to the eggs.
 - How did they change?
 - What method of beating worked the best?
 - Did the bubbles become larger or smaller?
 - Did the meringue still have bubbles?
 - What did the bubbles look like under the lens?
 - Did they look like the foam they made yesterday?
 - How were they the same or different?
3. Have the children wash hands and clean up their area for the next group of children.

Presentation Notes

ACTIVITY B**YEAST BUBBLES**

Time Required
5-10 minutes

Suggested Grouping
3 groups of 4 children
at each station

Using yeast, sugar, and warm water in a plastic Ziplock bag, children will observe the formation of bubbles and gas.

Materials You Will Need

- Sugar — 1/8 teaspoon per child
- Mixing bowl to hold the sugar
- Ziplock sandwich bag — 1 per child
- Fast-acting, dry yeast — 1 pkg per 4 children
- Warm water (from tap)
- Pitcher
- 1-cup measuring cup — 1 per 4 children
- Styrofoam cup — 1 per 4 children
- Several slices of sandwich bread
- Hand (magnifying) lens — 1 per 4 children
- Chart paper
- Markers

Getting Ready

- ❶ While the meringues are baking, help the children set up another activity, this time using yeast. *(Or set up this activity as one of the rotating stations.)*
- ❷ For every four children, provide a Ziplock bag, a packet of dry yeast, a teaspoon of sugar, warm water, and a Styrofoam cup. Set the supplies in the center of a table so the children can measure their own teaspoonful of sugar and fill their own cup from a pitcher of warm, **not hot**, water.



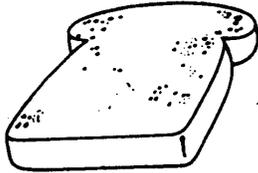
Tip
Having the children set up the activities teaches new skills and makes them responsible for the outcome.

ACTION: OBSERVING, COMPARING, AND COMMUNICATING

1. In your *Bubble Circle*, tell the children that in this activity they will be observing bubbles in yeast. Explain the steps that they will need to complete.
2. Instruct each group to pour the dry yeast and 1 teaspoon of sugar into the Ziplock bag.
3. Next, have them carefully pour 3 cup of warm water (*hot tap water that you can comfortably put your fingers in*) into the bag. Have them seal the bag, removing as much air as possible. You may need to assist some of the children in sealing their bags.
4. Instruct the children to place the Ziplock bag into the Styrofoam cup and fill half full with warm water.
5. Ask the children to predict what they think will happen inside the bag. Record some of their predictions.
6. While the yeast is "working," ask the children if they know how yeast is used. Show them several slices of bread. Ask if they can find any bubbles in the bread. (*They may want to use the hand lens.*) Ask if they know how the bubbles got into the bread.
7. After the observation, explain that yeast is used in making bread, if they didn't identify this.
8. After about 10 minutes, have the children re-examine the yeast. Let them explore for several minutes. Encourage them to touch the bag, look at it with the hand lens, and hold it up to the light.



<p>What Will Happen?</p> <hr/> <hr/> <hr/> <hr/> <hr/>
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**SCIENCING: OBSERVING, COMPARING,
AND COMMUNICATING**

1. Ask the children to describe what they observed about bread and yeast.
 - Were they surprised?
 - What happened to their bag?
 - What did the bubbles look like?
 - What did the bubbles smell like?
 - Did they hear anything?
 - How could they describe the bubbles?
 - Were the bubbles like the bubbles they saw in the prior session in the soap foam?
 - Were the bubbles like the bubbles in the egg foam?
2. Ask if they can think of other foods that have foam or bubbles in them.
3. Observe the bag again at the end of the day.

Presentation Notes

ACTIVITY C

DANCING RAISINS

Time Required

10 minutes

Suggested Grouping

individuals or teams
of 2 to 4

In this activity, you will help children discover how bubbles can move objects. Children will use soda and raisins to observe how the raisins can dance in their glasses.

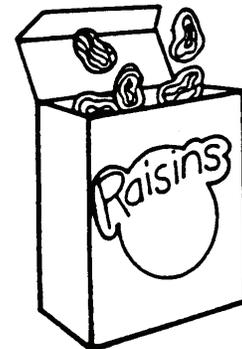
Materials You Will Need

- Lemon-lime or other clear soda – about 2 cup per child
- Raisins – 5 or 6 per child
- Clear, plastic cups – 1 per child
- Pencils – 1 per child
- Popcorn – several unpopped kernels per child, *optional*
- Penny – 1 per child, *optional*

Getting Ready

- ❶ Prepare this activity to do with all the children, or at a station to complement the day's other activities.
- ❷ Gather the needed supplies and place them at the *Bubble Observation Tables*.

Presentation Notes





Tip
 If each child has their own cup of soda to observe, you can suggest they drink it as part of the snack.

ACTION: OBSERVING, COMPARING, AND COMMUNICATING

1. While in the *Bubble Circle*, tell the children that they will have a chance to observe bubbles in soda. (*Most children probably already identified soda as a type of food that has bubbles in it.*) Explain that they will be observing what happens in the soda when they add raisins. Explain the instructions prior to moving the group to the *Bubble Observation Tables*.
2. Provide each child with a clear glass and ask them to fill it : full with clear soda. What do they notice? (*Bubbles!*) What are the bubbles doing? Where are the bubbles?
3. Instruct the children to drop one raisin into the soda. Ask them to observe carefully what happens. Have them add more raisins, one at a time, until they have five or six raisins in their cup. Tell them to keep watching the raisins in the cup. Let them observe the raisins for 4 to 5 minutes.

Optional

If time permits, give each child several kernels of popcorn. Ask them to drop them into the cup. Ask them to observe what happens. Give each child a penny and repeat.

Presentation Notes

SCIENCING: OBSERVING, COMPARING,
AND COMMUNICATING

1. Ask the children to describe what happened.
 - What happened first to the raisins? *(They usually sank to the bottom and tiny bubbles formed all around the raisins.)*
 - What happened next to the raisins? *(After a minute or two, the raisins began to dance. Then floated to the top.)*
 - What happened next? *(The raisins sank to the bottom of the glass.)*
2. Ask if the children were able to make the raisins dance? Describe how? Were they able to make them float or sink? If so, how? What makes the raisins float and move in the soda?
3. Encourage the children to explore more with their raisins. Ask them to predict how long they will keep dancing.

Other questions

Optional

If you gave the children popcorn kernels and the penny to observe, ask questions similar to those above. Ask the children to make comparisons about the three items.

ACTIVITY D

SNACK

Time Required
10 to 15 minutes

Suggested Grouping
entire group

Children will enjoy tasting their Egg-Foam Meringues, fresh from the oven, in this activity.



Materials You Will Need

- Meringues (made earlier)
- Milk – 1 cup per child
- Straws – 1 per child
- Napkins – 1 per child
- Drinking cups – 1 per child

Getting Ready

- ❶ Gather the needed supplies.
- ❷ Put the cooled meringues on a tray or place one on each napkin.
- ❸ Set up an area where the children can pour their own milk. *(If you don't have milk, serve the soda from Activity C.)*

ACTION: OBSERVING AND COMMUNICATING

1. Ask the children to pour a half cup of milk into their glasses.
2. Provide each child with a straw. If the children choose, encourage them to use the straw to blow into the milk. What did they create?
3. Serve the meringues. As the children are eating, talk to them about the bubbles in the snacks!



Tip
Some children may have food allergies or other health conditions. Check with the site staff prior to session to see if you will need to substitute any ingredients for them.

Further Exploration

1. Remind the children to continue bringing *bubble-makers* from home.
2. Encourage the children to explore how one another's *bubble-makers* work.
3. Add items brought from home to your *Bubble-Foam Exploration* collection.
4. If time permits, help the children create a bubble contraption from recycled or found items. See if they can invent a *bubble-maker* that can make bubbles more than one way!



AMAZING BUBBLES

Approximate Time Required for Session: 1 hour

Purpose

- By learning some of their properties, children will learn how to perform some amazing tricks with bubbles.
- Children will learn the importance of keeping their hands and bubble-makers wet with solution.

Overview of the Day's Activities

In this session, you will help children perform some amazing feats. Children will learn how to make huge bubbles from just string and straws. They will then explore the elastic qualities of the bubble solution by passing objects through a bubble window. Again, with drinking straws, children will explore with tabletop bubbles. Reading the book *Bubble, Bubble*, you will share the fictional story of a boy and his magical bubbles with the children.

Background Information

Children and adults are fascinated by bubbles and may sometimes think they are magical. By understanding some of the properties associated with bubbles and how to work with them, children can accomplish some amazing feats.

This session will focus on the elastic qualities of bubbles. Children will explore how soap molecules are highly attracted to one another; so there is a strong pull to return to their prior condition.

ACTIVITY A**MAGIC WINDOWS**

Time Required
20 minutes

Suggested Grouping
groups of 2 to 4 children

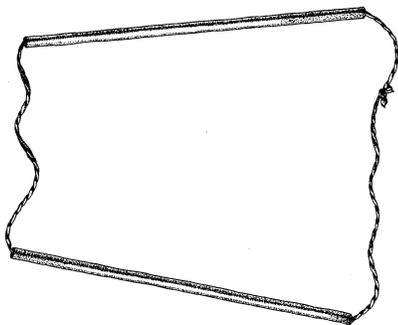
In this activity, children will further explore the elasticity of bubble solutions. Using bubble frames that you have made in advance from drinking straws and string, children will try to put their hand through the “magic window” without breaking the bubble solution.

Materials You Will Need

- Plastic drinking straws – 2 per child
- String – 1 ball
- Scissors
- Bath towel or cardboard box – 1 for each shallow tray
- Bubble solution – 1 gallon per 4 children
- Shallow pan – 1 per 4 children
- Plastic knife – 1 per 4 children
- Chart paper
- Markers
- Bubble Safety Chart*

Getting Ready

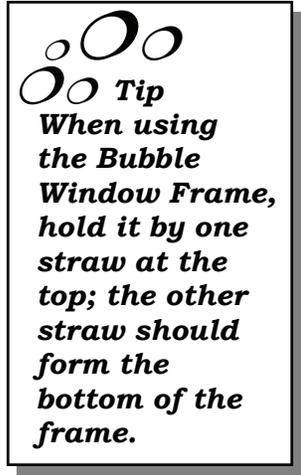
- ❶ This can be a messy activity. Try to conduct it in a sheltered, outside area or prepare an inside work area.
- ❷ Prepare the *Bubble Window Frames* in advance. Make at least one per child. For each frame, you will need two plastic straws and about three feet of string. Thread the string through the straws and tie a knot.
- ❸ Prepare bubble solution in shallow trays that



will accommodate the length of a straw. Children should work in teams of two, with four children per tray of bubble solution.

ACTION: OBSERVING, COMMUNICATING, AND COMPARING

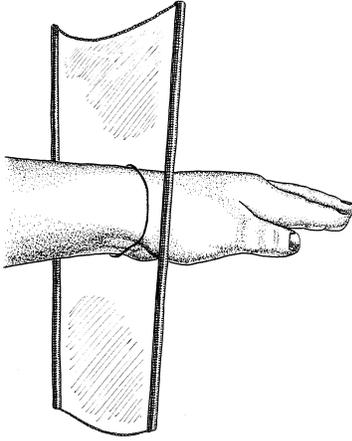
1. Begin the activity by asking the children if they have ever seen someone put their hand through a window. Tell them that today they will try to accomplish this feat. Before starting the activity, review the *Bubble Safety Chart*.
2. Have the children work in teams of four, provide each team with a shallow tray of bubble solution and the *bubble window frames* you prepared in advance for this activity.
3. Ask each team to experiment by dipping the window frame into the solution until they can create a "window." Most children should be able to master this activity fairly quickly. If some are having difficulty with the activity, ask questions that will help direct them to hold the straws to dip the frame to create a window.
4. When all of the teams have been able to create a bubble window, ask one child to create and hold it while a partner tries to stick their hand through the window without popping or breaking it. This may take several tries for the children to find the trick to preventing the bubble from breaking. If some teams are unable to complete the task successfully, ask one of the other teams to demonstrate how they did it. Encourage them to keep trying!
5. Remove the children from the *Bubble Exploration Table* or cover the trays with a towel before asking the *Sciencing* questions.



Tip
When using the *Bubble Window Frame*, hold it by one straw at the top; the other straw should form the bottom of the frame.



Tip
It is important to keep all objects, including hands, coated with the bubble solution.



SCIENCING: OBSERVING, COMPARING,
AND COMMUNICATING

1. What did their window look like? How did it feel? What did the bubble look like? Were they all alike?
2. Ask the teams to share with the group what steps were first involved in making the windows. Record their responses. What did they learn about holding the frame? Could they hold the string instead of the straw and make a window? What else did they discover?
3. Ask them if they were able to stick their hand through on their first attempt. Could they determine how they were able to accomplish this? (By keeping their hand wet with the solution, the window doesn't break.)

Presentation Notes

FURTHER ACTION: OBSERVING, COMPARING, AND COMMUNICATING

1. Return the children to the *Bubble Exploration Tables* or uncover the solution. Give the children a few more minutes to experiment with mastering the hand-through-the-window activity.
2. Next, ask them to gather as a team to try to create some other tricks with their windows. This can get a little messy, so caution the children to follow the bubble safety rules prior to starting the activity.
3. If they are having a difficult time creating another trick, offer some suggestions. For example, ask them what would happen if you twisted the window frame. What would happen if you blew into the window frame? Could you stick other items through the window without it breaking? (Have some plastic knives or other objects available for their exploration.)
4. Discuss with the children their new discoveries. Let them perform their new tricks for the larger group. Allow time for each team to share. Don't forget to applaud their efforts!

ACTIVITY B**BUBBLE IN A BUBBLE**

Time Required
15 to 20 minutes

Suggested Grouping
groups of 2 to 4 children

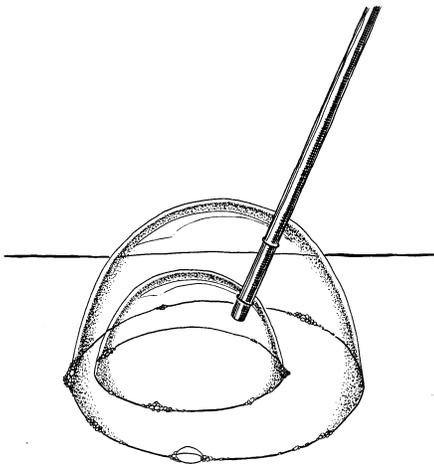
Using bubble solution and drinking straws, children will make a variety of bubbles by blowing into the bubble solution placed directly on a tabletop. Children will further explore how to create bubbles inside of bubbles.

Materials You Will Need

- Bubble solution (*use the same pans from Activity A*)
- Straws – 1 per child
- Clean tabletop
- Chart paper

Getting Ready

- ❶ Try out the activity yourself prior to the session.
- ❷ You will need a clean work area for this activity.
- ❸ Children should have room to place the bubble solution in front of them and then, using a straw, blow into the solution to create bubbles directly onto the tabletop. **Again, this activity can be messy, so prepare the work area in advance.**

**Presentation Notes**

ACTION: OBSERVING, COMPARING, AND COMMUNICATING

1. Before you begin this activity, ask the children if they think they can create a bubble inside a bubble, using just a straw. Let them share their thoughts with you. Record their responses.
2. Ask the children to pour a small amount of bubble solution on the area in front of them. An easy way to move the solution from the container to the surface is by placing their straw in the solution, putting their finger tightly on the top of the straw and lifting it out of the solution. As long as their finger remains tightly on the top of the straw, a few inches of solution should remain inside.

When the children are ready to place the solution on the table, they simply remove their finger from the top of the straw, and the liquid comes out.

3. Next, ask the children to practice blowing bubbles on the table with just the straw. Give them 5 to 10 minutes to explore. Then move them to the *Bubble Sciencing Circle*.

Presentation Notes



**SCIENCING: OBSERVING, COMPARING,
AND COMMUNICATING**

1. Ask the children to explain what they were able to do.
 - Were they able to make one big bubble?
 - Were they able to make lots of smaller bubbles?
 - Were they able to remove their straw from the bubble and have the bubble remain?
 - What did the bubbles look like? Were they the same? What was different?
2. Return the children to the *Bubble Exploration Tables* to further explore.

**MORE ACTION: OBSERVING,
COMPARING, AND COMMUNICATING**

1. Ask the children to make a single large bubble and then remove their straw from the bubble. Use questions to guide their success in accomplishing this. Ask if they can insert the straw into the bubble without popping it. Let them practice this.
2. Now ask if they can blow a bubble inside a large bubble. Let them practice trying to create at least one bubble inside of the other bubble. Some children may be able to create several bubbles inside the larger bubble.
3. Guide the children's exploration through questions or through their observation of other children's activities.



Tip
A way of making a bubble inside of another is to first blow one bubble, then blow another inside by starting in the center of the first bubble.

4. Suggest children measure the diameter of the popped bubble. (It will leave a circle on the table.)
5. Encourage the children to continue experimenting with the bubble solution on the table with the straws. Ask them to try to accomplish some new feats. If they are having difficulty creating new bubble formations, ask if they can create two separate bubbles and then push the bubbles together.
 - Can they blow together with a partner?
 - Can they create a row of bubbles on the table?
 - Can they create a circle of bubbles?
 - Can they make very tiny bubbles?
 - Can they make a really BIG bubble?
6. Cover the bubble solution and place all straws in the center of the table. Move the children to the *Bubble Sciencing Circle*.

SCIENCING: OBSERVING, COMPARING, AND COMMUNICATING

1. Ask the children to describe what they observed. Write the children's responses on a chart titled *What We Discovered*. Be sure to record all the responses.
2. Ask further questions that encourage the children to use their senses.

What We Discovered

ACTIVITY C**BOOKS AND BUBBLES**

Time Required
15 minutes

Suggested Grouping
large group

*Children will enjoy the Mercer Meyer's story, **Bubble, Bubble** that describes one boy's encounters with magical bubbles.*

Materials You Will Need

- Bubble, Bubble* by Mercer Meyer
- Drawing paper — 1 sheet per child
- Markers or crayons

Getting Ready

- ❶ Read the book several times prior to this activity so you are familiar with the story and the words.
- ❷ Gather the needed supplies.

ACTION: OBSERVING AND COMMUNICATING

1. Gather the children to listen to the story after cleanup from the last activity or while eating a snack.

Tips for Successful Oral Reading

- **Setting the stage** - Have the children sit in a semicircle, with your chair slightly higher. Ask some brief questions to build enthusiasm and encourage responses. Keep the book facedown or out of sight.
- **Presenting the book** - Show the book so the cover is clearly visible. Make sure the children can see the pictures easily. Tell



them the name of the book, the author, and the illustrator. Discuss the illustrations.

- **Reading the book** - Use plenty of expression. Adjust your voice and speed of reading to fit the story. Keep children involved by asking: "What do you think is going to happen?" **The most common mistake is reading too fast.** Read slowly enough for the children to build mental pictures.
2. Read *Bubble, Bubble*. Stop every few pages and encourage input from the children. Ask how the boy's adventures remind them of any they had while exploring with bubbles.

MORE ACTION: COMMUNICATING

1. After reading, ask the children to draw pictures about the story or create their own picture of a *Bubble Adventure*.
2. Allow time for each child to share their artwork with the group. Hang the pictures on the wall for all to see.

SCIENCING: OBSERVING, COMMUNICATING, AND COMPARING

1. Ask the children questions that relate the story to some of their own discoveries thus far in the *YES Bubble Project*.
 - Have you made bubbles that look like those made by the boy in the story?
 - How were your bubbles alike and different from the ones in the story?
 - What kind of tricks have you been able to do with your bubbles?

INSIDE A BUBBLE

Approximate Time Required for Session: 1 hour

Purpose

- Children will explore with "bigger than life" bubbles.
- Children learn more about bubble shapes and how they can be made.

Overview of the Day's Activities

Today's lesson gives children an opportunity to further explore surface tension and its effect on the creation of bubbles. First, children will explore making bubbles from several large bubble hoops. Then they will try improving the bubble hoops by wrapping the hoops with yarn or string.

The grand finale for today's session, and ***Magic Bubbles***, will be the *Kids in the Bubble Activity*. You will help children discover what it feels like to be inside a giant bubble!

Background Information

A bubble's shape is determined in part by surface tension. The soap film enclosing air will only stretch as far as it must in order to balance the air pressure inside the bubble against the surface tension of soap film.

ACTIVITY A**BUBBLE HOOPS****Time Required**

15-20 minutes

Suggested Grouping

groups of 4 to 6

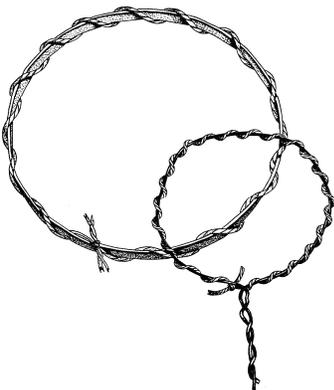
Children enjoy making giant bubbles. Using hoops that you have prepared or made with the children, you will assist them in making large bubbles from a variety of bubble-makers.

Materials You Will Need

- Bubble solution – 1 gallon per 4 children
- Shallow tray
- Hoops – from 2” to 12” in diameter (*Embroidery hoop frames work well. Hoops can also be made from coat hangers.*)
- Cotton rope
- String or yarn
- Scissors

Getting Ready

- ❶ This activity can be messy, so prepare a suitable work area.
- ❷ If you are using large hoops, you may want to conduct this activity outside in a sheltered area.
- ❸ If you don't have access to hoops, you can make, in advance, several different sizes of hoops from coat hangers or other wire. Wrap some of the coat hanger hoops with yarn.
- ❹ The *Windows* from *Session 4* work well for this activity.



ACTION: OBSERVING AND COMPARING

1. Review with the children what they've discovered about bubbles and bubble blowers in the earlier sessions. Tell them that today they are going to explore more with bubble hoops.
2. Show the children the various sized hoops. Ask the children to explore different sizes and shapes of bubbles they can make with each hoop. If time permits, help the children make their own hoops from coat hangers, yarn, and cotton rope.



Tip
Allow plenty of time for exploration. Children will enjoy making the larger bubbles.

SCIENCING: OBSERVING, COMPARING, AND COMMUNICATING

1. After the children have explored for about 10 to 15 minutes, bring them back to the group and discuss what they have learned.
 - What shapes were they able to create?
 - Did the bubbles change in size and shape?
 - Were they able to move the bubble by moving the hoop?

MORE ACTION: OBSERVING, COMPARING, AND COMMUNICATING

1. See how one person can make a bubble go through a larger hoop being held by another child. Let the children play with this activity until interest begins to lessen.
2. Give the children some yarn or string and ask them to wrap the edges of one of the hoops *(or provide the children with one of the hoops you*

wrapped in advance.) They may need some help wrapping and tying the yarn. When completed, ask them to dip it in the solution and create bubbles.

3. Be sure to have available other material for experimentation such as jump ropes. Allow time for play!

MORE SCIENCING: COMPARING AND COMMUNICATING

1. What did the children see, hear, smell, or feel?
2. What happened when they wrapped the hoops? Did it create stronger, longer-lasting bubbles? (It should increase the strength and length of time the bubble lasts because the yarn allows more soap film to be used in the formation of the bubble.)

Presentation Notes

ACTIVITY B

KIDS IN A BUBBLE

Time Required
20-40 minutes

Suggested Grouping
individuals

This final activity in the YES Magic Bubble Project is sure to be one of the children's favorites. Each child will have an opportunity to have a giant bubble created around his or her while standing in a wading pool.

Materials You Will Need

- Hoop large enough to fit easily over a child (*hula hoops work well*)
- A plastic wading pool large enough to hold the hoop
- Bubble solution to fill the pool 3" to 4" deep (*approximately 5 to 8 gallons*)
- Step or blocks to set in the center of the pool for children to stand on
- Towel to place over the step
- Paper towels
- Newspapers
- Goggles – 1 pair
- Drawing paper – 1 sheet per child
- Markers or crayons

Getting Ready

- ❶ Prepare a safe location for conducting this activity (*a shady outside area or adequate indoor space.*)
- ❷ Inflate the plastic swimming pool, if necessary.
- ❸ Make enough bubble solution to fill the pool with 3" to 4" of liquid. (*Usually about 5 to 8 gallons.*)



Tip
Make sure the hula hoop will fit easily into the wading pool.

**Tip**

Since only one child at a time can do this activity, set up an alternative activity in an area away from the bubble pool where children can wait their turn.

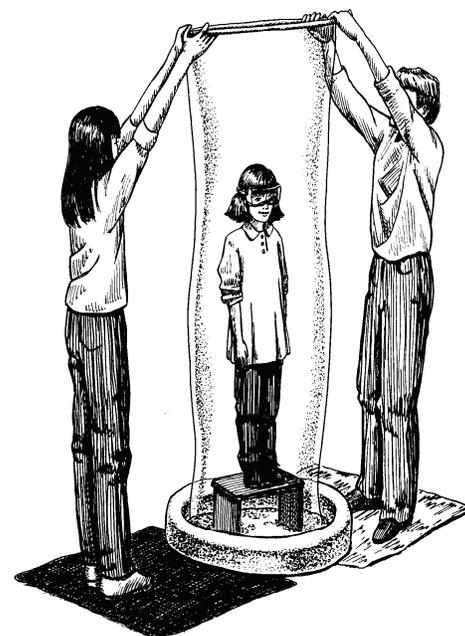
- ④ Place a step or blocks in the center that will be secure when children stand on it.
- ⑤ Place a towel over the top of the step if you think it will be slippery.
- ⑥ Place newspapers or towels around the edge of the pool to prevent slipping.
- ⑦ Fill the pool with 3" to 4" of bubble solution.
- ⑧ Set up a work area away from the pool for children to draw pictures.

Preparation Notes**ACTION: OBSERVING, COMPARING, AND COMMUNICATING**

1. Ask the children if they had ever thought about what it would be like to be inside a bubble. Allow some time for discussion.
 - How do they think it would feel?
 - Do they think they could see inside a bubble?
 - Would they float away?
2. Tell the children that next you will be making bubbles large enough for them to stand inside.

Every child will have an opportunity to be inside a bubble.

3. Explain that everyone needs to follow the instructions very carefully and practice safe behavior in the bubble station. Review your *Bubble Safety Chart*. Ask the children to list other safe behaviors they should follow for this activity. After the brainstorm, review the following list to make sure all safety points were covered;
 - *Don't run or push in the bubble area.*
 - *Beware of bubble solution on the floor.*
 - *Step on and off the center step of the bubble carefully.*
 - *Keep arms and legs close to your body when on the step.*
4. Explain the steps to creating a bubble to the entire group. Explain that a child will step onto the center of the step in the pool. The children should keep their arms and legs to their sides. You will be lifting the hoop over the top of them creating the bubble. *(Two teens will need to do the lifting of the hoop.)* Remind them to keep their eyes open. They won't want to miss the bubble! You can provide goggles for children with sensitive eyes.
5. Proceed with the steps above, giving each child an opportunity to be inside of a bubble.
6. If you have time, after all the children have had an opportunity to be inside, you may want to try some more tricks. For example, having two children stand on the step inside the bubble, or making an arch with the hoop to cover one child inside the pool and another outside the pool. Explore other methods and techniques.



7. Because you can only work with one child at a time on this activity, have a table area set up where one teen can supervise children in drawing a picture about one of their bubble experiences during the *Magic Bubble Session*.

SCIENTING: COMMUNICATING AND OBSERVING

1. Ask children to describe what it was like inside the bubble.
 - What did they see?
 - Were they able to see colors?
 - What did they feel? Hear? Smell?

Follow-Up

1. Ask the children to draw a picture of themselves inside of a bubble or some other fun thing they learned this week about bubbles. Mount the pictures on the bulletin board. Spend some time reviewing items that have been brought in for the *Bubble Science Centers*. Explore with blowers and bubble-makers made by the children.
2. Review the five lessons with the children. Ask each child to describe one thing they learned about bubbles! Encourage older children to write about their experience.

MAGIC BUBBLES BIBLIOGRAPHY

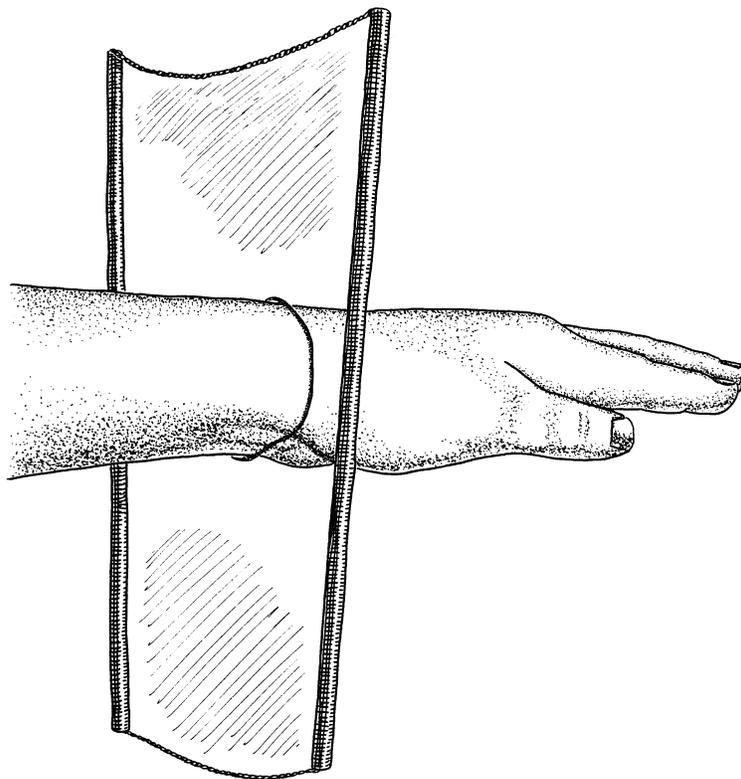
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MAGIC BUBBLES SUPPLY LIST

Session 1 BUBBLE-MAKERS

Activity A - Bubble-Makers

Plastic covering for the Bubble Table, or several large garbage bags
Brown, grocery-size paper bags
Shallow pans (*suggest at least 12" x 24"*) – 1 per table or group of 4 to 6 children
Towels or cardboard boxes – 1 to cover each shallow pan
Slotted spoons – 1 for each group of 4 children
Plastic fruit baskets – 1 for each group of 4 children
Paper towel rolls – 1 for each group of 4 children
Drinking straws – at least 1 per child
Other items of your choice for blowing bubbles
Bubble solutions of your choice – 1 or more
Bubble-Makers Rating Sheet – 1 per child
Pencils – 1 per child
Chart paper
Marking pens

Activity B - Giving Bubbles A Hand!

Same as Activity A

Activity C - Bubble Relays

Relay One

Bubble solution – 2 containers
Bubble-makers – 2 identical (*coat hangers and berry baskets work well*)

Relay Two

Balloons – 10 to 20 (enough for 2 teams)
Permanent marker
Baskets or containers for holding the balloons – 2
Stop watch, watch with a second hand or counter, or other timekeeper

Session 2 TINY BUBBLES**Activity A - Lots of Bubbles**

For each team of two to four:

Smooth table surface or plastic table covering

Wire whisk – 1 for each team

Hand egg beater – 1 for each team

Dishpan

Bucket

Styrofoam cups – 1 for every 2 children

Shaving cream – 1 can

Hand lens (magnifying) – 1 for every 2 children

Mop

Paper towels – 1 roll per team

Bath towel or cardboard box – 1 per team

Newspapers

Bubble Safety Chart

Bubble solution (use from *Session 1* or prepare according to a bubble recipe listed in the *Introduction*)

Activity B - Bubble Art

Construction paper – 1 or 2 sheets per participant

Powdered tempera paint in a shaker can

Supplies from *Activity A*

Very shallow pans or dish pans

Plastic tablecloth or large plastic garbage bag

Paper towels

Water for cleanup

Smocks or aprons for children, (old large- size shirts from home), *optional*

Activity C - Bubble Cups

Masking tape – 1 roll

Styrofoam cups – 1 per child

Sharpened pencils – several

Plastic drinking straws – 1 per child

Bubble solution (*at least 1 gallon for every 20 children*)

Measuring cup for pouring bubble solution

Crayons, *optional*

Activity D - Bubble-Foam Game

None

Session 3 BUBBLES IN FOOD

Activity A - Egg-Foam Meringue

Eggs — 1 for every 4 children
Deep, narrow bowls for mixing
Styrofoam cups — 1 for every 4 children
Wire whisk
Hand eggbeater
Electric mixer, *recommended*
Sugar — 3 cup for every 4 children
Cream of tartar — 1 can
Measuring cup — 3 cup size for each work station
Egg separator, *optional*
Measuring spoon — c teaspoon size
Mixing bowl — large
Cookie sheet
Oven or toaster oven
Vegetable oil
Hand (magnifying) lens — 1 for every 2 children
Paper towels

Activity B - Yeast Bubbles

Sugar — c teaspoon per child
Mixing bowl to hold the sugar
Ziplock sandwich bag — 1 per child
Fast-acting, dry yeast — 1 pkg per 4 children
Warm water (from tap)
Pitcher
1-cup measuring cup — 1 per 4 children
Styrofoam cup — 1 per 4 children
Several slices of sandwich bread
Hand (magnifying) lens — 1 per 4 children
Chart paper
Markers

Activity C - Dancing Raisins

Lemon-lime or other clear soda — about 2 cup per child
Raisins — 5 or 6 per child
Clear, plastic cups — 1 per child
Pencils — 1 per child
Popcorn — several unpopped kernels per child, *optional*

Penny – 1 per child, *optional*

Activity D - Snack

Meringues (made earlier)

Milk – 1 cup per child

Straws – 1 per child

Napkins – 1 per child

Drinking cups – 1 per child

Session 4 AMAZING BUBBLES

Activity A - Magic Windows

Plastic drinking straws – 2 per child

String – 1 ball

Scissors

Bath towel or cardboard box – 1 for each shallow tray

Bubble solution – 1 gallon per 4 children

Shallow pan – 1 per 4 children

Plastic knife – 1 per 4 children

Chart paper

Markers

Bubble Safety Chart

Activity B - Bubble in a Bubble

Bubble solution (*use the same pans from Activity A*)

Straws – 1 per child

Clean tabletop

Chart paper

Activity C - Books and Bubbles

Bubble, Bubble, by Mercer Meyer

Drawing paper – 1 sheet per child

Markers or crayons

Session 5 INSIDE A BUBBLE

Activity A - Bubble Hoops

Bubble solution – 1 gallon per 4 children

Shallow tray

Hoops – from 2” to 12” in diameter (*Embroidery hoop frames work well. Hoops can also be made from coat hangers.*)

Cotton rope

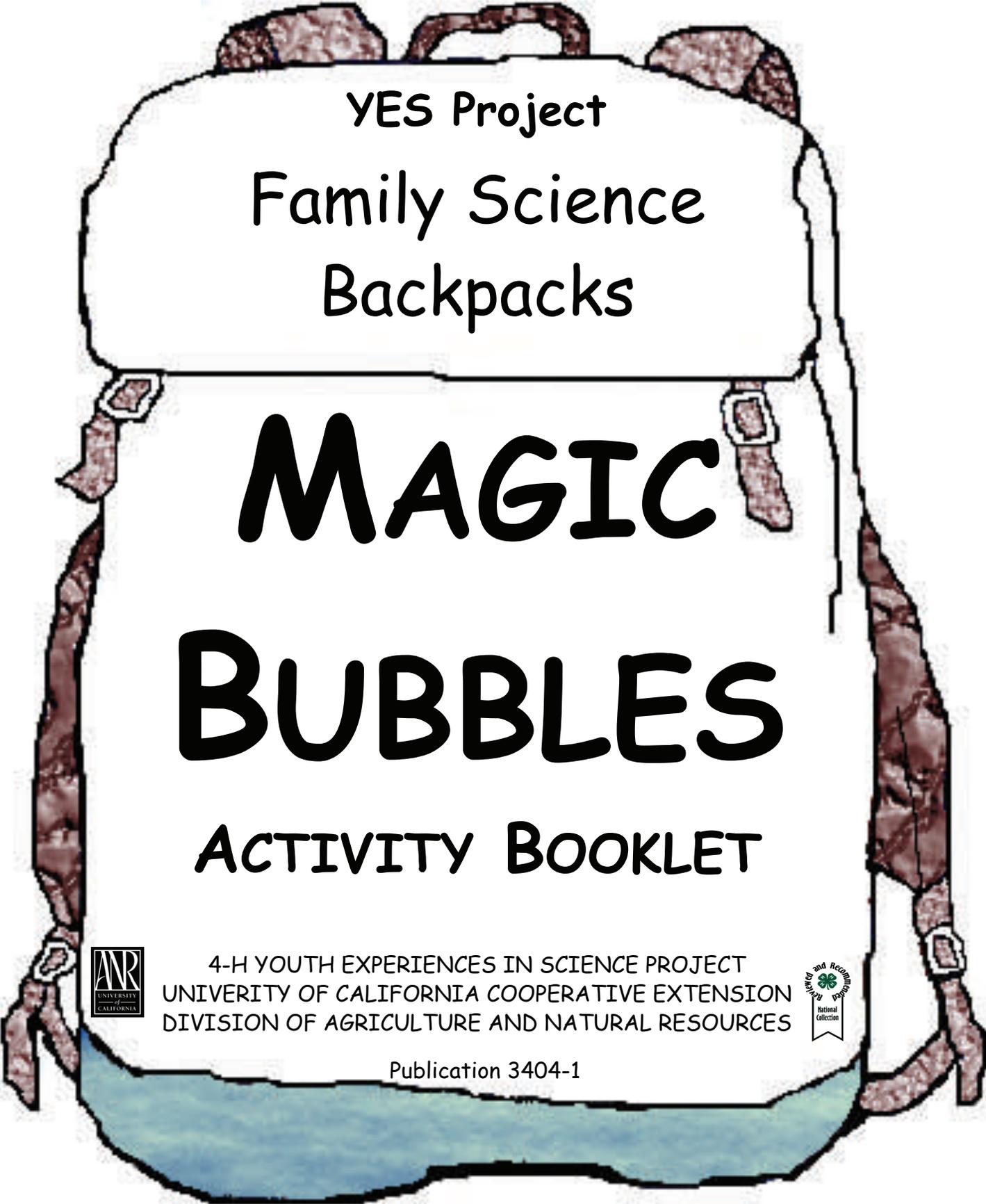


String or yarn
Scissors

Activity B - Kids in a Bubble

Hoop large enough to fit easily over a child (*hula hoops work well*)
A plastic wading pool large enough to hold the hoop
Bubble solution to fill the pool 3" to 4" deep (*approximately 5 to 8 gallons*)
Step or blocks to set in the center of the pool for children to stand on
Towel to place over the step
Paper towels
Newspapers
Goggles — 1 pair
Drawing paper — 1 sheet per child
Markers or crayons

Hand lenses are available from: Marshall Montgomery
1021 Delbrook Dr.
Napa, CA 94558
(707) 252-2381



YES Project
Family Science
Backpacks

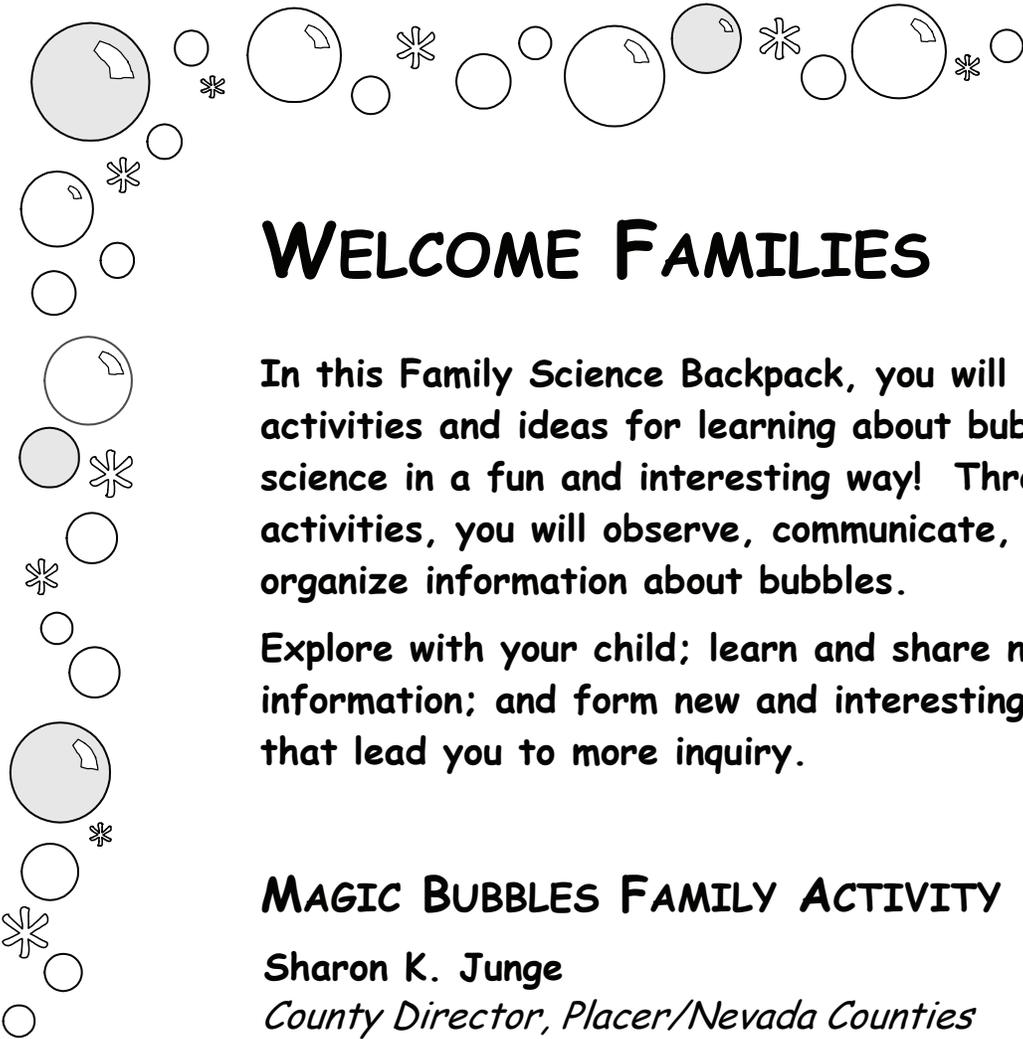
**MAGIC
BUBBLES**
ACTIVITY BOOKLET



4-H YOUTH EXPERIENCES IN SCIENCE PROJECT
UNIVERSITY OF CALIFORNIA COOPERATIVE EXTENSION
DIVISION OF AGRICULTURE AND NATURAL RESOURCES



Publication 3404-1



WELCOME FAMILIES

In this Family Science Backpack, you will find lots of activities and ideas for learning about bubbles and science in a fun and interesting way! Through these activities, you will observe, communicate, compare, and organize information about bubbles.

Explore with your child; learn and share new information; and form new and interesting questions that lead you to more inquiry.

MAGIC BUBBLES FAMILY ACTIVITY BACKPACK BY

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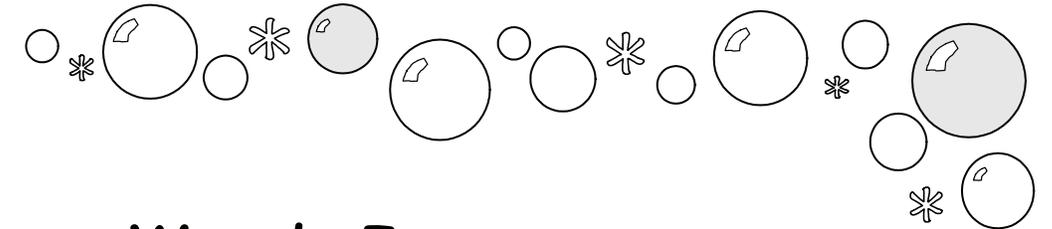
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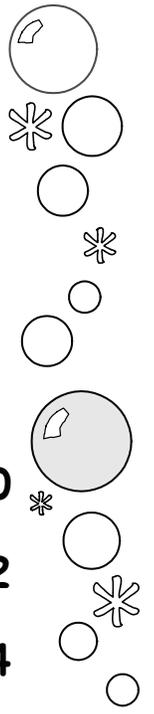
Program Representative, UC Davis

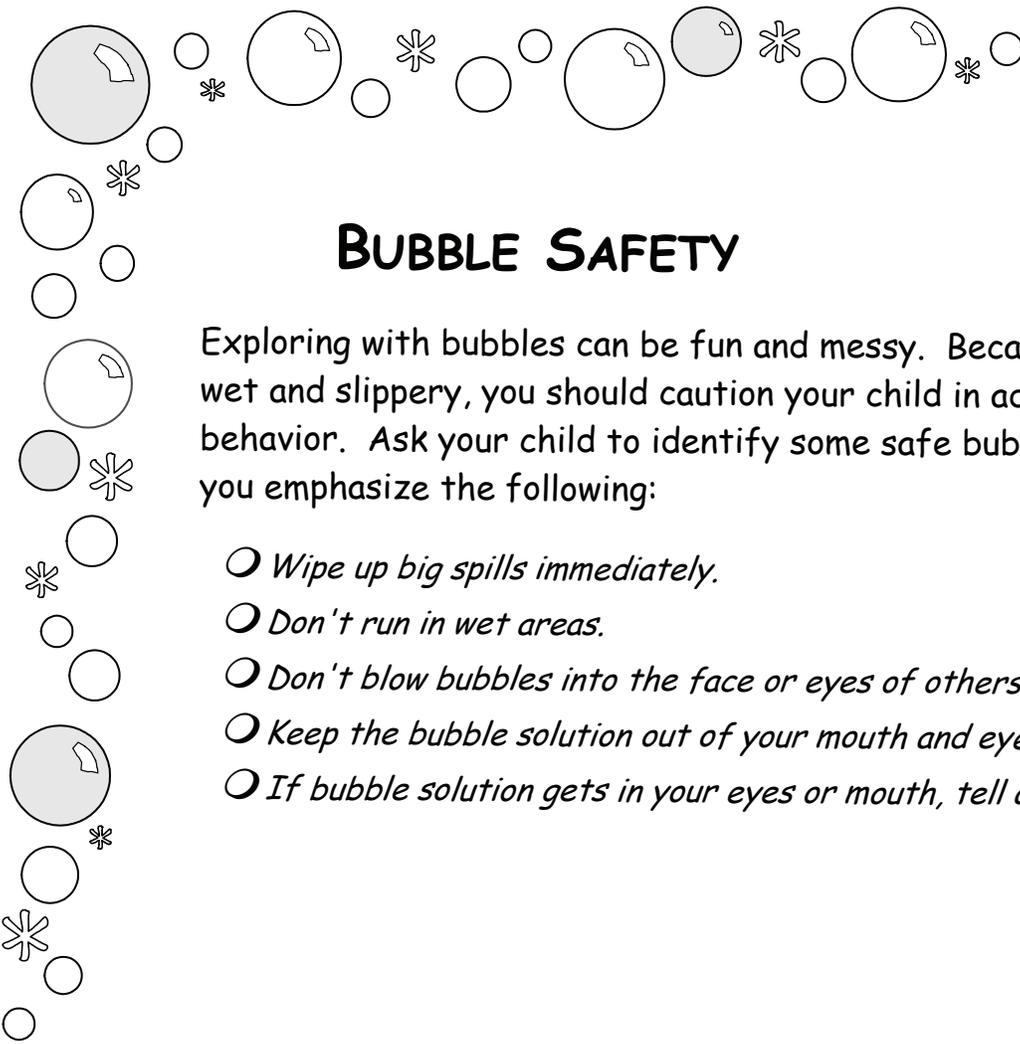
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○○○ **WHAT'S INSIDE** ○○○

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BUBBLE SAFETY

Exploring with bubbles can be fun and messy. Because bubbles are very wet and slippery, you should caution your child in advance about safe behavior. Ask your child to identify some safe bubble rules. Make sure you emphasize the following:

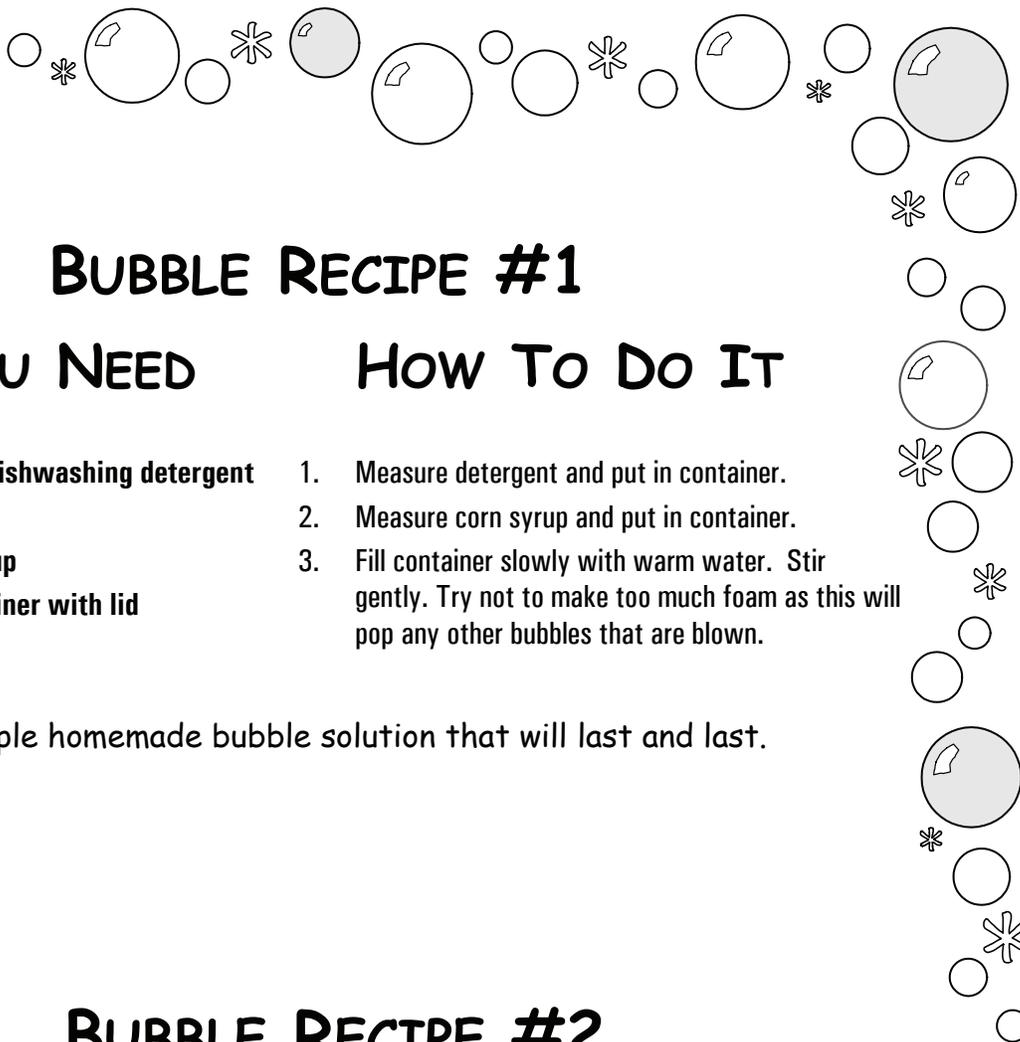
- *Wipe up big spills immediately.*
- *Don't run in wet areas.*
- *Don't blow bubbles into the face or eyes of others.*
- *Keep the bubble solution out of your mouth and eyes.*
- *If bubble solution gets in your eyes or mouth, tell an older person.*

BUBBLE CLEANUP

Cleaning up bubbles can be a chore. When possible, you may want to do activities outside, where the spills can be hosed off and left to evaporate. When making bubbles inside, the easiest way to cleanup is to have good set-up practices. Cover the work surfaces with plastic or newspapers. Place newspaper, towels, or tarps on the floor.

Plastic doesn't work well on the floor because it increases chances of slips and falls.

A vinegar and water solution helps to cut the soap film. Used in a squirt bottle, it can quicken cleanup. Remember to involve your child in the cleanup process when possible!



BUBBLE RECIPE #1

WHAT YOU NEED

- 2 cups JOY* brand dishwashing detergent
- 6 cups water
- ¼ cup light corn syrup
- 1 large plastic container with lid

HOW TO DO IT

1. Measure detergent and put in container.
2. Measure corn syrup and put in container.
3. Fill container slowly with warm water. Stir gently. Try not to make too much foam as this will pop any other bubbles that are blown.

You now have a simple homemade bubble solution that will last and last.

BUBBLE RECIPE #2

WHAT YOU NEED

- 1 cup DAWN* or JOY* brand dishwashing detergent
- 2 to 3 tablespoons glycerin (*can be found at the pharmacy*)
- 1 gallon water
- 1 gallon empty milk jug with lid

HOW TO DO IT

1. Measure detergent and pour into clean milk jug.
2. Measure and add glycerin.
3. Add water, filling to top of jug.
4. Stir gently, being careful not to make too much foam.

If possible, make this mixture a few days before you need to use it. The older the mixture, the better the bubbles!

** This is not intended as commercial endorsement of these products. However, these brands have been proven to work the best.*

Bubble-Makers

What do slotted spoons, berry baskets, clothes hangers, straws, and hula hoops have in common?

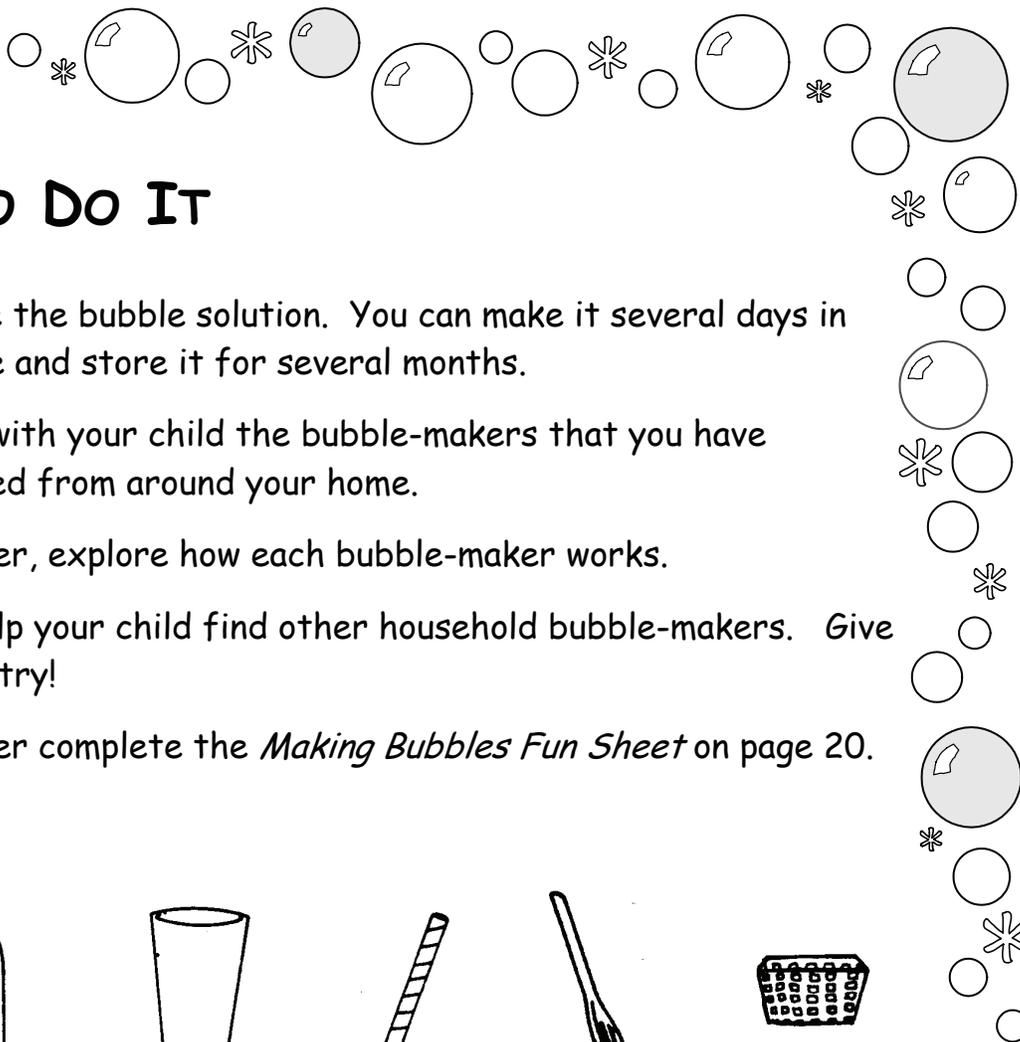
They all make fantastic bubbles! Help your child discover how everyday household items make great bubbles.



WHAT YOU NEED

- Bubble solution — *see bubble recipes*
- Bubble-makers — *tools from around your house*
- A shallow container — *large enough for your bubble-makers*





HOW TO DO IT

- ○ Prepare the bubble solution. You can make it several days in advance and store it for several months.
- ○ Share with your child the bubble-makers that you have gathered from around your home.
- ○ Together, explore how each bubble-maker works.
- ○ Now help your child find other household bubble-makers. Give them a try!
- ○ Together complete the *Making Bubbles Fun Sheet* on page 20.



QUESTIONS TO ASK YOUR CHILD

Ask open-ended questions that encourage further exploration by your child.

- ○ ○ *What kind of bubbles do you think this bubble-maker will form?*
- ○ ○ *What shape will the bubbles be? How big?*
- ○ ○ *How could you make larger bubbles? Smaller bubbles?*
- ○ ○ *Do you think the bubble-maker will make more than one bubble at a time?*

ACTIVITY
Two

Bubble Windows

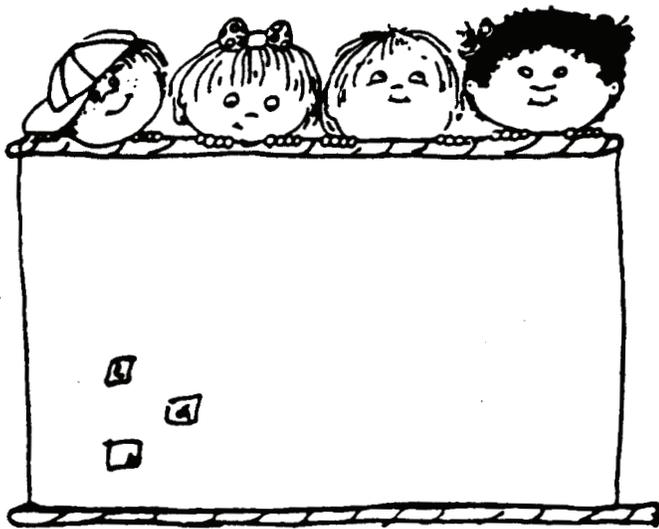
With just simple string and straws, you can create another fun bubble-maker.

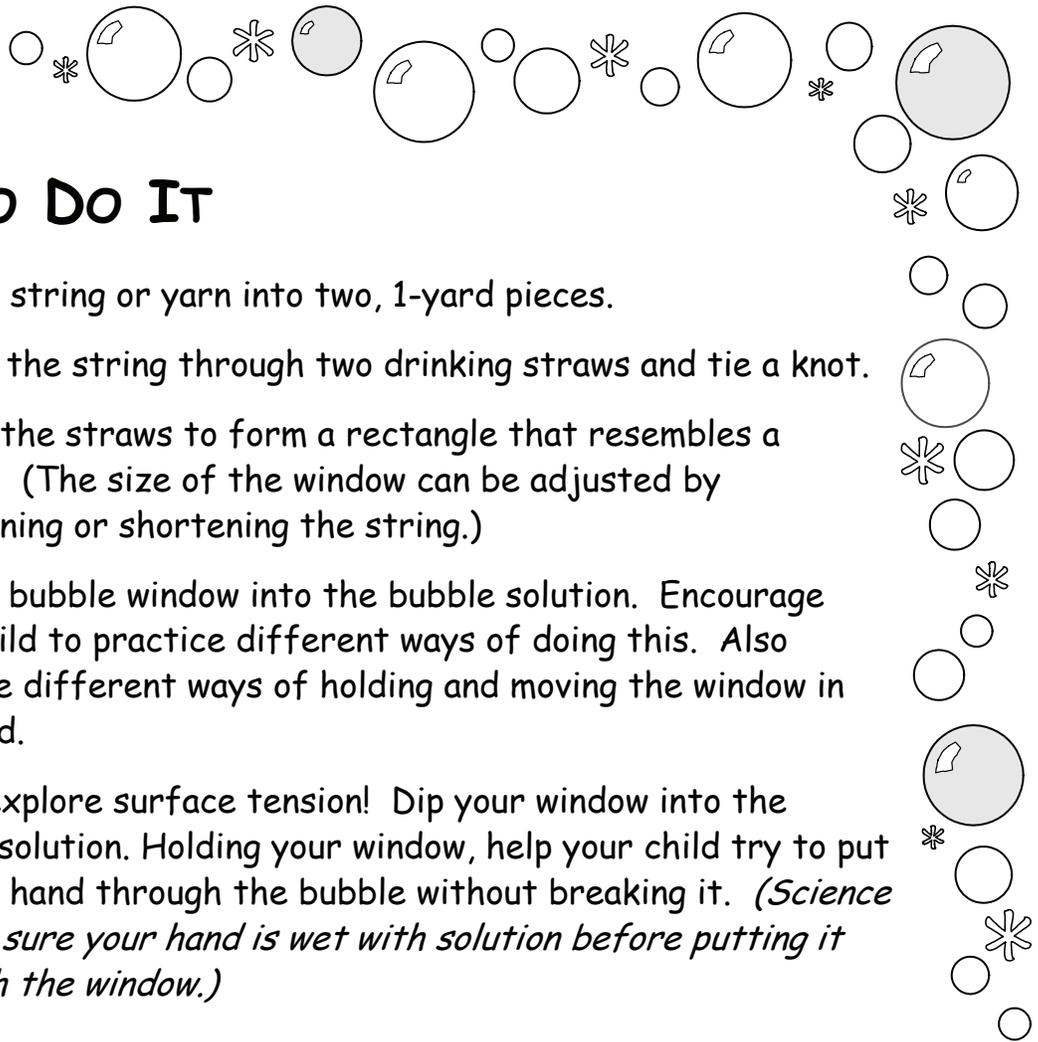
With just a little practice, you and your child will be making monster size bubbles.



WHAT YOU NEED

- Bubble solution — *see bubble recipes*
- Shallow pan
- Plastic drinking straws
- String or yarn — *about 2 yards*
- Scissors





HOW TO DO IT

- Cut the string or yarn into two, 1-yard pieces.
- Thread the string through two drinking straws and tie a knot.
- Adjust the straws to form a rectangle that resembles a window. (The size of the window can be adjusted by lengthening or shortening the string.)
- Dip the bubble window into the bubble solution. Encourage your child to practice different ways of doing this. Also practice different ways of holding and moving the window in the wind.
- Next, explore surface tension! Dip your window into the bubble solution. Holding your window, help your child try to put his/her hand through the bubble without breaking it. (*Science Tip: be sure your hand is wet with solution before putting it through the window.*)

QUESTIONS TO ASK YOUR CHILD

Ask open-ended questions that encourage further exploration by your child.

- *Describe how you made bubbles with string and straws.*
- *What other ways could you use the string and straws to make bubbles?*
- *How could you make different bubble shapes?*

Double Bubbles

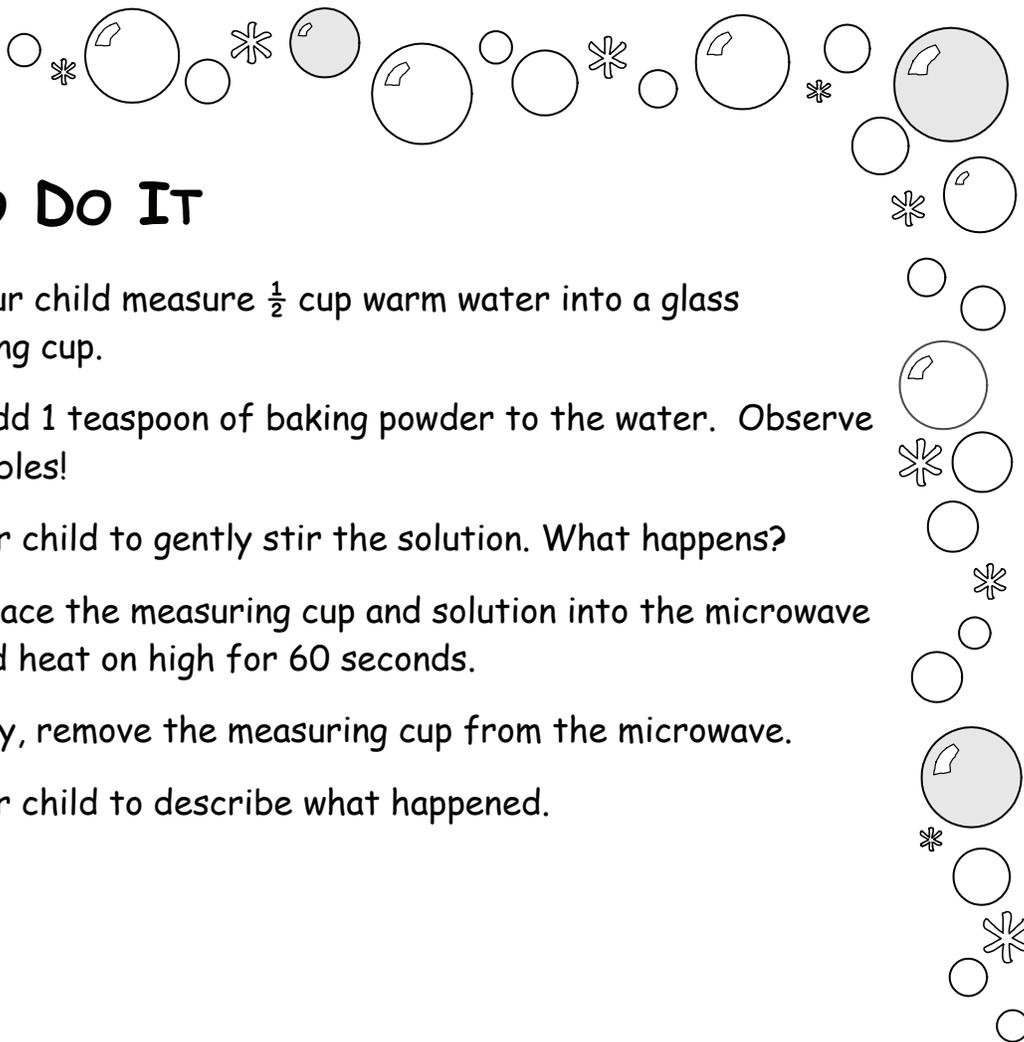
Baking powder contains an acid and a base (baking soda). When mixed with water, baking powder makes bubbles from carbon dioxide. When heated, it produces even more bubbles!



In this fascinating activity, you and your child will learn why baking powder is called double-acting!

WHAT YOU NEED

- 1 teaspoon double-acting baking powder
- Glass measuring cup — *pint or quart size*
- Mixing spoon
- Potholder
- Microwave oven



HOW TO DO IT

- ○ Help your child measure $\frac{1}{2}$ cup warm water into a glass measuring cup.
- ○ Next, add 1 teaspoon of baking powder to the water. Observe the bubbles!
- ○ Ask your child to gently stir the solution. What happens?
- ○ Next, place the measuring cup and solution into the microwave oven and heat on high for 60 seconds.
- ○ Carefully, remove the measuring cup from the microwave.
- ○ Ask your child to describe what happened.

QUESTIONS TO ASK YOUR CHILD

Ask open-ended questions that encourage further exploration by your child.

- ○ ○ *What made the bubbles in the water?*
- ○ ○ *How did these bubbles compare to those that you made with the bubble windows?*
- ○ ○ *How were you able to make more bubbles?*
- ○ ○ *Why do you think there were more bubbles after you heated the cup?*
- ○ ○ *What did the solution smell like?*
- ○ ○ *How do you think baking powder works in baking recipes?*

Bubble Cakes

In this activity your family will put into use what you learned in Double Bubbles by making delicious Bubble Cakes.



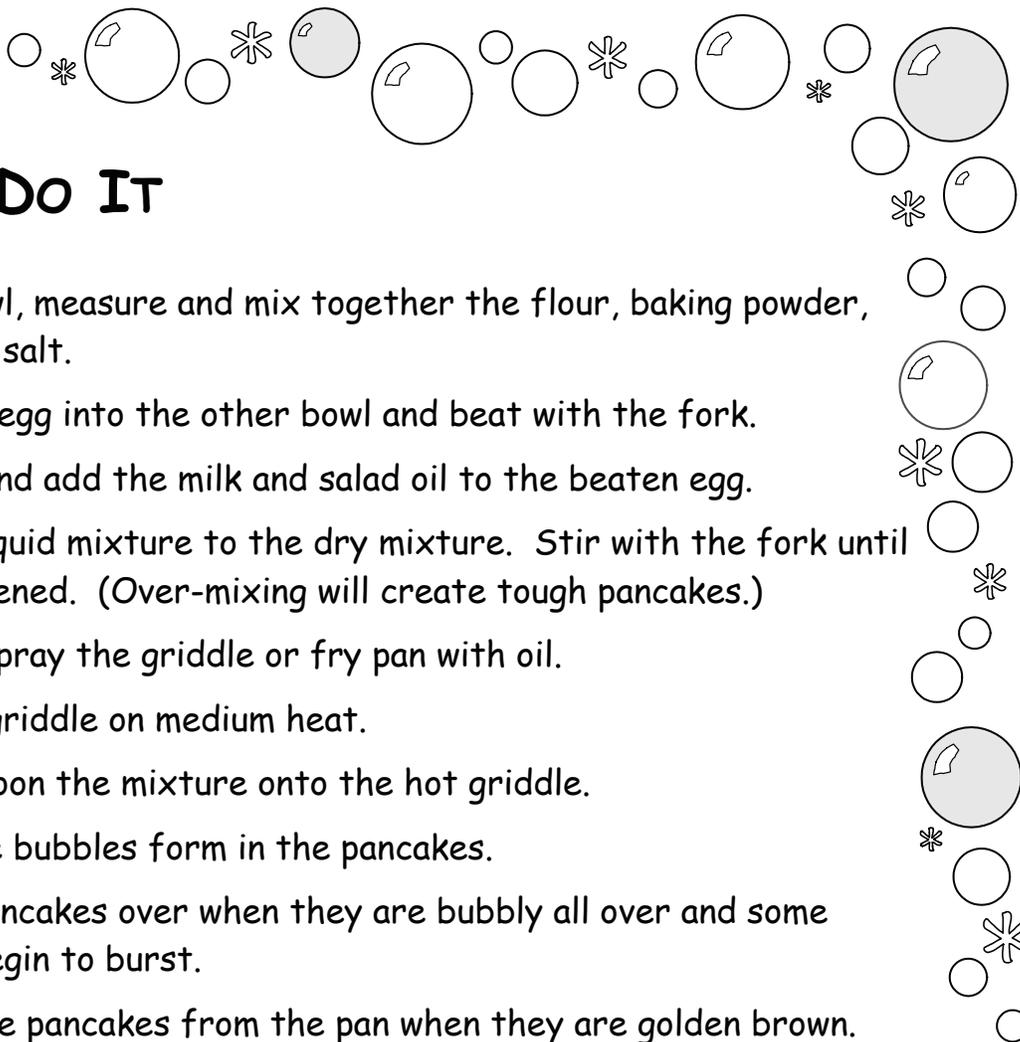
Baking powder combined with moisture and heat produces carbon dioxide bubbles. In pancakes, the bubbles swell the batter making light and fluffy pancakes.

WHAT YOU NEED*

- 1½ cups all-purpose flour
- 3 teaspoons baking powder
- 1 tablespoon sugar
- 1 egg
- 1 cup milk
- 2 tablespoons salad oil
- Griddle, skillet, or electric fry pan
- Spatula and fork
- Measuring cup and spoons
- 2 mixing bowls

* or a favorite recipe of your own





How To Do It

- ○ In one bowl, measure and mix together the flour, baking powder, sugar, and salt.
- ○ Crack the egg into the other bowl and beat with the fork.
- ○ Measure and add the milk and salad oil to the beaten egg.
- ○ Add the liquid mixture to the dry mixture. Stir with the fork until just moistened. (Over-mixing will create tough pancakes.)
- ○ Brush or spray the griddle or fry pan with oil.
- ○ Heat the griddle on medium heat.
- ○ Pour or spoon the mixture onto the hot griddle.
- ○ Watch the bubbles form in the pancakes.
- ○ Flip the pancakes over when they are bubbly all over and some bubbles begin to burst.
- ○ Remove the pancakes from the pan when they are golden brown.

QUESTIONS TO ASK YOUR CHILD

Ask open-ended questions that encourage further exploration by your child.

- ○ ○ *What happened when you beat the eggs?*
- ○ ○ *What happened when you mixed together the liquid and dry ingredients?*
- ○ ○ *What happened when you put the batter on the griddle?*
- ○ ○ *How did you know when it was time to flip the pancakes?*
- ○ ○ *Could you count the bubbles in the pancakes?*
- ○ ○ *How did the bubbles in the pancakes compare with the other bubbles you have seen?*

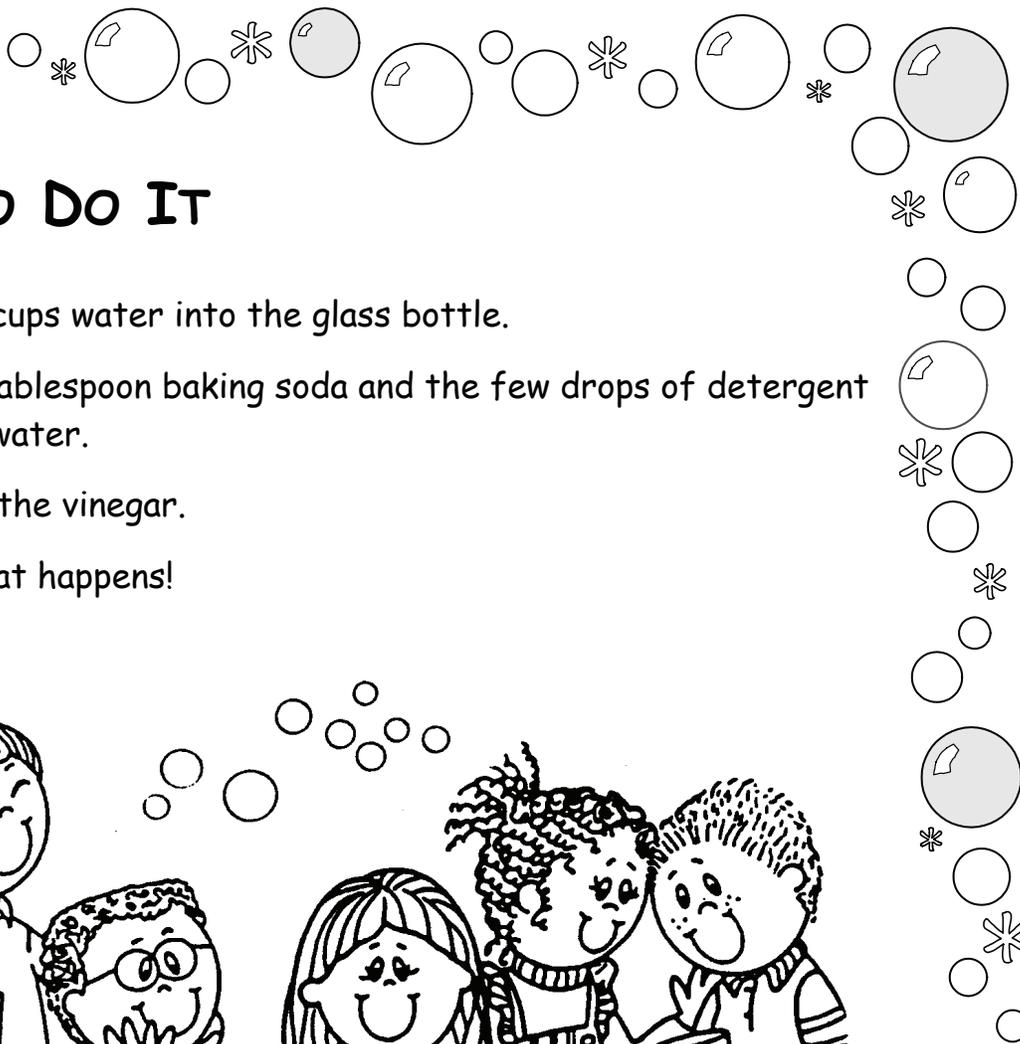
Soda Fountain Bubbles

You and your child will want to try this activity together. A chemical reaction produces tiny soap bubbles filled with carbon dioxide. The foam rises up and flows over the top of the bottle in a fountain of bubbles.



WHAT YOU NEED

- 2 cups water
- 1 tablespoon baking soda
- A few drops of liquid detergent (or a pinch of soap powder)
- 3 tablespoons vinegar
- 1 tall glass bottle



HOW TO DO IT

- ○ Pour 2 cups water into the glass bottle.
- ○ Add 1 tablespoon baking soda and the few drops of detergent to the water.
- ○ Pour in the vinegar.
- ○ See what happens!



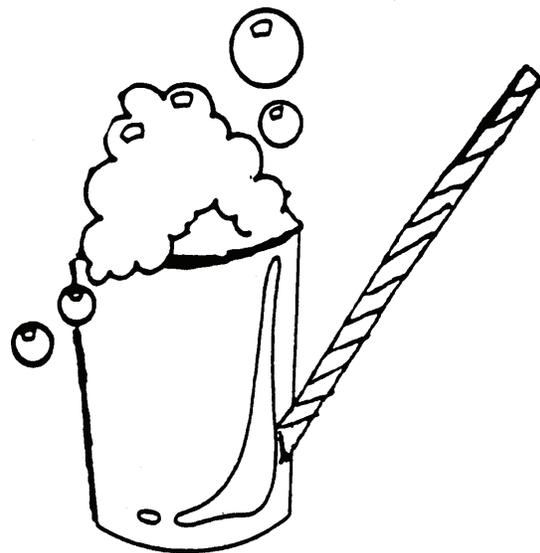
QUESTIONS TO ASK YOUR CHILD

Ask open-ended questions that encourage further exploration by your child.

- ○ ○ *What happened when you mixed together these ingredients?*
- ○ ○ *What did the bubbles look like? What do they remind you of?*
- ○ ○ *What do the bubbles smell like?*

Bubble Cups

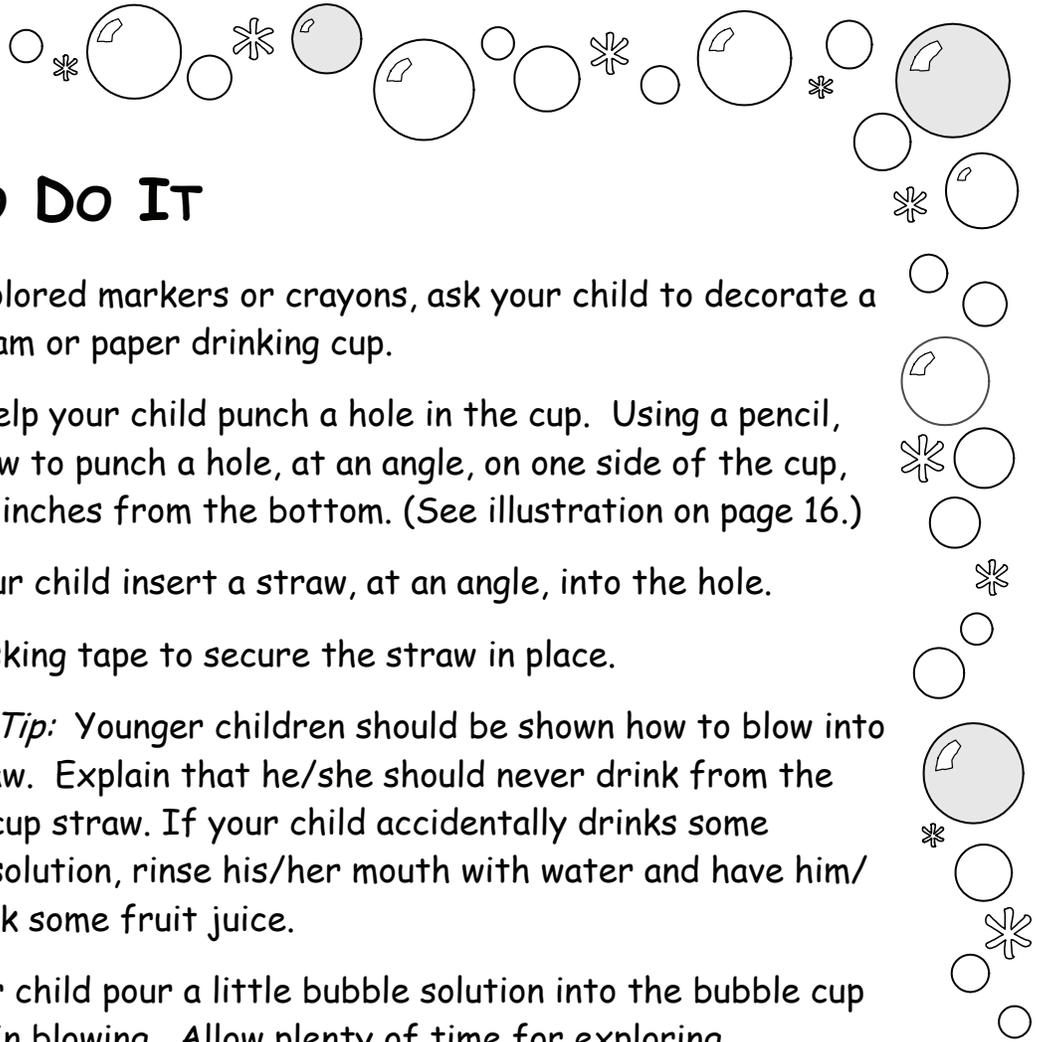
Bubble cups are easy-to-make machines that produce hundreds of bubbles with just a little blowing.



**HAPPY
BUBBLING!!**

WHAT YOU NEED

- Bubble solution — *see bubble recipes*
- Styrofoam or paper drinking cups
- Plastic drinking straws
- Masking tape
- Pencil
- Colored markers or crayons (*optional*)



HOW TO DO IT

- ○ Using colored markers or crayons, ask your child to decorate a styrofoam or paper drinking cup.
- ○ Next, help your child punch a hole in the cup. Using a pencil, show how to punch a hole, at an angle, on one side of the cup, about 2 inches from the bottom. (See illustration on page 16.)
- ○ Help your child insert a straw, at an angle, into the hole.
- ○ Use masking tape to secure the straw in place.
- ○ *Safety Tip:* Younger children should be shown how to blow into the straw. Explain that he/she should never drink from the bubble cup straw. If your child accidentally drinks some bubble solution, rinse his/her mouth with water and have him/her drink some fruit juice.
- ○ Let your child pour a little bubble solution into the bubble cup and begin blowing. Allow plenty of time for exploring.
- ○ Remember to make your own bubble cup and enjoy the bubble making with your child!!

QUESTIONS TO ASK YOUR CHILD

Ask open-ended questions that encourage further exploration by your child.

- ○ ○ *Describe how the bubbles looked. Were there different colors? Different sizes? Different shapes?*
- ○ ○ *How many bubbles do you think you made? How could you count them?*
- ○ ○ *What did the bubbles sound like?*
- ○ ○ *How did the bubbles feel?*

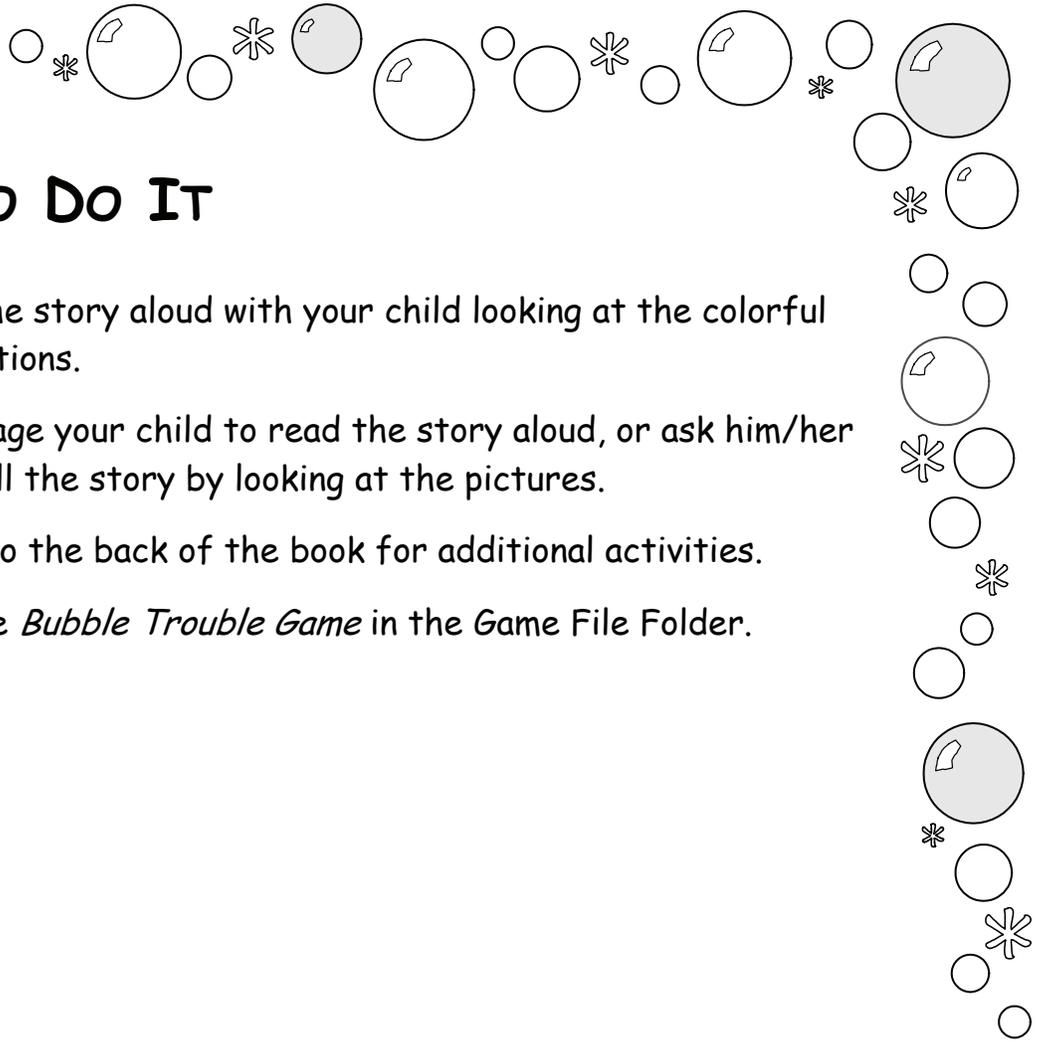
Bubble Trouble

In the book *Bubble Trouble* by Mary Packard, a curious boy discovers that he can make all sorts of bubbles. He looks for bubbles everywhere. You and your child will enjoy reading this boy's adventures and doing some of the activities found in the back of the book.



WHAT YOU NEED

- *Bubble Trouble* by Mary Packard — *in backpack*
- *Bubble Trouble Game Activity Sheet* — *see Game File Folder in backpack*
- *Bubble Trouble Activity Fun Sheet* — *page 21*



HOW TO DO IT

- ○ Read the story aloud with your child looking at the colorful illustrations.
- ○ Encourage your child to read the story aloud, or ask him/her to retell the story by looking at the pictures.
- ○ Refer to the back of the book for additional activities.
- ○ Play the *Bubble Trouble Game* in the Game File Folder.

QUESTIONS TO ASK YOUR CHILD

Ask open-ended questions that encourage further exploration by your child.

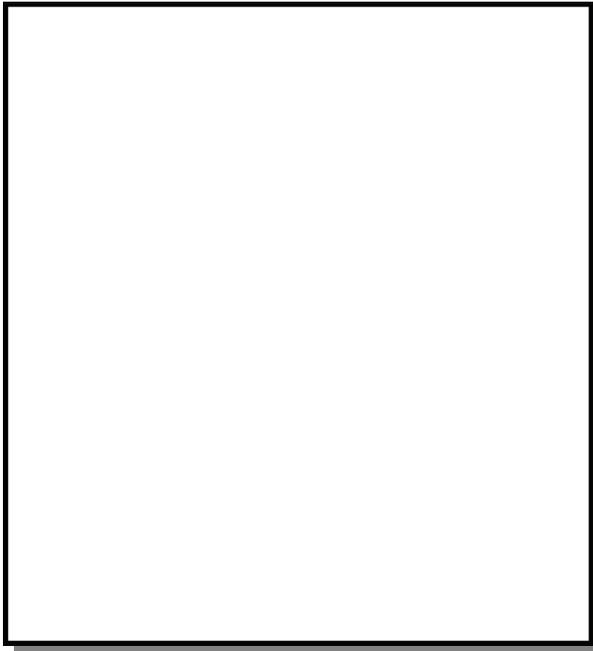
- ○ ○ *What was the story about?*
- ○ ○ *Have you ever had bubble troubles?*
- ○ ○ *Where do you think we can find bubbles around our home?*
- ○ ○ *How do you think the boy felt when he made a bubble mess?*

Making Bubbles

ATTENTION PARENTS AND KIDS!

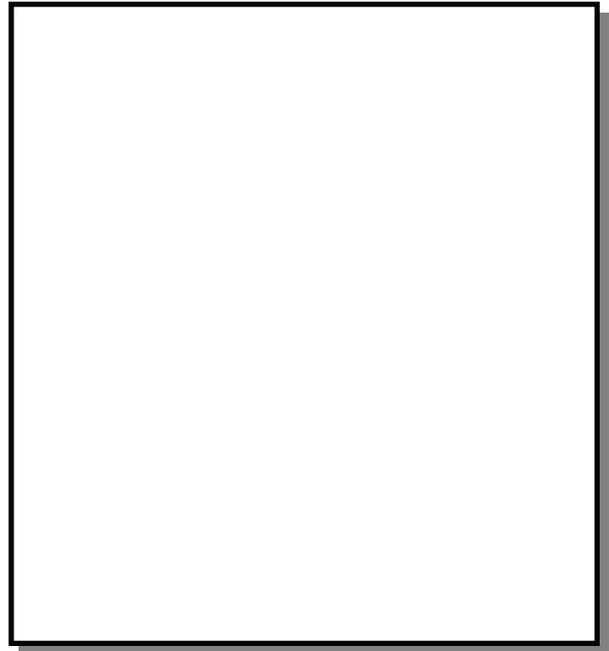
In the spaces below, draw a picture and write a few words about you making bubbles.

Picture of me making bubbles.



Parent

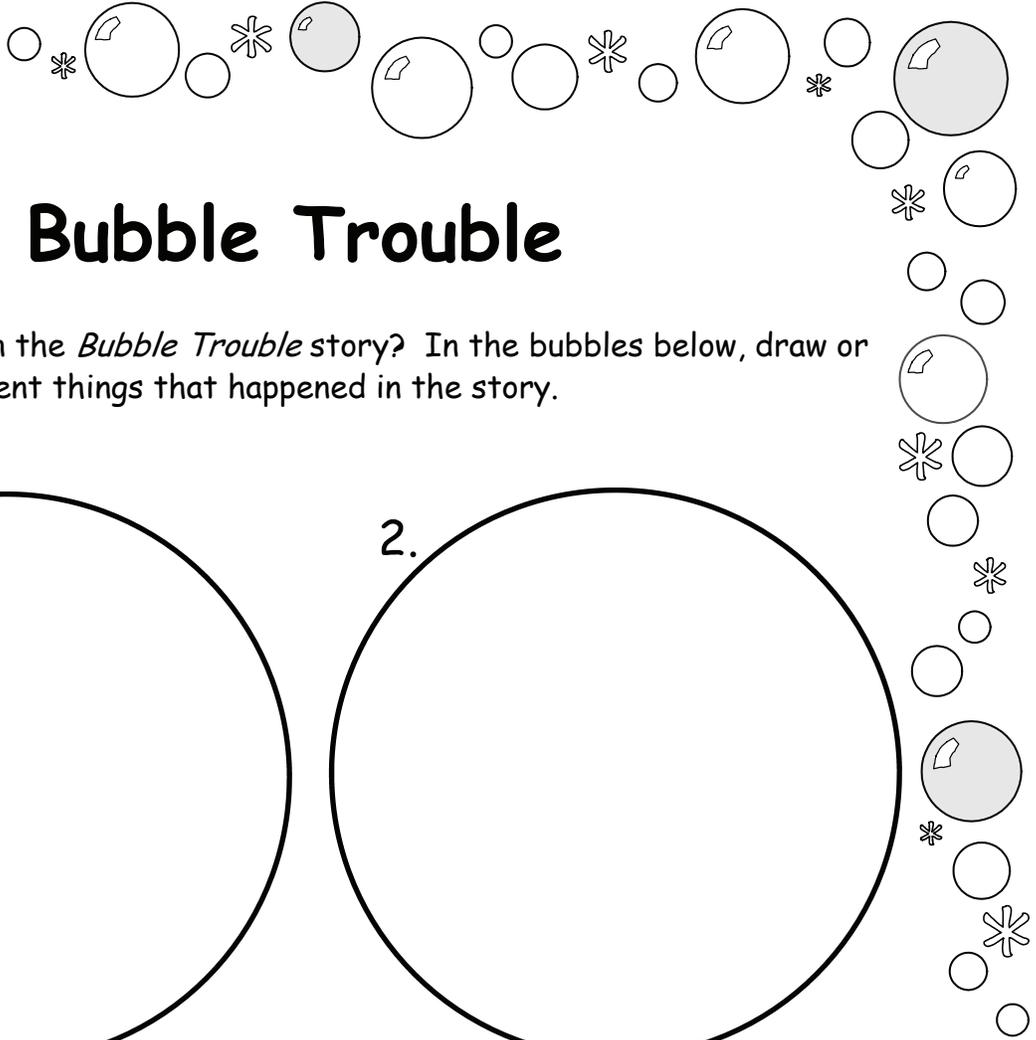
Picture of me making bubbles.



Child

When I make bubbles, I

When I make bubbles, I



ACTIVITY
FUN
SHEET

Bubble Trouble

What happened in the *Bubble Trouble* story? In the bubbles below, draw or write four different things that happened in the story.

1.

A large empty circle for drawing or writing.

2.

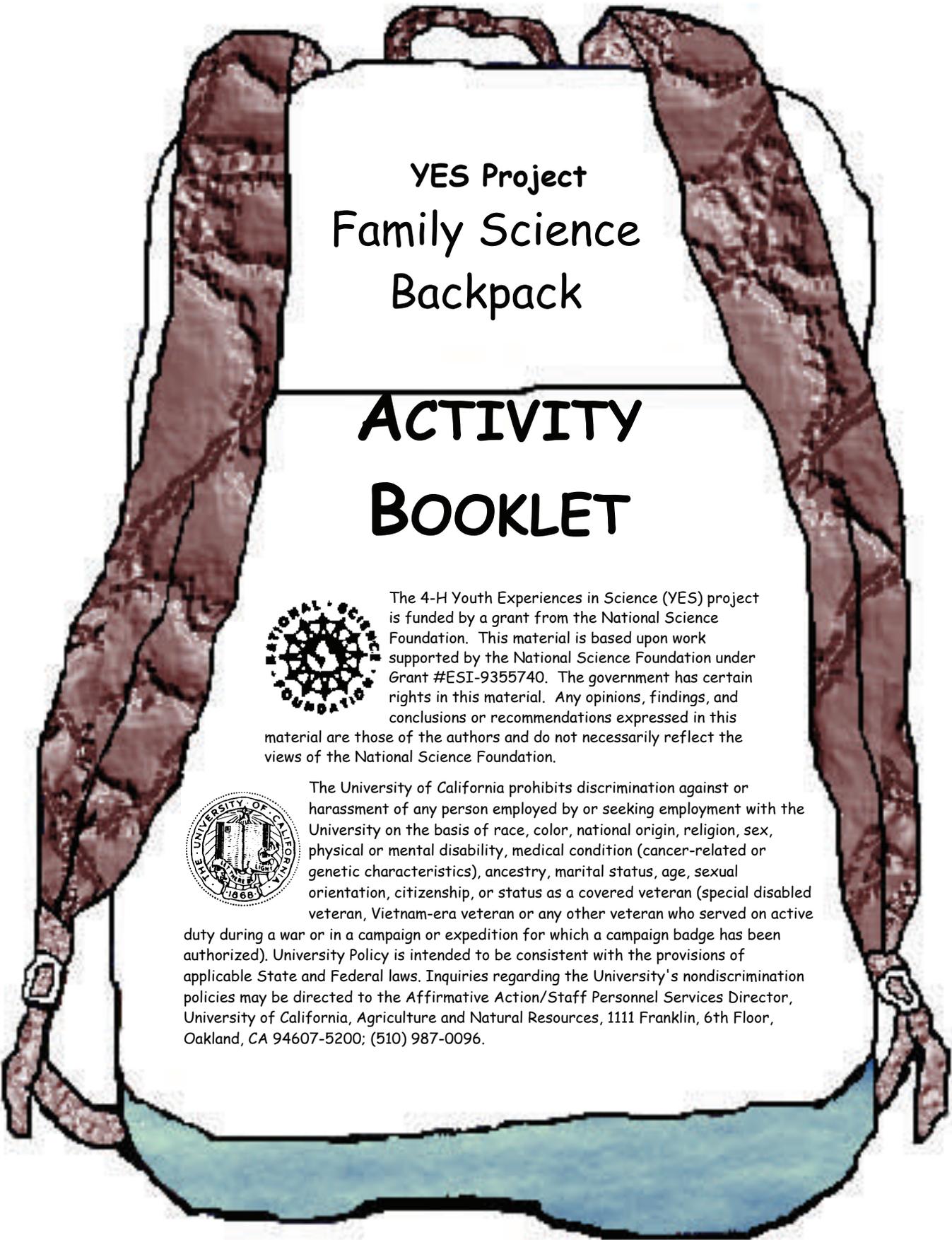
A large empty circle for drawing or writing.

3.

A large empty circle for drawing or writing.

4.

A large empty circle for drawing or writing.



YES Project Family Science Backpack

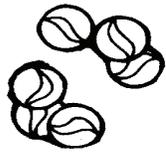
ACTIVITY BOOKLET



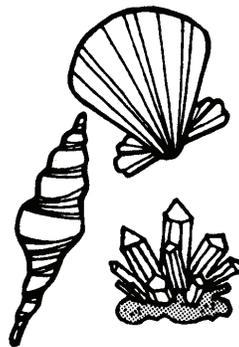
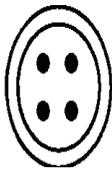
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The Collection Connection Teen Guide



4-H YOUTH EXPERIENCES IN SCIENCE PROJECT
 UNIVERSITY OF CALIFORNIA COOPERATIVE EXTENSION
 DIVISION OF AGRICULTURE
 AND NATURAL RESOURCES
 PUBLICATION 3405



The Collection Connection

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Welcome to the 4-H Youth Experiences in Science Project!

There is nothing like the **4-H YES Project** for providing high-quality children's science education in after-school settings. *4-H YES* uses specially trained teenage volunteers to conduct the hands-on science curriculum for children 5 to 8 years of age enrolled in school-age child care programs.

Each *YES* Theme Unit contains five or more 1- to 1½- hour sessions. Each session contains three or more activities that build upon the session's theme.

The session instructions provide an **Overview of the Day's Activities**, **Background Information** on the session's subject, a list of **Materials You Will Need** to conduct the session, a detailed outline on **Getting Ready**, the **Action** required, and specific **Sciencing** questions. When reading the curriculum, be sure to look for the **Tips** in the side column. They give valuable information on setting up and conducting the activities. At the end of the curriculum is a listing of all the supplies needed to conduct each activity.

The *YES* Curriculum incorporates inquiry-based activities with cooperative learning. It focuses on learning the scientific thinking processes and features the learning cycle model of instruction.

The **Scientific Thinking Processes** are built into each of the sessions. The processes of **observing**, **communicating**, **comparing**, and **organizing** are most commonly used in this curriculum aimed at younger children. The processes are indicated in small bold type after the **Action** and **Sciencing** sections of each activity.

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THE COLLECTION CONNECTION INTRODUCTION

Making, organizing, and sharing **collections** has always been a favorite pastime of children. They enjoy collecting everything from rocks and leaves to sports cards and dolls. Not only is it fun, but it is a great way for children to learn more about using the scientific thinking processes. As children develop *collections*, they use many of the same skills that scientists use everyday: **observation, comparison, classification, and communication.**

Children aren't the only ones who like and use *collections*. Throughout time, people have collected objects for a variety of reasons. Early humans collected sticks, brush, and branches to make fires to keep themselves warm and to ward off animals. Miners have collected metal ores to be melted down and shaped for uses such as horseshoes, tools, and flatware. *Collections* can have a specific purpose or are simply for personal enjoyment.

Scientists have made *collections* of plants and animals, soils and minerals, as well as data about volcanoes, earthquakes, and diseases. In businesses, people often have *collections* of shoes, candy, clothing, and appliances for sale. Even a library, dictionary, and an encyclopedia can be considered *collections* of books, words, and information.

Collections provide a wonderful way for children to apply the scientific thinking processes of **observing, communicating, comparing, and organizing.**

- **Observing**
Children are able to use their *collections* to look with a purpose. They can use their senses by looking, touching, tasting, smelling, and listening.
- **Communicating**
Children can use language, pictures, graphs, and other symbols to communicate their observations and findings from their *collections*.
- **Comparing**
Children can learn about the shape, color or size of their *collections* by comparing them to other objects. *Collections* help children observe how objects are alike and different.
- **Organizing**
Children can organize their *collections* in meaningful ways.

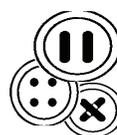
This helps young children better understand the relationships among materials or events in their environment. They can organize their *collections* according to specific attributes (color, size, shape); they can organize them according to a linear format called *seriation*. When children seriate their *collections*, they organize them in a continuum (from small to large, sharp to dull, rough to smooth, etc.)

Collections build on children's natural curiosity and interest in hunting for treasures and preserving them in some way. *Collections* provides hours of fun for young children and enhances their science learning.



BUTTONS, BUTTONS, DO YOU HAVE BUTTONS?

Approximate Time Required for Session: 1 hour



Purpose

- Children will have an opportunity to *explore* a collection of buttons.
- Children will *sort* and *classify* buttons into smaller groups.
- Children will use the buttons in their collections to play button games.

Overview of the Day's Activities

Buttons will be used to introduce children to the unit on collections. Teens will read the book *The Button Box* by Margarett S. Reid to introduce the session on *Buttons*. Children will sort buttons and chart their results.

Background Information

In the past, many people had button boxes full of loose or extra buttons. Buttons were useful parts of clothing. They were used to fasten shoes, pants, shirts, and coats. They were sometimes used as decorations on toys and clothing. Children have spent many hours stringing them to make toys and jewelry. Buttons come in many sizes, colors, shapes, designs, and are made of many kinds of materials.

Sorting and resorting buttons can help children develop the scientific thinking skills of *observing*, *communicating*, *comparing*, and *organizing*. They must look carefully at the buttons to notice how they are alike and how they are different. They can organize them by size, or by the number of holes in the buttons. The number of ways to organize buttons is surprising!

Presentation Notes

ACTIVITY A

A COLLECTION OF BUTTONS

Time Required
15 minutes

Suggested Grouping
large group

In this activity, you will help children begin to develop an interest in collections. They will have the opportunity to compare different buttons and sort them into smaller groups.

Materials You Will Need

- Button name tags
- Yarn
- Hole punch
- Markers or crayons
- The Button Box* by Margarett S. Reid
- Examples of collections (toys, baseball cards, rocks, coffee cups, miniatures)
- Buttons – a large variety and enough for each child to have 2 cup
- Plastic jar – 1 large
- Chart paper

Getting Ready

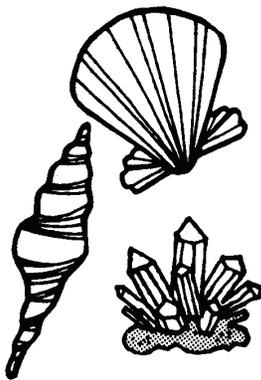
- 1** Gather all the needed supplies.
- 2** Read *The Button Box* several times before the session. Practice holding the book so all the children can see the illustrations.
- 3** Gather examples of collections to share with the children (*e.g., bottle caps, coffee mugs, match covers, rocks, sea shells, baseball cards, stamps*). Display them in a way that is easy for children to see.



- ④ Set up one or more tables, based on the number of youth participating.

ACTION: OBSERVING, COMPARING, AND COMMUNICATING

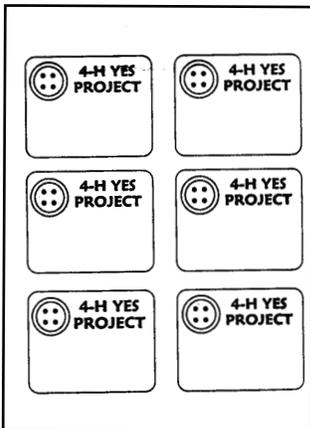
1. Have the children sit in a semicircle on the floor. Start the session by introducing yourself. Help each child make a button name tag. Explain that this unit is about *Collections*. Share the collections that you brought. One collection should be the jar of buttons. You might ask questions like the following.



- Do you have a collection at home?
- What do you collect?
- What collections have you seen?
- Do your parents or brothers and sisters have collections?

2. Next, ask what other kinds of things could make up a collection? List all the things that the children name. One teen should share with the children that scientists also *collect* groups of plants, animals, bones and rocks. Scientists *sort* or *group* things that are alike and different. We are going to use a button collection today to sort and compare.

3. Read the story *The Button Box* by Margarett S. Reid. Allow enough time for the children to observe the illustrations as you read the story.



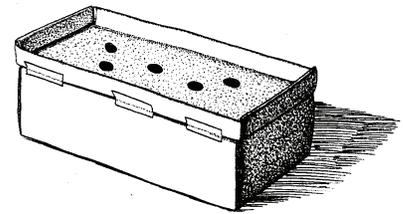
Tips for Successful Oral Reading

- **Setting the stage** - Have the children sit in a semicircle with your chair slightly higher. Ask some brief questions to build enthusiasm and encourage responses. Keep the book facedown or out of sight.
- **Presenting the book** - Show the book so the cover is clearly visible. Make sure the children can easily see the pictures. Tell them the name of the book, the author, and the illustrator. Discuss the illustrations.
- **Reading the book** - Use plenty of expression. Adjust your voice and speed of reading to fit the story. Keep children involved by asking "What do you think is going to happen?"
The most common mistake is reading too fast. Read slowly enough for the children to build mental pictures.



SCIENCING: COMMUNICATING AND COMPARING

1. Use the following questions and some of your own to help participants share their thinking about the story.
 - Describe some of the buttons you saw in the story.
 - How did the boy think some of the buttons were alike?
 - How do you think some of the buttons were different?
 - What were the different ways the boy sorted the buttons?



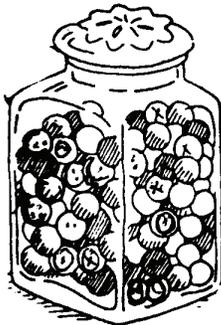
ACTIVITY B

GETTING TO KNOW YOUR BUTTONS

Time Required
15–20 minutes

Suggested Grouping
2–4 children

This activity will have children explore a button collection by sorting into several different kinds of groups. Children will compare each groups results and record them on a chart. Children will also predict the total number of buttons in the collection.



Materials You Will Need

- Crayons
- Zip-lock bags – small
- Buttons – one ½-cup bag for each group of 2 to 4 children
- Jar of buttons from *Activity A*
- Button Sorting Chart*
- Button Lotto Card*
- Masking tape

Getting Ready

- 1 Gather all supplies and sort crayons to match your buttons.
- 2 Make an enlarged *Button Sorting Chart* (similar to the attached chart; make sure the colors correspond with the color buttons you have).
- 3 Put ½ cup or more of buttons into small ziplock bags, one bag for each 2 to 4 children.
- 4 Make *Button Lotto* cards. You will need one per child. You may want to make cards with different attributes; 3 to 4 different cards.

BUTTON SORTING CHART																								
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
RED																								
BLUE																								
GREEN																								
YELLOW																								
PURPLE																								
BROWN																								
WHITE																								
BLACK																								
PINK																								
GREY																								

- 5 While one teen is reading the book in *Activity A*, another teen should put ziplock bags of buttons at the tables.

ACTION: OBSERVING, COMPARING, ORGANIZING, AND COMMUNICATING

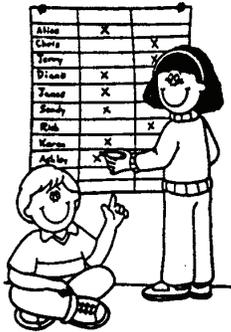
1. Move the children to the tables in groups of 2 to 4.
2. Ask the children to empty the bag of buttons on to the table. Ask them to observe the button collection and tell them that they will sort or group the buttons like the boy in the story.
3. Ask the children first to sort the buttons by color. They should group all the buttons that are similar.
4. When it appears that most of the groups have completed the task, move on to the *Sciencing* questions.

SCIENCING: COMMUNICATING AND COMPARING

1. Ask the children to count how many groups they sorted.
2. Using the *Button Sorting Chart*, have the children report which color group had the most buttons (e.g., white buttons, red buttons). Color in one cell of the corresponding colored square on the chart.
3. Ask the children to look at the chart and determine which color buttons had the most and the least.



Tip
Sorting
is grouping things that are similar, use words like “group the buttons that are alike and different.”



MORE ACTION

- Next, have the children sort by size. Ask the children to look at how the other children at their table sorted the buttons.
 - Did all the groups look alike?
 - Did anyone sort from the smallest to the largest? This is called *seriation*. Have the children seriate part of their collection from smallest to largest.
- Ask the children to think of one more way they could sort the buttons and have them do so. Have the children share how they sorted this time.
- Pass out *Button Lotto* sheets and have each child complete the *Button Lotto* game using their button collection.
- Gather the button collections and clear the tables.

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 UNIVERSITY OF CALIFORNIA
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SESSION 1

BUTTONS, BUTTONS...BUTTONS

BUTTON LOTTO

Place a button on each square that matches the description.

A WHITE BUTTON	A BUTTON WITH TWO HOLES	A GOLD BUTTON
A BUTTON WITH FOUR HOLES	A RED BUTTON	YOUR FAVORITE BUTTON
A BUTTON WITH NO HOLES	A BROWN BUTTON	A SMALL BUTTON

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Tip
Sorting from smaller to larger is called "sequence ordering."

Presentation Notes

ACTIVITY C

BUTTON PUZZLES

Time Required
15–20 minutes

Suggested Grouping
teams of 2 to 3 children

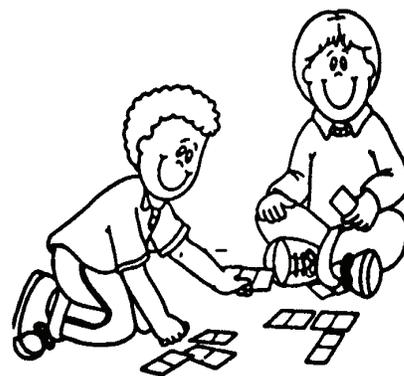
In this activity, children will have a chance to unscramble button puzzles and reorganize buttons to solve different puzzles.

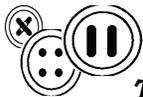
Materials You Will Need

- A collection of buttons
- Puzzle directions — 1 copy for each child
- Puzzle solutions
- Plain white paper — 20 sheets
- Marking pens

Getting Ready

- ❶ Gather all the needed materials and prepare tabletop work areas.
- ❷ Copy the directions and the solutions for each child.
- ❸ Review the puzzles and the solutions so you can assist the children.
- ❹ Mount the directions to each puzzle on card stock. Place the solution on another card. Make enough cards so that each team has one.
- ❺ Each table should be a different game with multiple teams. Have at least one teen per table to assist with the puzzles.





Tip
After-school staff can be helpful in placing children who work well together. Each group should include one older child to help with game directions.

ACTION: ORGANIZING AND OBSERVING

1. Ask children to choose teams of two to three students and to seat themselves at the tables.
2. Put a direction card and a pile of a variety of buttons on each table.
3. Explain the directions for the activity. Assist the children in placing the buttons in the needed arrangements. Encourage the children to solve the puzzle. When they think they have the solution, check to see if it is correct. If incorrect, have them try again.
4. Have children rotate to as many different puzzles as time allows.
5. After playing each game, ask the following *Sciencing* questions.

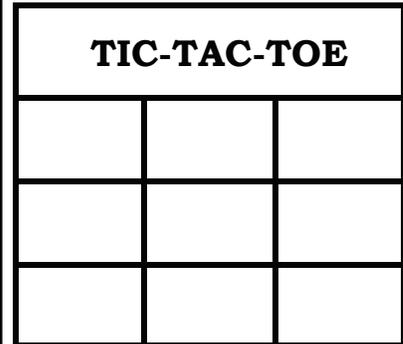
SCIENCING: COMMUNICATING AND OBSERVING

1. Ask questions regarding the puzzles.
 - How many were able to solve one puzzle?
 - How many were able to solve two puzzles?
 - How many were able to solve all the puzzles?
 - Which puzzle was the easiest?
 - Which puzzle was the hardest?

BUTTON PUZZLE #1
TIC-TAC-TOE

Directions

- ◆ Each player has three buttons of the same kind or color. Draw a tic-tac-toe game.
- ◆ The first player places a button in any cell except the center. Players then alternate turns until all buttons are on the tic-tac-toe board.
- ◆ If neither player has won by getting three in a row, each is allowed to move a button in turn to an adjacent square. However, players can only move horizontally or vertically, not diagonally.
- ◆ The game is over when one player gets three in a row.

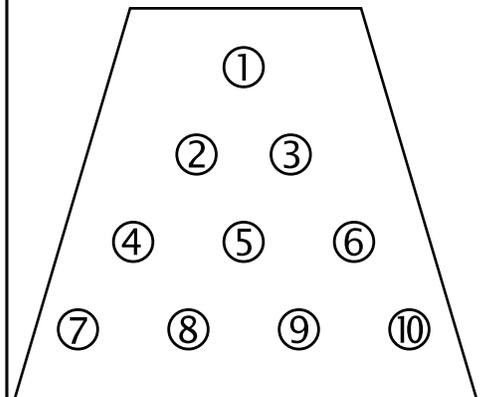


BUTTON PUZZLE #2
BUTTONS UP

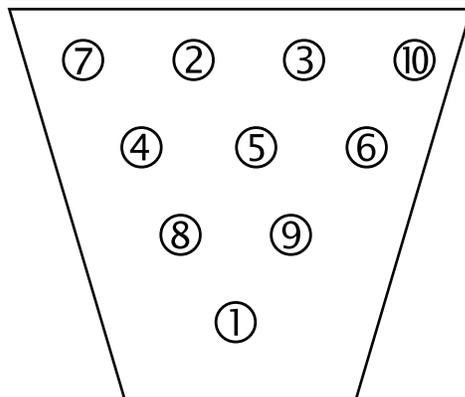
Directions

- ◆ Working as a team of two or three players, form a triangle with ten buttons as shown. Reverse the triangle so that it points down instead of up, by moving only **three** buttons.

BUTTONS UP



Answer

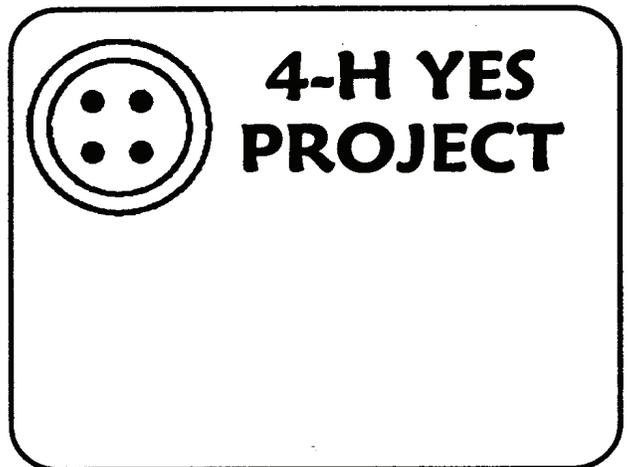
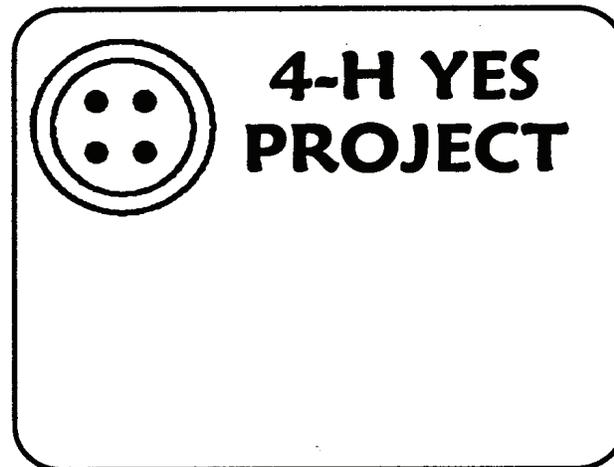
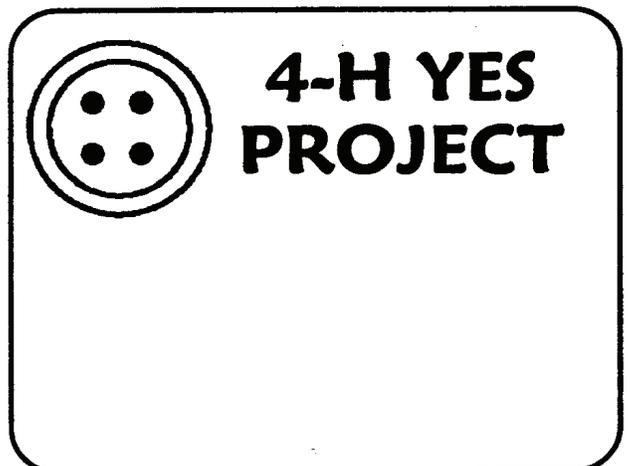
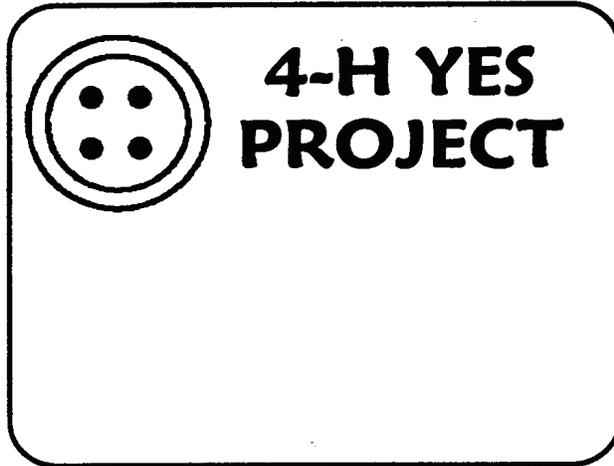
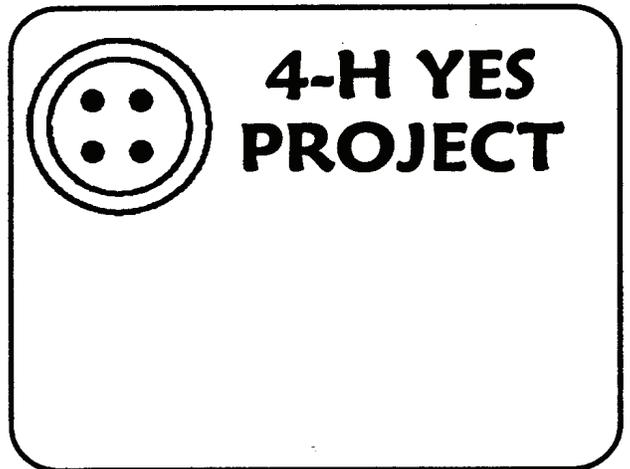
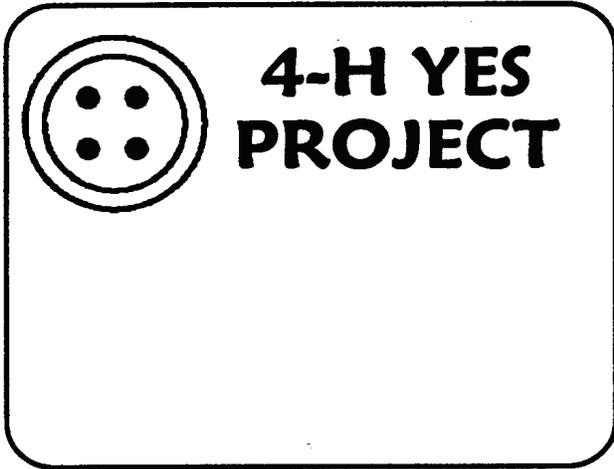


PUZZLE #3**ROLLING FOR RICHES*****Directions***

- ◆ Use a collection of buttons and one die. Take turns rolling the die. The die indicates the number of buttons a player will collect (for example, if they roll a 2, they take two buttons).
- ◆ The puzzle ends after each player has rolled the die five times. Then, count the buttons to see who has the most money. Another way is to give each player 20 pennies and have them “spend” money according to the roll of the die until one player is out of money.



BUTTON NAME TAG PATTERN



BUTTON SORTING CHART

C O L O R	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
B R O W N																				
R E D																				
Y E L L O W																				
B L U E																				
G R E E N																				
P U R P L E																				
W H I T E																				
B L A C K																				

BUTTON LOTTO

Place a button on each square that matches the description.

<p>A WHITE BUTTON</p>	<p>A BUTTON WITH TWO HOLES</p>	<p>A GOLD BUTTON</p>
<p>A BUTTON WITH FOUR HOLES</p>	<p>A RED BUTTON</p>	<p>YOUR FAVORITE BUTTON</p>
<p>A BUTTON WITH NO HOLES</p>	<p>A BROWN BUTTON</p>	<p>A SMALL BUTTON</p>

ROCK AND ROLLING

Approximate Time Required for the Session: 1½ hours

Purpose

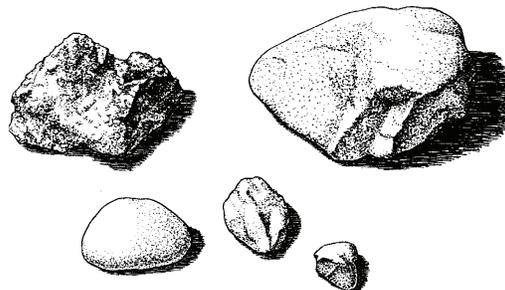
- Children will use a rock collection to develop skills of *observation, comparison, and communication.*
- Children will collect rocks and organize and mount their own rock collection.
- Children will use their senses in *sorting and classifying* rocks.

Overview of the Day's Activities

In this session, you will introduce the subject by having the children listen to the sounds made by rocks when shaken in boxes. Children will then go on their own *Rock Treasure Hunt* and organize and mount the rocks that they collect. Children will play *Shoe-Box Mysteries* and create a *Rockin' Art Project*, and make no-bake *Big-Rock Cookies*.

Background Information

Rocks provide a wonderful way for children to practice their sorting and organizing skills. With the plentiful supply of different rocks in almost any environment, children can continue their rock collecting after the *YES* Sessions.



ACTIVITY A

SHOE-BOX MYSTERIES

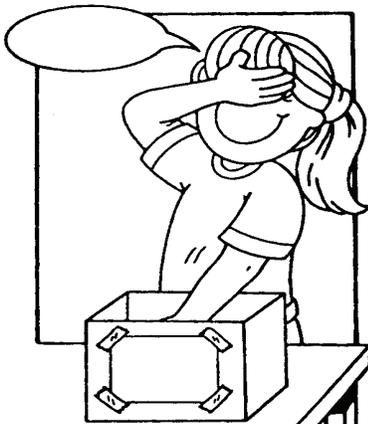
Time Required
10–15 minutes

Suggested Grouping
large group

In this activity, you will introduce children to the session's topic: rock collections. Using shoe boxes with different sizes and shapes of rocks in them, ask the children to use their sense of hearing to identify what they think are in the boxes.

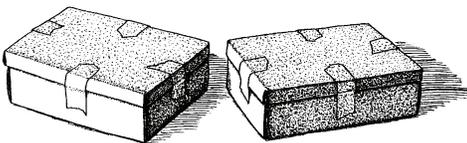
Materials You Will Need

- Sand – 1 to 2 cups
- Rocks – at least 3 or 4 different types of rocks (gravel, landscape rock, a large rock, etc.)
- Shoe boxes, one for each type of rock and sand. *(Make sure the shoe boxes have solid bottoms so the sand and rocks don't slide out.)*
- Chart paper
- Markers
- Masking tape



Getting Ready

- ❶ Gather all the needed supplies. Make sure to get a variety of rocks so that the sounds made in the shoe boxes are different.
- ❷ Put the rocks and sand in separate shoe boxes and tape shut.
- ❸ On the top of two sheets of chart paper, write the words **“Hearing”** and **“Seeing.”** You may also want to draw a picture of an ear and an eye on the sheets for the non-readers.



ACTION: OBSERVING, COMPARING, AND COMMUNICATING

1. As you introduce this activity, start your session by telling the children that they will be learning more about collections. Today, they will have a chance to use their sense of hearing to identify a mystery collection in a box.
2. Start by holding up a shoe box and shaking it. Ask the children what they think is inside the box. Record their predictions on the *Hearing Sheet*.
3. Next, hold up the other boxes, one at a time, and ask the children to tell you what they hear. Record their observations and predictions, again on the *Hearing Sheet*.
4. Distribute one box to each table or group of children. Ask the children to open the boxes and observe the contents. This time using their sense of sight, ask the children to describe what they observe. Record their responses on the *Seeing Sheet*. Compare with the earlier predictions.

SCIENCING: OBSERVING, COMPARING, AND COMMUNICATING

1. Ask the children to review the words on the chart that were used to describe the contents of boxes from what they heard and saw. Ask them to identify words that were the same and different.
2. Ask them to review their predictions. Were they correct? Why would the predictions be different from what was really inside the box?



Hearing



Tip
Don't say anything about rocks as you introduce the activity.



Seeing

ACTIVITY B**ROCK TREASURE HUNT**

Time Required
30–40 minutes

Suggested Grouping
individuals or teams

Teens will lead a treasure hunt in search of rocks. Children will collect rocks and then mount them according to their own organizational criteria.

Materials You Will Need

- Rock Treasure Hunt List* of rocks for the children to collect
- Brown paper bags — 1 per child or team
- Stapler and staples
- Markers
- Cardboard pieces or shoe boxes — 1 per child or team
- White glue

Getting Ready

- ❶ Gather the needed supplies. Make sure you have enough bags. If children work individually, lunch bags can be used. If children are working in teams, use a grocery bag.
- ❷ Review the rock list provided, making sure that the rocks listed are available in your designated treasure hunt area. You may want to bring in some spare rocks if your area is lacking in rocks. Duplicate the rock list and staple it to the outside of the brown paper bags.
- ❸ Review the outside area of the school-age child care site as to suitable locations for children to conduct the treasure hunt for rock collecting.
Check with the school-age child care staff for any areas that may be unsafe or off-limits.

ACTION: OBSERVING, ORGANIZING, COMPARING, AND COMMUNICATING

1. Tell children that they now will have an opportunity to go on a treasure hunt in search of their own rocks. Pass out the brown paper bags to the children with the attached list of rocks.
2. Go over the list of rock names before going outside. Make sure that children understand the instructions. *Discuss safe behavior and any restrictions in their searching.* Encourage the children to collect other types of rocks that are not on their list. Let them know that they don't have to find all of the rocks on the list.
3. Take the children outside and let them search for their rocks until all children find a fair amount of the rocks on the list. Through questions, encourage children in their search.
4. After the children have collected the rocks, return to your observation areas. Have the children sort through their rocks.



SCIENCING: COMPARING, ORGANIZING, AND COMMUNICATING

1. Ask the children to show the rocks that they collected. Ask them to describe where they found the rocks. Ask them if the rocks were found in different places. Ask if they were able to find many of the rocks on their list. Were they able to find other rocks?
2. Record the children's responses on chart paper.

ROCK AND ROLLING		SESSION 2
ROCK TREASURE HUNT LIST	ROCK TREASURE HUNT LIST	
See how many of the rocks listed you can find!	See how many of the rocks listed you can find!	
___ Black Rock	___ Black Rock	
___ White Rock	___ White Rock	
___ Rough Rock	___ Rough Rock	
___ Smooth Rock	___ Smooth Rock	
___ Rock with 2 colors	___ Rock with 2 colors	
___ Rock with 3 colors	___ Rock with 3 colors	
___ Round Rock	___ Round Rock	
___ Small Rock	___ Small Rock	
___ Large Rock	___ Large Rock	
___ Rock that you like!	___ Rock that you like!	

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MORE ACTION: OBSERVING,
COMPARING, AND ORGANIZING

1. Pass out the cardboard sheets or the shoe boxes. Ask the children to organize their rock collection any way that they would like and mount it with glue on the cardboard or shoe boxes. Explain that scientists mount or display their collections.
2. Make sure each table has enough glue for mounting the rocks. Have markers or crayons available if the children want to label their rock collections.

 **Tip**
Have the children lay their collection flat to dry overnight.

MORE SCIENCING: COMPARING
AND COMMUNICATING

1. Ask each child or team to describe their rock collection to the larger group.
2. Ask them to describe how they organized their rocks. Ask them to tell *why* they organized their collection in this manner.

Presentation Notes

ACTIVITY C

ROCK PAINTING

Time Required

15 minutes

Suggested Grouping

children at tables or
work areas

In this activity, children will be painting a design or picture on a rock that they collected or on a rock that you provide.

Materials You Will Need

- Flat rocks large enough to paint on
- Acrylic paint – assorted colors
- Paint brushes
- Newspapers
- Cups of water
- Paper plate – 1 for each table or work area

Getting Ready

- ❶ Gather enough flat rocks so each child has one. *Rocks should be large enough so children can paint a picture or design on the rock's surface. Wash and dry the rocks if they are dirty.*
- ❷ Determine in advance where the children will be painting and cover the areas or tables with newspaper.
- ❸ Set paints, brushes, and cups of water on each table, making sure there are adequate supplies for each child. Squirt some of each color of paint on the paper plates so the children won't be competing to use the paint bottles.



**ACTION: OBSERVING AND ORGANIZING**

1. Tell the children they will be painting rocks with their own designs. Discuss where the activity will be done and the importance of sharing the supplies.
2. Encourage the children to be creative in their artwork.
3. When the children have finished painting have them place their rocks in an area to dry.
4. While the rocks are drying, prepare the *Big-Rock Cookies*.

Preparation Notes

ACTIVITY D

BIG-ROCK COOKIES (OPTIONAL)

Time Required
5–20 minutes

Suggested Grouping
small groups

Children will make no-bake, Big-Rock Cookies in this activity.

Materials You Will Need

For each recipe yielding 3–4 dozen cookies, you need the following:

- Sugar – 2 cups
- Water – ½ cup
- Margarine – ½ cup
- Powdered cocoa – 3 tablespoons
- Peanut butter – ½ cup
- Salt – ½ teaspoon
- Oatmeal – 4 cups, uncooked
- Powdered milk – 1 cup
- Raisins – 1 cup
- Vanilla – 1 teaspoon
- 2-quart saucepan
- Stove top or portable burner
- Cookie sheet
- Measuring spoons
- Measuring cups
- Spoons
- Napkins
- Large mixing bowl

Getting Ready

- 1 Gather all the needed supplies. The above supplies are based on one recipe that will make 3–4 dozen cookies. If you have a large group of children, you will need to make additional



Tip
Some children have food allergies; check with the site staff. If some do have allergies, they can help make the cookies but you or the staff should provide another snack.

ROCK AND ROLLING

SESSION 2

BIG-ROCK COOKIES

For each recipe that makes 3–4 dozen cookies you need the following:

- Sugar – 2 cups
- Water – ½ cup
- Margarine – ½ cup
- Powdered cocoa – 3 tablespoons
- Peanut butter – ½ cup
- Salt – ½ teaspoon
- Oatmeal – 4 cups, uncooked
- Powdered milk – 1 cup
- Raisins – 1 cup
- Vanilla – 1 teaspoon
- 2-quart saucepan
- Stove top or portable burner
- Cookie sheet
- Measuring spoons
- Measuring cups
- Spoons
- Napkins
- Large mixing bowl

Help the children prepare the recipe according to the following directions.

- Measure the sugar, water, margarine, cocoa, peanut butter, and salt. Put them into the saucepan and mix slightly.
- Cook over low heat until the mixture comes to a boil. Boil for 1 minute and set aside.
- Measure the oatmeal, powdered milk, and raisins, and pour into a large mixing bowl. Stir until well blended.
- Add the heated mixture to the dry ingredients in the bowl. Mix thoroughly.
- Drop by teaspoons onto a cookie sheet. Let cookies cool until firm.

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The Collection Connection

See page 30



Tip
As you are preparing the Big-Rock Cookies, make sure that all children have an opportunity to contribute by measuring, stirring, etc.



recipes; you should increase the supplies accordingly.

- ② Although this recipe is for a no-bake cookie, it does require heating. Locate a stove top burner or bring a portable burner for the session.
- ③ Some children in the group may be allergic to cocoa. Check with the school-age child care staff. If some children are allergic to cocoa, you can omit it from the recipe.
- ④ Prepare a clean work area for this activity and set it up so the children can easily access the materials.

ACTION: COMMUNICATING AND OBSERVING

1. Help the children prepare the recipe according to the following directions.
 - Measure the sugar, water, margarine, cocoa, peanut butter, and salt. Put them into the saucepan and mix slightly.
 - Cook over low heat until the mixture comes to a boil. Boil for 1 minute and set aside.
 - Measure the oatmeal, powdered milk, and raisins, and pour into a large mixing bowl. Stir until well blended.
 - Add the heated mixture to the dry ingredients in the bowl. Mix thoroughly.
 - Drop by teaspoons onto a cookie sheet. Let cookies cool until firm.
2. As the children are preparing the cookies, ask questions about what they are doing and why it is important.
3. Clean up the work area.

ACTIVITY E

SANDBOX CONCENTRATION

(OPTIONAL)

Time Required

10–20 minutes

Suggested Grouping

groups of two to three

This activity will allow children to practice their memory skills using the popular game of concentration and a collection of rocks.

Materials You Will Need

- Dishpan or other shallow pan, box or container
- Sand to fill the container to about 2”-3” of the top
- Six to ten sets of rocks

Getting Ready

- ❶ Gather the needed supplies.
- ❷ Fill the dishpan or container to 2”-3” inches of the top.
- ❸ Bury in the sand one of each pair of matching rocks.
- ❹ Set up the *Sand Box Concentration* activity in an area where children can easily access the box and dig through the sand.

ACTION: OBSERVING, COMPARING AND COMMUNICATING

1. Set up the *Sand Box Concentration* materials in an area where all children can observe.
2. *Explain the activity:* Children will select one of the rocks on the table and dig in the sand to find its match pair. If the child finds the matched pair, then he gets to keep both rocks and the next player has a turn. If he is unable to match the rocks, he buries the rock and the play moves to the next player. The play continues until all the rocks were matched.
3. *For older children:* Bury all the rocks. The children dig for two rocks, trying to match the two. If a match is made they keep the rocks. If no match is made, the rocks are both reburied.
4. Use this activity as a filler to the other session activities. This activity can also be put in the *Collection Science Center*, so children can play at a later time.

<p align="center">ROCK TREASURE HUNT LIST</p>	<p align="center">ROCK TREASURE HUNT LIST</p>
<p align="center">See how many of the rocks listed you can find!</p> <p>_____ <i>Black Rock</i></p> <p>_____ <i>White Rock</i></p> <p>_____ <i>Rough Rock</i></p> <p>_____ <i>Smooth Rock</i></p> <p>_____ <i>Rock with 2 colors</i></p> <p>_____ <i>Rock with 3 colors</i></p> <p>_____ <i>Round Rock</i></p> <p>_____ <i>Small Rock</i></p> <p>_____ <i>Large Rock</i></p> <p>_____ <i>Rock that you like!</i></p>	<p align="center">See how many of the rocks listed you can find!</p> <p>_____ <i>Black Rock</i></p> <p>_____ <i>White Rock</i></p> <p>_____ <i>Rough Rock</i></p> <p>_____ <i>Smooth Rock</i></p> <p>_____ <i>Rock with 2 colors</i></p> <p>_____ <i>Rock with 3 colors</i></p> <p>_____ <i>Round Rock</i></p> <p>_____ <i>Small Rock</i></p> <p>_____ <i>Large Rock</i></p> <p>_____ <i>Rock that you like!</i></p>

BIG-ROCK COOKIES

For each recipe that makes 3–4 dozen cookies you need the following.

- Sugar – 2 cups
- Water – $\frac{1}{2}$ cup
- Margarine – $\frac{1}{2}$ cup
- Powdered cocoa – 3 tablespoons
- Peanut butter – $\frac{1}{2}$ cup
- Salt – $\frac{1}{2}$ teaspoon
- Oatmeal – 4 cups, uncooked
- Powdered milk – 1 cup
- Raisins – 1 cup
- Vanilla – 1 teaspoon
- 2-quart saucepan
- Stove top or portable burner
- Cookie sheet
- Measuring spoons
- Measuring cups
- Spoons
- Napkins
- Large mixing bowl

Help the children prepare the recipe according to the following directions.

- Measure the sugar, water, margarine, cocoa, peanut butter, and salt. Put them into the saucepan and mix slightly.
- Cook over low heat until the mixture comes to a boil. Boil for 1 minute and set aside.
- Measure the oatmeal, powdered milk, and raisins, and pour into a large mixing bowl. Stir until well blended.
- Add the heated mixture to the dry ingredients in the bowl. Mix thoroughly.
- Drop by teaspoons onto a cookie sheet. Let cookies cool until firm.

COIN COLLECTORS

Approximate Time Required for Session: 1½ hours

Purpose

- Children will develop the skills of *observation* and *communication* through activities that involve estimating and measuring.
- Children will develop the skills of *comparison* and *organization* through coin collection activities.

Overview of the Day's Activities

You will help children discover more about *Collections*. This session's collection is *Coins*. Children will observe and compare coins by predicting, estimating, and weighing different and similar coins. They will observe, organize, and communicate as they create coin rubbings and solve coin puzzles.

Background Information

The study of the collection of coin's is called *numismatics*. Collecting coins is more popular than collecting paper money. The value of coins depends on their condition. Coins that have not been circulated are worth more than worn coins. Older coins tend to be worth more than recent releases. The first coins minted were silver half cents. Some of them are worth \$20,000. Mistakes in printing also raise the value. The 1937 three legged buffalo nickels are worth \$80 to \$1,500. Ordinary 1937 nickels are valued at \$.30 to \$25.00.



ACTIVITY A

PENNIES WITH A PURPOSE

Time Required
10–15 minutes

Suggested Grouping
1 large group at tables

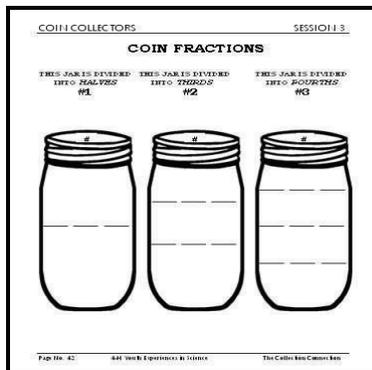
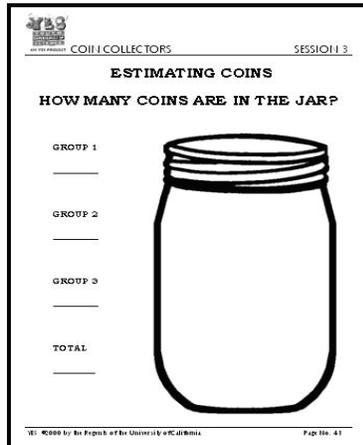
In this activity, you will help the children estimate or predict the number of pennies in a container. The children will also sort pennies according to different attributes.

Materials You Will Need

- Clear ½-pint jars — 4 (straight, not tapered bottoms)
- Pennies — \$8.00 worth
- Permanent marking pen — 1
- Estimating Coins* poster
- Coin Fractions* poster
- Chart paper and markers

Getting Ready

- 1 Gather all of the needed supplies.
- 2 Make the *Estimating Coins* and *Coin Fractions* posters (use the enclosed charts as your guide).
- 3 Fill a ½-pint jar with pennies. Record the number of pennies the jar contains.
- 4 Using the permanent marker, draw a circle around another jar at the half-way mark (use the fraction chart as your guide). Label the lid on the jar as number *One*. On jar number *Two*, draw two circles at the one-third and two-thirds levels. On jar number *Three*, draw three circles at one-quarter, one-half, and three-fourths levels.



ACTION: OBSERVING, ORGANIZING, AND
COMPARING

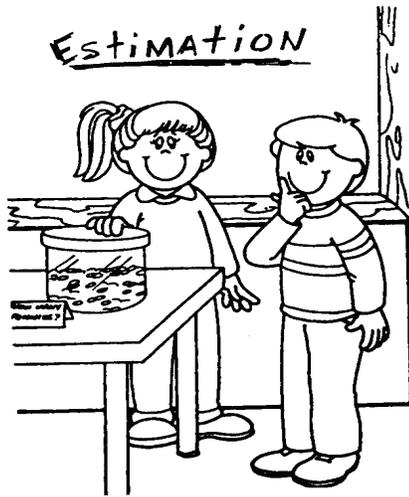
1. Show the children the jar of pennies. Ask how many pennies they think are in the jar. Record the children's estimations on chart paper or black board.
2. Next, divide the children into three groups.
3. Pass out one marked and labeled jar to each group. Give each group enough pennies to fill their jar to the first circle.
4. Have the group fill the jar to the first circle. Have them count the number of pennies it took.
5. When all the groups are done, have one child from each group write the number of pennies they have in the appropriate jar on the fraction poster.

SCIENCING: COMMUNICATING AND
COMPARING

1. Have the children compare the three jars.
 - Which one had the most pennies?
 - Which one had the least?
2. Show the children the original jar again.
 - Now which jar has the most?
 - Which estimation do you think is the closest?
3. Ask the children if they would like to estimate again. Record these estimations on the *Coin Estimation Poster*.



Tip
If there are more than 20 children, you may need to divide them into 6 groups and rotate them. You will also need three more jars and more pennies.



MORE ACTION

1. Have the children pick up any extra pennies and then put the jars aside.
2. Give each group approximately one-third of the pennies from the original jar. Ask each group to count their pennies.
3. Have a child from each group put their answer on the *Estimation Poster*. Add all the numbers to get the total.

SCIENCING

1. Which estimation was the closest? Was the closest estimation from the first set or second set of estimations?
2. Have each child take a handful of pennies and move to the tables.
3. Have the children work in groups of two or three. Ask them to look at their pennies and figure out one way to sort them. Have them sort them.
4. Have the children look at the other groups pennies at their table. Ask them to guess how each group sorted their pennies.
5. Have the children share how they sorted their pennies. Record all the different attributes.

ACTIVITY B

JUST A DROP OF WATER

Time Required
10–15 minutes

Suggested Grouping
5 to 6 children per group

In this activity, children will predict and chart how many drops of water they can fit on different coins.

Materials You Will Need

- Drops of Water Chart
- Pennies – 10 to 15
- Dimes – 10 to 15
- Quarters – 10 to 15
- Nickels – 10 to 15
- Eyedroppers – 8
- Water – 1 quart
- Sponges and paper towels for cleanup
- Paper cups – 6 to 8

Getting Ready

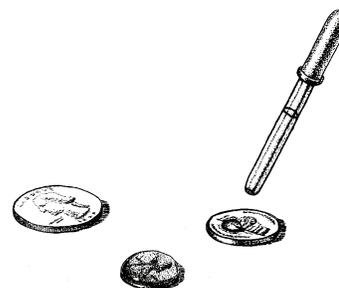
- ❶ Gather all the supplies and prepare the table or tables.
- ❷ Make 10 to 15 copies of the *Drops of Water* chart.

ACTION: OBSERVING, COMPARING, AND COMMUNICATING

1. Place a penny and a cup of water in front of each child.
2. Tell the children you are going to do some more estimating. Ask them how many drops of water will fit on a penny.



Tip
The next three activities B, C, and D, work best if you have them all going on at the same time. Have one teen at each table and have the children rotate activities every 10–15 minutes. If you have a large group of children, have two tables for each activity with one teen for each activity instead of every table.



Tip

This can be a messy activity. If there are tables outside, and weather permits, move outdoors. Be sure to leave enough time for cleanup.

DROPS OF WATER											
	0-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100	100+ Penny
PENNIES											
NICKELS											
DIMES											
QUARTERS											

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- Demonstrate how to make drops of water by holding up an eye dropper with water in it and squeezing the bulb to make one drop of water at a time.
- Let the children practice several times and then tell them that they will record the number of drops each of them has on their penny.
- Have each child put a colored dot in the cell on the chart that corresponds to the appropriate number of drops.
- Ask the children to predict how many drops will fit on a dime.
- Give each child a dime and have them repeat the action. Once again have the children fill in another *Drops of Water* chart.
- Repeat with other coins as long as time permits.

SCIENCING

- While the children are doing the quarters and nickels, ask them some of the following questions.
 - What was the highest number of drops anyone had?
 - Which coin held the most water? Why?
 - Why do you think some of you had more drops on your penny than others? What makes the difference?
 - Did the coins look different when they were full of water?
 - How did they look different?

ACTIVITY C

COIN RUBBINGS

Time Required
10–15 minutes

Suggested Grouping
group or individuals

In this activity, you will help the children use their coin collection to make rubbings on paper. This will help them visually communicate the type of information that is on the coin.

Materials You Will Need

- Pennies — 1 roll (the same pennies from *Activities A and B*)
- Dimes — 10
- Quarters — 10
- Nickels — 20
- Photocopying paper — 50 sheets
- Crayons — 1 or more boxes

Getting Ready

- ❶ Gather the supplies.
- ❷ Make a sample coin rubbing to show the children.

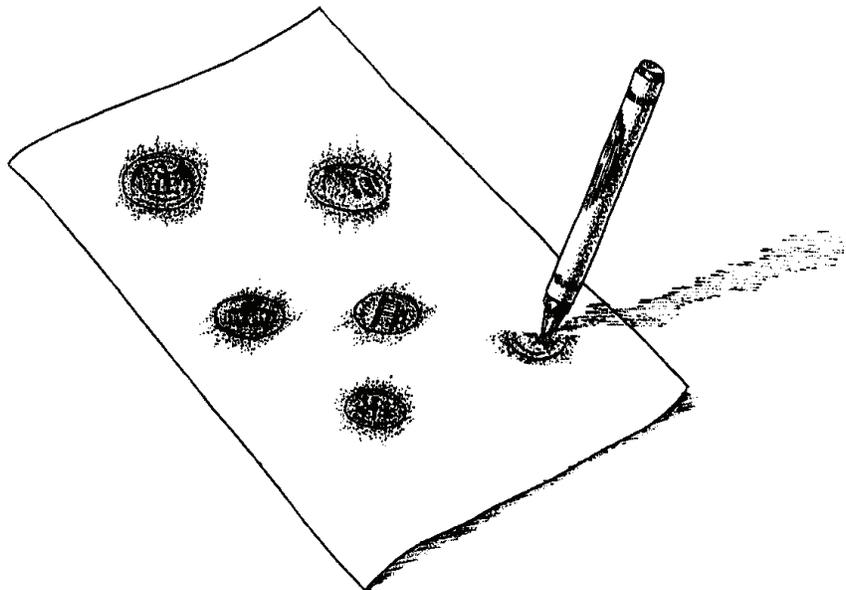
ACTION: ORGANIZING AND COMMUNICATING

1. Tell the children that they are going to be making rubbings of their coins with a crayon and a piece of paper. Demonstrate for the children how to put the paper on top of a coin and gently rub the crayon over it to make a rubbing.
2. Have the children choose several coins and organize how they want them to appear on the paper.

3. Allow the participants to experiment with different colors and different coins as they make their rubbings. Encourage them to try different designs.
4. Be sure to have the children put their names on their artwork.

SCIENCING

1. Describe what you saw as you made your rubbings.
2. Did some coins make better rubbings than others?
3. Why do you think this happened?
4. What information did you discover about the coins? Dates, pictures?
5. Add your own questions.



ACTIVITY D

COMPARE COINS BY WEIGHT

Time Required
10–15 minutes

Suggested Grouping
5 to 6 children

In this activity, children will compare all coins by weight.

Materials You Will Need

- Balance scales — 2 or 3
- Clear plastic cups — 1 dozen
- Pennies — 4 rolls
- Quarters — 1 roll
- Dimes — 2 rolls
- Nickels — 2 rolls

Getting Ready

- ❶ Gather all the supplies and set up the tables.
- ❷ Practice weighing some coins so you know how the scales work.

ACTION: COMPARING

1. Show the children how to use the balance scale by weighing 10 pennies. Have the children guess how many dimes it will take to equal 10 pennies.
2. Ask the children to put four quarters in a cup. Have them put nickels in the other cup until the cups are balanced. How many nickels did it take? How many dimes and pennies would it take?



3. Make up some other amounts for the children to weigh and then let them do some of their own.
4. You may also want to have some other items that the children can weigh against the coins, like crayons, small toy cars, paper clips, or screws.
5. You can also have the child weigh a dollar's worth of dimes against a dollar's worth of nickels. Think up other equivalent amounts to see which weighs the most.

SCIENCING: COMPARING AND COMMUNICATING

1. Which coin weighs the most?
2. Which coin weighs the least?
3. Think up some of your own questions.

Preparation Notes

ESTIMATING COINS

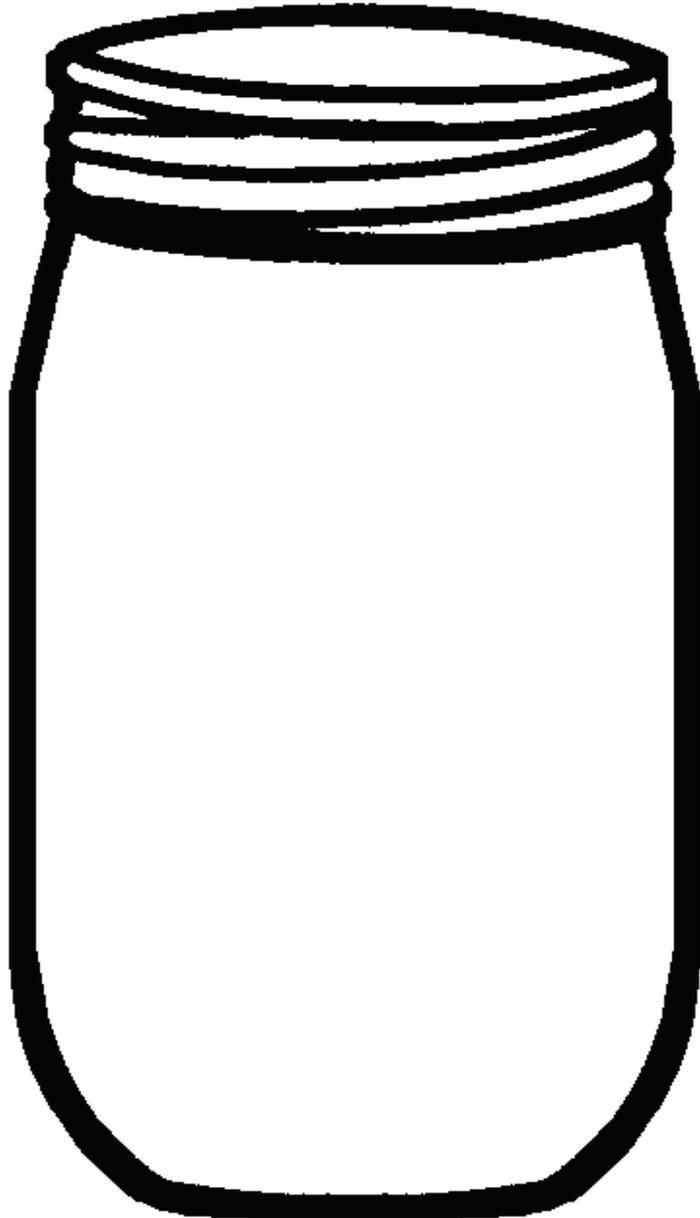
HOW MANY COINS ARE IN THE JAR?

GROUP 1

GROUP 2

GROUP 3

TOTAL



COIN FRACTIONS

THIS JAR IS DIVIDED
INTO *HALVES*

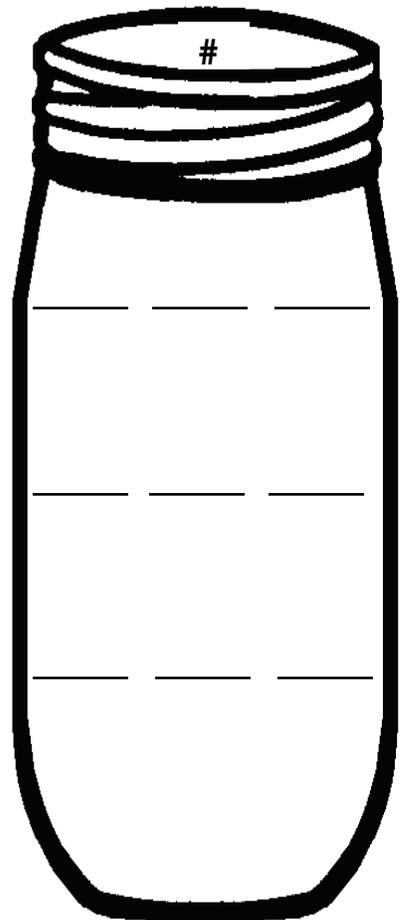
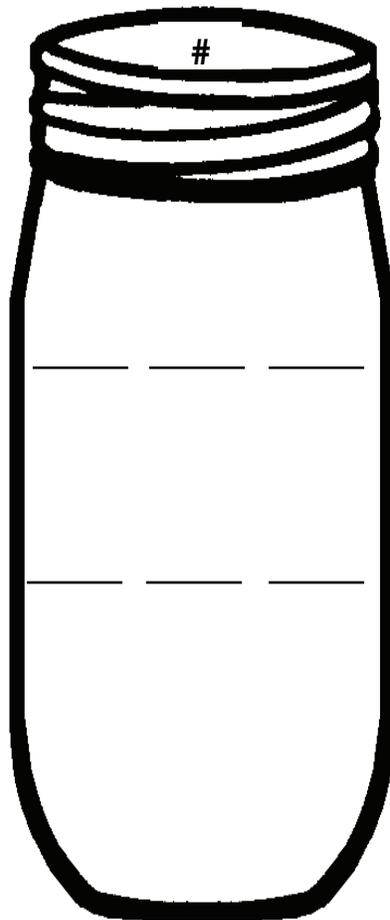
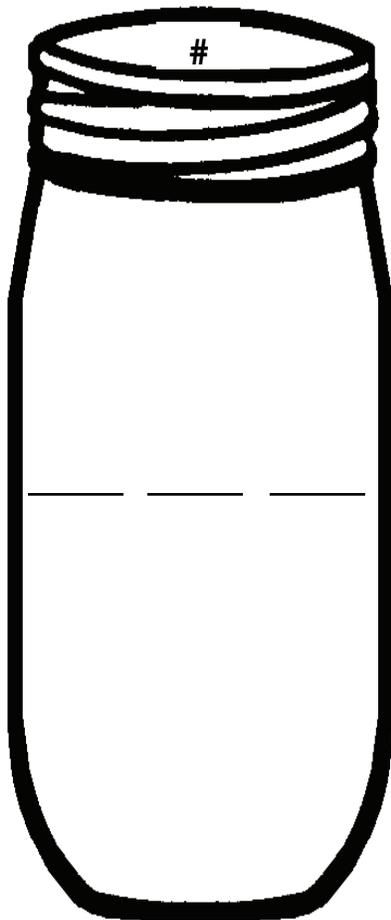
#1

THIS JAR IS DIVIDED
INTO *THIRDS*

#2

THIS JAR IS DIVIDED
INTO *FOURTHS*

#3



DROPS OF WATER										
	under 20	21-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	100 and over
PENNIES										
NICKELS										
DIMES										
QUARTERS										

MARBLE MANIA

Approximate Time Required for Session: 1 to 1½ hours

Purpose

- Children will further the ability to *sort, organize, and classify* objects according to different attributes.
- Children will organize, communicate, and compare their observations and discoveries with marbles.
- Children will use a marble collection to create an art project, play a game, and create a marble maze.

Overview of the Day's Activities

You will lead children in exploring more about collections. This time you will use marbles as the collection. Children will practice the sorting skills they have learned in earlier *YES Collections* sessions. They will observe, organize, and communicate as they make their own marbles, create a marble masterpiece, and design marble games. A highlight of the day will be making marble mazes out of recyclable materials.

Background Information

Playing with marbles has been an American pastime since before Colonial times. Native Americans played a version of marbles. Marbles were collected and played by the Romans thousands of years ago. Clay marbles used by the Aztecs have been found in their ruins. Polished stones, glass, nuts, china, wood, and plastic have also been used to make marbles. In addition to collecting and playing, marbles also serve other useful purposes. Marbles are used in aerosol cans, oil filters, printing plates, and ball bearings. The uniqueness of marbles makes them excellent to sort, classify, and collect.

ACTIVITY A

MARBLE SORTING

Time Required
15–20 minutes

Suggested Grouping
teams of 2 to 4 children

In this activity, you will help children practice their sorting and organizing skills using marbles and egg cartons. You will also help children learn the names of different types of marbles.

Materials You Will Need

- Egg cartons — 1 for every 2 to 4 children
- Clear container to show an assortment of marbles
- Know Your Marbles* handout
- Marble Names Graphs* handout
- Assortment of marbles (include a variety of sizes, colors, and marble materials)
- Each team of children should have at least 30–40 marbles
 - Chart paper
 - Marking pens
 - Scissors
 - Paper towels



Tip
Because of the rolling nature of marbles, you will want to keep them contained as much as possible during each of the activities. We suggest that you use empty egg cartons to hold and sort the marbles.

Getting Ready

- ➊ Make the poster and chart needed for this activity. Use the *Know Your Marbles* handout as a guide for creating the poster. Use colored drawings for the marbles, or glue an actual marble on the poster next to the appropriate names. Prepare the chart for recording the children's responses. Use the drawing as an example for this chart.
- ➋ Gather all the needed materials and prepare the tabletop work areas.

- 3 Make sure you have a good assortment of marbles. You will want a variety of colors, designs, and types. Refer to the *Know Your Marbles* handout for a listing of popular marbles. Also, include marbles made from a variety of materials such as glass, plastic, wood, steel.
- 4 Prior to starting the activity, for each team of children, place 30–40 marbles in the top section of an empty egg carton. Children can use the 12 egg holes in the carton as sorting boxes for the activity.
- 5 Place the opened egg carton, with marbles in the lid, in the center of the tables; two to four children can work around one carton. Make sure placing the marbles in the lid doesn't cause the carton to tip. If so, cut the lid off the carton and use it separately.
- 6 Cover the egg carton with a paper towel if you will be starting the activity at the table. This will prevent the children from exploring with the marbles before you have given them the introduction.

ACTION: OBSERVING, ORGANIZING, AND COMPARING

1. Show the children a few marbles in a bag, carton, or jar. Share any stories from your childhood about marbles. You may wish to share some of the history of marbles contained in the *Background Section* with the children.
2. Ask the children if they remember sorting the buttons in the first *YES* session on *Collection Connections*. Ask if they can share with you some of the ways they sorted buttons.
3. Tell the children that they will have a chance to observe lots of marbles and to sort them just as they did with the buttons.

MARBLE MANIA SESSION 4

KNOW YOUR MARBLES

Marbles are made of many different materials and come in many different colors, shapes, patterns, and sizes. Marbles have names that identify their markings, patterns, and colors. Here are some of the most common marbles:

- **Agate** - A marble made of the mineral agate and usually of a marbled pattern of gray and black.
- **Alloy** - A marble made of steel, aluminum, or marble, or a glass marble made to look as if it is made of real marble.
- **Car's eye** - A clear glass marble with a tint of color inside.
- **Clearite** - Any clear glass marble of any color.
- **Confocal** - A glass marble with two or more spots of color covering its surface.
- **Old egg** - A marble made of glass.
- **Marble** - A solid white marble.
- **Pinfire** - A solid color, clear marble.
- **Steel ball** - A steel ball bearing used as a marble.
- **Swirl** - A glass marble with a swirl of color on the inside or outside of the marble.

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MARBLE MANIA SESSION 4

YES MARBLE NAMES GRAPH

Color in a square for each marble you have of the names listed at the bottom of this page.

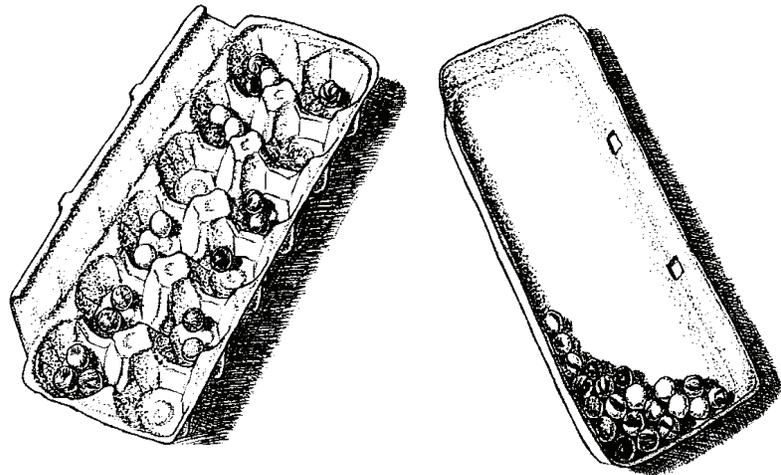
20					
19					
18					
17					
16					
15					
14					
13					
12					
11					
10					
9					
8					
7					
6					
5					
4					
3					
2					
1					
	AGATE	ALLOY	CAR'S EYE	CLEARITE	CONFOCAL

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Tip
If you have smaller groups, you can ask each group to gather around the table to observe one another's assorted marbles.

4. Tell the children that they will be working as a team to sort the marbles into the 12 holes in the egg carton.
5. Move the children to the observation tables and remove the paper towels covering the egg cartons.
6. At first, the children will enjoy just holding and handling the marbles. Encourage the children to share among themselves all the different types of marbles that they have discovered. Encourage the children to continue sorting until their interest lessens.



SCIENCING: COMMUNICATING AND COMPARING

1. Ask the children to describe to you their marble collections. One teen can record their responses on chart paper. Help children notice the words that they used to describe their collections.
2. Ask the groups to describe how they sorted their collection of marbles. You can do this by having each group describe one way, followed

by each group describing one other attribute they used until all methods have been shared.

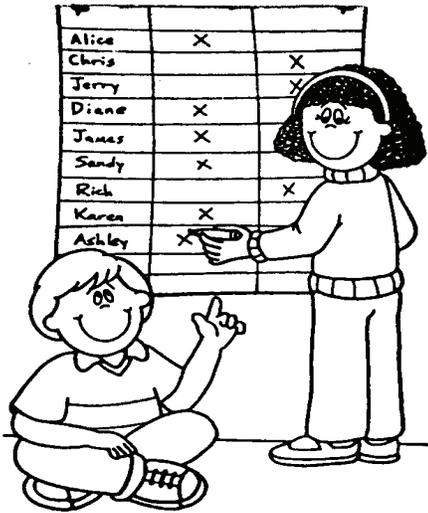
3. If the groups would like to sort their marbles again, allow time for this exploration.

MORE ACTION

1. With the marbles covered or the children removed from the observation tables, discuss the different names used to describe or identify marbles. Some of the children may have used these names when they described their sorting.
2. Tell the children that scientists often give names to things that they observe to make their descriptions easier and more exact. Use the enlarged *Marble Names Graph* that you made prior to the session to show the children marbles and their descriptive names.
3. Now ask the children to sort their marbles according to the chart that you have shared with them. Keep the chart posted so it is visible to the children.
4. After the children have had ample time to sort the marbles, record the children's efforts according to the directions outlined in the *Sciencing* section.

MORE SCIENCING

1. Using your *Marble Names Graph* and the recording chart, ask each group to share how many of each type of marble they have in their collection. One teen should record the responses on the chart, while another teen leads the discussion.



2. After all the responses have been recorded for each marble type contained in the collections, ask the children to look at the results on the chart.
3. Ask the children to tell you what they have learned about the marble collections from the results recorded on the chart. If the children are unable to do this, help them by asking what type of marble the groups have the most of? The least of? How many milkies did the groups have, etc.?

Presentation Notes

ACTIVITY B

MARBLE MAKING

Time Required

15 minutes

Suggested Grouping

tables with 4 to 6 children

You will lead children in this activity to make their own marbles. You will then encourage the children to describe the marbles that they have made and compare them to the ones they used in Activity A.

Materials You Will Need

- Playdough or clay – 4 colors, 1 cup each (enough for 20 children) **OR** make your own playdough from flour and salt
- Paper towels – 1 per child
- Paper plates – 1 per child
- Oven, (optional)

Getting Ready

- ❶ Gather all the needed supplies. Use already prepared clay or playdough, or make your own.
- ❷ Identify tabletop work areas for the activity.
- ❸ Divide the playdough into balls or pieces and place it in the center of the tables so children can easily reach it.

ACTION: OBSERVING, ORGANIZING, AND COMMUNICATING

1. Pass out a paper plate to each child. Ask the children to write their names on the plates. Tell the children that they are now going to make some marbles of their own. Ask if anyone has ever made marbles.



Tip
If time permits, you can place balls of each color of playdough on a paper towel for each child.



Tip
If you plan to bake the marbles, give each child a pie tin and a piece of tape to mark their name.

2. Explain that you will give each child four different colors of clay. You would like for them to make marbles by rolling a small piece of the clay or playdough between their hands until it forms a small ball. If you are working with very young children you may want to demonstrate this.
3. Tell the children that they may make solid colored marbles or combine the clay to make multi-colored marbles. When they have finished making a marble, place it on their plate.
4. Depending on the playdough or clay that you use, you can let the marbles air-dry or bake them in the oven.

SCIENCING: COMMUNICATING AND COMPARING

1. Ask the children to describe how they made their marbles. Ask questions that will help the children give descriptive answers.
2. Ask questions that require children to use their senses.
 - How did the playdough feel?
 - What did the touch remind you of?
 - What did the marbles look like?
 - What did the marbles smell like?
3. Ask questions that help the children compare.
 - How did their marbles compare to the ones you sorted earlier?
 - Did you make any marbles that had the names you learned in *Activity A*?



Tip
While the children are making the marbles, encourage their exploration by asking questions.

- Can you use the marble names you learned earlier to describe your marbles?
- Did you give new names to your marbles?
- Did your marbles remind you of something else?

Presentation Notes

ACTIVITY C**MARBLE MAZE****Time Required**

20–30 minutes

Suggested Grouping

tables of small groups

In this activity, you will help the children create their own marble maze. They will be able to apply some of the things they have learned through the YES project in this activity.

Materials You Will Need

- Marbles – several for each maze that is being created
- Shoe boxes – 1 for each group of younger children
- Cardboard soda cases – 1 for each group of children
- Cardboard scraps
- Construction paper
- Assorted paper
- Assortment of recyclable items – paper towel tubes, meat trays, Styrofoam, etc.
- Scissors
- Markers or crayons
- Masking or scotch tape
- Glue or paste

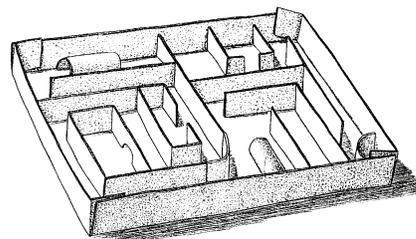
Getting Ready

- ❶ Prior to the day's session, make one each of the two mazes to use as models for demonstration with the children.
- ❷ Gather all the needed supplies, making sure you have plenty of different materials for the children to choose from. You will need to have scissors, glue, and tape at each table.

- ③ Determine ahead of time if each child will make their own maze or if the children will work in groups. If the children work in groups, make sure that the groups are no larger than four children.

ACTION: OBSERVING, COMPARING,
ORGANIZING, AND COMMUNICATING

1. Start the activity by showing the children the *marble mazes* that you have made. Ask the children if they have ever played with a maze. Ask them to explain the object of the maze. *(To get the marble from the start to the finish or score points by getting the marbles through the holes.)*
2. Explain to the children how you have organized the work areas and how they will be grouped for making the mazes. *Before starting the activity, ask the children to review the safety rules and how to work as a team.*
3. Move the children to the work areas and encourage their activity and exploration. Instructions for making the mazes follow. Younger children will need help in cutting the holes in the shoe box lids. Other children may need assistance in getting started. Remember to ask questions that will direct their activity rather than telling them how to make the maze. You want to encourage creativity and discovery!

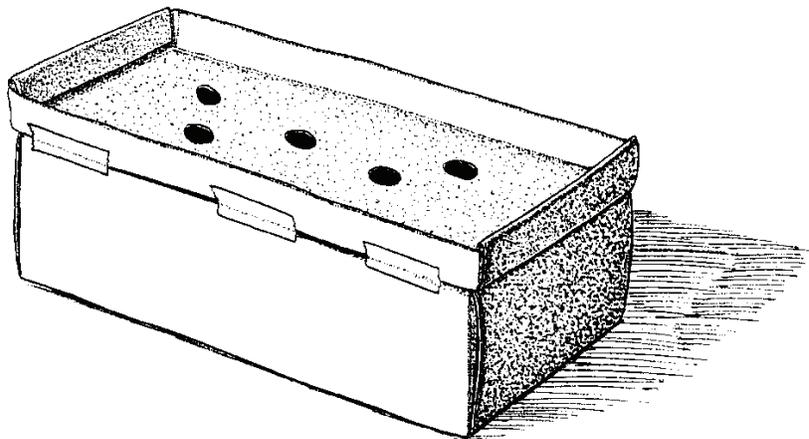


SHOE-BOX MAZE

This maze will be easier for the younger children. It is also good to use if you have little time to work on the mazes.

Directions

1. Remove the lid from a shoe box. Turn the lid upside down (lip facing up). Mark the location for one or more holes in the lid.
2. Cut holes in the lid. Each hole should be large enough for a marble to drop through.
3. Decorate the top of the lid with markers, crayons, or construction paper.
4. Points can be assigned to each hole or different colored marbles can be used to play the game.
5. Place the decorated lid, lip side up, on top of the box. Cut three 2" strips of masking tape. Use the tape to make hinges on one side of the lid. *(This way the lid will stay in place, but can be easily removed to retrieve the marbles.)*



CARDBOARD-FLAT MAZE

This maze will take a little longer to construct, but will allow the children more creativity constructing it.

Directions

1. In a cardboard soda case or other cardboard box, mark a start, a finish, and a rough maze trail.
2. Using the recyclable materials, begin to construct a maze by cutting, taping, and gluing materials to the cardboard flat. Be creative in using the materials. Try to make unique obstacle courses for the marbles.

SCIENCING: OBSERVING, COMPARING, AND COMMUNICATING

1. After the children have completed their mazes, ask each group to share their creation with the larger group. Ask them to explain how they made their maze.
2. Ask other questions.
 - What materials did you use?
 - Why did you choose those materials?
 - Did you have any problems? How did you overcome the problems?
 - Did you make any rules on how to play with the maze?
3. Ask each group to demonstrate how to play their maze.
4. If every child made a maze, ask them to take it home and share it with their family. If the mazes were made in groups, place the mazes in the *Collection Center*.

ACTIVITY D

MARBLE GAMES (OPTIONAL)

Time Required
15–20 minutes

Suggested Grouping
small groups

Children have enjoyed playing marbles for hundreds of years. President Lincoln liked to play a game called Old Bowler. The first marble championship was held in Philadelphia in 1922. The winner of the second championship was a girl named Babe Ruth. In this activity you will help children learn how to use their marble collection to play several marble games.



Tip
This activity is optional; however, it can be used along with the Marble-Making Activity as a means of keeping children who finish early interested. It can also be used while children are making the marble mazes or as a good outdoor break from the indoor activities.

Materials You Will Need

- Marbles
- Game instructions
- Chalk to mark lines or circles

Getting Ready

- ❶ Read over the marble game instructions that follow this activity. Make sure that you understand how to play the games before starting the activity.
- ❷ Gather the needed supplies and materials.
- ❸ Identify an inside or outside area to play the games.

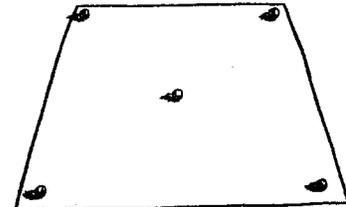
ACTION: COMMUNICATING AND OBSERVING

1. After you have determined which games the children will be playing and have set up a play area, move the group to the circle and explain the game.
2. Ask for several volunteers and walk through the playing of the game.
3. Then divide the children into the appropriate size groups and encourage them to play.
4. After the children have played for a while, ask them to share how they played the game. Did any of the groups change the rules?

OLD BOWLER

Directions

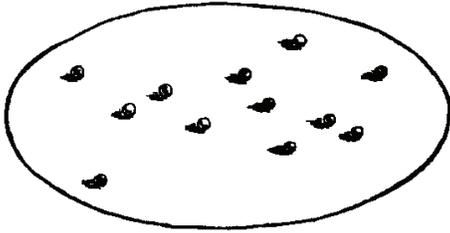
1. Draw a 12" or 18" square in the dirt or on the pavement. Draw a shooting line about 4 feet from the edge of the square.
2. Place a marble in each corner of a square.
3. Place a fifth marble in the center of the square (This marble is called the *Old Bowler*).
4. Players take turns shooting from behind the line and try to shoot the marbles out of the square.
5. If a player hits a marble, they collect it and their shooter and continue playing. If they miss a marble, they collect their shooter, and it is the next player's turn.
6. Players may not hit the *Old Bowler* until all other marbles have been knocked out of the square. If a player hits the *Old Bowler* before all the marbles are out of the square, they are out of the game.



POISON RING

Directions

1. Draw a large circle in the dirt or on the pavement. Draw a shooting line about 4 feet from the circle.
2. Each player places four marbles in the circle.
3. Each player takes turns shooting at the marbles in the circle from behind the shooting line.
4. If a marble is hit, the player picks up the marble and his shooter, and his turn is over.
5. If a player does not hit a marble, he picks up his shooter, and his turn is over.
6. The game is over when all marbles have been hit.

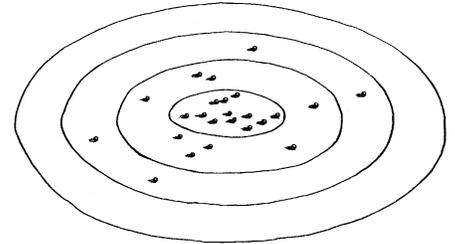


Presentation Notes

FORTS

Directions

1. Draw four circles in the dirt or on the pavement. The first circle should be about 2 feet across, the second 4 feet across, the third 6 feet across, and the fourth 8 feet across.
2. Each player places three marbles in the inner circle, two marbles in the second circle and one marble in the third circle.
3. On the first shot, each player shoots from the edge of the outer circle. Only marbles in the third circle are targets. If a player hits a marble into the fourth circle, he keeps it and leaves his shooter where it ended. He starts his next turn from that place.
4. If a player doesn't hit a marble, the player must pay a marble to the third circle.
5. Play continues until all marbles have been hit out of the third circle. Play then moves to the second circle, and then to the final circle, following the rules above. The game is over when all the marbles have been hit.



Tip
Leave the instructions for the marble games with the child care staff, so children can continue to play these games.

KNOW YOUR MARBLES

Marbles are made of many different materials and come in many different colors, shades, patterns, and sizes. Marbles have names that identify their markings, patterns, and colors. Here are some of the most common marbles:

- **Aggies** - A marble made of the mineral agate and usually of a marbled pattern of gray and black.
- **Alley** - A marble made of real alabaster or marble, or a glass marble made to look as if it is made of real marble.
- **Cat's eye** - A clear, glass marble with a twist of color inside.
- **Clearie** - Any clear, glass marble of any color.
- **Corkscrew** - A glass marble with two or more spirals of color covering its surface.
- **Glassy** - A marble made of glass.
- **Milkie** - A solid white marble.
- **Puree** - A solid-color, clear marble.
- **Steelie** - A steel ball bearing used as a marble.
- **Swirl** - A glass marble with a swirl of color on the inside or outside of the marble.

YES MARBLE NAMES GRAPH

Color in a square for each marble you have of the names listed at the bottom of the page.

20					
19					
18					
17					
16					
15					
14					
13					
12					
11					
10					
9					
8					
7					
6					
5					
4					
3					
2					
1					
	<i>AGGIES</i>	<i>ALLEY</i>	<i>CAT'S EYE</i>	<i>CLEARIE</i>	<i>CORK SCREW</i>

YES MARBLE NAMES GRAPH

Color in a square for each marble you have of the names listed at the bottom of the page.

20					
19					
18					
17					
16					
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14					
13					
12					
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10					
9					
8					
7					
6					
5					
4					
3					
2					
1					
	<i>GLASSY</i>	<i>MILKIE</i>	<i>PUREE</i>	<i>STEELIE</i>	<i>SWIRL</i>

OH BOY, M-&-M'S!

Approximate Time Required for Session: 1 hour



Purpose

- Children will use M&M's to *sort, organize, and classify* the *collection*.
- Children will use M&M's and other ingredients to make *gorp*, or trail mix, which is a type of collection.
- Children will organize colored circles to make and play Dominos.

Overview of the Day's Activities

In this session you will teach children additional sorting activities which use a unique collection of M&M's and similar circles. The *M&M's Brand Counting Book* will be used to show how math and science skills can be developed by using grouping items. Children will practice measuring skills to complete a recipe.

Background Information

M&M's are not usually thought of as being part of a collection. However, in this unit they make a great collection for this age group to sort, classify, and observe. M&M's are a collection of circles and colors.

ACTIVITY A

M&M'S COUNTING

Time Required
15–20 minutes

Suggested Grouping
individual children
grouped at tables

Materials You Will Need

- M&M Counting Book* by Barbara Barbieri McGrath
- M&M's — ½ cup per child
- Paper cup — 1 per child
- Construction paper — 11" x 17" — 1 per child
- Plastic jar — large (*for left over candy*)

Getting Ready

- ❶ Gather all the needed supplies.
- ❷ Practice reading *The M&M's Brand Counting Book* several times before the day of the presentation.
- ❸ Set tables with approximately ½ cup of M&M's candy per child. Put the cups in the middle of the table and cover them with a towel. This will prevent the children from eating the M&M's candy before you have given them the instructions.
- ❹ Put a large piece of construction paper at each child's place at the tables.

ACTION: OBSERVING AND ORGANIZING

1. Show the children some M&M's in a clear jar. Ask how many of them like M&M's?
2. Ask the children if they remember sorting buttons and marbles. Ask the children to



Tip
You will need to tell children not to eat the M&M's until the end of the activity or when the story tells you to eat one.



Tip
Some children may be allergic to chocolate. Ask the staff beforehand if they have any children who are allergic. If so, purchase a different candy for these children to eat.

describe some of the ways they sorted the marbles and the buttons.

3. Tell the children that today they are going to sort M&M's as you read *The M&M's Brand Counting Book*.
4. Position yourself so all the children can see you. Have the children pour out the M&M's onto the construction paper.
5. Read *The M&M's Brand Counting Book* by Barbara Barbieri McGrath. Make sure each child can see each page. Have the children organize their M&M's like each page of the book.

Tips for Successful Oral Reading

- ***Setting the stage*** - Have the children sit in a semicircle with your chair slightly higher. Ask some brief questions to build enthusiasm and encourage responses. Keep the book facedown or out of sight.
- ***Presenting the book*** - Show the book so the cover is clearly visible. Make sure the children can see the pictures easily. Tell them the name of the book, the author, and the illustrator. Discuss the illustrations.
- ***Reading the book*** - Use plenty of expression. Adjust your voice and speed of reading to fit the story. Keep children involved by asking: "What do you think is going to happen?" ***The most common mistake is reading too fast.*** Read slowly enough for the children to build mental pictures.

6. Teens who are not reading the story should move around and make sure the children are able to keep up with the story and do the sorting.



Tip
Some editions of The M&M's Brand Counting Book do not have blue M&M's. If you have an old edition, have the children substitute the blue M&M's for the tan ones.



7. When you get to the part near the end of the story where they are to eat an M&M's candy, *tell them it is OK to eat only the one the story tells them to eat. It's also OK not to eat them, just move them to one side.*

SCIENTING: COMMUNICATING AND COMPARING

1. What was the largest number of M&M's you used on any page?
2. What was the smallest?
3. How many colors are in the M&M's collection?
4. Add you own questions.

MORE ACTION: COMMUNICATING

1. Tell the children you are going to describe some more ways for them to arrange the M&M's.
2. Tell the children to count out one yellow, one orange, two red, and four brown. Next have the children put four *browns* in a line across the paper. Add a *red* M&M's candy to each end. Place the *yellow* M&M's candy in the 3rd position from the right. Put the *orange* M&M's candy on the 2nd position from the left. Have the children compare their M&M's to see if they are the same. Make up two or three more arrangements.
3. Ask the children to create their own arrangement.
4. Have the children put their M&M's back into their cups.



ACTIVITY B

M&M'S GRAPHING

Time Required

10–15 minutes

Suggested Grouping

teams of 2 to 3 children
at tables

Materials You Will Need

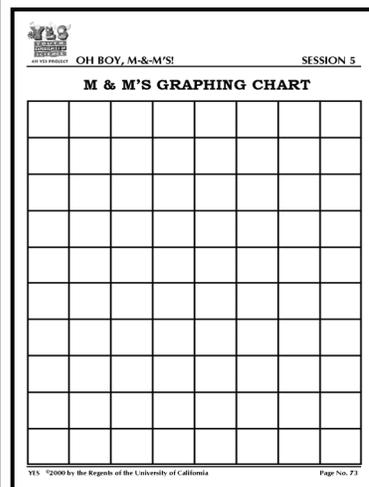
- M&M's from the previous activity
- M & M's Graphing Chart* handout – 1 per group, printed on card stock
- Glue bottle – 1 per group

Getting Ready

- ❶ Gather all the needed materials.
- ❷ Make a sample M&M's graph.
- ❸ Assemble cups containing 20 M&M's.

ACTION: OBSERVING AND COMPARING

1. Group the children into teams of two or three.
2. Show the children a sample of an *M&M's Graph*. Explain that each group will be using their M&M's Collection to create their own graph.
3. Give each team one cup that contains 20 M&M's.
4. Have the children pour their M&M's on the table, selecting 20 M&M's for each group. Move all the extra M&M's off the table.
5. Pass out the glue and *M&M's Graphing Chart* handout.



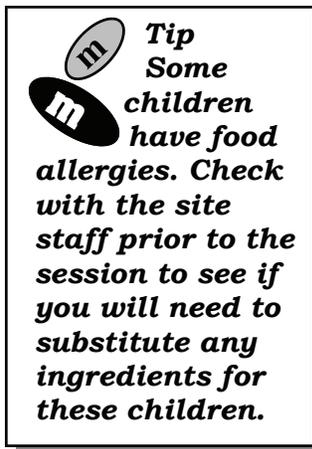
The handout is titled "M & M'S GRAPHING CHART" and features a 10x10 grid. At the top left is the YES logo, and at the top right is "SESSION 5". At the bottom left, it says "YES ©2000 by the Regents of the University of California" and at the bottom right, "Page No. 77".

6. Have the children sort their collection of M&M's by *color*, and glue each color onto the chart. Glue one M&M's candy per cell.
7. When each group is done, have them put the charts on the table to dry. Have the children walk around the table to look at each graph.

SCIENCING: COMPARING

1. Have each group share what color of M&M's had the tallest line on the graph. Record the answer.
2. What color had the shortest line? Record the answer.

Presentation Notes



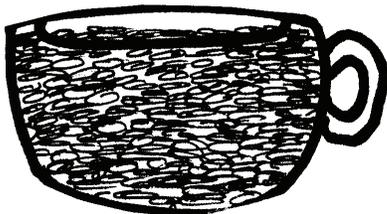
ACTION: COMPARING

1. Tell the children that “*recipes are a collection of ingredients mixed together to make a new food.*” Give some examples, like chocolate chip cookies made of flour, margarine, and chocolate chips; or pancakes made of flour, egg, and milk.
2. Tell the children that you are going to make gorp, or trail mix.
3. You should demonstrate how to measure one ingredient. Show them where 1 cup, $\frac{1}{2}$ cup, and $\frac{1}{4}$ cup markings are.
4. Teens should move around the tables and assist the children.
5. When each group is finished, have them divide up the gorp and put it in cups or sandwich bags for each child.
6. Assist groups with the clean up.
7. While children are eating their gorp, ask the following *Sciencing* questions.

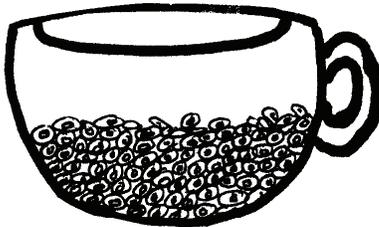
SCIENCING

1. How many items or ingredients are in the gorp?
2. Which item did you use the most?
3. What other foods could you use in making gorp?

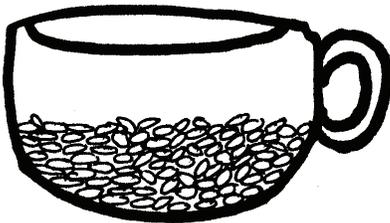
GORP RECIPE



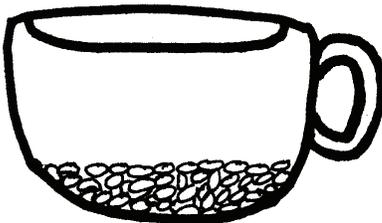
1 CUP GRANOLA



1/2 CUP CHEERIOS



1/2 CUP M&M'S



1/4 CUP PEANUTS

MIX ALL INGREDIENTS TOGETHER AND ENJOY!



THE COLLECTION CONNECTION BIBLIOGRAPHY

Brooke, Maxey. *Challenging Coin Games and Puzzles*. Dover Publications. New York, 1963.

McGrath, Barbara Barbieri. *The M&M's Brand Counting Book*. Charlesbridge Publishing. Watertown, MA, 1994.

Reid, Margarette S. *The Button Box*. Dutton Children's Books. New York, 1990.

THE COLLECTION CONNECTION SUPPLY LIST

Session 1 - BUTTONS, BUTTONS, DO YOU HAVE BUTTONS?

Activity A – A Collection of Buttons

Button name tags

Yarn

Hole punch

Markers or crayons

The Button Box by Margarett S. Reid

Examples of collections (toys, baseball cards, rocks, coffee cups, miniatures)

Buttons – a large variety and enough for each child to have $\frac{1}{2}$ cup

Plastic jar – 1 large

Chart paper

Activity B – Getting to Know Your Buttons

Crayons

Zip-lock bags – small

Buttons – one $\frac{1}{2}$ -cup bag for each group of 2 to 4 children

Jar of buttons from *Activity A*

Button Sorting Chart – enlarged

Button Lotto Card

Masking tape

Activity C – Button Puzzles

A collection of buttons

Puzzle directions – 1 copy for each child

Puzzle solutions

Plain white paper – 20 sheets

Marking pens

Session 2 - ROCK AND ROLLING

Activity A – Shoe-Box Mysteries

Sand – 1 to 2 cups

Rocks – at least 3 or 4 different types of rocks (gravel, landscape rock, a large rock, etc.)

Shoe boxes – 1 for each type of rock and sand. (*Make sure the shoe boxes have solid bottoms so the sand and rocks don't slide out.*)

Chart paper

Markers

Masking tape

Activity B – Rock Treasure Hunt

Rock Treasure Hunt List of rocks for the children to collect

Brown paper bags – 1 per child or team

Stapler and staples

Markers

Cardboard pieces or shoe boxes – 1 per child or team

White glue

Activity C – Rock Painting

Flat rocks large enough to paint on

Acrylic paint – assorted colors

Paint brushes

Newspapers

Cups of water

Paper plate – 1 for each table or work area

Activity D – Big-Rock Cookies (optional)

Sugar – 2 cups

Water – ½ cup

Margarine – ½ cup

Powdered cocoa – 3 tablespoons

Peanut butter – ½ cup

Salt – ½ teaspoon

Oatmeal – 4 cups, uncooked

Powdered milk – 1 cup

Raisins – 1 cup

Vanilla – 1 teaspoon

2-quart saucepan

Stove top or portable burner

Cookie sheet

Measuring spoons

Measuring cups

Spoons

Napkins

Large mixing bowl

Activity E – Sandbox Concentration (optional)

Dishpan or other shallow pan, box or container

Sand to fill the container to about 2”-3” of the top

Six to ten sets of rocks

Session 3 - COIN COLLECTORS

Activity A – Pennies with a Purpose

Clear ½-pint jars – 4 (straight, not tapered bottoms)

Pennies – \$8.00 worth

Permanent marking pen – 1

Estimating Coins poster

Coin Fractions poster

Chart paper and markers

Activity B – Just A Drop of Water

Drops of Water chart

Pennies – 10 to 15

Dimes – 10 to 15

Quarters – 10 to 15

Nickels – 10 to 15

Eye droppers – 8

Water – 1 quart

Sponges and paper towels for cleanup

Paper cups – 6 to 8

Activity C – Coin Rubbings

Pennies – 1 roll (the same pennies from *Activities A and B*)

Dimes – 10

Quarters – 10

Nickels – 20

Photocopying paper – 50 sheets

Crayons – 1 or more boxes

Activity D – Compare Coins by Weight

Balance scales – 2 or 3

Clear plastic cups – 1 dozen

Pennies – 4 rolls

Quarters – 1 roll

Dimes – 2 rolls

Nickels – 2 rolls

Session 4 - MARBLE MANIA**Activity A – Marble Sorting**

Egg cartons – 1 per 2 to 4 children

Clear container to show an assortment of marbles

Know Your Marbles handout

Marbles Name Graph charts

Assortment of marbles (include a variety of sizes, colors, and marble materials)

Each team of children should have at least 30–40 marbles

Chart paper

Marking pens

Scissors

Paper towels

Activity B – Marble Making

Playdough or clay – 4 colors, 1 cup each (enough for 20 children) OR make your own playdough from flour and salt

Paper towels – 1 per child

Paper plates – 1 per child

Oven *optional*

Activity C – Marble Maze

Marbles – several for each maze that is being created

Shoe boxes – one for each group of younger children

Cardboard soda case – 1 for each group of children

Cardboard scraps

Construction paper

Assorted paper

Assortment of recyclable items – paper towel tubes, meat trays, Styrofoam, etc.

Scissors

Markers or crayons

Masking or scotch tape

Glue or paste

Activity D – Marble Games (optional)

Marbles

Game instructions

Chalk to mark lines or circles

Session 5 - OH BOY, M-&-M's!

Activity A – M&M's Counting

M&M Counting Book by Barbara Barbieri McGrath

M&M's – $\frac{1}{2}$ cup per child

Paper cup – 1 per child

Construction paper – 11" x 17" – 1 per child

Plastic jar – large (for left over candy)

Activity B – M&M's Graphing

M&M's from the previous activity

1 *Graphing Chart* handout per group, printed on card stock

1 glue bottle per group

Activity C – Gorp

Mixing bowl (medium or large)

Measuring cup – 1-cup size, 1 per group

Wooden spoon – 1 per group

Plastic sandwich bags

Plain M&M's – $\frac{1}{2}$ cup per group

Gorp Recipe handout – 1 per group

Dry roasted peanuts – $\frac{1}{4}$ cup per group

Cheerios – $\frac{1}{2}$ cup per group

Granola – 1 cup per group

Small cups or sandwich bags for each child

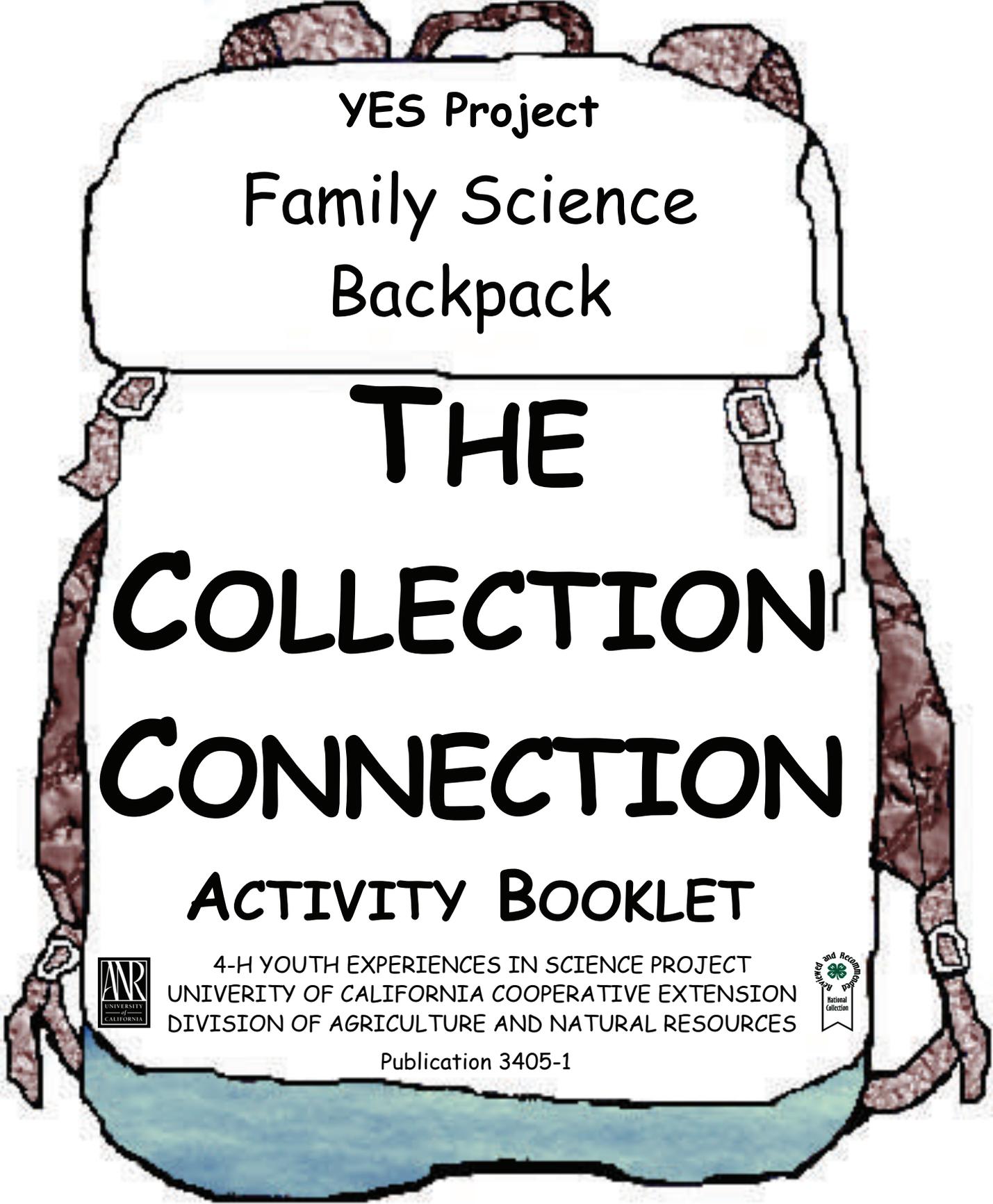
Note: Balance scales and hand lenses are available from:

Marshall Montgomery

1021 Delbrook Dr.

Napa, CA 94558

Ph. (707) 252-2381



YES Project
Family Science
Backpack

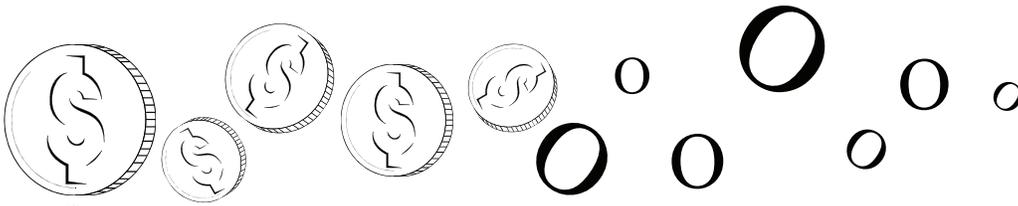
THE
COLLECTION
CONNECTION
ACTIVITY BOOKLET



4-H YOUTH EXPERIENCES IN SCIENCE PROJECT
UNIVERSITY OF CALIFORNIA COOPERATIVE EXTENSION
DIVISION OF AGRICULTURE AND NATURAL RESOURCES



Publication 3405-1



WELCOME FAMILIES

In this Family Science Backpack, you will find lots of activities and ideas for learning about collections and science in fun and interesting ways! Through exploration activities, you will observe, communicate, compare, and organize information about collections. Through your actions, interpretations, and reactions to collections, you and your child will create a new base of knowledge, learn important scientific thinking skills, and have lots of fun!

THE COLLECTION CONNECTION FAMILY ACTIVITY BACKPACK BY

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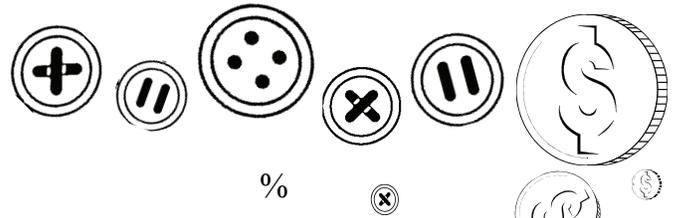
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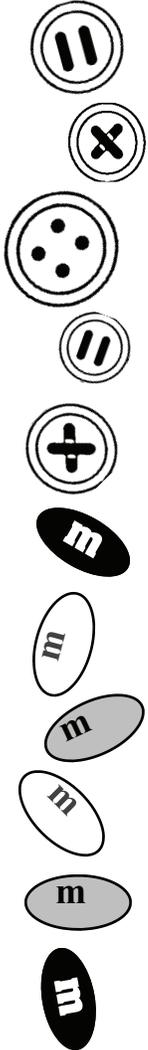
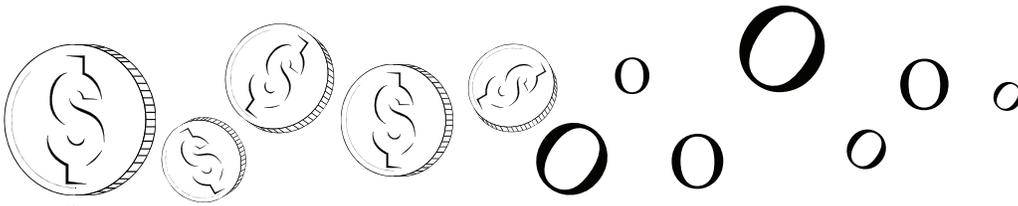
Program Representative, UC Davis

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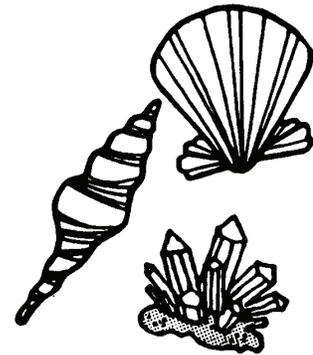
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ALL ABOUT COLLECTIONS

Making, organizing, and sharing collections has always been a favorite pastime of children. Children enjoy collecting everything from rocks and leaves to sports cards and dolls. Not only is it fun, but it is a great way for children to learn more about using the scientific thinking processes. As children develop collections they use many of the same skills that scientists use everyday: observation, comparison, classification, and communication.

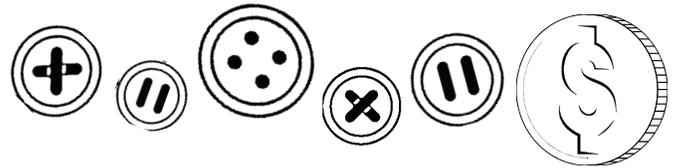


Children aren't the only ones who like and use collections. Throughout time, people have collected objects for a variety of reasons. Early humans collected sticks, brush, and branches to make fires to keep themselves warm and to ward off animals. Miners have collected metal ores to be melted down and shaped for uses such as horseshoes, tools, and flatware. Collections sometimes have a specific purpose or are simply for personal enjoyment.

Scientists have made collections of plants and animals, soils and minerals, as well as data about volcanoes, earthquakes, and diseases. In businesses, people often have collections of shoes, candy, clothing, and appliances for sale. Even a library, dictionary, and an encyclopedia can be considered collections of books, words, and information respectively.

Collections provide a wonderful medium for children to apply the scientific thinking processes of observing, communicating, comparing, and organizing.

THE COLLECTION CONNECTION



⊗ **OBSERVING**

Children are able to use their collections to look with a purpose. They can use their senses by looking, touching, tasting, smelling, and listening.

○ **COMMUNICATING**

Children can use language, pictures, graphs, and other symbols to communicate their observations and findings about their collections.

Ⓢ **COMPARING**

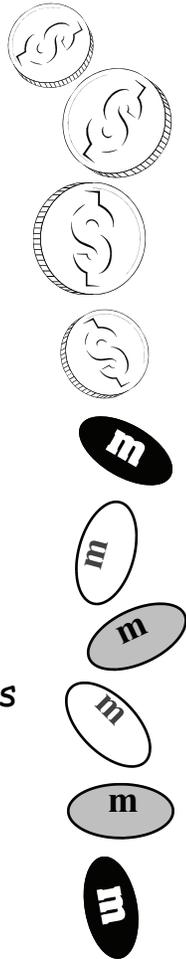
Children can learn about the shape, color, or size of their collections by comparing the shapes, colors, and sizes to other objects. Collections help children observe how objects are alike and different.

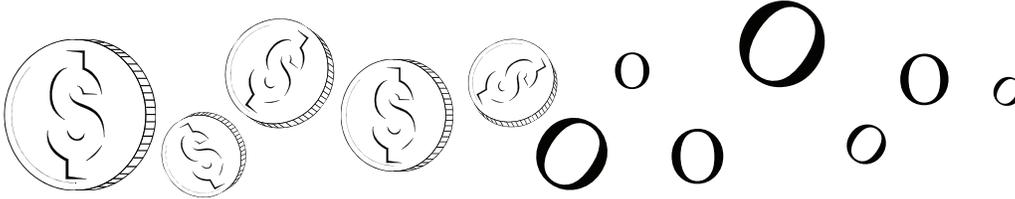
% **ORGANIZING**

Children can organize their collections in meaningful ways.

This helps them better understand the relationships between materials or events in their environment. Young children can organize their collections according to specific attributes (color, size, shape). They can organize them according to a linear format called a seriation. When children seriate their collections they organize them along a continuum (from small to large, sharp to dull, rough to smooth, etc.).

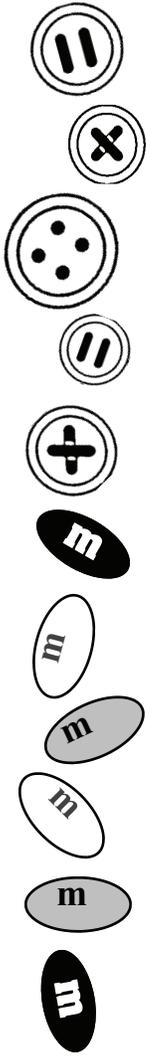
Collections build upon children's natural curiosity and interest in hunting for treasures and preserving them in some way. Collections provide hours of fun for young children and build upon their science learning.





The Button Box

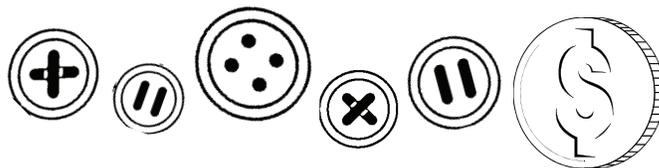
Reading together is both fun and educational! Books can make children think, wonder, and want to know more. Margarett Reid's story, *The Button Box*, is about a boy and his fascination with his grandmother's button box. It will lead to lots of discussion and discovery about buttons in your own home.



WHAT YOU NEED

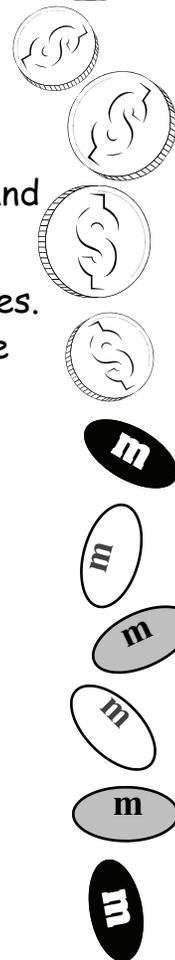
- ⊗ *The Button Box*, by Margarett Reid
- ⊗ Assorted buttons
- ⊗ Pencil, markers, or crayons





HOW TO DO IT

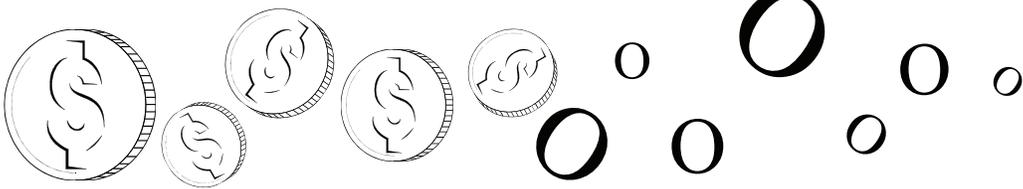
- ⊗ When reading to your child, put life into your reading! Change your voice for different characters. Let your voice get soft and loud.
- ⊗ Involve your child in your reading. Let your child turn the pages. Ask her to guess what will happen during the story. Encourage her to retell the book from the pictures, or to share in the reading.
- ⊗ After you have read the story, ask your child some of the questions below.
- ⊗ Share with your child some of the buttons provided in the backpack or some that you have at home. Ask your child to find buttons that look like the one's in the story.
- ⊗ Ask your child to see how many different ways she can sort the buttons (color, size, number of holes, texture, design, etc.). You'll be surprised at how many different ways you can sort the buttons!



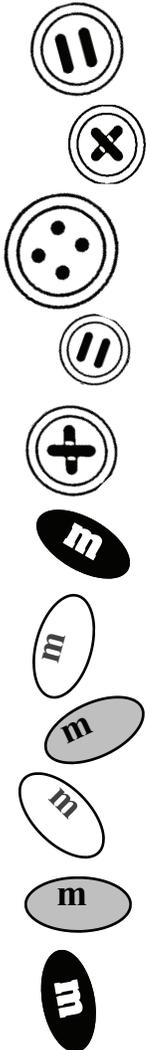
QUESTIONS TO ASK YOUR CHILD

Ask open-ended questions that encourage further exploration by your child.

- ⊗ *What was the story about? Who were the characters?*
- ⊗ *What happened first (second, or last) in the book?*
- ⊗ *Have you had experiences like the boy in the story?*
- ⊗ *Ask questions that use your child's senses. How do you think the buttons felt? What's it like to run your fingers through a box of buttons? Describe how the buttons looked? How were the buttons alike, different?*



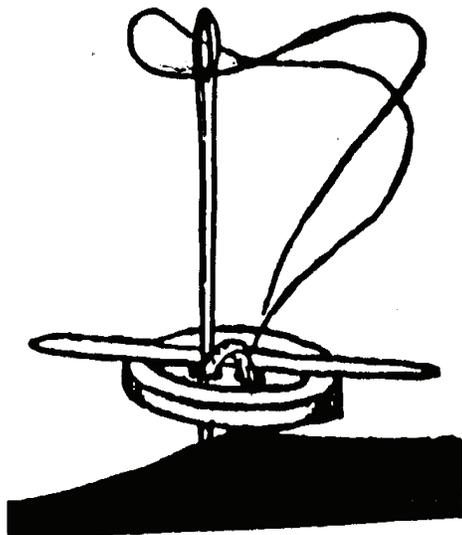
Button Works

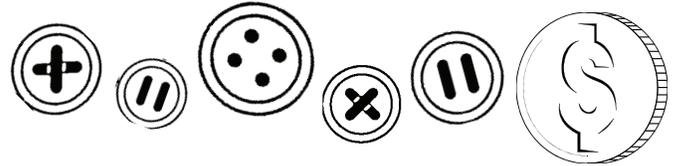


Buttons provide a wonderful way for children to practice their sorting and classifying skills. But, buttons also serve a very useful purpose. You can help your child apply what they learned in the Button Box story about how buttons are used. Children love to try their hand at new skills. In this activity you can help your child learn to sew on a button!

WHAT YOU NEED

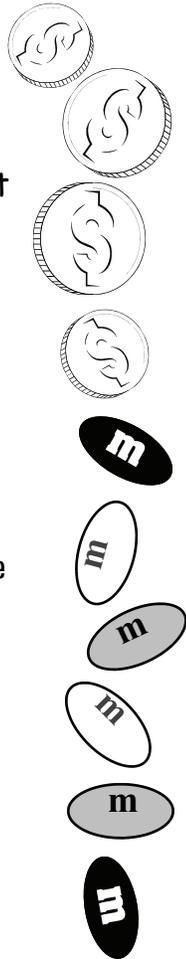
- ⊗ Pencil
- ⊗ Buttons
- ⊗ Thread
- ⊗ Needle
- ⊗ Scissors
- ⊗ Toothpick
- ⊗ Fabric, or a garment needing a button





HOW TO DO IT

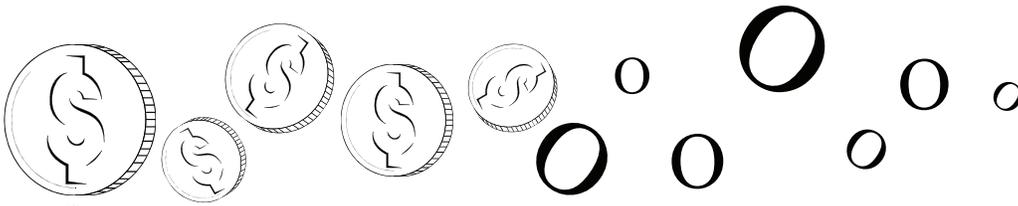
- ⊗ Go on a hunt through your closets or laundry basket for garments that need buttons replaced. (If you have no garment needing repair, substitute a piece of fabric.)
- ⊗ Help your child sew on a button following these instructions:
 - ✂ Mark the location of the button with a pencil.
 - ✂ Thread the needle. Knot the thread together at the ends, making the thread double.
 - ✂ Bring the needle up from the wrong side of the fabric through the pencil mark.
 - ✂ Run the needle through one hole, making sure the button is in the proper location.
 - ✂ Lay a toothpick over the top of the button and run the needle through another hole in the button and through to the backside of the fabric. (The toothpick prevents the button from being sewn down too tightly.)
 - ✂ Continue sewing up and down through each hole of the button four or five times. Each time stitch over the toothpick.
 - ✂ Remove the toothpick and bring the needle through the fabric, but not through the button. Wind the thread firmly around the threads under the button to form a shank.
 - ✂ Bring the needle through the fabric to the wrong side of the fabric and tie a knot.
- ⊗ For more button fun, play some of the button games found in the *Backpack Button File Folder*.



QUESTIONS TO ASK YOUR CHILD

Ask open-ended questions that encourage further exploration by your child.

- ⊗ *Describe the steps you used in sewing on the button.*
- ⊗ *Why did you use the toothpick? Could you have used something else?*
- ⊗ *Do you remember seeing anyone sewing on buttons?*
- ⊗ *How do you think garment companies sew on buttons?*
- ⊗ *Do you think we can find other clothes that need buttons replaced?*

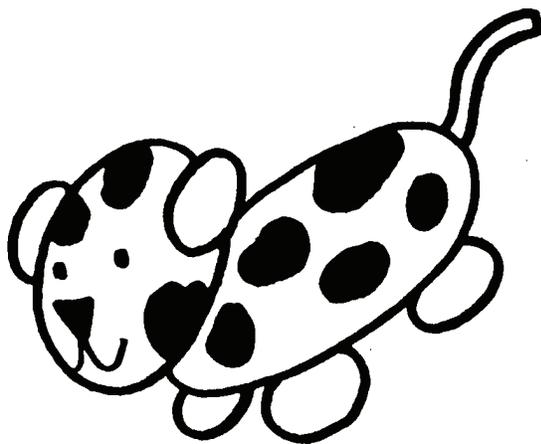


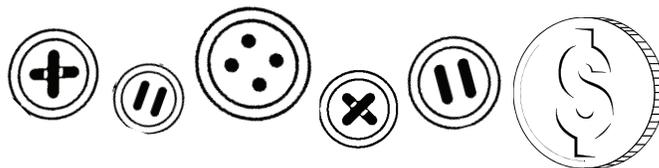
Rock Hound

The plentiful supply of rocks in most environments make rock collecting a fun and inexpensive hobby for young children. Your child may in fact already have a rock collection! Sorting and displaying a rock collection is a great science activity. Using the rocks to make a rock hound is a fun way to use the rock collection.

WHAT YOU NEED

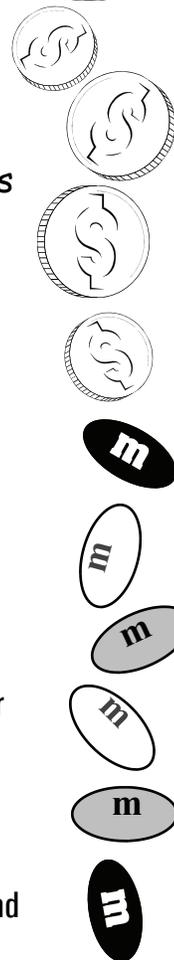
- Paper bag
- Egg carton
- Rocks — 1 large, 1 medium, and 4 small
- White glue
- Acrylic paint and paint brush, or permanent markers
- Felt scraps
- Scissors





HOW TO DO IT

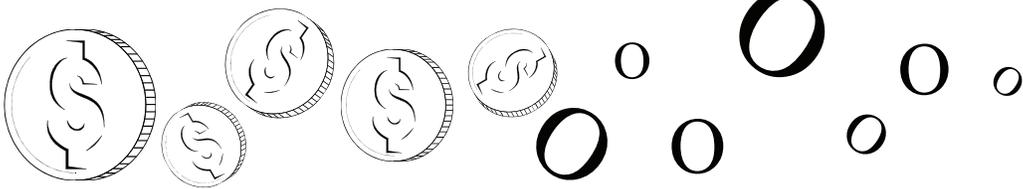
- If your child doesn't already have a rock collection, go on a rock hunt. As you are hunting for rocks, point out other things in the environment for your child to observe.
- When you have an assortment of rocks, pour them out for the two of you to observe. Ask your child questions that help him describe the rocks and see similarities and differences.
- Use the egg carton as a tool in sorting the rocks. Ask your child to use the 12 compartments to find 12 different ways to sort the rocks.
- Follow the instructions below to make a *Rock Hound*.
 -  Choose an oval rock for the head, a larger rock for the body, and 4 small rocks for the feet. Make sure these are flat rocks of the same size so your Rock Hound doesn't wobble.
 -  Glue the rocks together as shown on page 10.
 -  Prop up the head while the glue is drying. Let dry for about 2 days.
 -  Paint (or use permanent markers) your favorite color, adding eyes, nose, and mouth.
 -  Small ears and a tail (made from felt scraps) can be added.



QUESTIONS TO ASK YOUR CHILD

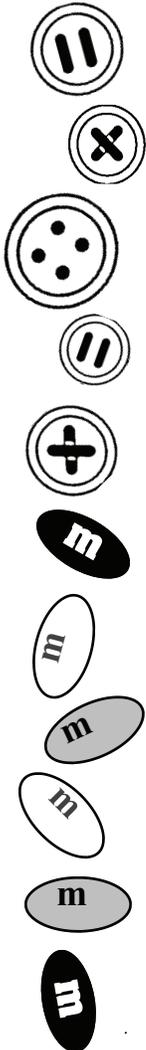
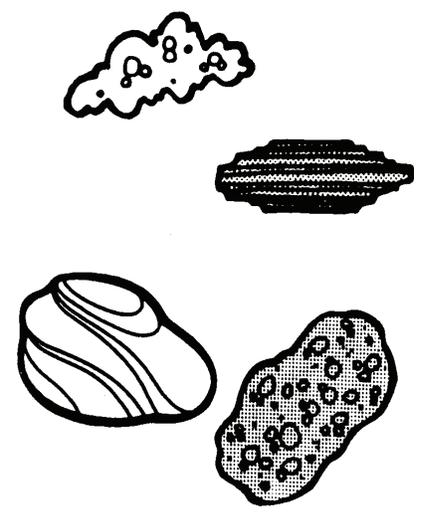
Ask open-ended questions that encourage further exploration by your child.

- *Where did we find the rocks? Did we find the same kinds of rocks in the same places?*
- *Ask questions that use the senses. Describe the rocks that we found. How did they look? How did they feel? Did you hear or smell anything unusual when you were rock hunting?*
- *In what ways did you sort the rocks? Why did you decide to sort them that way?*



Under a Rock

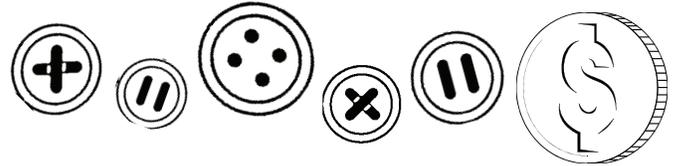
Children have an inquisitive nature. They enjoy observing things. Again using rocks, you will be able to build on this natural interest. You will find a rock, stake it out, and watch and learn from it!



WHAT YOU NEED

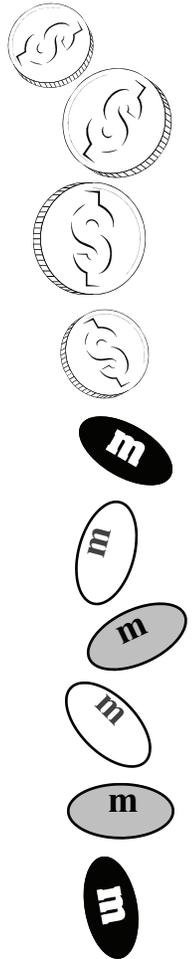
- Large rock in its natural environment
- Leaves and twigs
- Bread or hard candy
- Paper and pencil *(optional)*





HOW TO DO IT

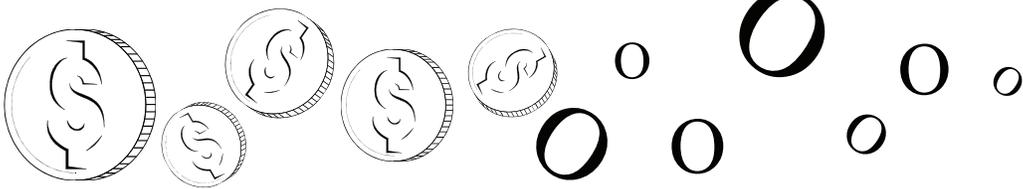
- Go on another rock hunt. This time look for a large rock (one that can be easily lifted).
- With your child, carefully turn over the rock. Observe what is under the rock. Look for plant and animal life. Look at the condition of the soil and the surroundings.
- Through words or pictures, help your child record what you observed.
- Next, place a few leaves or twigs or pieces of bread or hard candy where the rock had been. Return the rock to its original place.
- Check the rock at regular intervals to observe changes that occur. Check for changes in the materials that you placed under the rocks. Observe the conditions of plant and animal life. Record these observations with words or pictures. Compare these observations with the first observation.



QUESTIONS TO ASK YOUR CHILD

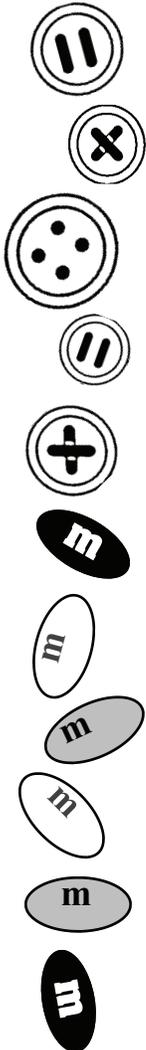
Ask open-ended questions that encourage further exploration by your child.

- *Describe what was under the rock the first time we moved it. How did it look? Smell? Feel?*
- *Describe the changes that occurred after we placed items under the rock. How did it look? Smell? Feel?*
- *What do you think caused the changes? What will happen to the items we placed under the rock?*



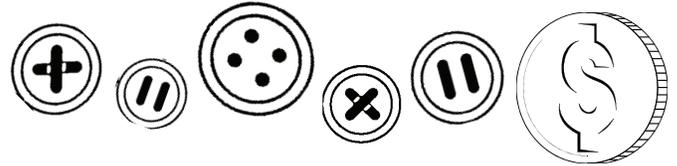
Coin Collectors

Coins are one of the most popular forms of collections. With just a few loose coins, you can help your child practice valuable sorting and organizing skills. The *Coin Games* found in the file folders in the backpack are also fun and educational!



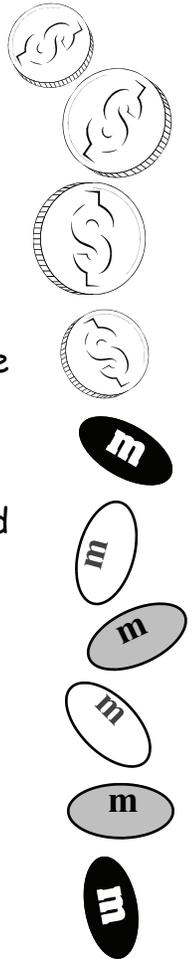
WHAT YOU NEED

-  Pennies, nickels, dimes, quarters, half dollars
-  Coin sorting cards
-  1-or 2-lb coffee can
-  Construction paper
-  Markers
-  Knife
-  Scissors
-  Tape



HOW TO DO IT

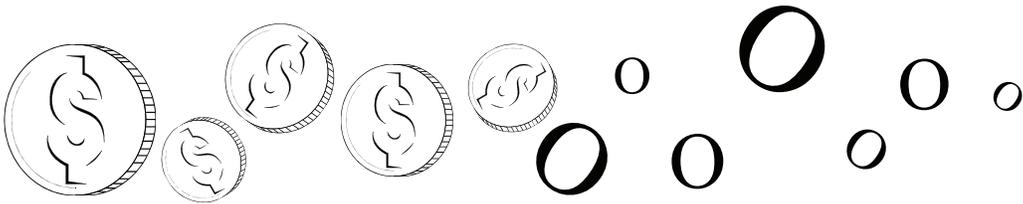
-  Show your child the coins that you have gathered. Ask your child to sort the coins. Count how many ways you found to sort the coins.
-  Using just the pennies, ask your child to find the dates on the pennies. First ask your child to sort the pennies by the decade they were produced: 1960s, 1970s, 1980s, 1990s, etc.
-  Next, have your child place the pennies in a line from the oldest to the newest. Repeat with the other coins if your child is interested.
-  Using the *Coin Cards* on page 16 as a sample, place several coins in piles that have varying values. On slips of paper, write the values. Ask your child to match the paper slips with the appropriate piles. Repeat the activity several times.
-  Learning to save money can be a valuable life skill. Follow the instructions on page 17 and help your child make a *Coin Collector Bank*.



QUESTIONS TO ASK YOUR CHILD

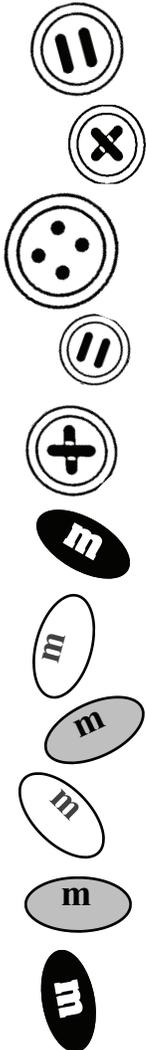
Ask open-ended questions that encourage further exploration by your child.

-  *Describe how you sorted the coins. Why did you sort them this way?*
-  *Describe how you determined the coin pile values. Did you do it the same way each time? Explain.*
-  *What did you do first (second, last, etc.) when you made the coin bank? How many coins do you think you will have in a month? In a year?*

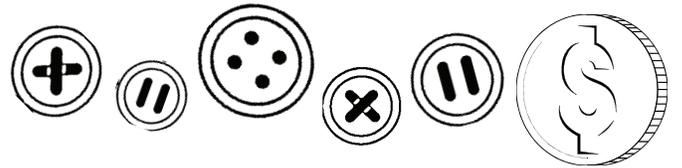


Coin Cards

Match the card to the correct value shown on the slip of paper.



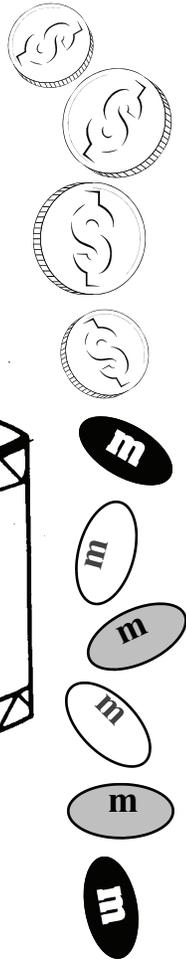
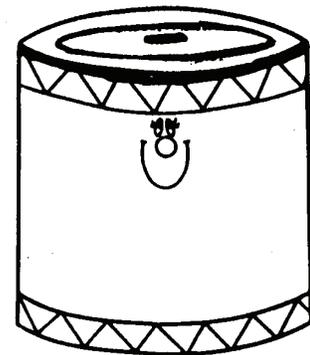
60¢	35¢
\$1.10	25¢
82¢	41¢

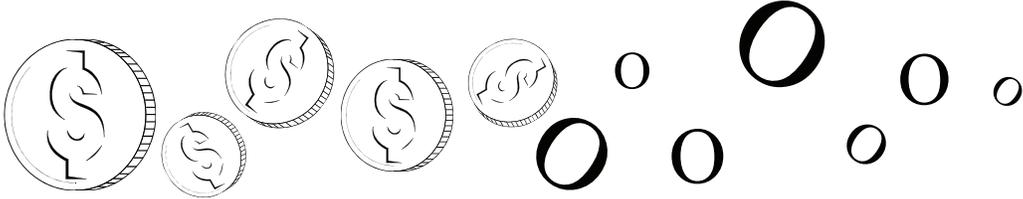


Coin Collector Bank

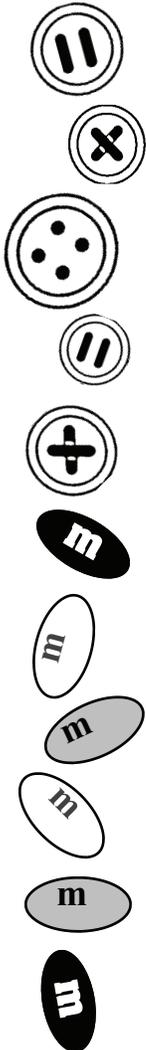
INSTRUCTIONS

- ① Help your child mark a small slot for the coin drop on the plastic lid of the empty coffee can.
- ① Carefully, with a knife, cut out the marked slot in the plastic coffee can lid for your child.
- ① Help your child measure and cut the construction paper to cover the sides of the coffee can, allowing for some overlap.
- ① Ask your child to decorate the construction paper with markers or crayons.
- ① Help your child wrap the construction paper around the can and tape into place.
- ① Put the lid on the coffee can to complete the bank.
- ① Discuss with your child why saving money is important.
- ① Discuss ways that your child can save money.





Marble Maze



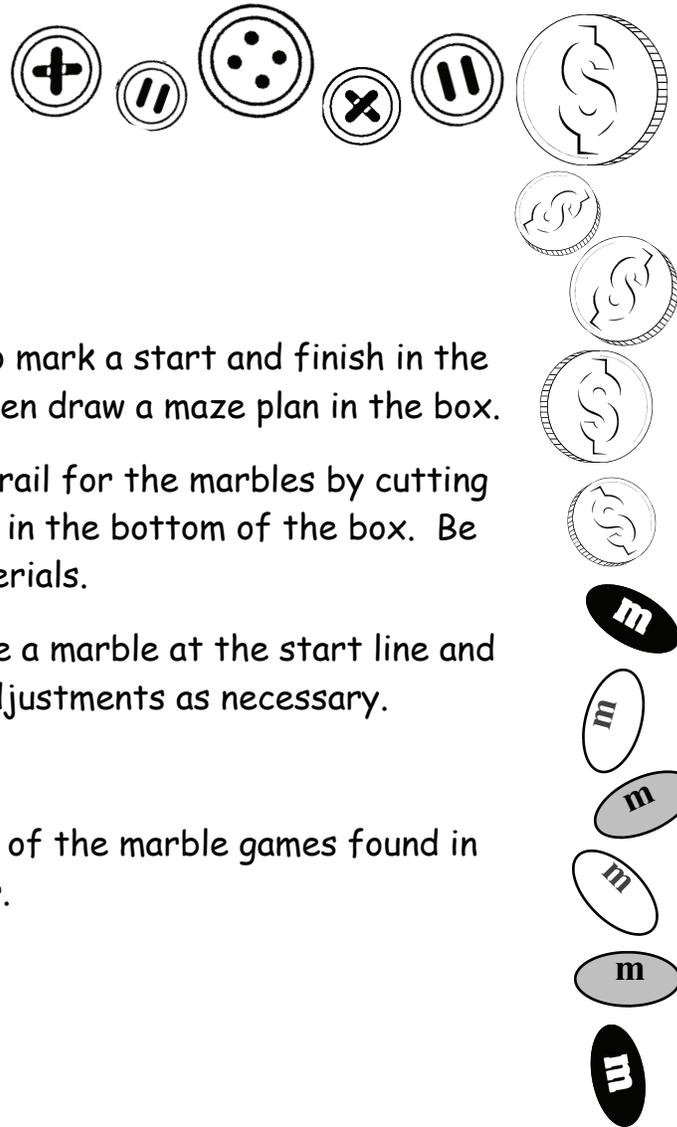
Playing with marbles has been an American pastime since before colonial times. Native Americans played a version of marbles. The diversity of marbles also make them excellent for sorting and classifying.



You will enjoy making marble mazes and creating your own marble games!

WHAT YOU NEED

- % Marbles
- % Shoe box, or cardboard soda case flat
- % Assorted cardboard, Styrofoam, paper towel tubes, and other recyclable items
- % Scissors
- % Masking tape
- % Pencil



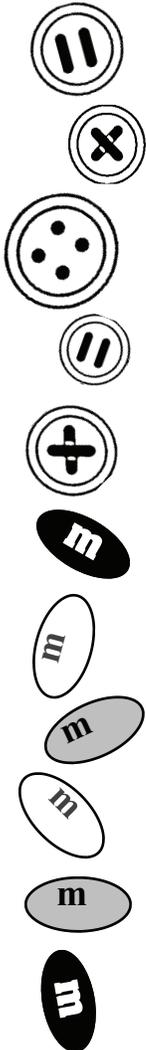
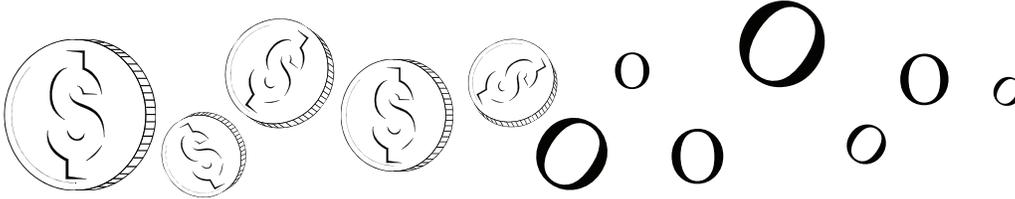
HOW TO DO IT

- % Ask your child to use a pencil to mark a start and finish in the shoe box or cardboard flat. Then draw a maze plan in the box.
- % Help your child create a maze trail for the marbles by cutting and taping the recyclable items in the bottom of the box. Be creative in your use of the materials.
- % When you finish the maze, place a marble at the start line and try out your invention. Make adjustments as necessary.
- % Play the marble maze game.
- % For more marble fun, play some of the marble games found in the backpack marble file folder.

QUESTIONS TO ASK YOUR CHILD

Ask open-ended questions that encourage further exploration by your child.

- % *Describe your completed marble maze.*
- % *What did you do first (second, last, etc.) to make the maze?*
- % *How does the maze work? How could you change the maze to make it harder? Easier?*
- % *Can you think of other mazes that you have seen? Describe them.*



M&M's Collection

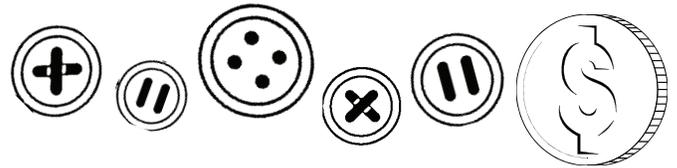
The *M&M's Counting Book* by Barbara Barbieri McGrath provides lots of fun ways to further your sorting and organizing activities with your child. Using M&M's, you and your child can follow along with the instructions in the story. At the end, you can create other ways to sort and count your M&M's.

You'll want to save some of the candies to use in the next activity, **Collector's Trail Mix!**



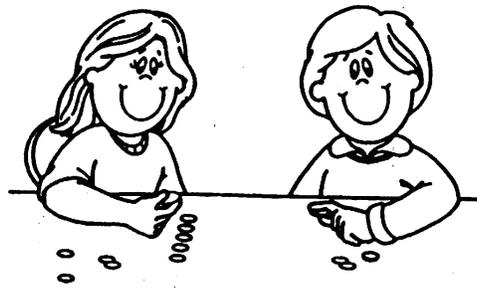
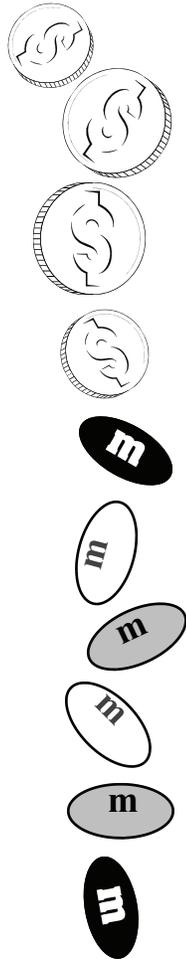
WHAT YOU NEED

-  *The M&M's Counting Book*, by Barbara Barbieri McGrath
-  M&M's candies
-  Two clean, blank sheets of paper



HOW TO DO IT

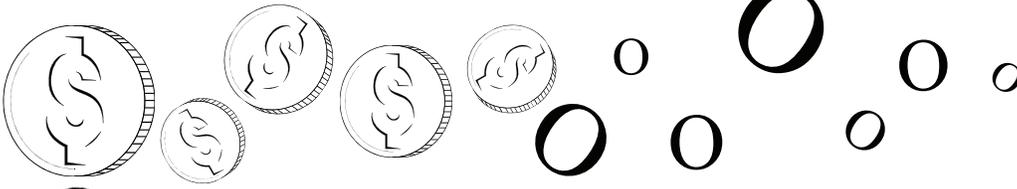
- m** Read the book aloud with your child. If your child is a reader, ask her to alternate with you in the reading.
- m** After you have read a page, use your blank sheets of paper and the M&M's to follow the instructions given on the page. Do this activity side-by-side with your child.
- m** Continue page-by-page, completing each set of instructions.
- m** When you complete the book, ask your child to think of other ways she could sort or arrange the M&M's. Follow your child's instructions. Then give your child some instructions for sorting the M&M's. When interest begins to slow, move on to the **Collector's Trail Mix Activity**.



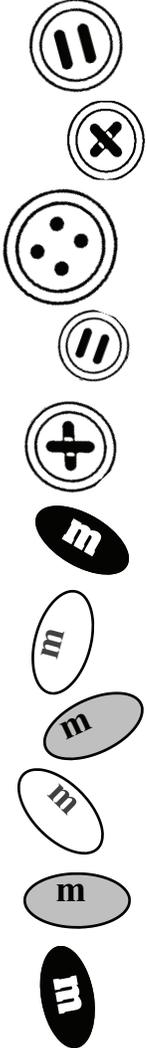
QUESTIONS TO ASK YOUR CHILD

Ask open-ended questions that encourage further exploration by your child.

- m** *Describe how you sorted and counted the M&M's.*
- m** *What new way to sort the M&M's did you create?*
- m** *Which way did you sort the M&M's first (second, last, etc.)?*
- m** *What color of M&M's do you have the most of? The least of?*



Collector's Trail Mix

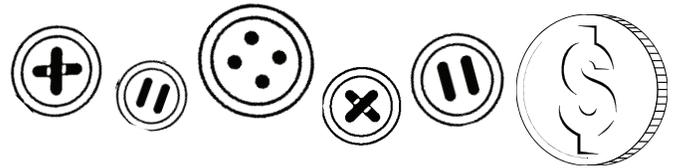


Here's a tasty treat that uses a collection of cereals and M&M's. By providing the ingredients in larger quantities children can measure the amounts needed for this recipe.

WHAT YOU NEED

-  Large mixing bowl
-  1-cup measuring cup
-  1 wooden spoon
-  1 large package of plain M&M's
-  1 large jar of dry roasted peanuts
-  1 box Cheerios, or similar-type cereal
-  1 box granola
-  Small cups, or bags for serving

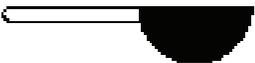
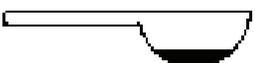


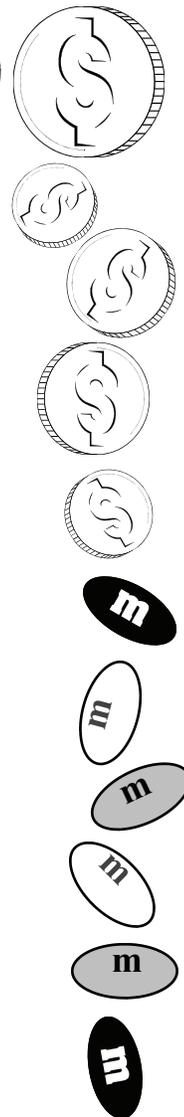


HOW TO DO IT

- m** Help your child gather all the supplies and get set up at a table.
- m** Assist your child in measuring the ingredients according to the recipe below.
- m** Mix all the ingredients together.
- m** Store in covered container or plastic bag.

COLLECTOR'S TRAIL MIX

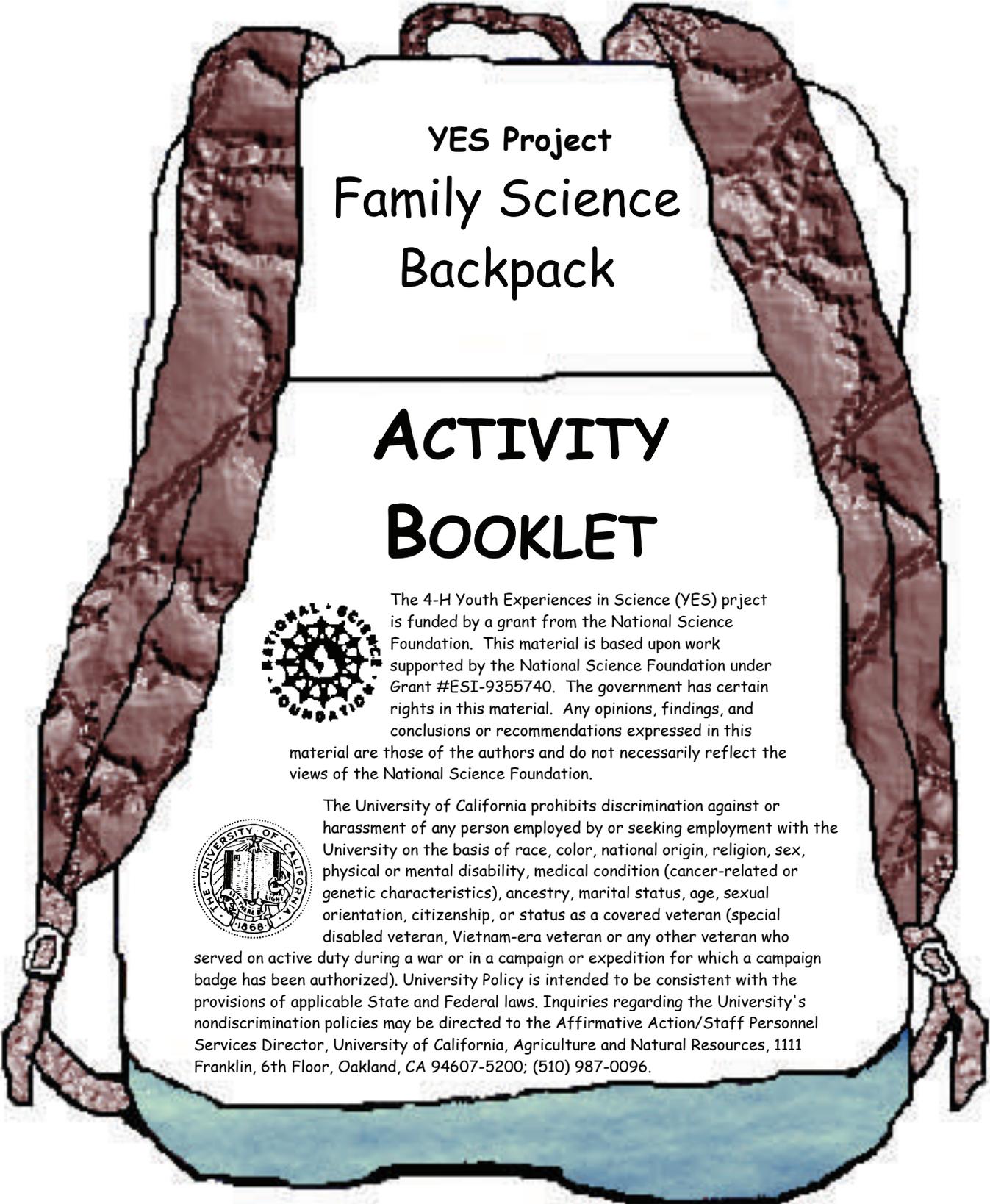
	1 cup granola
	$\frac{1}{2}$ cup Cheerios, or similar-type cereal
	$\frac{1}{2}$ cup M&M's
	$\frac{1}{4}$ cup peanuts



QUESTIONS TO ASK YOUR CHILD

Ask open-ended questions that encourage further exploration by your child.

- m** *Describe the collection contained in the Collector's Trail Mix.*
- m** *Name the ingredients you used in making the trail mix.*
- m** *What else could you put in the trail mix?*
- m** *Describe how the Collector's Trail Mix tastes. Smells. Feels to the touch.*
- m** *Describe how the Trail Mix sounds when you chew it.*



YES Project Family Science Backpack

ACTIVITY BOOKLET

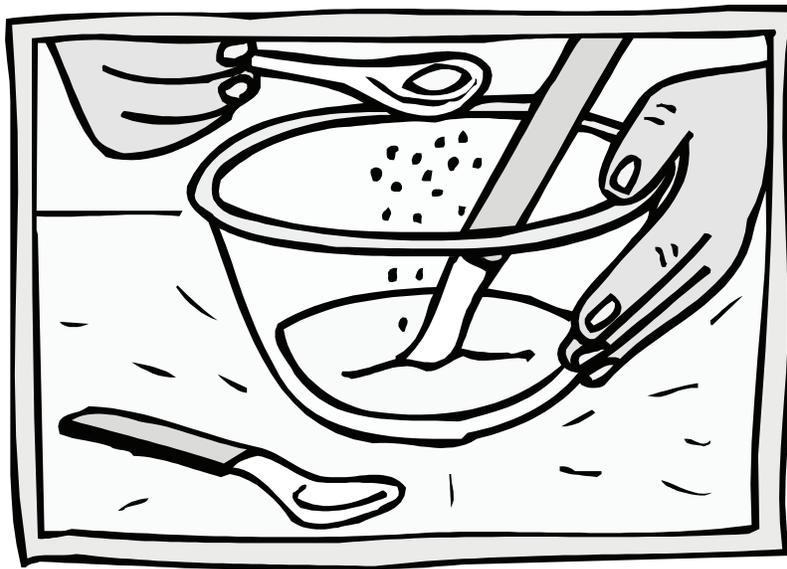


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Kitchen Science Teen Guide



4-H YOUTH EXPERIENCES IN SCIENCE PROJECT
UNIVERSITY OF CALIFORNIA COOPERATIVE EXTENSION
DIVISION OF AGRICULTURE
AND NATURAL RESOURCES
PUBLICATION 3406



Kitchen Science

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Welcome to the 4-H Youth Experiences in Science Project!

There is nothing like the **4-H YES Project** for providing high-quality children's science education in after-school settings. *4-H YES* uses specially trained teenage volunteers to conduct the hands-on science curriculum for children 5 to 8 years of age enrolled in school-age child care programs.

Each *YES* Theme Unit contains five or more 1- to 1½- hour sessions. Each session contains three or more activities that build upon the session's theme.

The session instructions provide an **Overview of the Day's Activities**, **Background Information** on the session's subject, a list of **Materials You Will Need** to conduct the session, a detailed outline on **Getting Ready**, the **Action** required, and specific **Sciencing** questions. When reading the curriculum, be sure to look for the **Tips** in the side column. They give valuable information on setting up and conducting the activities. At the end of the curriculum is a listing of all the supplies needed to conduct each activity.

The *YES* Curriculum incorporates inquiry-based activities with cooperative learning. It focuses on learning the scientific thinking processes and features the learning cycle model of instruction.

The **Scientific Thinking Processes** are built into each of the sessions. The processes of **observing**, **communicating**, **comparing**, and **organizing** are most commonly used in this curriculum aimed at younger children. The processes are indicated in small bold type after the **Action** and **Sciencing** sections of each activity.

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BACKGROUND INFORMATION

KITCHEN SCIENCE

The kitchen is a wonderful place for children to explore. It is full of sensory experiences that encourage children to learn more about the scientific thinking processes in a fun, hands-on way. Children can enjoy the aroma of fresh baked chocolate chip cookies, feel the warmth of dough while making bread, dance to the sounds of popping popcorn, taste the different flavors of a fruit salad, and observe the changes in water and ice.

The parts of the body that allow you to smell, touch, hear, taste, and see are called sense organs. These sense organs include your nose, your skin, your ears, your tongue, and your eyes. In the YES Kitchen Science unit, you will help children use these sense organs to observe, compare, and communicate experiences in and around the kitchen.

Sense of Smell - Your nose is really only a “hood” to cover the other delicate parts of your inner nose. When you breathe in, the air carries smells in the nostrils and up the nasal cavity. When the chemicals in the air that you breathe touch the olfactory receptors, it creates chemical impulses. The impulses are sent to your brain by nerves. Your brain then tells you what you smelled.

Sense of Touch - Your skin is your largest sense organ. It is covered with tiny nerve endings that can sense five different types of touch: texture, pressure, heat, cold, and pain. Each of the nerves send different messages to the brain. Not all areas of your skin have the same amount of nerve receptors. Your lips and fingertips have many more nerve sensors than other parts of the body.

Sense of Hearing - Your ears are your hearing sense organ. Soundwaves are captured by your outer ear and move through the auditory canal to the eardrum. The waves cause the eardrum to vibrate and send electrical impulses to a special nerve in the brain. Your brain then reads this information. Your brain interprets sounds in three ways: pitch, loudness, and tone. Pitch is determined by how many soundwaves hit your eardrum within a given time. Loudness is determined by the force of the soundwaves. Tone is a special quality created by the vibrations of the soundwaves.

Sense of Taste - Your tongue is your taste sense organ; it is covered by thousands of tiny taste buds. When you eat, the chemicals in your food touch the tips of these receptors. This creates electrical impulses that are sent to a special nerve in the brain. The taste receptors can distinguish four main tastes: *salty, sweet, bitter, and sour*. All the different tastes that you experience when you eat food are determined by a combination of these four basic tastes.

Sense of Sight - Your sense of sight gives you another type of information: visual. The information is gathered by your eyes, your sight organs. After your eye gathers the information, it is changed into electrical impulses and sent to a special nerve in the brain. The brain is then able to read the eye's information. Your eye works much like a camera. A small black hole in the center of the eye is called the *pupil*. It lets light into your eye. The *iris*, or colored part of your eye, works like a shutter on a camera by adjusting the amount of light. Behind the iris is the *lens*. Just like in a camera, it focuses the light and sends it to the *retina*. The retina operates like film in a camera and sends the recording to the brain.

SIGHTS IN THE KITCHEN

Approximate Time Required for Session: 1 hour

Purpose

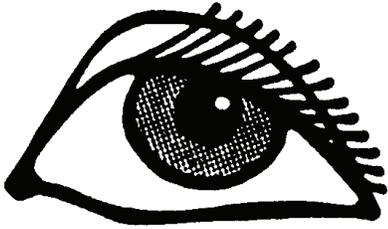
- Children will use their *sight* to observe several chemical reactions that occur in the kitchen.
- Children will use their *sight* to observe color changes that occur in the kitchen.
- Children will communicate what they observe with their sense of *sight*.

Overview of the Day's Activities

In this session, you will introduce the children to the *Kitchen Science Unit*. Using the story *My Five Senses* by Alikei, you will help the children understand how they use their senses to observe. The remainder of the session will focus on the sense of *sight* in the children. Children will use baking soda and vinegar to observe color changes that occur when added to grape juice.

In *Activity C*, children will use their sense of *sight* to observe color movement in milk when dishwashing detergent is added to the milk, dispersing the fat in it.





Background Information

The kitchen can be a great place for children to explore using the sense of *sight*. Many visual comparisons can be made in the kitchen, like sizes of different food items, cooked and uncooked pasta, browning of toast, and how different appliances work.

The sense of *sight* gives visual information. The information is collected by the eyes. The eyes work very much like a camera. The visual information is changed into electrical impulses and sent by a special nerve to the brain. The brain is then able to interpret the eye's information.

Presentation Notes

ACTIVITY A

MY FIVE SENSES

Time Required
20 minutes

Suggested Grouping
large group

*In this activity, you will use the *My Five Senses* story to introduce the Kitchen Science Unit and the importance of our senses in observing things that occur in our world.*

Materials You Will Need

- My Five Senses* by Alik
- Chart paper
- Markers
- Senses Cutouts

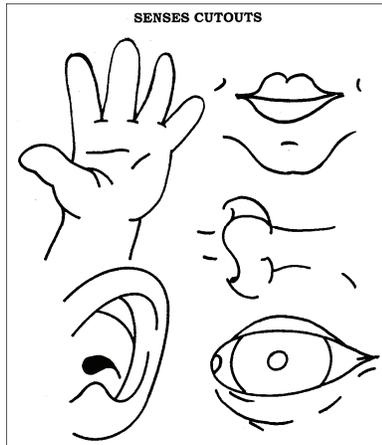
Getting Ready

- ❶ Gather all of the needed supplies.
- ❷ Reading the story to a large group of children will work best if they are seated in a circle on the floor. In advance, find an area where the children can be seated comfortably.
- ❸ Read the *My Five Senses* story several times before the session. Practice holding the book so all children can see the illustrations.
- ❹ Enlarge and cut apart the *Senses Cutouts* or see page 12.

ACTION: OBSERVING, COMMUNICATING, AND COMPARING

1. Seat the children in a semicircle on the floor. Start the day by showing the children the





See page 12



Senses Cutouts. Ask the children to discuss what the cutouts represent. Tell the children that during the *Kitchen Science Unit*, each day will focus on a different sense. As they do the activities, tell them that you'd like them to use all of their senses.

2. Show the children the storybook. Before reading, ask the children to predict what they think the story is about.
3. Read *My Five Senses* by Aliko.

Tips for Successful Oral Reading

- **Setting the stage** - Have the children sit in a semicircle with your chair slightly higher. Ask some brief questions to build enthusiasm and encourage responses. Keep the book facedown or out of sight.
- **Presenting the book** - Show the book so the cover is clearly visible. Make sure the children can see the pictures easily. Tell them the name of the book, the author, and the illustrator. Discuss the illustrations.
- **Reading the book** - Use plenty of expression. Adjust your voice and speed of reading to fit the story. Keep children involved by asking: "What do you think is going to happen?" **The most common mistake is reading too fast.** Read slowly enough for the children to build mental pictures.

**SCIENCING: OBSERVING,
COMMUNICATING, AND COMPARING**

1. Use the following questions, and some of your own, to help children share their thinking about the story.
 - What did the boy see, hear, smell, taste, and feel in the story?
 - Have you seen, heard, smelled, tasted, or felt these same things?

Other Questions

2. As a group, ask the children to make a list of items that they can see, hear, smell, taste, or feel in the kitchen. Record their responses next to the five *Senses Cutouts*. Refer to this list as you lead all five sessions.

ACTIVITY B**COLOR CHANGES****Time Required**

20 minutes

Suggested Groupinggroups of 4 to 6
children

In this activity, you will help the children observe changes that occur when baking soda and vinegar solutions are added to glasses of grape juice.

Materials You Will Need

For one table group of 4 to 6 children:

- 100% grape juice, **not grape drink or juice mix**
— enough so each child has 2 cup
- Baking soda — 1 box
- Vinegar — 1 quart
- Measuring spoons — 1 set per table
- Clear glasses — 3 per team of children
- Spoons for mixing
- Chart paper and markers

Getting Ready

- ❶ Gather all of the needed supplies based on the size of the group with which you will be working. *(The materials list is based on a table of 2 to 4 children.)*
- ❷ *Make sure you use 100% pure grape juice.* Read the label carefully. The activity won't work with grape drink or a grape juice combination.
- ❸ Read through the instructions and determine how you will organize the exploration activity; organize your table and supplies accordingly.

Since many of the same supplies are needed for this activity as for Activity C, you may wish to introduce the activity at the same tables in order to keep cleanup easier.

ACTION: OBSERVING, COMPARING, AND COMMUNICATING

1. Show the children the *sight* symbol. Ask the group to brainstorm the types of things that they use their sense of sight to observe in the kitchen. (*Encourage the discussion to include things that are not always observable with other senses such as color, movement, and changes in form.*) Record the children's responses.
2. Explain that in this activity they will use their sense of sight to observe changes that occur when they add different substances to grape juice.
3. First, tell the children to fill three glasses $\frac{1}{2}$ full of grape juice. *Make sure the children are using clear glasses so they can fully observe the reaction.*
4. Next, tell each group of children to measure c teaspoon of baking soda into one glass of the grape juice. Stir the solution with a clean spoon. Observe the color change. *Compare this to the color in the other glasses.*
5. Next, tell the children to measure 3 teaspoon of vinegar into a second glass of grape juice. Stir the solution with a clean spoon. Observe the color change. *Compare this to the color in the other two glasses.*



Tip
 Refer to
 the
SIGHT
 symbol
 as you conduct
 the Scien^g
 questioning.

SCIENCING: OBSERVING, COMPARING, AND COMMUNICATING



Tip
If working in a team, one teen asks questions while another records the children's responses.

What Happened?

Our Discoveries

1. Move the children away from the tables to the *Sciencing Circle*.
2. Ask the children to describe what happened at their table.
3. Ask questions such as the following.
 - What happened when you added the baking soda solution? What color change did you observe? Did you see other changes?
 - What happened when you added the vinegar solution?
 - Did you use any other senses besides sight to observe the changes? If so, which ones?
 - Have you observed any other color changes in your kitchen? *(Think of color changes you have observed, such as a sliced apple turning brown to prompt the children's responses.)* List their observations on the chart paper.
4. Return the children to the tables to further explore. This time, encourage them to think of their own "What if" questions (e.g., what would happen if we poured the vinegar solution into the glass with the grape juice and baking soda solution?) Allow plenty of time for exploration.

ACTIVITY C

COLOR STREAMERS

Time Required

15 minutes

Suggested Grouping

tables of 4 to 6

In this activity, you will help children explore the effects of surface tension. They will use their sense of sight to observe the colorful changes that occur when dishwashing soap is added to milk and food coloring.

Materials You Will Need

For one table group of 4 to 6 children:

- Clean, shallow bowl or pie plate
- Food coloring — 1 set of 4 colors
- Liquid dishwashing detergent (*use a high quality brand*)
- Paper towels
- Whole milk — 1 quart
- Chart paper and markers

Getting Ready

- ❶ Gather all the supplies based on the size of the group with whom you will be working. (*The materials list is based on a table of 4 to 6 children.*) Make sure each table has its own set of food coloring and a small amount of the dishwashing liquid.
- ❷ Set up chart paper for recording the children's observations.



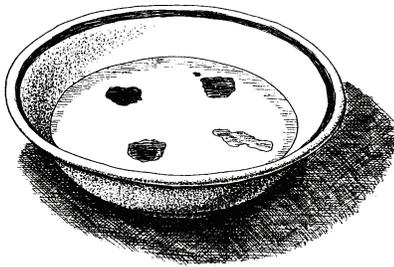
Tip
Make sure
the milk is
whole
milk.



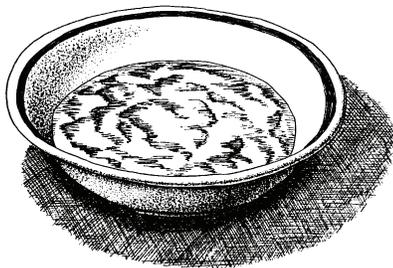
Tip
Make
sure that
the bowl
or pie
plate that you
use is clean and
free of oil.



Tip
Point to
the sight
symbol
and the
observations
recorded.



Tip
Food
coloring
can stain
the
children's
clothing, so use
caution.



ACTION: OBSERVING, COMMUNICATING, AND COMPARING

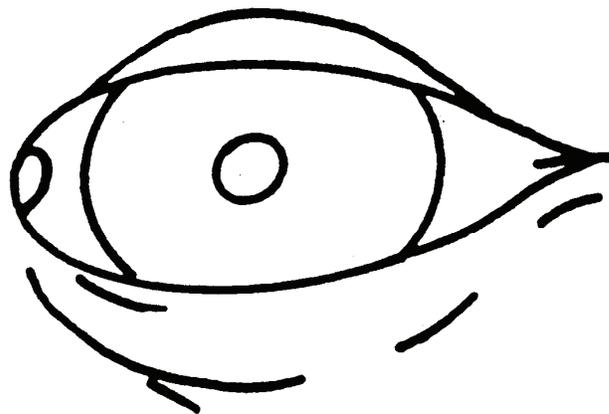
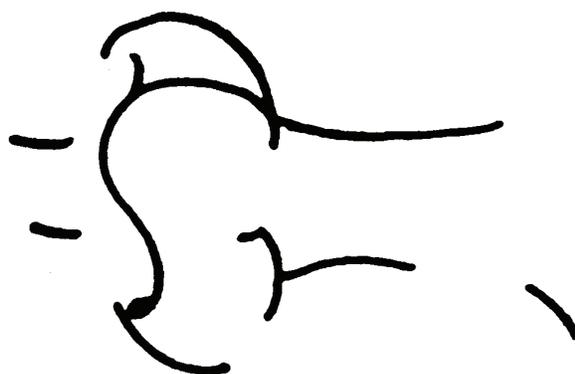
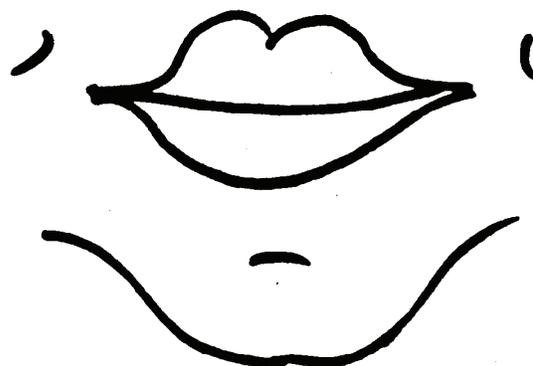
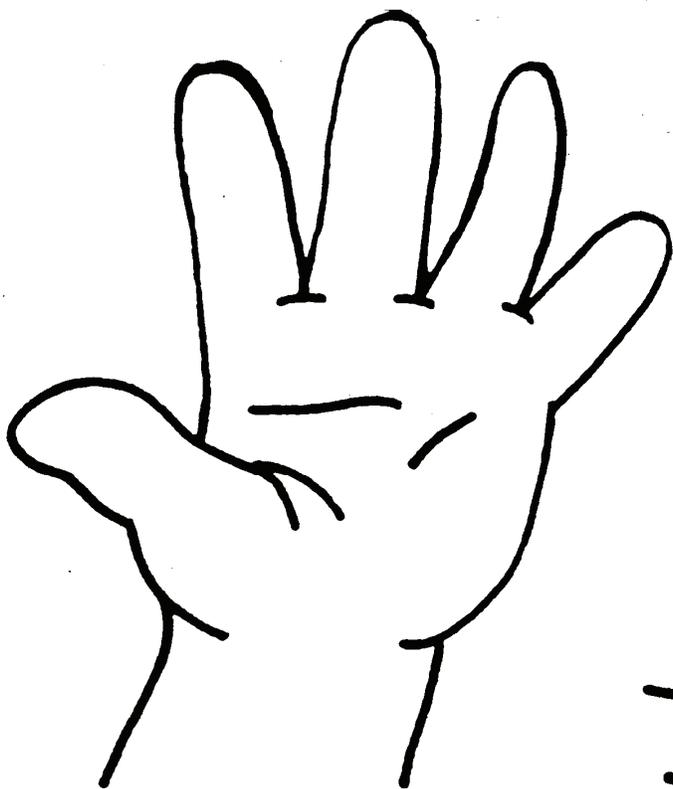
1. Again, ask the children to think about their sense of sight and how it is used to observe color. Ask if any other of their senses can observe color.
2. Pass out the bowls, milk, dishwashing detergent, and food coloring to each table. Explain to the group that you want them to follow your instructions carefully.
3. Ask one child at each table to pour a small amount of milk into the bowl or pie tin, enough to cover the bottom of the dish with about 1 inch of liquid.
4. Ask four other children to put two or three drops of food coloring into the milk. *Tell them not to stir the bowl.* Ask them to observe the colors. Record what they observe.
5. Now ask another child to add one drop of detergent into the milk. Observe the changes. Record the children's responses.
6. Ask the children what would happen if they added more detergent. Tell the children to add another drop or two of the detergent and observe those changes.
7. After the colors have stopped moving, ask the children to find a way to get the colors moving again.
8. Allow plenty of time for further exploration at each table.
9. If time permits and the children are interested, encourage them to pour out the milk and redo the activity.

**SCIENCING: OBSERVING,
COMMUNICATING, AND COMPARING**

1. Move the children away from the table to the *Sciencing Circle* for further discussion.
2. Ask each group to tell *one thing they observed* in the activity using their sense of sight. Repeat until all the responses have been recorded.
3. Ask if they used other senses besides their sight to observe changes.
4. Ask how they were able to get the color streamers moving again.
5. Ask if anyone knows what is causing the changes to occur. (*The soap breaks the surface tension of the milk. It breaks apart the tiny drops of fat that are in the milk.*)

Presentation Notes

SENSES CUTOUTS



SOUNDS IN THE KITCHEN

Approximate Time Required for Session: 1 hour

Purpose

- By using their sense of *hearing*, children will observe things found in the kitchen.
- Children will identify various objects through their sense of *hearing*.
- Children will explore individually, and as a group, the *sounds* that kitchen objects make.
- As the children explore the *sounds* made with kitchen glassware, they will learn about pitch and loudness.

Overview of the Day's Activities

Children will use their sense of hearing to observe and explore the different sounds that kitchen objects make. They will listen to a collection of sounds on a cassette tape recording and try to identify what objects made the sounds.

Children will attach different kitchen utensils to a string and, by touching the ends of the string to their ears, they will hear and feel different sounds and the vibrations they make. They will explore the sounds made by different levels of water in glass containers when blown into, when tapped with a spoon, and when a finger is rubbed around the rim.





Background Information

The kitchen can be a great place to explore the science of *sound*. With appliances, metal and wooden spoons, pots, pans, and potato peelers, a multitude of different sounds can be made and experienced.

Sound travels in waves. These sound waves can travel through air, water, wood, and even along a piece of string. They can produce a brilliant chiming, loud clanging, or soft whir.



Preparation Notes

ACTIVITY A

NAME THAT SOUND!

Time Required

15 minutes

Suggested Grouping

large group

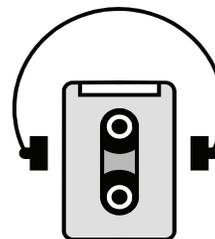
In this activity, children will listen to a tape recording of a collection of kitchen sounds made by the teen leader. As they listen to each sound, the children will try to identify it.

Materials You Will Need

- Portable cassette tape recorder with microphone
- New batteries for the tape recorder
- Blank cassette tape
- Chart paper
- Markers
- Senses Cutouts
- Tape

Getting Ready

- 1** *Prior to the day of presentation, make a tape recording of kitchen sounds for the children to identify. Each sound should last long enough to be heard clearly. Record about 10 different sounds. Some ideas might be: *blender, cabinet doors shutting, popping corn, pouring cereal into a bowl, measuring rice in a cup, pouring milk, etc.* Try to record kitchen sounds that would be common in the children's experience.*
- 2** *Make a list of the sounds you record in the order in which they are heard on the tape. This will allow you to later verify the children's guesses.*



ACTION: OBSERVING, COMPARING, AND COMMUNICATING

1. Use the hearing senses cutout to introduce the activity on hearing in the kitchen. Explain that you want children to use their sense of hearing as they conduct the activities.
2. Tell the children that there are many things that make sounds in a kitchen. Name some sounds you hear in your kitchen. Say: What made the sound? Name sounds you like that come from the kitchen. Name sounds you don't like. *Have one teen record the responses.*
3. Tell the children that they are going to listen to a tape recording you made of kitchen sounds. Ask them to listen carefully to each sound. Play the tape of the kitchen sounds once. Ask if anyone can identify any of the sounds. Record their first responses.
4. Then play the tape again, pausing after every separate sound. Ask the children to identify the sound they just heard. Record their observations on the chart paper. *Does it compare to their first list?* If there are multiple responses, record them. Replay each sound if necessary. So children can confirm the sounds, tell them the correct response after each sound rather than waiting until the end of the tape.



Tip
Be sure to keep your list of the order of the sounds near you so that you can refer to it if necessary.

Presentation Notes

SCIENCING: OBSERVING, COMPARING,
AND COMMUNICATING

1. Compare their first and second responses with the correct answer. (Replay the tape so the children can confirm the sounds if they still are uncertain.)
2. Ask the children to describe what it was about the sounds that helped them identify them. (Did it sound like noises in their kitchen? Did it sound like when they used the blender at home? etc.)
3. Were any of the sounds alike? If so, describe *how*. (E.g., two sounds used water or two used pots and pans.)

Presentation Notes

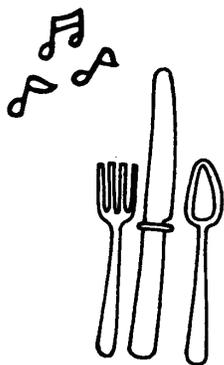


ACTIVITY B

CHIMING KITCHEN
GADGETS

Time Required
25 minutes

Suggested Grouping
teams of 2 children



In this activity, children will observe the different sounds made by a variety of kitchen gadgets when tied to a string. Working with a partner, the children will help each other observe the differences in sounds when the string is held to their ears.

Materials You Will Need

- Balls of string — 2 different thicknesses
- Ball of yarn
- Scissors
- Collection of kitchen gadgets: *large metal spoons, slotted spoons, spatulas, metal cooling racks, wooden spoons, mixers, beaters, whisks, salad tongs, scissors, etc.* — enough so each team will have 1 or 2 utensils
- Pencil for each team of children
- Chart paper
- Small pad of self-adhesive notes (1" x 2")



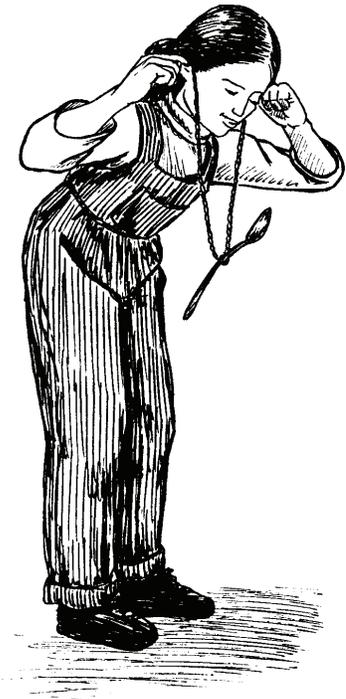
Tip
You will want to have at least one item made from silver. Thrift stores or rummage sales are great places to find old silverware.

Getting Ready

- ➊ Obtain all necessary materials listed above. Make sure you have enough for each team of children. *(The materials list is based on a table of 4 to 6 children.)*
- ➋ Cut the string and yarn into 2-foot lengths. Make one 2-foot length for each kitchen gadget.
- ➌ Tie each kitchen gadget in the center of the string.

- ④ Test each gadget *before the meeting* so that you are familiar with the procedure and the sounds that the different ones make.
- ⑤ Make the *Favorite Sound Chart* for the *Sciencing* section by writing “Our favorite kitchen gadget sounds ” and, at the bottom, the name of each kitchen gadget (see example on page 21).

Presentation Notes



ACTION: OBSERVING, COMMUNICATING, AND COMPARING

1. Show the children a large metal spoon and ask them what sound they think it might make? Ask how they could find out? Most will say “hit it on another object, or hit it with another object.”
2. Explain to the children that they are going to be observing the sounds that kitchen gadgets make—in a different way—when the gadgets are dangling from a string!

Demonstrate to the children how to do the activity with the large metal spoon.

- Tie a string onto a utensil so that it will dangle freely from the two string ends. (See figure on page 19.)
 - Show them how to wrap the ends of the string once or twice around the tip of each index finger and pinch the string.
 - Bring your fingers up to your ears, as if you were plugging them, then lean your body forward. Make sure that the string dangles freely and does not catch on anything.
 - Ask one of the children to gently tap the dangling kitchen gadget with a pencil. Listen and describe the sound that it makes.
3. Explain to the children that they are going to work with a partner and observe the sound that each kitchen gadget makes.
 4. Place several gadgets on each table. Instruct the children to find a partner and get a kitchen gadget to observe. Explain that after they have each observed one object, they should try the other kitchen gadgets.



Tip
This can be done as one large group, or by a teen at each table.



Tip
Walk around the room and help anyone who is having difficulty dangling the string freely. You may actually have to help them by bending their body to allow the string to dangle freely.

5. Allow the children plenty of time to listen to each kitchen gadget and encourage them to talk about what they are hearing.

SCIENCING: OBSERVING, COMMUNICATING, ORGANIZING, AND COMPARING

1. After everyone has had an opportunity to observe the various sounds, gather the groups around each table and ask the children to share their experiences.
 - Hold up each kitchen gadget and ask them to describe the sounds they heard.
 - How were the sounds alike? How were they different?
 - Ask the children to sort the gadgets by the sound they made.
 - Ask them what they noticed about the kitchen gadgets in each group they sorted.
 - How can they sort them in other ways?
 - Ask them why they think they are able to hear the sounds through the string.
2. Chart the children’s responses to the sounds made by the kitchen gadgets. Chart with the name of each gadget across the bottom. Give each child a self-adhesive note. Ask them to place the label above the name of their favorite sound.
3. After all of the children have placed their labels on the chart, ask them to observe the chart and draw some conclusions. *(For example: For the group, what were the favorite gadgets for making sounds? Their second favorite? Their least favorite?)*

Favorite Sound Chart

Our favorite kitchen gadget sounds are

Spoon	Fork	Rack	Bowl
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ACTIVITY C**RINGING WATERS****Time Required**

20 minutes

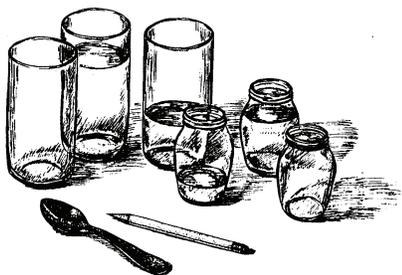
Suggested Grouping4 to 6 children at
tables

In this activity, children will explore the sounds made by tapping objects against glass jars and containers filled with various amounts of water. Children will observe how changing the amount of water can change the pitch. They will observe differences produced by varying the containers and the tapping instruments. They will also blow into bottles and use their finger to circle the rim of a glass to make sounds.

Materials You Will Need

For one table group of 4 to 6 children:

- Variety of glass containers – collect in sets of 3 (*empty baby food jars, mayonnaise jars, soda bottles, glasses and cups from your home, stemmed glasses and other glass containers that represent a variety of sizes and shapes*)
- Metal spoons – 1 per child
- Pencils – 1 per child
- Pitcher of water – 1 per table
- Funnel – 1 per table
- Dish pan or plastic bucket – 1 per table
- Chart paper
- Markers

**Getting Ready**

- ❶ Gather all of the needed supplies based on the size of the group with which you will be working. (*The materials list is based on a table of 4 to 6 children.*)

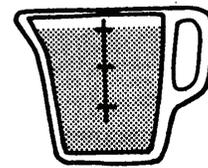
- 2 Make sure you have at least one set of three identical glass containers for each table group, and one tapping instrument per child to start the activity.
- 3 For the second and third actions in the activity, be sure to have sets of bottles and stemmed glassware.
- 4 Experiment with the different sounds made from the containers prior to conducting the activity.
- 5 Arrange one or two matched sets of glassware at each table so that children can freely access the containers, water, and buckets. Arrange extra containers on another table that children can explore later in the activity.
- 6 Try to have one teen at each table of children to assist in the observations and exploration.
- 7 Set up a demonstration area with four identical containers. Fill one container 1/3 full with water, one 1/2 full, and one 3/4 full of water. Keep one container empty. Gather several spoons or pencils for the demonstration.

ACTION: OBSERVING, COMMUNICATING, AND COMPARING

1. Show the children the three identical glass containers. Tell them that two have been filled with water and one is empty. Ask the children to predict whether each container will make the same sound when tapped with a spoon. Will it make the same sound when tapped with a pencil? Record the predictions.



Tip
 Provide a number of identical containers so that children can vary the water levels in similar containers and observe the variation in sounds.





Tip
Only use
glassware
or jars for
this

introductory
part. Introduce
the bottles and
stemmed
glassware later
in the activity.

Ask for volunteers to gently tap the containers with the spoons. What did they discover? Next, tap the containers with a pencil. Were the sounds the same? Explain that the different sounds they were making are called *pitch*.

2. Move the children to the tables where the supplies have been arranged. Ask the children to explore with the matched set of containers. Ask them to see if they can make different sounds.
3. After the children have had some time to explore, ask them to stop their activity for a moment so you can ask several questions.
 - What have you found out by using the containers, water, and the tapping instruments?
 - How were you able to make different sounds?
 - How could you make higher and lower pitches?
 - How could you make softer or louder sounds?

Now ask the children to continue exploring with a partner using some different containers that you've placed on their table. Can they create different sounds from those that they made with the first containers?

**SCIENCING: OBSERVING,
 COMMUNICATING, AND COMPARING**

1. After the groups have had ample time to explore together, ask them to stop their activity. Move the groups to the *Sciencing Circle* for discussion.
 - Ask what they discovered. How did they make new sounds?
 - Could they make any patterns out of the sounds?
2. One by one, ask each table group to share one thing they tried or discovered (e.g., “We tried filling the glass all the way to the top.” “We found the pencil made a different sound than the spoon.”)
3. As the groups share their discoveries, encourage the children to use descriptive words related to sounds. Record on chart paper what the children are discovering. See how many different discoveries you can list on the chart paper.

OUR DISCOVERY CHART

OUR SOUND WORDS	

**MORE ACTION: OBSERVING,
 COMMUNICATING, AND COMPARING**

1. Move the groups back to the tables to continue this exploration. Tell them you have added five empty soda bottles to their tables. Ask if anyone wants to make a prediction about the sounds that can be made with the bottles.
2. Next, ask the groups to fill the bottles with various levels of water. See if they can create different sounds and pitches from the bottles by blowing into them. Ask them to experiment with the levels of water in the bottles, and also with empty bottles.



3. Ask the children to see if they can create a musical scale or a simple child's song like *Do, Re, Me* or *Mary Had a Little Lamb*.
4. Next, encourage them to use a pencil or spoons to tap the bottles. Continue clinking for another minute or two. How does the pitch change?

SCIENCING: OBSERVING, COMMUNICATING, AND COMPARING

1. While still at the tables, ask each group to share one thing they discovered about the bottles and sound making.
2. Are the sounds made from blowing the same as the sounds made by tapping the bottles?

MORE ACTION: OBSERVING, COMMUNICATING, AND COMPARING

1. Now provide each table with *three stemmed glasses*.
2. Demonstrate how to wet a fingertip and rub it back and forth around the rim of a glass until it begins to ring. Ask the children to try to get one of their glasses to ring.
3. Next, ask the children to see if they can create different pitches from the glasses based on the amount of water in the glass. Encourage them to use the other glasses and bottles to create different sounds.



**SCIENCING: OBSERVING,
COMMUNICATING, AND COMPARING**

1. Move the children away from the exploration tables to the *Sciencing Circle*.
2. Ask the children to describe other things that they have discovered about the glasses and bottles. Ask how they found this out.
3. Could they make sounds louder? How?
4. Could they make the pitch higher or lower? How?
5. Could they create different sounds using a fingertip?
6. Relate to their sense of hearing how they can distinguish all these different sounds.
7. If time permits, allow for additional exploration.

OUR RINGING WATER DISCOVERIES	

TOUCH IN THE KITCHEN

Approximate Time Required for Session: 1 hour

Purpose

- Children will observe things found in the kitchen using their sense of *touch*.
- Children will make comparisons about things that they *feel*.
- Children will communicate what they observe through their sense of *touch*.

Overview of the Day's Activities

In this session, you will focus the attention of the children on touch in the kitchen. Using a variety of kitchen items, from food to utensils, you will create opportunities for discovery and observation. In *Activity A*, the children will match pairs of similar items through their sense of touch, and will sort kitchen items according to their texture. In *Activity B*, children will create several kitchen mixtures and doughs. They will explore and compare the mixtures and observe changes in their size, texture, and form.

Background Information

Touch is one of our five senses. Through our sense of touch, we can feel all kinds of things: heat, cold, pain, texture, and pressure. Our sense of touch helps us observe and learn more about the world around us.





Underneath our skin are millions of tiny touch sensors that send signals to our brain. Some of these sensors tell if things are hot, others tell if things are cold, and still others tell if we are in pain. These sensors not only help us experience our world, but they are important alarms to protect us from harm.

Not all parts of our skin have the same sensitivity. The skin on our hands, feet, and face, are much more sensitive than other parts of our skin. The tip of our tongue has the most touch sensors. Our fingertips are the most sensitive part of our hands. They have many more sensors than the palms or backs of our

Preparation Notes

hands.

ACTIVITY A

IT'S IN THE BAG!

Time Required

15 minutes

Suggested Grouping

tables of 4 to 6 children

This activity provides a fun way to introduce the day's session. Children will enjoy using their "touch test" to match pairs of objects in brown paper bags. Without the benefit of sight, children will be asked to use their sense of touch to determine which objects should be paired together. They will be challenged by items such as cooked and uncooked spaghetti, a grape and a raisin, and an aluminum foil pie pan and a sheet of foil wrap.

Materials You Will Need

For one table group of four to six children:

- Brown paper grocery bags – 1
- Large rubber bands – 1
- Grapes and raisins
- Cooked and uncooked spaghetti
- Aluminum foil pie tin and sheet of foil wrap
- Peeled and unpeeled orange
- Walnuts, shelled and unshelled
- Corn on the cob and popcorn kernels
- Whole apple and apples peeled and sliced
- Add other kitchen pairs of your own

Getting Ready

- ❶ Gather and prepare the supplies listed above.
- ❷ You will need to cook part of the spaghetti, peel an orange, slice an apple, and crack a walnut for the *Touch and Feel Bags*.





Tip
Add other
pairs of
your
choice to
the brown paper
bag.



Tip
Use the pie
tin to hold
the items
not placed
in the paper bag.

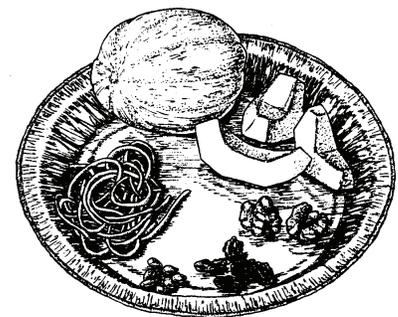
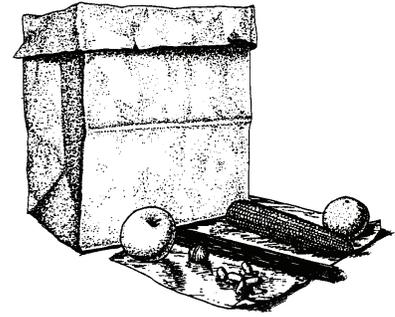
- ③ Fold down the edges of the bag and secure it about 3 inches from the top with a large rubber band. (The rubber band should allow the bag opening to stretch enough for children to stick their hands comfortably into the bag.)
- ④ Put one item of each of the pairs listed above into the large grocery size bag. Keep the other half of the pair items out for visual observation (*i.e., keep out the grape, orange, walnut, etc: put the raisin, peeled orange, and walnut meat into the bag.*) Secure the top of the bag as described above.
- ⑤ Prepare one bag for each table of children according to the directions outlined above.
- ⑥ Prepare one pair of samples to use as the introductory pair (*e.g., whole apple and sliced apple.*)
- ⑦ Set up the flip chart or identify a chalk board

Presentation Notes

area for recording children's responses. Label the top of the chart *Touch and Feel Words*.

ACTION: OBSERVING, COMMUNICATING, AND COMPARING

1. Tell the children that today they are going to use their sense of *touch* to explore items found in the kitchen. *Show them the hand touch symbol cutout.*
2. Tell the children you have prepared some *touch and feel* bags for them to test their ability to identify items through their sense of touch. Show the children a set of paired items, such as a whole apple and a slice of apple, or a peeled orange and a whole orange.
3. Explain that you want them to use their sense of touch to match items in a brown paper bag with the items in the pie pan. They can only use their hands. Each person will have a chance to find and retrieve *one pair of items*. Then the bag will be passed to the next person.
4. Pass out the bags after you have given the instructions. Assign a teen to each table to assist in the discovery and observation.
5. After each child has found a matched pair, lead the *Sciencing* discussion.



SCIENCING: OBSERVING, COMPARING, AND COMMUNICATING

1. At each table, give each child an opportunity to share what items they matched. Ask them to share how and why they made the match.
2. Next, using the chart paper, ask the children to use descriptive *touch and feel* words to describe

TOUCH AND FEEL WORDS	
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

their pair of kitchen items. Encourage the children to use words such as *slimy, gooey, cold, wet, smooth, rough*, etc. Record these words on the chart labeled *Touch and Feel Words*. You will use the list for an introduction to the next part of the activity.

MORE ACTION: OBSERVING, COMMUNICATING, AND COMPARING

1. While the children are still in the *Sciencing Circle*, explain that now they will be sorting the items according to their sense of touch using the touch and feel words that they just described, or according to some other characteristic. (*e.g., color, size, use, or shape.*)
2. Ask the children to move to the tables. Assign a teen to each table to assist with any questions about the directions.
3. Allow the children several minutes to sort the items.

MORE SCIENCING: OBSERVING, COMMUNICATING, AND COMPARING

1. While still seated, ask the children at the first table to describe what they sorted. *Have one teen record the responses on chart paper.*
2. Moving to the next table, repeat the above, to describe the items described by another word. Rotate which table starts the discussion of a different way to sort, making sure every table gets to start at least one description.
3. Ask other questions that encourage the children to use their sense of touch, as well as other senses to describe their sorting of the kitchen textures.

ACTIVITY B

THE FEEL OF DOUGH

Time Required

30 to 40 minutes

Suggested Grouping

tables of 4 to 6
children

In this activity, you will assist children in making three doughs and mixtures. They will be fascinated by how the mixtures are made and the changing qualities of some of the doughs. You will

Special Note: This activity is set up so that there are three tables operating simultaneously. Each table will be making a separate recipe. After each table is finished, the children will rotate from table to table to explore and experience that table's creation. At the end, each dough will be divided into small pieces so each child can take home a sample of the three doughs.

probably have a hard time getting the children to put away the dough, so we suggest that you send some home with each child in a Zip-lock plastic bag.

RECIPE #1 - GOO

Materials You Will Need

For one table group of 4 to 6 children:

- Borax powdered soap – 2 teaspoons
- Warm water – 1 cup
- White glue – 2 cups
- Cool water – 1 ½ cups
- Mixing bowls – 2

- Measuring cup
- Measuring spoons
- Spoon or stirrer
- Zip-lock plastic sandwich bag – 3 per child
- Marker

Getting Ready

- ❶ Determine how many groups of four to six children you will be working with and gather the needed supplies based on the number of groups.
- ❷ Set up the supplies to make the *Goo* at a table. Increase the recipe as needed, based on the size of the group.
- ❸ Reproduce the recipe sheet on poster paper so the children can follow along with your instructions.

ACTION: OBSERVING, COMMUNICATING, AND COMPARING

1. Start the activity by telling the children that they will be making *Goo*. (*Goo is very similar to Gak, which they may have seen in toy stores.*) Explain that they will be observing a chemical reaction as they mix the ingredients.
2. Review with the group how you will be making the *Goo* dough, and how it is important for each table team to work cooperatively.
3. Hold up the enlarged *Goo Dough Recipe* poster. Read each step as other teens monitor the children's preparation of the *Goo*.

Step 1: Measure 2 teaspoons of the Borax powdered soap into a bowl.

Step 2: Measure 1 cup of warm water and pour it into the Borax powder. Stir until dissolved. Set aside.

Step 3: Measure 2 cups of glue and pour it into



another bowl.

Step 4: Measure 1½ cups of cool water and pour it into the glue mixture. Stir well.

Step 5: Pour the Borax and water mixture into the glue. Mix it with your hands or a spoon. Watch what happens!

4. After the *Goo* has been created, divide it into equal amounts for the children at the table. *Allow plenty of time for the children to explore their gooey creation.* It won't take them long to think of all kinds of experiments to try with the *Goo*!
5. When the children have had time to observe the *Goo* in several situations, ask them to put it back into the bowl.
6. Now rotate the children to another table to explore what was created at that table.
7. Rotate a third time so all children get to explore each finished recipe.
8. Ask each child to write their name on three plastic sandwich bags before moving the children to the *Sciencing Circle*. Other teens can divide the dough into equal sections so each child receives some of each type to take home.

RECIPE #2 - COFFEE DOUGH

Materials You Will Need

For one table group of 4 to 6 children:

- All purpose white flour – 2 cups plus ¼ cup
- Salt – 1 cup
- Used coffee grounds – 2 cups
- Cold, leftover coffee – 1 cup
- Large mixing bowl



Tip
Make sure to allow plenty of time for the children to observe and play with their mixture.



- Wooden spoon
- Paper towels
- Smooth working surface
- Liquid and dry measuring cups

Getting Ready

- ❶ Gather all the needed supplies based on the size of the group with whom you will be working. If necessary, increase the recipe based on the size of the group.
- ❷ Remember, this will be one of the three rotating tables. Only one group of children will make this dough; however, each of the other two groups will rotate to the table to explore and play with it.
- ❸ Make sure you have enough used coffee grounds. You can save the grounds by storing them in the refrigerator until you have collected enough for the recipe.
- ❹ Set up the work area at the table so all children can participate in some aspect of the recipe making.
- ❺ Reproduce the recipe on poster paper so the children can follow along with the your instructions.

ACTION: OBSERVING, COMMUNICATING, AND COMPARING

1. Assign one teen to this table. Start off by telling the children that they will be making *Coffee Dough*. Tell them that you will assist them in reading and preparing the recipe.

Step 1: Measure 2 cups of flour and pour it into the mixing bowl.

Step 2: Measure 1 cup of salt and pour it into the mixing bowl.

Step 3: Measure 2 cups of coffee grounds and pour them into the mixing bowl.

Step 4: Mix the dry ingredients thoroughly with a wooden spoon.

Step 5: Measure 1 cup of cold coffee and pour it into the dry mixture.

Step 6: First with the spoon, and then with your hands, mix the ingredients thoroughly to form a dough.

Step 7: Divide the dough into several smaller pieces and knead on a floured surface until a smooth dough is formed. (Give each child an equal amount of the dough.)

3. After the *Coffee Dough* has been created, allow plenty of time for the children to explore it. As the children are working with the dough, ask questions that encourage the children to use their sense of touch to describe their creation.

4. When all of the children have had adequate time to observe and explore, ask them to put the dough back into the bowl and move to another table to explore and observe the dough made by another group of children.

RECIPE #3 - FLOUR DOUGH***Materials You Will Need***

For one table group of 4 to 6 children:

- Mixing bowl
- Liquid and dry measuring cups
- Measuring spoons
- Paper towels
- Heat source
- Sauce pan or 2-quart pot
- Wooden spoon
- Flour – 2 cups
- Salt – 1 cup
- Water – 2 cups
- Vegetable oil – 2 tablespoons
- Cream of tartar – 1 tablespoon

Getting Ready

- ❶ Gather all of the needed supplies based on the size of the group with whom you will be working. If necessary, increase the recipe based on the size of the group.
- ❷ Identify a heat source and place (stove top or portable burner) to put it.
- ❸ Set up the supplies at the table so each child can have access to the materials.
- ❹ Reproduce the recipe sheet so the children can follow along with your instructions.

ACTION: OBSERVING, COMMUNICATING, AND COMPARING

1. Assign one teen to this table. Start off by telling the children that they will be making *Flour Dough*. Tell them that you will assist them in reading and preparing the recipe.



Tip
Encourage the children to use their hands to mix the dough. This will help them fully explore the texture of the dough.

2. Hold the recipe sheet or poster so that the children at the table can all follow along. Read the instructions slowly, pointing out each of the steps. Set up the work area so all children can participate in some aspect of the recipe making.

- Step 1:** Measure 2 cups of flour and put it into the pot.
- Step 2:** Measure 1 cup of salt and pour it into the pot; mix the salt and flour with the wooden spoon.
- Step 3:** Measure 2 cups of water and pour it into the pot. Stir.
- Step 4:** Measure 2 tablespoons of oil and add it to the mixture.
- Step 5:** Measure 1 tablespoon of cream of tartar and add it to the mixture. Stir thoroughly.
- Step 6:** Place the pot on the burner over low heat. Stir constantly. Make sure the mixture doesn't stick to the sides of the pot.
- Step 7:** Keep stirring until the mixture looks like mashed potatoes instead of soup.
- Step 8:** Remove it from the burner. Gather the mixture together with a wooden spoon and pour it onto the table. Let it cool for a few minutes.
- Step 9:** On a lightly floured surface, knead the dough until it is smooth. *(Give each child an equal amount of the dough.)*

4. After the *Flour Dough* has been created, allow plenty of time for the children to explore it. As the children are working with the dough, ask questions that encourage the children to use their sense of touch to describe their creation.
5. When all of the children have had an adequate time to observe and explore, ask them to put the dough back into the bowl and move to another table to explore and observe the dough made by another group of children.



Tip
Discuss
Safety Tips
when
working
around a heat
source.



Tip
Teens should
closely
supervise the
cooking of
the dough. When
working with
young children,
teens may want to
demonstrate the
cooking steps.

GOO - RECIPE #1

INGREDIENTS

2 teaspoons Borax powdered soap

1 cup warm water

2 cups white glue

1½ cups cool water

- Step 1. Measure 2 teaspoons of the Borax powdered soap into a bowl.
- Step 2. Measure 1 cup of warm water and pour it into the Borax powder. Stir until dissolved. Set aside.
- Step 3. Measure 2 cups of glue and pour it into another bowl.
- Step 4. Measure 1½ cups of cool water and pour it into the glue mixture. Stir well.
- Step 5. Pour the Borax and water mixture into the glue. Mix with your hands or a spoon and watch what happens!

COFFEE DOUGH - RECIPE #2

INGREDIENTS

All purpose white flour - 2 cups (plus $\frac{1}{4}$ cup - use for kneading or if sticky)

Salt— 1 cup

Used coffee grounds — 2 cups

Cold, leftover coffee — 1 cup

Large mixing bowl

Wooden spoon

Paper towels

Smooth working surface

Liquid and dry measuring cups

- Step 1.** Measure 2 cups of flour and pour it into the mixing bowl.
- Step 2.** Measure 1 cup of salt and pour it into the mixing bowl.
- Step 3.** Measure 2 cups of coffee grounds and pour them into the mixing bowl.
- Step 4.** With the wooden spoon, mix the dry ingredients thoroughly.
- Step 5.** Measure 1 cup of cold coffee and pour it into the dry mixture.
- Step 6.** First with the spoon, and then with your hands, mix the ingredients thoroughly to form a dough.
- Step 7.** Divide the dough into several smaller pieces and knead on a floured surface until a smooth dough is formed.

FLOUR DOUGH - RECIPE #3

INGREDIENTS

Mixing bowl
Liquid and dry measuring cups
Measuring spoons
Paper towels
Heat source
Sauce pan or 2–quart pot
Wooden spoon
Flour — 2 cups
Salt — 1 cup
Water — 2 cups
Vegetable oil — 2 tablespoons
Cream of tartar — 1 tablespoon

Step 1: Measure 2 cups of flour and put it into the pot.

Step 2: Measure 1 cup of salt and pour into the pot; mix the salt and flour with the wooden spoon.

Step 3: Measure 2 cups of water and pour it into the pot. Stir.

Step 4: Measure 2 tablespoons of oil and add it to the mixture.

Step 5: Measure 1 tablespoon of cream of tartar and add it to the mixture. Stir thoroughly.

Step 6: Place the pot on the burner over low heat. Stir constantly. Make sure the mixture doesn't stick to the sides of the pot.

Step 7: Keep stirring until the mixture looks like mashed potatoes instead of soup.

Step 8: Remove the pot from the burner. Gather the mixture together with a wooden spoon and pour it onto the table. Let it cool for a few minutes.

Step 9: On a lightly floured surface, knead the dough until it is smooth.

SMELLS IN THE KITCHEN

Approximate Time Required for Session: 1 hour

Purpose

- Children will use their sense of *smell* to observe things often found in the kitchen.
- Children will make comparisons about things that they *smell*.
- Children will communicate what they observe through their sense of *smell*.

Overview of the Day's Activities

Using their sense of *smell*, children will explore things often found in the kitchen. They will try to match smells in small containers. Then they will identify the smells and organize the smell containers in a variety of ways. Children will enjoy creating their own *Story of Smells* using cutouts of various kitchen aromas. The session will conclude with the children making *Scented Spreads* with cream cheese and flavoring extracts.



Background Information

Smell is one of the five senses. The kitchen, because of its favorable association with food, provides a wonderful laboratory for exploring the sense of smell. The nose contains many nerve cells that respond to odors. These cells are so responsive that you can recognize smells from the kitchen while in another room!



The sense of *smell* serves several purposes. Your sense of smell works as a safety device alerting you to the smell of a burning building or to spoiled food. It also is responsive to pleasant odors, drawing you closer to smell a flower.

Smell also works very closely with your sense of taste. It is almost impossible to put food into your mouth without smelling it as it passes under your nose. Therefore, taste is most often a combination of taste and smell. *Think about how your food tastes when you have a cold and can't smell!*

Preparation Notes

ACTIVITY A

THE SMELLING GAME

Time Required

20 minutes

Suggested Grouping

tables of 4 to 6
children

In this activity, you will help the children use their sense of smell to identify and match odors that you have placed in small containers.

Materials You Will Need

- Film canisters (opaque) – 16 per group
- Different aromas – 8 (to put in containers)
(*peanut butter, cocoa, cinnamon, garlic, vanilla extract, peppermint extract, lemon and orange extracts or juice*)
- Cotton balls – 16 (for extracts) per group
- Ice pick, nail, or other sharp object
- Masking tape – 1 roll
- Permanent marking pen – 1
- Chart paper
- Senses Cutouts*

Getting Ready

- ❶ Determine the number of children you will be working with, and the materials needed from the supply list. (You will need a set of eight different scents for each table; two containers per scent, for a total of 16 containers for each table.)
- ❷ Carefully poke small holes in the lids of the film canisters with a nail or ice pick.
- ❸ Using the masking tape and pen, label half the canisters with *numbers* and the other half with *letters*. Be sure to randomly number and letter the containers.



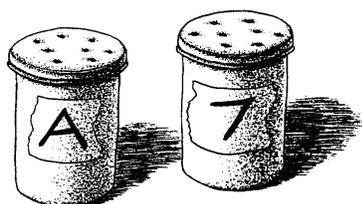
Tip

You can often get recycled film canisters from photo developing stores.



Tip

Make sure the canisters are numbered and lettered in random order when putting in the scents. Remember, part of the activity is for the children to find the matching smells.





Tip
For long-term storage, place a piece of masking tape over the holes in the lid.

SMELLS IN THE KITCHEN

4 Shortly before the meeting, put the different aroma items into the canisters. You will need to make two sets of canisters (*one set that is numbered and one set that is lettered*). When putting the extracts into the canisters, first put a cotton ball in the bottom, then drop some of the extract on it. Put on the lid that you prepared in step 2.

5 While the children are in the circle for the introductory discussion, place the sets of matching smells on each table (*eight scents per table*).

ACTION: OBSERVING, COMMUNICATING, AND COMPARING

1. Ask the children to gather around you and sit in a circle. Start off the day by showing the smell symbol and asking questions about smells.
 - When you walk into your kitchen, what are some things you like to smell?
 - What are some things you don't like to smell?
 - Name some places that have smells you like. Name some places that have smells you don't like.
 - Do you think smells are important? Why or why not?

Record the children's responses.

2. Explain to the children that they are going to be using their sense of smell to identify and match various aromas that are found in the kitchen. Show them one of the canisters, pointing out that it has a number or letter on it and holes in the lid.

3. Shake the canister gently, then walk around and ask several children to sniff it. Ask them what they think the smell is. Explain that they will be matching and identifying smells.
4. Tell the children to be seated at tables where they will be working as a group. Tell them you placed 16 canisters on the table. They will first try to find smells that match and will sort the canisters accordingly.

SCIENCING: OBSERVING, COMMUNICATING, AND COMPARING

1. After everyone has had an opportunity to smell, sort, and identify the scents in the canisters, move the children back to the circle area. After the groups have matched the smells, ask the children to first identify matched smells by letters and numbers. Then ask the children to identify the odor.
 - Were you able to match all the smells?
 - Were some harder to match than others?
 - Could you identify all the smells?
2. Ask other questions.
 - Which smells did you like the best? Which smells did you like the least? Why?
 - What are some of your favorite smells?

Other Questions

SMELL GAME		
Smell	Smell	Odor
A	7	vanilla
B		
C		
D		
E		
F		
G		
H		

ACTIVITY B**THE STORY OF SMELLS****Time Required**

20 minutes

Suggested Groupingtables of 4 to 6
children

Children will create a story using paper cutouts of kitchen items that have distinctive odors. Each table will create their own group story. Then they present it to the entire group and record it for later fun and laughs!

**Materials You Will Need**

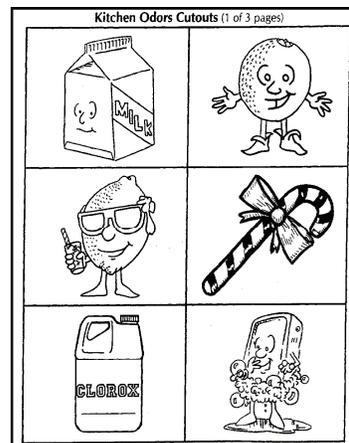
- Crayons or markers – enough for each table
- Popsicle sticks –10 per table
- Transparent tape – 1 roll
- Scissors
- Tape recorder
- Blank tape
- Kitchen Odors Cutouts* – 1 set per group
- Blank sheet of paper

Getting Ready

- ❶ Gather and prepare all of the needed supplies based on the number of children that will be participating.
- ❷ Cut apart the kitchen odor pictures found in the handout. You will need to have one set for each table. If you are short on time, you can cut out each picture, otherwise have the children cut out the pictures.
- ❸ Place tape, popsicle sticks, and crayons or markers at each table.
- ❹ Test the tape recorder in advance to make sure it records.

ACTION: OBSERVING, COMMUNICATING, AND COMPARING

1. Start this activity by telling the children that they will now have an opportunity to create a story that uses information that they have observed and discovered about smells.
2. Explain that they will work in table groups to create a story. Each child will be given a specific kitchen odor cutout that they will color and make into a stick puppet. *(If time permits, let the children create their own cutout picture on the blank paper.)*
3. Tell the children that after the puppets have been made, they will create their own story about kitchen smells. Explain that they will record the story and act it out for the entire group.
4. Pass out the cutouts, crayons, scissors, and popsicle sticks. Ask the children to cut out the pictures of the odors. Ask each child to color their picture. Then, using transparent tape, secure the popsicle stick to the back of the colored picture.
5. Next, ask each child to take a few minutes to think about the odors in their picture and how they could describe it for the story.
6. Tell the children that you will give them the opening sentence of a story about kitchen smells and that you would like for them, one by one, to add a sentence to the story about their kitchen smell. You can create your own first sentence, or use one of these:
 - One day a little boy and girl were in their grandmother’s kitchen and



See page 59

- The kitchen window was wide open and the boy and girl noticed all sorts of smells coming through the window. They could smell

7. Help each table group record their story on the tape recorder. Save these to play back later. This can also be added to the *Kitchen Center* or the *Family Science Backpack*.
8. Ask each group to use their puppet kitchen characters to retell their story. You can have the children use the tape recording to retell it aloud. Make sure they use their puppets to act out the story.

SCIENCING: OBSERVING, COMMUNICATING, AND COMPARING

1. After each of the groups have presented their *Kitchen Smells Story*, ask the children to identify something that they learned about smells.
2. Ask how they could sort some of the smells used in the story.
3. Ask what other kitchen smells would be good to use in a story.



Presentation Notes

ACTIVITY C

SCENTED SPREADS

Time Required

20 minutes

Suggested Grouping

tables of 4 to 6 children

In this activity, three tables of children will make three different scented spreads using peanut butter, vanilla, and peppermint extracts mixed with cream cheese. The children will enjoy sampling the spreads on crackers.

Materials You Will Need

- Mixing bowls – 3 small
- Wooden mixing spoons – 3
- Lowfat cream cheese – 3 eight-ounce packages
- Peanut butter – 2 cup
- Sugar – 6 tablespoons
- Red food coloring
- Vanilla extract
- Peppermint extract
- Crackers – 3 to 6 per child
- Table knives – 1 per child
- Measuring spoons
- Napkins
- Paper towels
- Paper plates – 4 per group
- Chart paper
- Markers

Getting Ready

- 1** Gather all the needed supplies based on the number of children with which you will be working.
- 2** Set out the supplies on three tables. (*Supplies for one recipe on each table.*)





Tip
Some children have food allergies.

Check with site staff prior to session to see if you will need to substitute any ingredients for some children.



Tip
Remember to have children wash their hands before starting.

hands before starting.

- ③ Arrange the materials so that all children can have easy access to the materials for preparing the recipe.
- ④ Make sure children wash their hands with soap and water before starting this activity.

Presentation Notes

ACTION: OBSERVING, COMMUNICATING, AND COMPARING

1. Show the children the smell symbol. Tell them that now they are going to have an opportunity to use their senses of smell and taste. They will prepare three different scented spreads and then eat them on crackers.
2. Explain that you have set up the materials and ingredients at three tables to make peanut butter, vanilla, and peppermint cream cheese spread. Although each table will only make one of three scented spreads, everyone will get to taste all three.
3. Assign a teen to each table to assist the children. Read the recipes out loud and show them the instructions.

Recipe #1
PEANUT BUTTER SCENTED SPREAD

- Step 1:** Unwrap the cream cheese and place it in a small mixing bowl.
- Step 2:** Measure $\frac{1}{2}$ cup of peanut butter and add it to the cream cheese.
- Step 3:** Mix with the wooden spoon until all the peanut butter is well blended and the spread is smooth and creamy.
- Step 4:** Spread the mixture onto small crackers.



Recipe #2
VANILLA SCENTED SPREAD

- Step 1:** Unwrap the cream cheese and place it in a small mixing bowl.
- Step 2:** Measure 2 teaspoons of vanilla extract and add it to the cream cheese.
- Step 3:** Measure 3 tablespoons of sugar and pour it into the bowl.
- Step 4:** Mix with the wooden spoon until smooth and creamy.
- Step 5:** Spread the mixture onto small crackers.



Recipe #3
PEPPERMINT SCENTED SPREAD

- Step 1:** Unwrap the cream cheese and place it in a small mixing bowl.
- Step 2:** Measure 2 teaspoons of peppermint extract and add it to the cream cheese.
- Step 3:** Measure 3 tablespoons of sugar and pour it into the bowl.
- Step 4:** Add two drops of red food coloring to the mixture.
- Step 5:** Mix with a wooden spoon until smooth and creamy.
- Step 6:** Spread the mixture onto small crackers.



4. After all the groups have prepared their scented spreads, have them put a small amount on crackers.
5. Ask the children to first smell the cracker. Can they smell the scent? Next, ask them to taste the cracker and spread by holding their nose. Can they tell the scent of the spread? Next, have the children taste the cracker and spread without holding their nose. Can they tell a difference?
6. After the tables have sampled the first spread, move the children (or the bowl of spreads) to the next table and repeat steps 4 and 5.

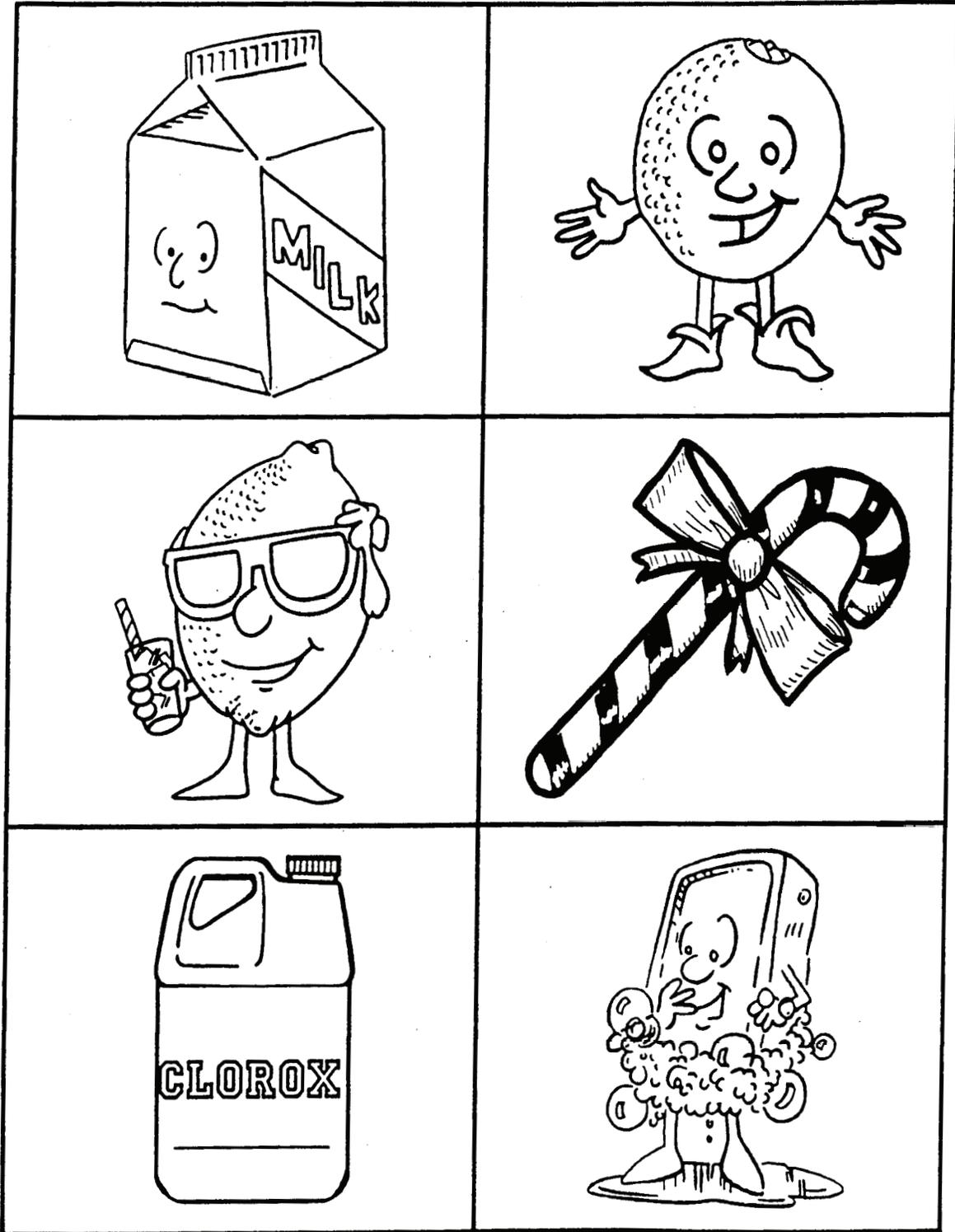
SCIENCING: OBSERVING, COMMUNICATING, AND COMPARING

1. Ask the children to describe the steps they used to create their spreads. Which were the same steps used and which were different?
2. How did the crackers and spreads taste when they held their nose?
3. How did the crackers taste when the children didn't hold their nose? Why was there a difference? Can they think of other scented spreads that they could make? How would they do it?

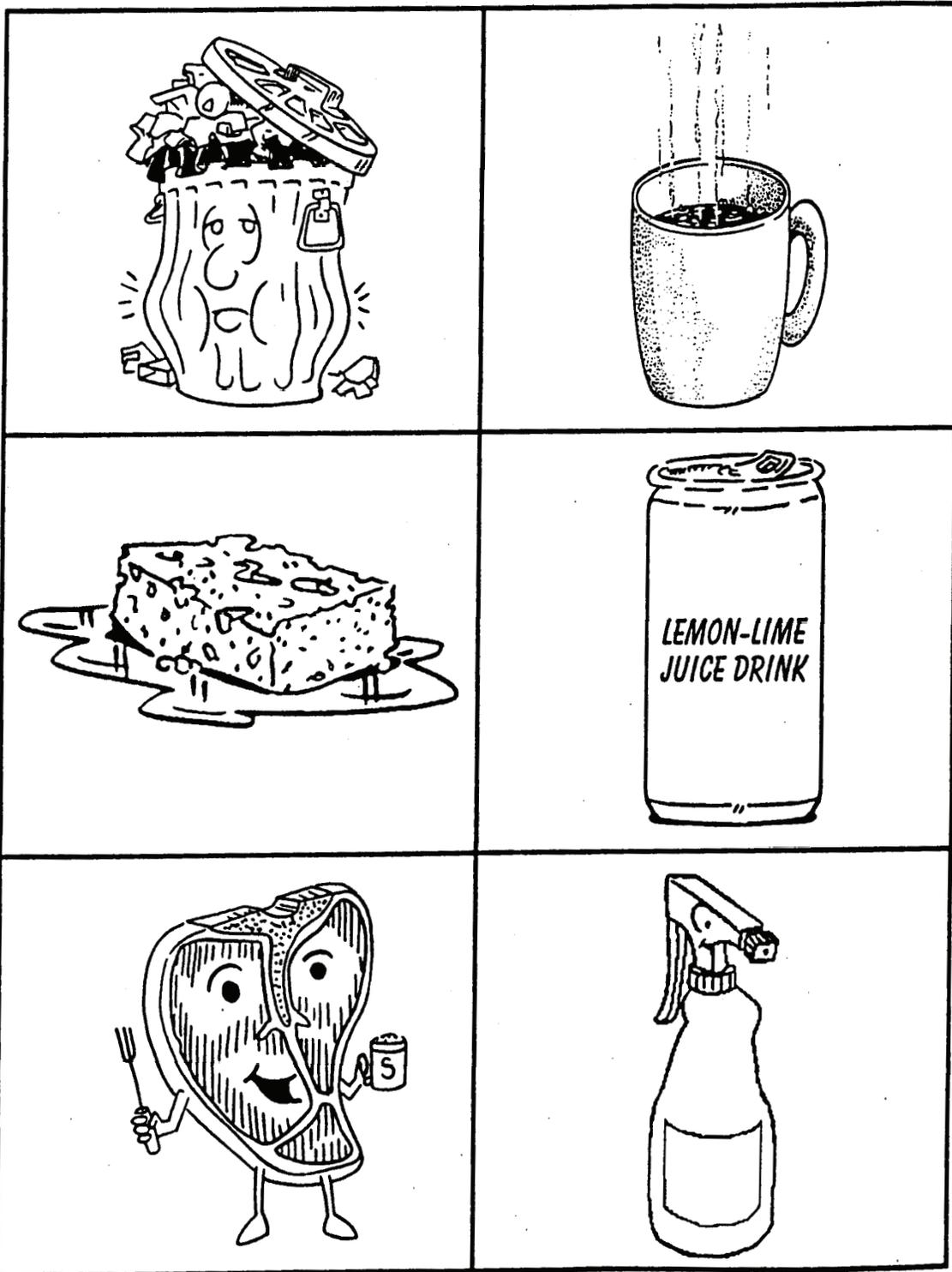
Other Questions



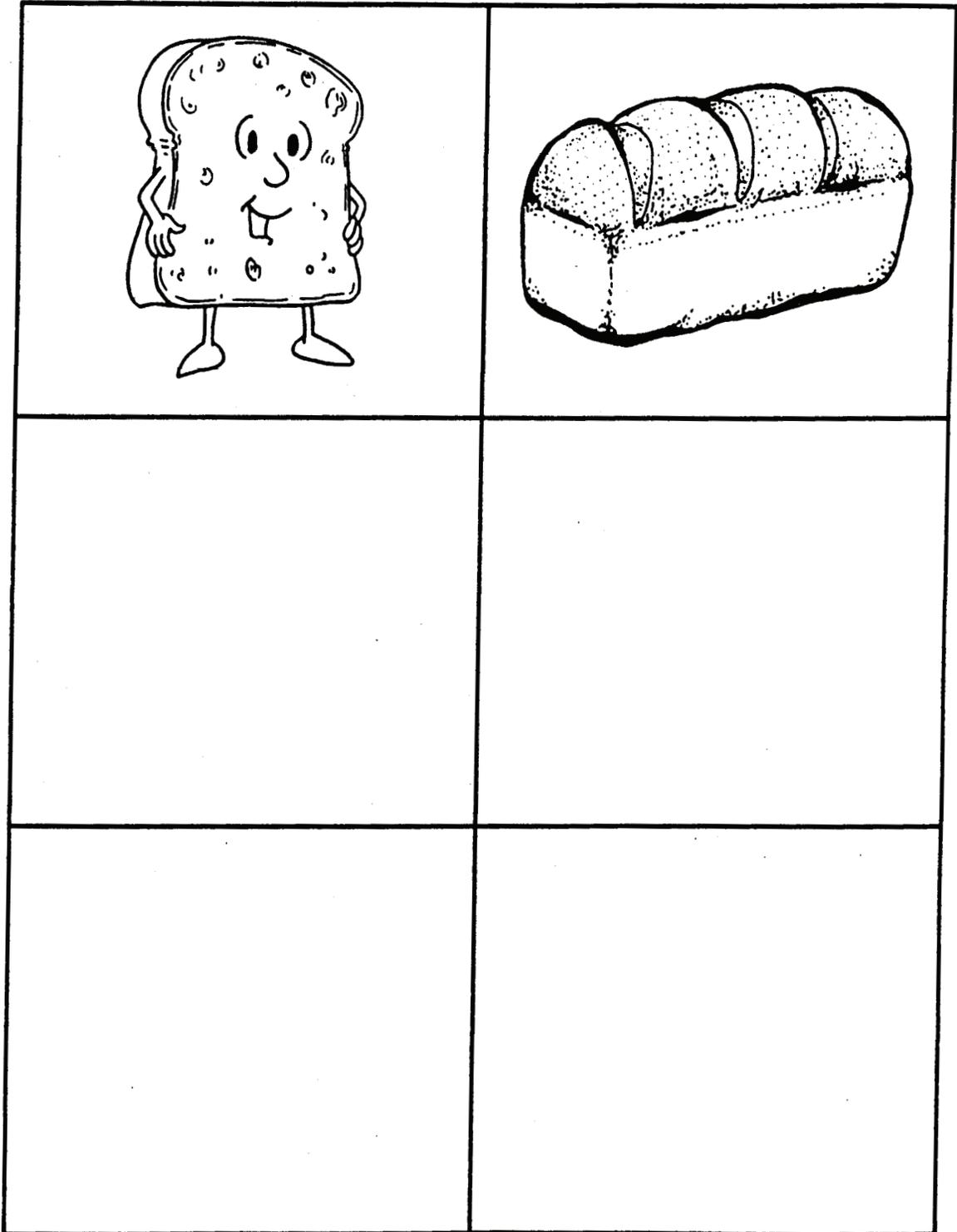
Kitchen Odors Cutouts (1 of 3 pages)



Kitchen Odors Cutouts (2 of 3 pages)



Kitchen Odors Cutouts (3 of 3 pages)



TASTES IN THE KITCHEN

Approximate Time Required for Session: 1 hour

Purpose

- Children will use their sense of *taste* to observe, compare, and communicate science in the kitchen.
- Using their sense of *taste*, children will observe items found in the kitchen.
- Children will use their tongue to distinguish the difference between *salty*, *sour*, *sweet*, and *bitter tastes*.
- Children will use their sense of *taste* to communicate their observations.

Overview of the Day's Activities

Children observe and explore kitchen science through their sense of *taste*. First, you will help them taste *salty*, *sour*, *sweet*, and *bitter*. Through a blind taste test, children will rate three different brands of lemon-lime soda. Finally, they will make their own lemon-lime soda.

Background Information

The sense of *taste* is a function of the nervous system. Taste buds, which are nerve endings located on the tongue, pick up messages and send them to the brain. The brain then responds by identifying *salty*, *sour*, *sweet*, or *bitter tastes*.



ACTIVITY A

TASTY TASTE BUDS

Time Required
20 minutes

Suggested Groupings
tables of 6 to 8 children

In this activity, you will help children explore the taste buds found on different areas of their tongue. Not all taste buds are the same. The taste buds that tell you something is sweet are on the tip of your tongue. The ones that taste salt are on the sides, and farther back on the top of the tongue are the ones that taste sour, and all the way back are the buds that pick up bitter tastes. Using lemon, unsweetened chocolate, salt, and sugar, you will help children discover these different tastes and the location of the taste buds.

Materials You Will Need

For each child you will need the following:

- Unsweetened** chocolate – tiny piece
- Lemon – tiny slice
- Sugar cube
- Salt – individual packet
- Paper cup
- Napkin
- Knife
- Markers
- Plastic sandwich bags
- Pencil
- Tasty Taste Buds* handout

Getting Started

- ❶ Determine how many children you will have in the session and prepare the needed supplies.
- ❷ Cut or break the unsweetened chocolate into tiny pieces.



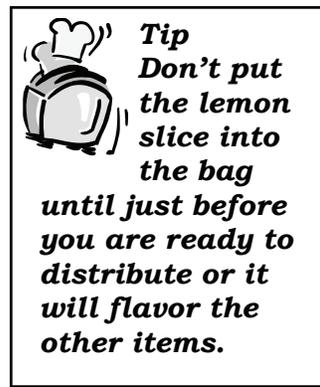
Tip
Some children have food allergies.

Check with site staff prior to the session to see if you will need to substitute any ingredients for some children.

- ③ Slice a lemon into sliver-sized slices.
- ④ In a sandwich bag place the chocolate piece, lemon slice, sugar cube, and individual packet of salt. Have the bag ready to pass out to each child.
- ⑤ Reproduce the *Tasty Taste Buds* handout, one per child.
- ⑥ Arrange the room so the children can sit in small groups at tables.
- ⑦ Set up a flip chart or charting paper.

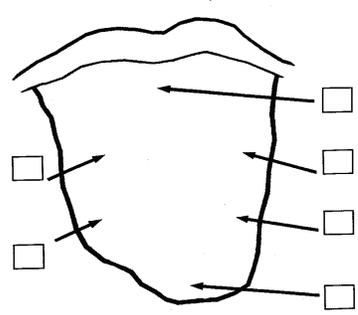
ACTION: OBSERVING, COMMUNICATING, AND COMPARING

1. Start today's session by introducing the children to the concept of taste. Show the taste symbol and ask them to list some of their favorite foods. As one teen is leading this discussion, have another teen list children's responses on the chart paper.
2. Next, ask the children to describe the taste of the different foods that they listed. Notice if they use the words sweet, sour, salty, and bitter. If they don't list all these tastes, suggest them and ask the children to identify a food for each taste (e.g., salty-pretzel; sour-lemon).
3. Tell the children that now they will have a chance to observe these tastes on their tongue. Explain that you will pass out the unsweetened chocolate, lemon slice, salt, and sugar. Ask them first to predict how each will taste.
4. Pass out the Tasty Taste Bud handout, a pencil, and one bag of the tasters to each



Tip
Don't put the lemon slice into the bag until just before you are ready to distribute or it will flavor the other items.

TASTY TASTE BUDS
I TASTED ... (CHECK THEM OFF)



In each box place the letter of the correct taste.
A - BITTER (unsweetened chocolate)
B - SOUR (lemon)
C - SALTY (salt)
D - SWEET (sugar cubes)

NAME _____

See page 73

OUR FAVORITE
FOODS



Tip
One teen
should
lead the
discussion

*while the other
teens distribute
tasting bags.*

*Assign one teen
to each table to
assist with the
tasting and to
answer
procedural
questions.*



Tip
Have the
children
wash
their

*hands before
beginning this
activity.*



Tip
Be sure
the
children
taste the

*foods in the
order listed.*

child. One by one, ask the children to taste each of the foods in the following order: chocolate, lemon, salt, and sugar.

5. Ask each child to identify the *chocolate piece*. Have them hold it up and taste it on the tip of their tongue, on the side of the tongue, and then farther back until they can taste the bitterness.
6. Repeat with the *lemon, salt, and sugar*. Ask each child to record his/her responses on the handout. (*The children should taste saltiness on the side of tongue; farther back they should taste sourness; and on the tip sweetness. This may vary among children.*)
7. After all children have experimented with the tastes, move the groups from the table to a circle area and ask them the *Sciencing* questions.

SCIENCING: OBSERVING, COMMUNICATING, AND COMPARING

1. Ask the children the following questions.
 - *How* did the four foods taste?
 - How did they determine *where* they could taste each of the foods?
 - Could they taste some of the foods in *more than one place* on their tongue? Could they only taste some foods in just one place?
 - Did the foods taste *different* when placed on different parts of the tongue?
 - Ask if what they learned about these tastes could affect how other foods taste.
 - Why might foods taste different to other people? Use these questions as a transition to *Activity B: The Big Taste Test*.

ACTIVITY B

THE BIG TASTE TEST

Time Required
 20 minutes

Suggested Grouping
 tables of 4 to 6
 children

In this activity, you will help children explore their personal tastes by staging a taste test of lemon-lime sodas. The children, through a blind test, will taste three different lemon-lime sodas and rank which they like first, second, and third.

Materials You Will Need

- 7 Up – 1 liter
- Sprite – 1 liter
- Another lemon-lime soda –1 liter
- Paper cups - 4 oz size – 3 per child
- Crayons or markers for each table
- Chart paper
- Paper - 8½” x 11” – 3 sheets
- Tape
- Big Taste Test* handout

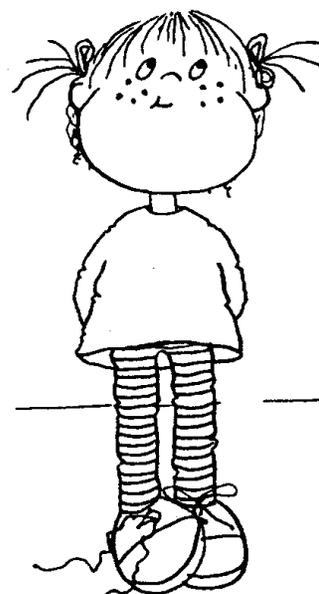
Getting Ready

- ❶ Determine how many children will be participating. Gather enough of the above supplies for the size of the group.
- ❷ Reproduce the *Big Taste Test* handout, one per child.
- ❸ For each child, prepare a set of three paper cups. Mark the cups *A, B, and C*.
- ❹ Cover the outside of the three liters of lemon-lime soda with the paper and tape securely so children cannot see the brand name. Label the bottles *A, B, and C*.



Tip
If some of the children were

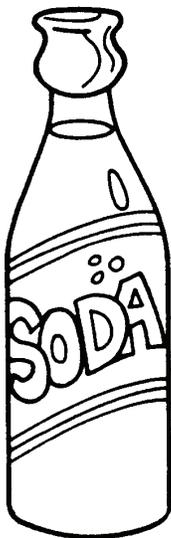
unable to distinguish the taste buds, allow time for further exploration.



- 5 Pour a small amount of *Bottle A* into each of the A cups, *Bottle B* into the B cups, and *Bottle C* into the C cups.
- 6 Set up the tables by placing a handout, pencil, and the three filled cups (*A*, *B*, and *C*) at each child's place.
- 7 Prepare an enlarged version of the handout on the chart paper.

ACTION: OBSERVING, COMMUNICATING, AND COMPARING

1. Introduce this activity while the children are still in the *Sciencing Circle*. Tell them that they are going to be taste testers of lemon-lime soda.
2. Give them instructions away from the table on how the activity will be conducted.
 - Each child will be given a sheet of paper to rank the taste of three different sodas.
 - Each child will be given three cups labeled *A*, *B*, and *C*.
 - Each child is to taste cup *A*, then *B*, and then *C* and determine which one they like best, second best, and least.
3. Give the children plenty of time to taste the sodas. Assign one teen per table to assist with any questions and filling out the sheets.



SCIENCING: OBSERVING, COMMUNICATING, AND COMPARING

1. After all of the children have finished tasting and ranking, compare their choices as a group.
 - Ask children to raise their hands if they ranked *soda A* the best. *Record the answers.*

- Ask children to raise their hands if they ranked *soda B* the best. *Record the answers.*
 - Ask children to raise their hands if they ranked *soda C* the best. *Record the answers.*
2. Ask the children to look at the chart and determine which was the favorite soda of the group. Which was the least favorite?
 3. Before revealing the brand names, ask the children if they think they know which brand was *A*, *B*, or *C*. Reveal the names of the soda brands.
 4. Ask the children how they made their choices.
 5. How could they describe the differences in the soda tastes? Why do they think some children liked some brands better than others?

WE LIKED...

SODA A

SODA B

SODA C

Presentation Notes

ACTIVITY C**LEMON-LIME SODA
OUR WAY!****Time Required**

20 minutes

Suggested Groupingtables of 4 to 6
children

Children will enjoy creating their own lemon-lime soda! If you have extra soda remaining from the prior activity they can even compare it to the other sodas!

Materials You Will Need

- Lemon-Lime Soda Recipe* sheet
- Knife
- Cutting board
- Lemons – 1 for every 2 children
- Limes – 1 for every 2 children
- Club soda (or water) – 1 to 2 liters
- Ice cubes – 2 to 3 per child
- Sugar
- Paper cup – 1 per child



For each table group of four to six children:

- Lemon juicer – 1
- Measuring cup – 1
- Plastic spoons – 4
- Chart paper
- Markers

Getting Ready

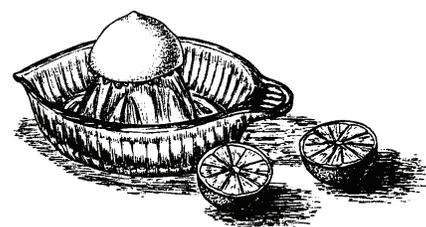
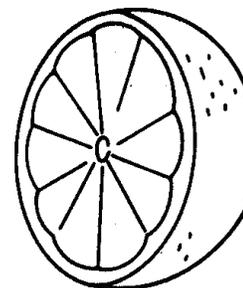
- ❶ Determine the number of children that will be participating. Prepare the number of supplies needed for the size of the group.
- ❷ Reproduce the *Lemon Lime Recipe* so that each

table has one. You can also write the recipe on the chart paper so that children can follow along with your instructions.

- ③ Cut the lemons and limes in half *crosswise*.
- ④ Set the needed ingredients and utensils in the center of each table, making sure the children have enough materials to successfully complete the activity.

ACTION: OBSERVING, COMMUNICATING,
 AND COMPARING

1. Tell the children that they now get to make their own lemon-lime soda. Explain that by using several ingredients they will be able to create a soda that will taste similar to the ones they taste tested in *Activity B*.
2. Tell the children you will read the recipe aloud and you want them to follow the recipe placed at their table. Explain that they will need to share the equipment and that a teen will assist each table if they have any questions.
3. Slowly read the instructions for preparing the lemon-lime soda, making sure that every child has completed a step before moving to the next.
 - Squeeze the lemon half on the juice squeezer. Get out as much juice as possible and pour into the cup.
 - Squeeze the lime half on the juice squeezer. Get out as much juice as possible and pour into the cup with the lemon juice.
 - Measure 1 teaspoon of sugar and pour into the cup with the juices.
 - Add 2 to 3 ice cubes to the cup.



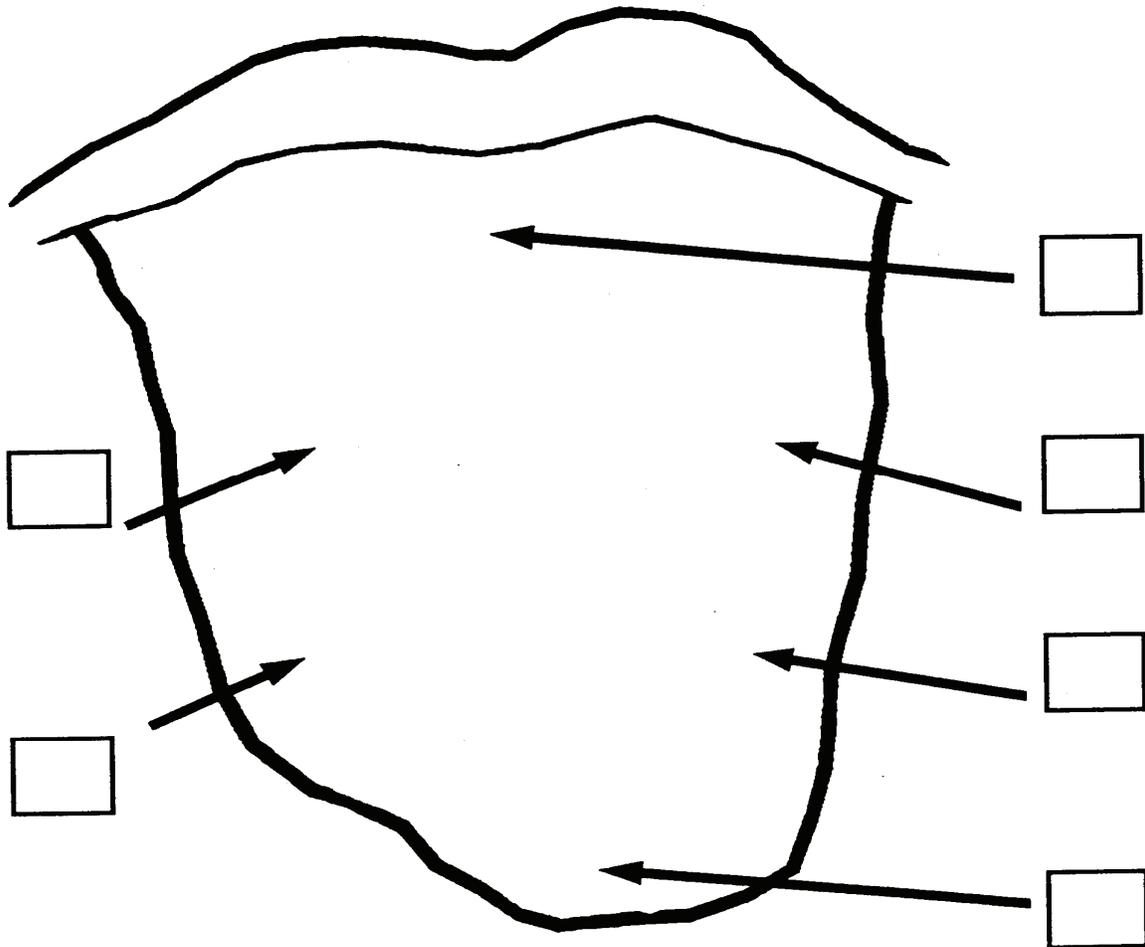
- Measure $\frac{3}{4}$ cup club soda or water and pour into the cup.
- Stir for one minute. Enjoy!

**SCIENCING: OBSERVING,
COMMUNICATING, AND COMPARING**

1. Ask the children to taste their sodas. Ask them to describe how the soda tastes.
2. How does their soda compare to the sodas that they tasted earlier?

TASTY TASTE BUDS

I TASTED ... (CHECK THEM OFF)



In each box place the letter of the correct taste.

A - BITTER (unsweetened chocolate)

B - SOUR (lemon)

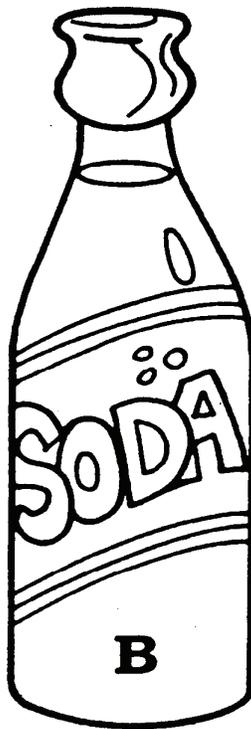
C - SALTY (salt)

D - SWEET (sugar cubes)

NAME _____

THE BIG TASTE TEST

Soda Ranking



Rate sodas A, B, and C below.

1 _____ favorite 2 _____ ok 3 _____ least favorite

LEMON-LIME SODA RECIPE

INGREDIENTS

Lemon - ½

Lime - ½

Club soda (or water) - about ¾ cup

Ice cubes - 2 to 3

Sugar - 1 teaspoon

Paper cup - 1

- Step 1:** Squeeze the lemon half on the juice squeezer. Get out as much as possible and pour into the cup.
- Step 2:** Squeeze the lime half on the juice squeezer. Get out as much juice as possible and pour into the cup with lemon juice.
- Step 3:** Measure 1 teaspoon of sugar and pour in the cup with the juices.
- Step 4:** Add 2 to 3 ice cubes to the cup.
- Step 5:** Fill the cup with club soda or water.
- Step 6:** Stir and Enjoy!



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KITCHEN SCIENCE SUPPLY LIST

Session 1 SIGHTS IN THE KITCHEN

Activity A – My Five Senses

My Five Senses by Alikei

Chart paper

Markers

Senses Cutouts

Activity B – Color Changes

100% Grape juice **not grape drink** – enough so each child has 2 cup

Baking soda – 1 box

Vinegar – 1 quart

Measuring spoons – 1 set per table

Clear glasses – 3 per team of children

Spoons for mixing

Chart paper and markers

Activity C – Color Streamers

For each table:

Clean, shallow bowl or pie plate

Food coloring – set of four

Liquid dishwashing detergent (use a quality brand)

Paper towels

Whole milk – 1 quart

Chart paper and markers

Session 2 SOUNDS IN THE KITCHEN

Activity A – Name That Sound!

Portable cassette tape recorder with microphone

New batteries for the tape recorder

Blank cassette tape

Chart paper

Markers

Senses Cutouts

Tape

Activity B – Chiming Kitchen Gadgets

Balls of string – 2 different thicknesses

Ball of yarn

Scissors

Collection of kitchen gadgets: *large metal spoons, slotted spoons, spatulas, metal cooling racks, wooden spoons, mixers, beaters, whisks, salad tongs, scissors, etc.* – enough so each team will have 1 or 2 utensils

Pencil for each team of children

Chart paper

Small pad of self-adhesive notes (1" x 2")

Activity C – Ringing Waters

Variety of glass containers – collect in sets of 3 (*empty baby food jars, mayonnaise jars, soda bottles, glasses and cups from your home, footed glasses and other glass containers that represent a variety of sizes and shapes*)

Metal spoons – 1 per child

Pencils – 1 per child

Pitcher of water – 1 per table

Funnel – 1 per table

Dish pan or plastic bucket – 1 per table

Chart paper

Markers

Session 3 TOUCH IN THE KITCHEN**Activity A – It's In The Bag!**

Brown paper grocery bags – 1 per group

Large rubber bands – 1 per group

Grapes and raisins

Cooked and uncooked spaghetti

Aluminum foil pie tin and sheet of foil wrap

Peeled and unpeeled orange

Walnuts, shelled and unshelled

Corn on the cob and popcorn kernels

Whole apple and apples peeled and sliced

Add other kitchen pairs of your own

Activity B – The Feel of Dough

For each table group of 4 to 6 children:

Borax powdered soap – 2 teaspoons

Warm water – 1 cup

White glue – 2 cups
Cool water – at least a gallon
Large mixing bowls
Liquid and dry measuring cups
Measuring spoons
Spoon or stirrer
Ziplock plastic sandwich bag – 3 per child
Marker
All purpose white flour – 4½ cups
Salt – 1 cup
Used coffee grounds – 2 cups
Cold, leftover coffee – 1 cup
Wooden spoon
Smooth working surface
Paper towels
Heat source
Sauce pan or 2-quart pot
Vegetable oil – 2 tablespoons
Cream of tartar – 1 tablespoon

Session 4 SMELLS IN THE KITCHEN

Activity A – The Smelling Game

Film canisters, opaque – 16 per group
Different aromas – 8 (to put in containers) (*peanut butter, cocoa, cinnamon, garlic, vanilla extract, peppermint extract, lemon and orange extracts or juice*)
Cotton balls – 16 (for extracts) per group
Ice pick, nail, or other sharp object
Masking tape – 1 roll
Permanent marking pen – 1
Chart paper
Senses Cutouts

Activity B – The Story of Smells

Crayons or markers – enough for each table
Popsicle sticks – 10 per table
Transparent tape – 1 roll
Scissors
Tape recorder
Blank tape
Kitchen Odors Cutouts – 1 set per group
Blank sheet of paper

Activity C – Scented Spreads

Mixing bowls – 3 small
Wooden mixing spoons – 3
Lowfat cream cheese – 3 eight-ounce packages
Peanut butter – 2 cup
Sugar – 6 tablespoons
Red food coloring
Vanilla extract
Peppermint extract
Crackers – 3 to 6 per child
Table knives – 1 per child
Measuring spoons
Napkins
Paper towels
Paper plates – 4 per group
Chart paper
Markers

Session 5 TASTES IN THE KITCHEN**Activity A – Tasty Taste Buds**

For each child:

Unsweetened chocolate – tiny piece
Lemon – tiny slice
Sugar cube
Salt – individual packet
Paper cup
Napkin
Knife
Marker
Plastic sandwich bags
Pencil
Tasty Taste Buds handout

Activity B – The Big Taste Test

Crayons or markers – enough for each table
7 Up – 1 liter
Sprite – 1 liter
Liter of another lemon-lime soda – 1 liter
Paper cups – 4 oz size, 3 per child
Chart paper
Paper – 8½” x 11” – 3 sheets

Tape

Big Taste Test handout

Activity C – Lemon-Lime Soda Our Way!

Lemon-Lime Soda Recipe sheet

Knife

Cutting board

Lemons – 1 for every 2 children

Limes – 1 for every 2 children

Club soda, or water – 1 to 2 liters

Ice cubes – 2 to 3 per child

Sugar

Paper cup – 1 per child

Lemon juicer – 1 per group

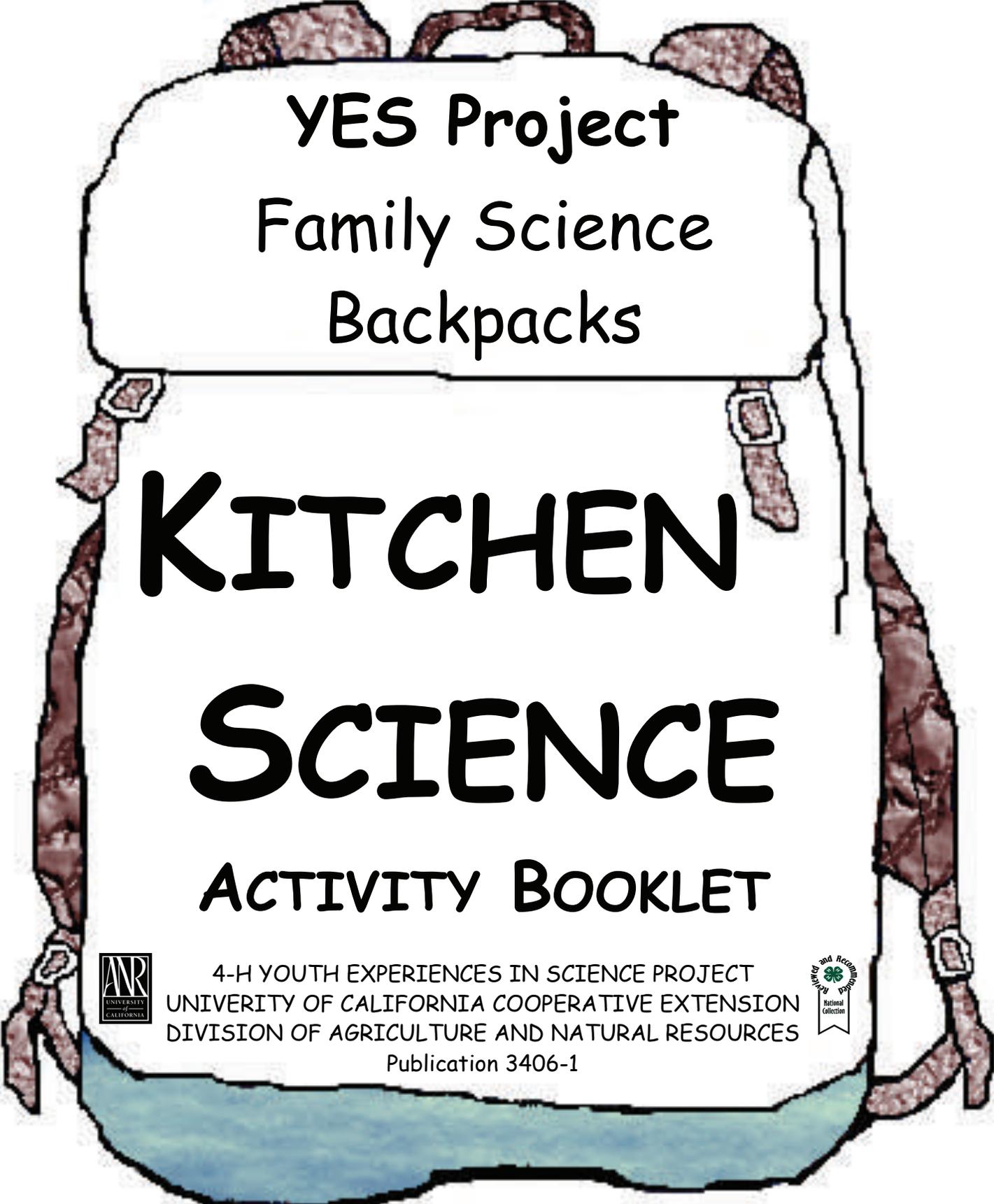
Measuring cup – 1 per group

Plastic spoons – 4 per group

Chart paper

Markers

Brandenberg, Alike, *My Five Senses*, Let's Read and Find Out Science Series, Stage 1, Harper Collins Publishing, ISBN #0-06-445083-X.



**YES Project
Family Science
Backpacks**

**KITCHEN
SCIENCE
ACTIVITY BOOKLET**



4-H YOUTH EXPERIENCES IN SCIENCE PROJECT
UNIVERSITY OF CALIFORNIA COOPERATIVE EXTENSION
DIVISION OF AGRICULTURE AND NATURAL RESOURCES



Publication 3406-1



WELCOME FAMILIES



In this Family Science Backpack, you and your child will find lots of activities and ideas for learning about science in a fun and interesting way! Through exploration activities in your kitchen, you and your child will observe, communicate, compare, and organize information. Through your child's actions, interpretations, and reactions to the activities, he or she will create a new base of knowledge and form new questions about science in the kitchen.

KITCHEN SCIENCE FAMILY ACTIVITY BACKPACK BY

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KITCHEN SCIENCE



The kitchen is a wonderful place for children to explore. It is full of sensory experiences that encourage children to learn more about the scientific thinking processes in a fun and hands-on way. Children can enjoy the aroma of fresh baked chocolate chip cookies, feel the warmth of dough while making bread, dance to the sounds of popping popcorn, taste the different flavors of a fruit salad, and observe the changes in water and ice.

This backpack emphasizes the sense organs that allow you to smell, touch, hear, taste, and see in exploring the kitchen. These sense organs include your nose, your skin, your ears, your tongue, and your eyes. You and your child will use these sense organs to observe, compare, and communicate experiences in and around the kitchen.

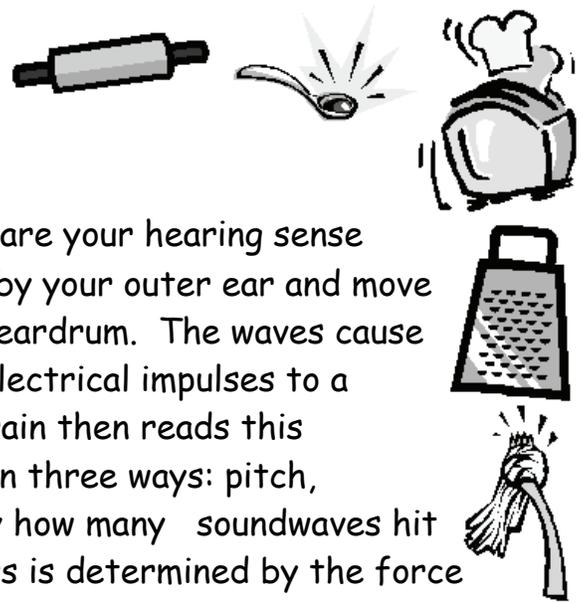
HOW OUR SENSES WORK

SENSE OF SMELL — Your nose is really only a “hood” to cover the other delicate parts of your inner nose. When you breathe through your nose, air is drawn into the nostrils and goes up into the nasal cavities. The tiny hairs inside your nose are called *olfactory receptors*. When the chemicals in the air that you breathe touch these receptors, it creates chemical impulses. The impulses are sent to your brain by nerves. Your brain then tells you what you smelled.



SENSE OF TOUCH — Your skin is your largest sense organ. It is covered with tiny nerve endings that can sense five different types of touch; touch, pressure, heat, cold, and pain. Each of the nerves sends a different message to the brain. Not all the areas of your skin have the same amount of nerve receptors. Your fingertips have many more nerve sensors than other parts of the body.





SENSE OF HEARING — Your ears are your hearing sense organ. Sound waves are captured by your outer ear and move through the auditory canal to the eardrum. The waves cause the eardrum to vibrate and send electrical impulses to a special nerve in the brain. Your brain then reads this information. Your brain interprets sound in three ways: pitch, loudness, and tone. Pitch is determined by how many soundwaves hit your eardrum within a given time. Loudness is determined by the force of the soundwaves. Tone is a quality created by the vibrations of the sound waves.



SENSE OF TASTE — Your tongue is your taste sense organ. It is covered by thousands of tiny taste buds. When you eat, the chemicals in your food touch the tips of these receptors. This creates electrical impulses that are sent to a special nerve in the brain. The taste receptors can distinguish four main tastes: salt, sweet, bitter, and sour. All the different tastes that you experience when you eat food are determined by a combination of these four basic tastes.

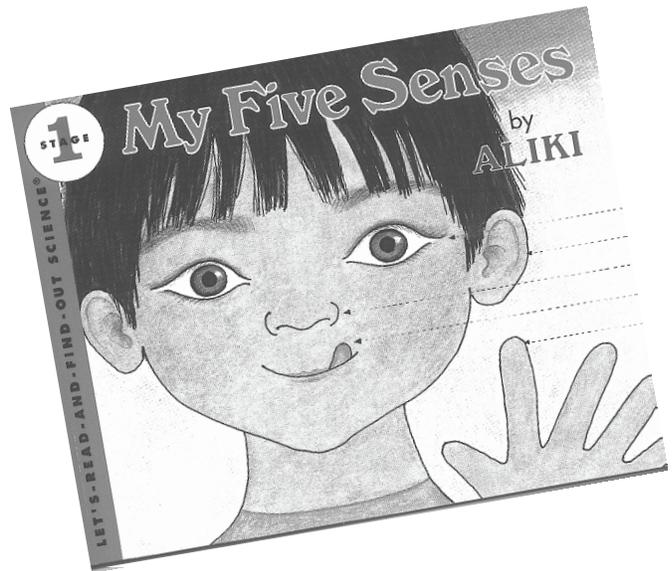


SENSE OF SIGHT — Your sense of sight gives you another type of information; visual. The information is gathered by your eyes, your sight organ. After your eye gathers the information it is changed into electrical impulses and sent to a special nerve in the brain. The brain is then able to read the eyes' information. Your eye works much like a camera. A small black hole in the center of the eye is called the *pupil*. It lets light into your eye. The *iris*, or colored part, of your eye works like a shutter on a camera by adjusting the amount of light. Behind the iris is the *lens*. Just like a camera, it focuses the light and sends it to the *retina*. The retina operates like film in a camera and sends the recording to the brain.



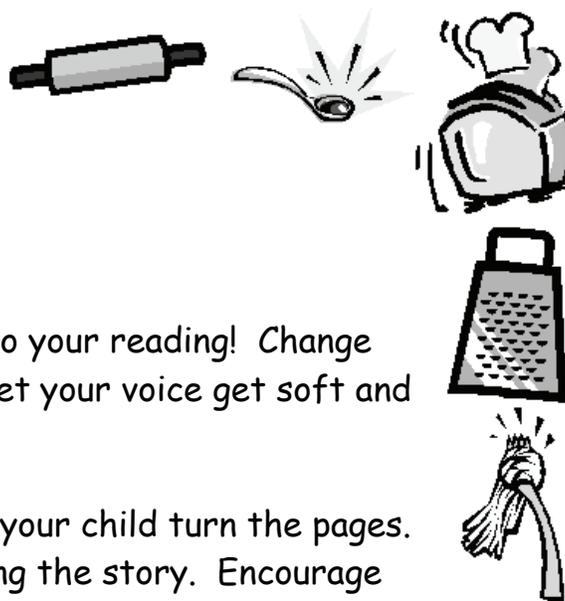
The Five Senses

Reading together is both fun and educational! Books can make children think, wonder, and want to know more. The story, *My Five Senses*, by Aliko is about a boy who learns about his senses. It will lead to lots of discussion between you and your child. What you and your child learn in the story will be useful as you do the other activities in this packet!



WHAT YOU NEED

-  *My Five Senses* by Aliko
-  Paper
-  Pencil, markers, or crayons



HOW TO DO IT

-  When reading to your child, put life into your reading! Change your voice for different characters. Let your voice get soft and loud.
-  Involve your child in your reading. Let your child turn the pages. Ask him to guess what will happen during the story. Encourage him to retell the book from the pictures, or share in the reading.
-  After you have read the story, ask him some of the questions below.
-  If your child is still interested, ask him to draw a picture of some part of the story, or show a way that he has used his senses to discover things in the kitchen.



QUESTIONS TO ASK YOUR CHILD

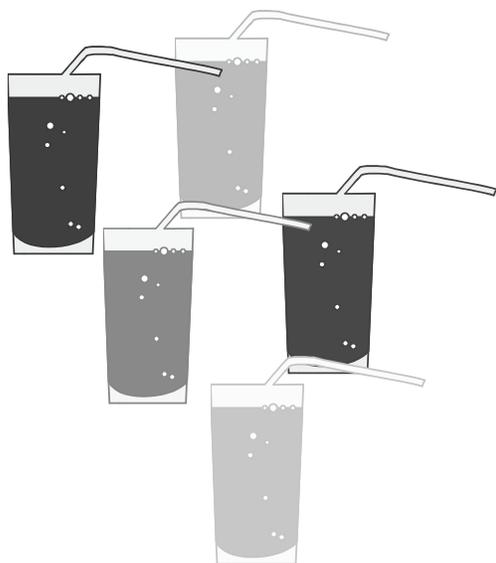
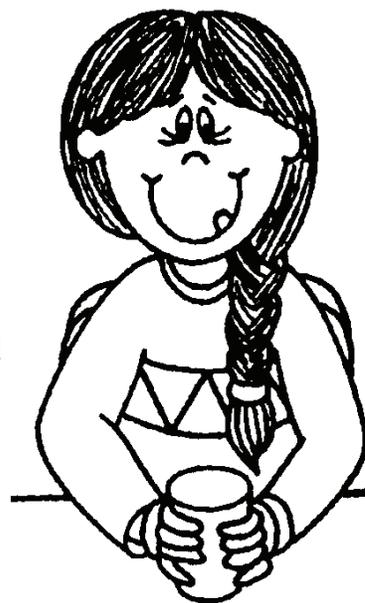
Ask open-ended questions that encourage further exploration by your child.

-  *What was the story about? Who were the characters?*
-  *What happened first (second, or last) in the book?*
-  *Have you had any experiences with your senses that were like the experiences of the boy in the story?*
-  Ask questions about the senses that relate to the kitchen. For example: *What sounds are made in the kitchen? What textures have you felt in the kitchen? What aromas have you smelled in the kitchen?*



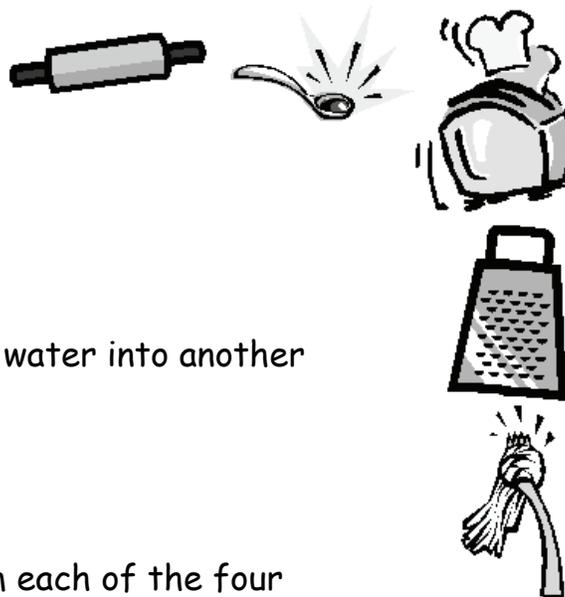
Juice Taste

Our sense of taste is affected by our sense of smell. In this activity, you will help your child understand how the senses of taste and smell work together. Your child will taste four different juices with and without the benefit of his or her nose!



WHAT YOU NEED

-  5 glasses
-  4 different juices — apple, orange, grape, pineapple, etc.
-  Water
-  Blindfold



HOW TO DO IT

-  Pour each fruit juice into a glass. Pour water into another glass.
-  Blindfold your child.
-  Carefully, help your child sip juice from each of the four glasses. Ask him to identify the juices.
-  Next, ask him to rinse out his mouth by drinking some water.
-  Now, ask him to taste the juices again. But this time have him hold his nose shut. Ask him to identify the juices. (It will be much harder to tell one juice from another without the sense of smell!!!)



QUESTIONS TO ASK YOUR CHILD

Ask open-ended questions that encourage further exploration by your child.

-  *What juices did you taste the first time?*
-  *Were you able to tell the juices apart when your nose was closed?*
-  *How does your sense of smell affect the taste of the juices?*
-  *Can you think of other foods that you could taste with or without your sense of smell?*



Floating Egg

Our eyes observe all types of changes that occur in the kitchen. In this activity, you and your child will use your sense of sight to observe how an egg can be made to float in a glass of water.



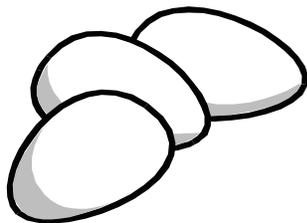
WHAT YOU NEED

-  Clear drinking glass
-  Spoon
-  Salt
-  Water
-  Uncooked egg



HOW TO DO IT

-  Fill the glass about half-full of water.
-  Add lots of salt to the water until no more salt will dissolve.
-  Place a spoon in the glass.
-  Carefully fill the rest of the glass with water, pouring over the spoon so that the two liquids do not mix.
-  Carefully drop an egg into the glass. The egg should remain suspended between the two liquids.
-  If you have time, try the same experiment with a cube of potato.



QUESTIONS TO ASK YOUR CHILD

Ask open-ended questions that encourage further exploration by your child.

-  *Were you surprised by what happened?*
-  *Describe the steps we used in this activity.*
-  *Why did we place the spoon in the glass before adding more water?*
-  *Can you think of other things we can try to float in the glass?*
-  *Do you think it will work if we stir the water? If we use hot water or ice water?*



Kitchen Gadgets

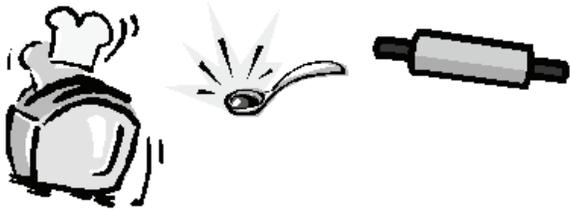
Did you know that the wire rack in your kitchen can make sounds like a harp? Or that a silver spoon can sound like church bells?

Allow plenty of time for you and your child to explore all the beautiful sounds that can be made by kitchen gadgets, some string, and your fingers stuck in your ears!!



WHAT YOU NEED

-  **String**, cut in 1-yard lengths
-  **Variety of kitchen gadgets**— wire racks, silver spoon, spatula, egg beater, scissors, etc.
-  **Wooden pencil**



Hot or Cold

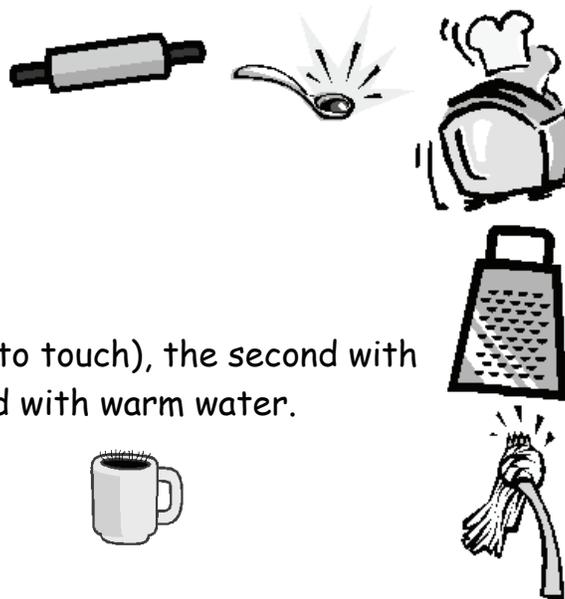


The kitchen includes a collection of temperatures, from frozen ice cubes to boiling soup! Our sense of touch is important when distinguishing between hot and cold surfaces. Your child may be surprised by how hot and cold water feels when he does this activity!



WHAT YOU NEED

-  3 coffee cups
-  2 heat-resistant measuring cups
-  Hot, cold, and warm water
-  Ice cubes



HOW TO DO IT

- Fill the first cup with hot water (able to touch), the second with cold water and ice cubes, and the third with warm water.



- First, have your child dip a finger into the hot, cold, and warm waters.
- Next, have him, at the same time, put one finger in the hot water and one finger in the cold water. Hold the fingers there for about a minute.
- Dip the finger that was in the hot water into the warm water. How does it feel? (It will feel cold because it is not as hot as his skin.)
- Dip the cold finger into the warm water. How does it feel? (Now, the water will feel hot.)
- Retry the activity.

QUESTIONS TO ASK YOUR CHILD

Ask open-ended questions that encourage further exploration by your child.

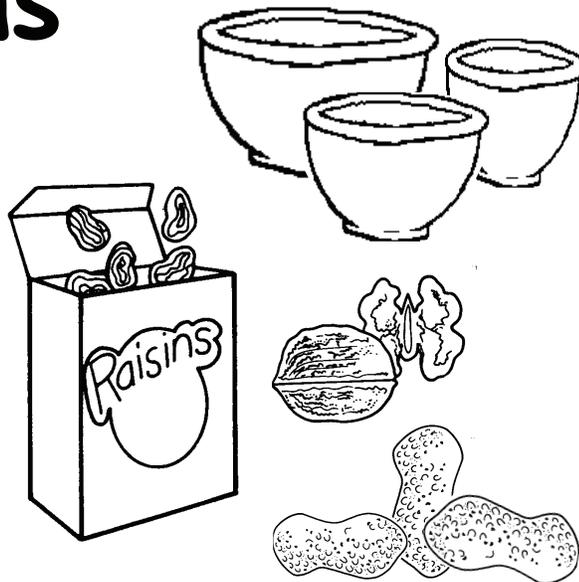
- How did your fingers feel when dipped into the hot, cold, and warm waters?*
- What differences did you feel when you felt the warm water?*
- What caused the differences?*



Kitchen Collections

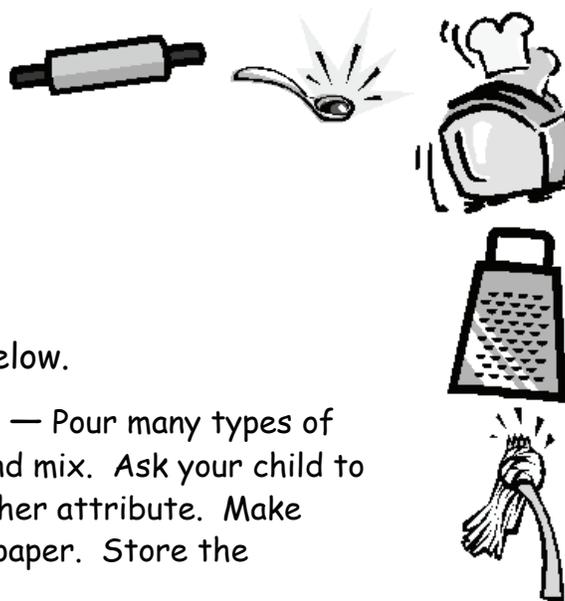
The kitchen is a wonderful place for children to create collections. When children make collections they are using many of the same skills that scientists use everyday; observing, comparing, classifying, and communicating.

See how many kitchen collections you can create!



WHAT YOU NEED

-  **Containers to hold collections** — bowls, boxes, bags, etc.
-  **Kitchen collectibles** — cereals, seeds, macaroni, food, utensils, recipes, etc.
-  **Tape recorder and tape** (optional)



HOW TO DO IT

 Try to make some of the collections below.

CEREAL AND MACARONI COLLECTION — Pour many types of cereals and macaroni into a bowl or bag and mix. Ask your child to sort the items by color, shape, size, or other attribute. Make pictures using the collection by gluing on paper. Store the collection for later use.

SEED COLLECTION — Ask your child to find as many different kinds of seeds as she can in the kitchen (consider spices, popcorn, beans, peas, rice, the inside of an apple, plum, etc.). Sort the seeds from the smallest to the largest. Talk about their uses. Try planting some of the seed collections.

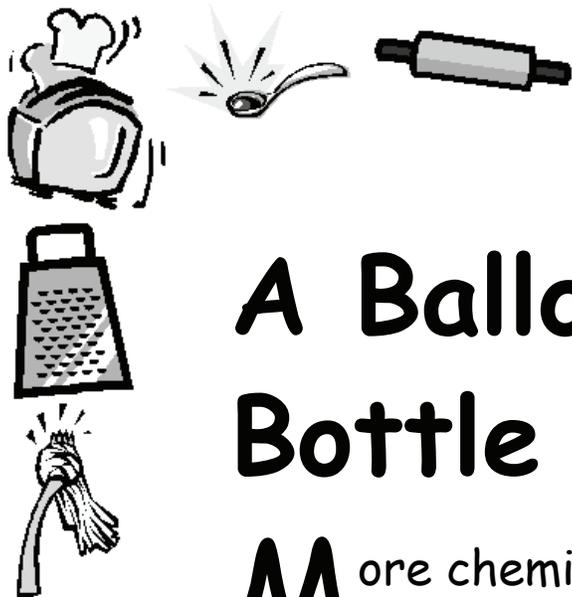
TASTE COLLECTION — Using canned and packaged foods, ask your child to make a collection of her favorite foods. Then ask her to make a collection of foods that she would like to serve for breakfast, lunch, or dinner. Help your child plan a menu.

SOUND COLLECTION — Using a tape recorder, ask your child to make a collection of sounds (running water, frying an egg, opening a cupboard, pounding a pan, etc.). Take turns guessing the sounds and adding to the collection.

QUESTIONS TO ASK YOUR CHILD

Ask open-ended questions that encourage further exploration by your child.

-  *Describe the collections you made.*
-  *How did you sort, classify, or organize your collections?*
-  *How are kitchen collections used by other people?*
-  *What other collections could you make?*



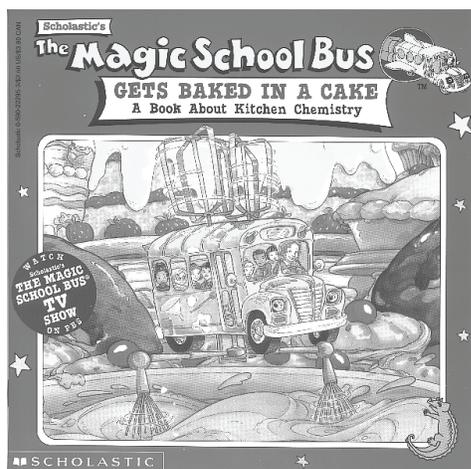
A Balloon and a Bottle

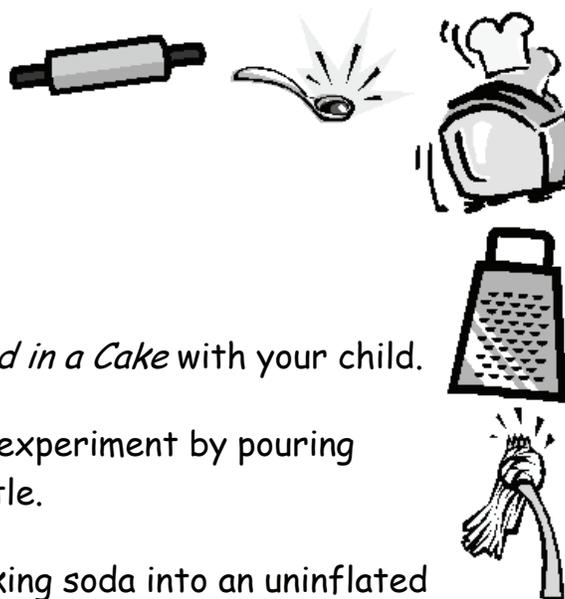
More chemical changes occur in the kitchen than in any other room of the house. Almost every cooking activity requires some type of chemical reaction. You and your child will enjoy watching the chemical reaction of baking soda added to vinegar and reading *The Magic School Bus Gets Baked in a Cake*.



WHAT YOU NEED

-  *The Magic School Bus Gets Baked in a Cake*, by Joanna Cole
-  1 cup of vinegar
-  $\frac{1}{4}$ cup baking soda
-  Measuring spoons, tablespoon
-  Clear, empty soda bottle
-  Balloon





HOW TO DO IT

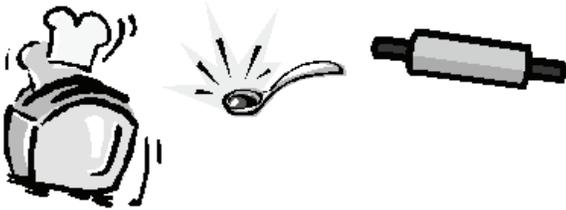
-  Read *The Magic School Bus Gets Baked in a Cake* with your child.
-  Then help your child create their own experiment by pouring about $\frac{1}{2}$ cup of vinegar into a soda bottle.
-  Then spoon about 2 tablespoons of baking soda into an uninflated balloon.
-  Carefully, help your child fasten the balloon over the lip of the soda bottle, making sure none of the baking soda falls into the vinegar.
-  On the count of three, carefully lift the balloon so that the baking soda falls into the vinegar.
-  Watch the chemical reaction!!
-  Repeat the activity varying the amounts of baking soda and vinegar.



QUESTIONS TO ASK YOUR CHILD

Ask open-ended questions that encourage further exploration by your child.

-  *Were you surprised by what occurred?*
-  *What was created in the bottle that caused the balloon to inflate?*
-  *How are baking soda and vinegar used in cooking?*
-  *Do you think you can make the balloon inflate even larger? How?*



Baking Mini-Cakes



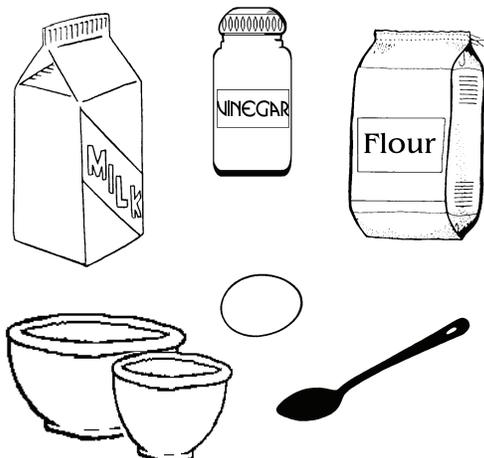
After reading *The Magic School Bus Gets Baked in a Cake* and conducting the balloon and bottle activity, you're ready to try your hand at baking your own cake! Included is a simple mini-cake or muffin

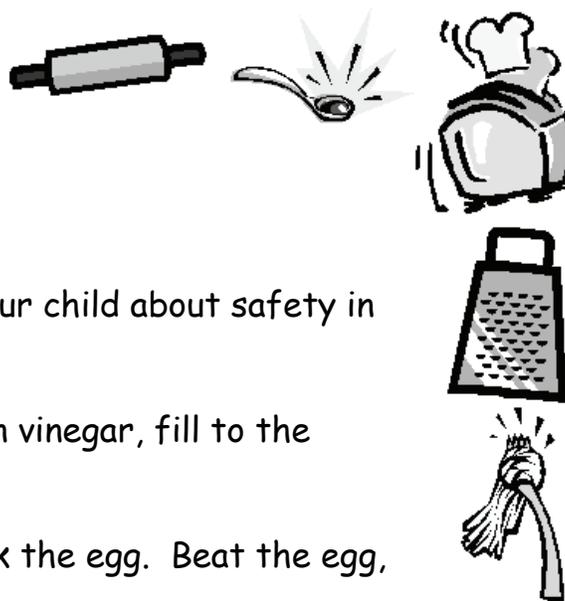


recipe that is easy to make and uses many of the same ingredients as those in the story.

WHAT YOU NEED

-  1 egg
-  1 cup milk
-  1 tablespoon vinegar
-  $\frac{1}{4}$ cup vegetable oil
-  2 cups flour
-  1 tablespoon baking powder
-  $\frac{1}{2}$ teaspoon baking soda
-  1 teaspoon salt
-  Muffin tin
-  Paper muffin cups
-  Small and large mixing bowls
-  Mixing spoon





HOW TO DO IT

-  Preheat the oven to 400°F. Talk to your child about safety in the kitchen!
-  In a measuring cup, add one tablespoon vinegar, fill to the 1-cup line with milk, and stir.
-  In the small bowl, help your child crack the egg. Beat the egg, add the milk mixture and oil, and stir.
-  In the large bowl, combine the flour, sugar, salt, baking powder, and baking soda. Ask your child what the baking soda did in the *balloon and bottle activity*.
-  In the large bowl, help your child dig a hole in the dry ingredients.
-  Pour the egg mixture into the hole in the dry ingredients. Stir the batter until just moist (don't over stir!!).
-  Spoon the batter into the muffin tins, filling about two-thirds full.
-  Bake 15 to 18 minutes, until golden brown.



QUESTIONS TO ASK YOUR CHILD

Ask open-ended questions that encourage further exploration by your child.

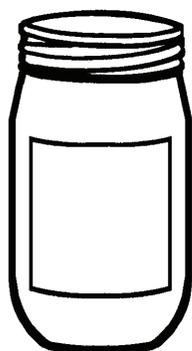
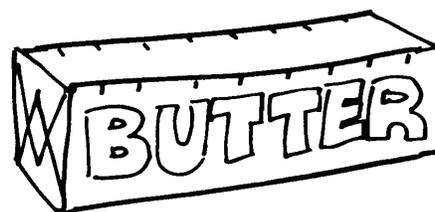
-  *What did you observe in making the mini-cakes that was similar to the balloon and bottle activity?*
-  *What changes did you observe in the batter and in the baked mini-cakes?*
-  *How did the different ingredients smell? What did the mini-cakes taste like?*
-  *Could we add other ingredients to the mini-cakes? (nuts, fruit, flavoring?)*
-  *Why did we mix the ingredients separately? Why did we not over stir?*



From Liquid to Solid

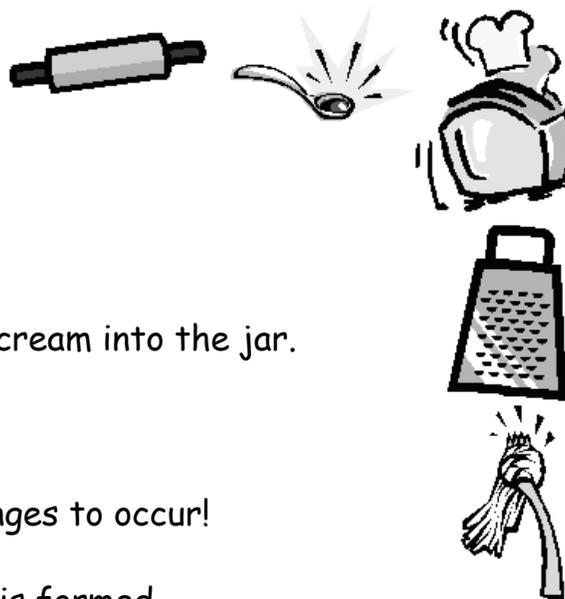


All types of changes occur in the kitchen. In this activity, you will observe a liquid change into a solid; in this case, whipping cream changing into butter. Your tasty creation can be served with the mini-cakes that you made in Activity Eight!



WHAT YOU NEED

-  $\frac{1}{2}$ pint heavy whipping cream
— found in the milk section of the dairy case
-  8-ounce clear jar with a lid
-  Salt



HOW TO DO IT

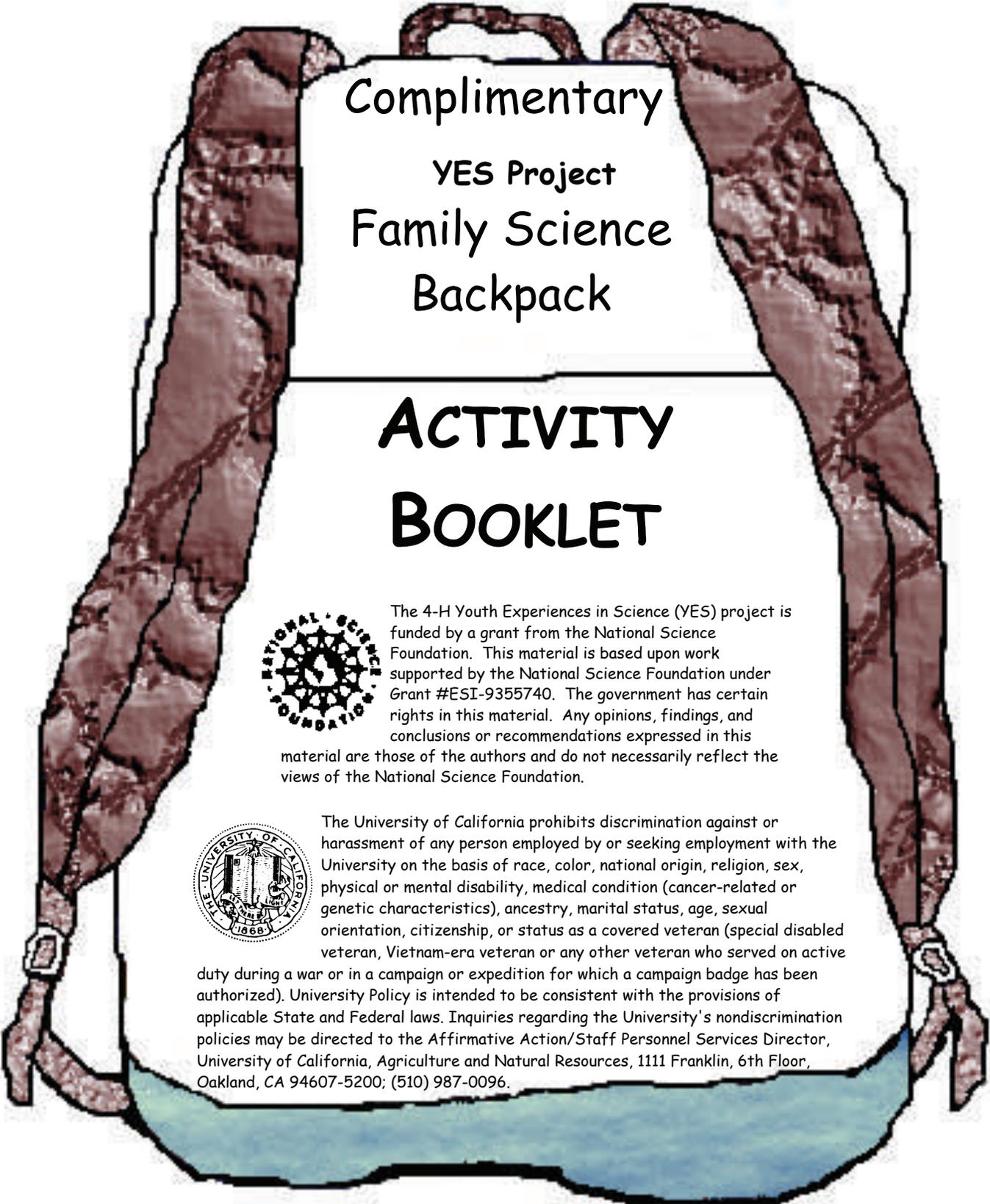
-  Pour about $\frac{1}{2}$ cup of the cold whipping cream into the jar.
-  Put on the lid securely.
-  Begin shaking the jar. Watch for changes to occur!
-  Continue shaking until a ball of butter is formed.
-  After the ball of butter is formed, open the jar and pour off the liquid.
-  Observe the butter and remaining liquid. Compare with the whipping cream liquid.
-  Taste the butter. If you prefer a salty flavor, add a pinch of salt and blend.
-  Spread the butter on the mini-cakes or toast.



QUESTIONS TO ASK YOUR CHILD

Ask open-ended questions that encourage further exploration by your child.

-  *What were the steps that we used to make the butter?*
-  *What did the shaking do to the cream?*
-  *What changes occurred in the liquid?*
-  *Does the butter smell differently than the cream? How does the butter taste? Is it the same as store-bought butter?*
-  *What other things in the kitchen change from liquid to a solid?*



Complimentary

YES Project
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ACTIVITY BOOKLET



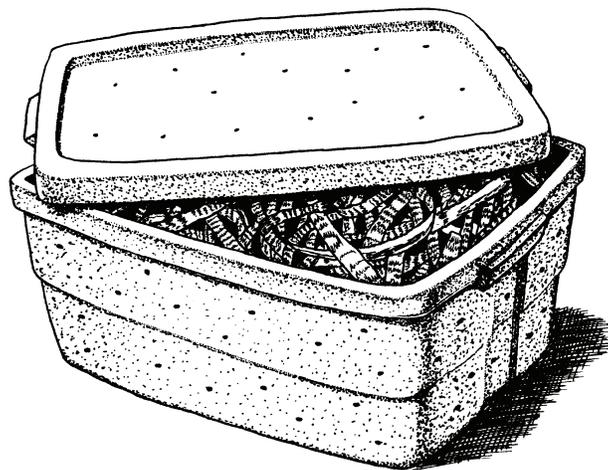
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This is Yours to Keep!!

Wonderful Worms Teen Guide



4-H YOUTH EXPERIENCES IN SCIENCE PROJECT
UNIVERSITY OF CALIFORNIA COOPERATIVE EXTENSION
DIVISION OF AGRICULTURE
AND NATURAL RESOURCES
PUBLICATION 3407



Wonderful Worms

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Welcome to the 4-H Youth Experiences in Science Project!

There is nothing like the **4-H YES Project** for providing high quality children's science education in after-school settings. *4-H YES* uses specially trained teenage volunteers to conduct the hands-on science curriculum for children 5 to 8 years of age enrolled in school-age child care programs.

Each *YES* Theme Unit contains five or more 1- to 1½- hour sessions. Each session contains three or more activities that build upon the session's theme.

The session instructions provide an **Overview of the Day's Activities**, **Background Information** on the session's subject, a list of **Materials You Will Need** to conduct the session, a detailed outline on **Getting Ready**, the **Action** required, and specific **Sciencing** questions. When reading the curriculum, be sure to look for the **Tips** in the side column. They give valuable information on setting up and conducting the activities. At the end of the curriculum is a listing of all the supplies needed to conduct each activity.

The *YES* Curriculum incorporates inquiry-based activities with cooperative learning. It focuses on learning the scientific thinking processes and features the learning cycle model of instruction.

The **Scientific Thinking Processes** are built into each of the sessions. The processes of **observing**, **communicating**, **comparing**, and **organizing** are most commonly used in this curriculum aimed at younger children. The processes are indicated in small bold type after the **Action** and **Sciencing** sections of each activity.



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Introduction and Background Information

The ***Wonderful Worms*** 4-H YES Curriculum provides numerous opportunities for you to assist primary-age children to learn about worms, their natural habitat, and how important worms are to our environment. The accompanying materials emphasize the science processes using the *Learning Cycle*. The activities included in this unit encourage hands-on learning and integrate literature, math, music, and arts and crafts with the important science lessons.

Worms are a wonderful subject to spark children's natural curiosity. Remember when you first touched a worm? Do you remember how it felt in your hand as it tried to wiggle away? Maybe you were even one of the thousands of children who tasted a worm! As you read through this material we encourage you to draw on your own childhood experiences and use them as you prepare for your leading of the *Wonderful Worms* unit.

WHAT ABOUT WORMS?

In this unit, we will be dealing exclusively with earthworms. Did you know that there are nearly 3,000 different kinds of earthworms? There are thousands of other types of worms, but earthworms have special characteristics and live in soil and decaying organic matter. They vary in length from less than 1 inch to over 9 feet, the longest variety living in Australia. Earthworms can have patterned bodies and can vary in color; they usually have shades of red, brown, or gray in their coloring.

The Beneficial Worm Earthworms are often referred to as "nature's plowmen." This is because of the super amount of soil they move. As they tunnel through the ground, they mix up the soil. They carry rotting and decaying material called *humus* into the lower layers of the soil. This is good for plants. The tunneling done by worms also aerates the soil and provides for better penetration of water to plant roots.

Earthworms are also beneficial because they help in disposing of decaying matter. Redworms can eat about half of their body weight each

day. This process of turning decaying materials into useful products is essential to the balance of life.

THE WORM ENVIRONMENT

Earthworms inhabit dark, moist places where plenty of plants are growing. Most earthworms live in burrows in the top 18 inches of the soil. The earthworm digs its own burrow by eating its way through the soil.

In hot, dry weather, the earthworm digs deeper into the soil to find a cooler and moister environment. *Worm's can't withstand extremely cold temperatures.* They protect themselves by burrowing below the frozen ground and often plug their burrow openings with leaves, pebbles, sticks or mud. Worms can stay deep in their burrows until spring when the soil begins to warm.

Worms can not tolerate too much moisture. When it rains, some worms escape to the pavement to prevent being drowned. Once outside of their burrows, especially in the daylight, worms must protect themselves from dehydration. *Too much sun causes a worm to suffocate and die.*

Earthworms live in very crowded conditions. In a square foot of garden soil it would not be uncommon to find 100 worms. In compost and worm bins, worms enjoy an even more crowded environment.

THE WORM ANATOMY

Earthworms have no eyes. However, they are sensitive to light. When worms are suddenly exposed to bright light they quickly try to move away from it. ***Worms also have no teeth.*** Instead they have a muscular gizzard which functions similarly to that of birds. Small grains of sand and mineral particles lodge in this gizzard. Muscular contractions compress these hard materials and the food, mix it with some fluid, and grind it into smaller particles. ***Worms also have no lungs.*** Respiration occurs directly through their skin. A worm's skin must be kept moist to allow it to breathe. It will die if its skin becomes too dry.

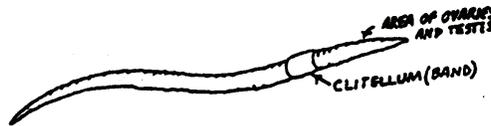
Worms are *hermaphrodites*, equipped with both male and female organs. When temperatures, moisture, and food are favorable, a mature redworm can mate and produce two to three cocoons per week. Two to five baby worms can hatch from each cocoon produced by a two-month old redworm. Worm cocoons are lemon-shaped and about the size of a match head.

LIFE EXPECTANCY

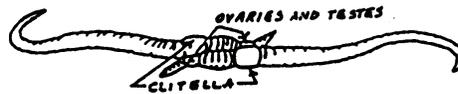
Most worms probably live and die within the same year, although they can live longer. Worms are very prolific, but they will automatically keep their numbers in check in a worm box. If worms are removed, such as for starting another worm bin, the population in the first bin will quickly return to its former level.

Earthworm Mating and Cocoon Formation

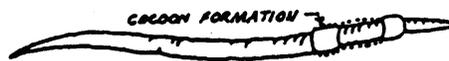
Each worm has BOTH ovaries and testes.



Two worms join by mucus from their clitella. Sperm then pass from each worm to the sperm storage sacs in the other worm.



Later, a cocoon forms on the clitellum of each worm. The worm backs out of the hardening cocoon.



Eggs and sperm are deposited in the cocoon as openings from ovaries and sperm storage sacs pass over it.



After being released from the worm, the cocoon closes at both ends. Egg fertilization takes place in the cocoon.



Two or more baby worms hatch from one end of the cocoon.

Contrary to folklore, if a worm is cut in half, both halves do not regenerate; a worm can replace a limited number of front or hind segments but only if it still has a middle.

VERMICULTURE

Composting with worms is called vermiculture. Worm composting systems are neat, easy and odorless. They provide a means for nearly everyone to compost. *Session 4* gives detailed information on how to set up a worm bin.

Worm Food - All worms eat the same type of organic matter, that is anything that was once living and growing. Redworms used in vermiculture bins will eat all types of vegetable and fruit scraps, pasta, bread, cooked beans, and other kitchen leftovers.

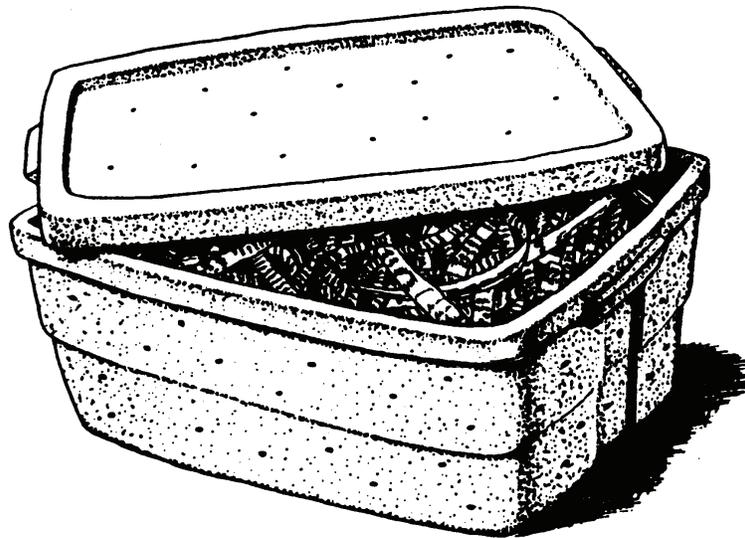
Coffee grounds are excellent for earthworms and even enhance the texture of the final compost. Tea leaves, tea bags, coffee filters, paper towels and napkins are also acceptable worm food.

Egg shells are good food and they provide hard particles to help with grinding in their gizzards. *No animal products should be added to the worm bin, including cheese, oils, bones, or meat.*

Yard trimmings can also be fed to worms. The same rules apply as with open and closed air composting, such as avoiding diseased plants or plants recently treated with herbicides, etc. Chopping food and yard trimmings into smaller pieces will speed up digestion by the worms.

Feeding Worms in a Worm Bin - Worms can be fed every day, twice a week or only once a week. Let your schedule, not the worms, be your guide. Most classrooms will want to feed once or twice a week. Food scraps can be stored in the refrigerator until ready to feed.

To feed the worm bed, push back the bedding (shredded newspaper), add the food, and cover it so that it's an inch or so beneath the surface. In larger bins it can be placed deeper. There is no need to chip or grind the food; let the micro-organisms and worms do that for you. However, remember that more food can be added if you do some of the mashing and processing.



HARVESTING THE WORM COMPOST

When most of the contents of the bin have become dark castings, and the finished compost has been greatly reduced from the original volume, it is time to harvest the worm compost. Following are several methods of harvesting castings.

Horizontal Harvest

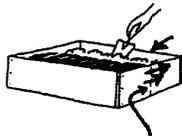
1. Pull vermi-compost and worms to one side of the box.



2. Add new bedding to vacant side.



3. Bury food in new bedding.



Worms move to new bedding in search of food. Black plastic this side only.



4. Remove vermicompost in 2-3 months and replace with new bedding.

Vertical Harvest: Since worms will migrate to the surface to feed on newly added food, most of the worms will be concentrated in the top layer of material. Remove the top few inches, set it aside in a bucket or wheelbarrow and harvest the compost below. This method works best for tall bin systems.

Horizontal Harvest: In this method, the contents of the bin are moved to one side, fresh bedding is added in the empty space and all food is then added to the new bedding. The worms will migrate slowly over to the new bedding. Every two to three months, the vermicompost can be removed and replaced with fresh bedding and the process continued from side to side.

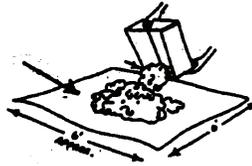
Dump and Sort: This method is more labor intensive. Spread a sheet of plastic out under a bright light or in the sun. Dump the contents of the worm box into a number of piles on the sheet. The worms will crawl away from the light into the center of each pile and you can brush away the worm compost on the outside by hand. Each time the outer compost is scraped, give the worms about a half hour to migrate toward the center before scraping again. Soon you will have wriggling piles of worms surrounded by donut-shaped piles of worm compost. Sift the harvest compost to remove the uncomposted materials and return these to the bin.

Extra worms harvested from the bin can be shared with another classroom to establish their own worm composting system, or children can take the worms home to create their own system.

Dump and Hand Sort

1. Worms and vermicompost

Plastic sheet



4. After removing vermicompost, you will find masses of worms at the bottom of each pile



2. Make cone-shaped piles

Bright light

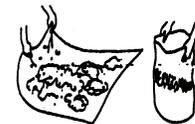


5. Place "pure worms" in a container and weigh them



Each pile contains worms and vermicompost

6. Save the vermicompost for garden and house plants



3. Worms go to the bottom of each pile to avoid aight. Remove top and sides

7. Add the worms to the box with new bedding



USING WORM COMPOST

Worm compost, or worm castings, are generally too fine-grained and dense to use as a growing medium. *It is best to make a planting mix using the worm compost as the basic ingredient. A successful mix is equal parts of worm compost, peat moss and coarse sand.* Vermiculite may be used in place of the sand. This is a very good mix for seed starter trays and cups.

The pure worm compost can be used as a general soil conditioner for house plant containers. Because of the concentration of nutrients in this material, it can be used as a slow release fertilizer. Worm compost can be sifted onto lawns, spread around vegetable plants, or worked into the soil around shrubs and trees.

Like traditional compost, worm compost has a dark brown color and a fresh, earthy smell. It is good for plant growth. Use the worm compost to mix with soil to plant seedlings or seeds as an extension of your composting project.

Worm Bin Troubleshooting Guide

SYMPTOM	PROBLEM	SOLUTION
Worm bin smells bad	Not enough air circulation	Add fresh bedding
	Improper food scraps added	Remove meat, bones or other animal products
Worms are dying	Not enough food	Add food into bedding
	Bin too dry	Moisten contents until slightly damp
	Bedding eaten, too many castings	Add bedding
Fly infestation	Food exposed	Secure lid, line with latches and weather stripping, cover scraps with bedding, cover worms and bedding with plastic sheet or newspaper
Ant infestation	Food accessible	Set legs of bin in cans of water or mineral oil

GETTING TO KNOW WORMS

Approximate Time Required for Session: 1 hour

Purpose

- Children will have an opportunity to *observe* earthworms in several settings.
- Through *observation*, children will learn the basic body parts of a worm.

Overview of the Day's Activities

Worms provide a wonderful medium for applying many science concepts and processes and encouraging creative exploration in young children. This first session will focus on introducing youngsters to the study of earthworms. The following sessions will build on this introductory session.

Background Information

Earthworms have no eyes. However, they are sensitive to light. When worms are suddenly exposed to bright light they quickly try to move away.

Worms also have no teeth; instead, they have a muscular gizzard which functions similar to that of birds. Small grains of sand and mineral particles lodge in this gizzard; muscular contractions compress these hard materials and the food, mix it with some fluid, and grind it into smaller particles.

Worms also have no lungs; respiration occurs directly through their skin. A worm's skin must be kept moist to allow it to breathe. It will die if its skin becomes too dry.

ACTIVITY A**LET'S LOOK AT WORMS**

Time Required
15–20 minutes

Suggested Grouping
Four to six children

In this activity, you will help children begin to develop an appreciation and understanding of earthworms. The children will observe at their own pace how worms live.

Materials You Will Need

- Worm Name Tag handout
- Writing material
- Hole punch
- Yarn - 1 skein
- Redworms and worm bin
- Night crawlers
- Plate or shallow pan - 1 for each child
- Water
- Spray bottles - 1 for each table
- Trowel or scoop - 1 for each group
- Hand lens - 1 for each group
- Worm Body Sheet handout
- Flip chart paper
- Pencils
- Senses cutouts

Getting Ready

- ❶ Gather all the needed supplies for the name tags and *Worm Observation Activity*.
- ❷ Set up one or more tables, depending on the number of children participating.

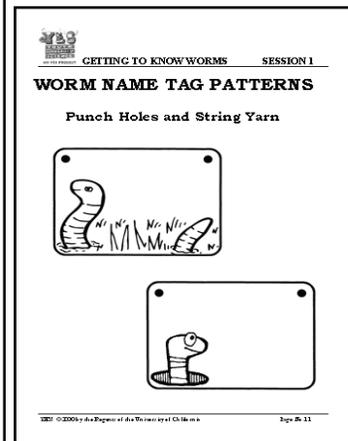
- ③ Have at least one teen assigned to each table or observation center.
- ④ Make copies of the handouts.
- ⑤ Make the comparison chart.
- ⑥ Enlarge and cut apart the *Senses* cutouts.

ACTION: OBSERVING, COMPARING, AND COMMUNICATING

1. Start the session by introducing yourself and helping each child make a *worm name tag*. Remember to make one for yourself. If you are short of time, cut out the name tags in dvance.
2. Introduce the *Wonderful Worms* unit by showing the children the *five senses cutouts* and asking questions that relate to the senses. You might want to ask questions like the following:
 - Where have you *seen* worms?
 - What do worms *feel* like?
 - What do worms *smell* like?
 - Do you think worms can *hear*?
 - What *sounds* do you think they make?
 - Who *eats* worms?
 - What do you think worms *taste* like?

While one teen is leading the discussion, another teen can categorize and record the children's responses on sheets of paper that have the *senses cutouts* at the top of the page.

Sample



See page 11



Tip
Some children may be a little squeamish when it comes to worms. Don't force them to touch or feel the worms. Encourage them to observe in other ways.



Tip
Lead this brief discussion by drawing pictures on a flip chart or holding up cards with illustrations of the senses (i.e. eyes, ears, nose, hands, and mouth). See the sample sensing illustrations at the end of this chapter.

3. Before observing worms, lead a brief discussion on how to handle worms. Remind the children that worms are living creatures! Discuss the importance of keeping worms moist.

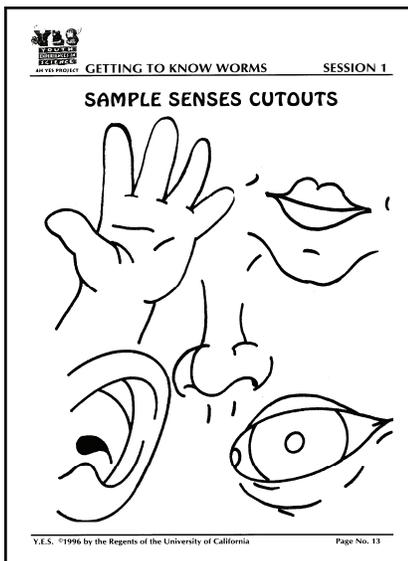
4. Next, have an area ready for the children to observe worms in a worm bin or box. Let the children observe the worms in these settings.

If they are interested, encourage them to dig through the soil to see if they can find more worms.

5. Next, encourage each child to take a worm out of the container and place it on a dampened plate or pan. *(Remember, worms need moisture.)* Allow time for the children to observe the worm's movements. Then, provide a magnifying hand lens for the participants.

Show children other types of earthworms. This can give participants a chance to observe **similarities and differences** in worms. Redworms from a compost bin and night crawlers make a good contrast.

Sample



See page 12

Presentation Notes

SCIENCING: COMPARING, COMMUNICATING

1. When the children appear to be losing interest in observing the worms, ask them to carefully place their worms back into the containers. Move the group away from the tables to discuss what they observed. Use the following questions and some of your own to help children share their observations and experiences.

- Describe how the worms looked. Write their key words on a chart or poster paper.
- What words can you use to describe the worms? (Encourage the use of descriptive words such as **long, thin, slimy, etc.**)
- Why do you think the worms look this way?
- Describe how the worms acted. (Record the key responses.)
- Why do you think the worms behaved in these ways?
- Add your own questions.

Other questions

Again, you may want to use picture cutouts of the five senses to lead this discussion.



Tip
Refer back to the Senses

charts when discussing observations.



Tip
One teen can lead the

discussion while another records the children's responses.



Tip
Make sure all worms are

returned to the worm boxes before you move on to the next section.

ACTIVITY B

WORM BODY PARTS

Time Required
15–20 minutes

Suggested Grouping
Four to six children

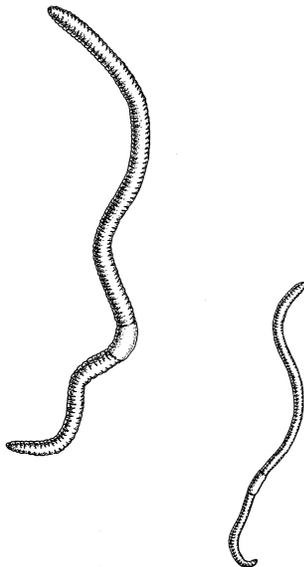
In this activity, you will be directing the children’s observation of the body parts of the earthworm. This activity will further develop the children’s observation skills as they examine the worm’s behavior.

Materials You Will Need

- Worm Body Sheet handout
- Worms
- Worm Comparison Chart
- Flannel board (optional)

Getting Ready

- ➊ Gather all supplies.
- ➋ If you plan to use a flannel board, prepare the enlarged worm and body parts and description words for the presentation.
- ➌ Duplicate a copy of the *Worm Body Sheet* handout for each child.
- ➍ Prepare the *Worm Comparison Chart*.



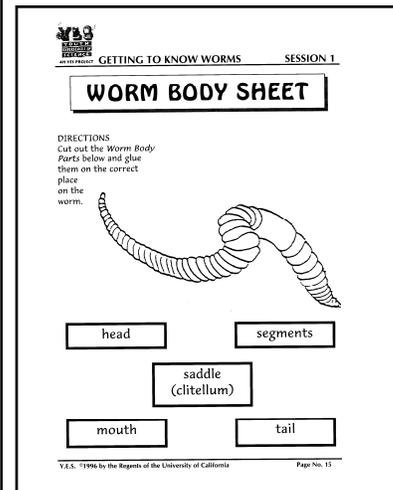
Presentation Notes

ACTION: OBSERVING, COMPARING, AND COMMUNICATING

1. While the children are still away from the observation tables, hold up an enlarged picture of an earthworm or one of the handouts. Point out the different body parts and practice saying the words with the kids.
2. Distribute the *Worm Body Sheet* handout to each child. Ask the children to use the sheet to observe the parts of their worm. Help them observe the key body parts:
 - head
 - tail
 - mouth
 - segments
 - saddle or band (clitellum)

Presentation Notes

Sample



See page 15

SCIENCING: OBSERVING, COMPARING, AND COMMUNICATING

1. Ask the children to return to your discussion circle, away from the observation tables. Use the following questions to lead a discussion on their most recent observations.

- How many of you could find all five body parts on the worm?
- Using your enlarged worm and a flannel board or the *Worm Body Parts* sheet, ask the children to point to the parts they observed.
- Ask if anyone observed other body parts. (List on a chart.)
- Add your own questions.

Other questions

2. Next, show the children the *Worm Comparison Chart*. Ask them to list body parts of people (*e.g., arms, legs, feet, nose*). List these attributes under the “*People*” column. Use pictures or drawings of human body parts.

- Ask the children to put a star under the worm column if the worms they observed had the same attributes.
- Now ask the children to count how many ways the worms were like people and how many ways they were different.

What We Know About Worms	

ACTIVITY C

WORM STICK PUPPET

Time Required

15 minutes

Suggested Grouping

Four to six children

Primary age children enjoy dramatic play. Use this activity to help children better understand and retain the information in Activities A and B. Each child will create a Worm Stick Puppet, following directions below.

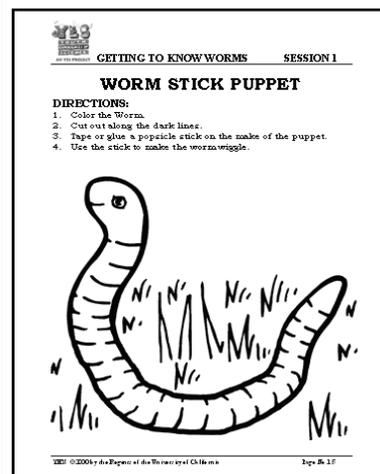
Materials You Will Need

- Worm Stick Puppet handout - 1 per child
- Markers or crayons
- Scissors - 1 for every 2 to 4 children
- Popsicle sticks
- Glue or tape

Getting Ready

- ❶ Make a sample puppet in advance of this activity.
- ❷ Reproduce the *Worm Puppet* handout. The puppets are more durable if the pattern is reproduced on cardstock or heavier paper.
- ❸ Make sure you have enough supplies so children won't compete for the materials. If you have limited supplies (*scissors and crayons*), have one group start by cutting out the puppet and the other start by coloring.
- ❹ Clear an area where children can easily access all the needed supplies.

Sample



See page 15



Tip
Younger children will need

assistance in cutting out the puppet. To speed up the activity, you may want to have the puppets precut so the children can decorate and have plenty of time to role-

ACTION: COMMUNICATING

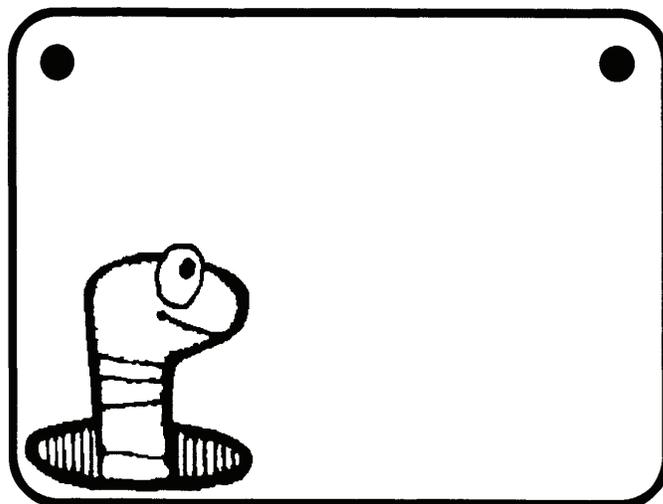
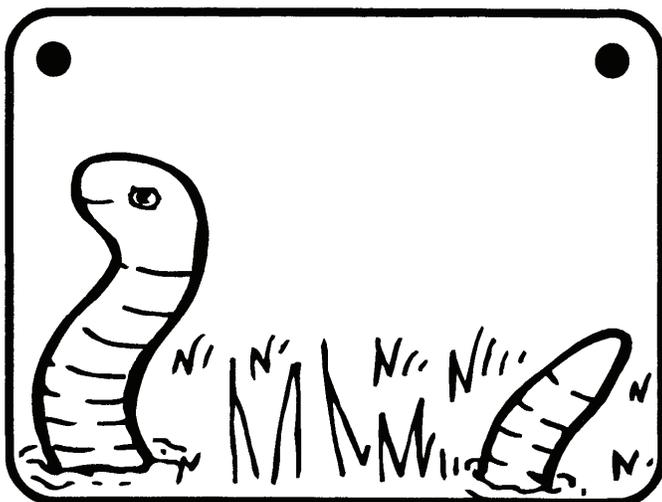
1. Show the children the sample puppet you've made. Use that puppet to explain the directions for creating their own puppets, following the instructions on the handout.
2. Encourage creativity in coloring and decorating the puppet drawing.
3. After all of the children have finished their puppets, direct the children to the discussion circle. (*If some children finish earlier, one teen can begin the discussion in smaller groups.*)

SCIENCING: COMMUNICATING

1. Ask one of the children to volunteer to be your partner. Ask the volunteer to use his/her puppet to describe him/herself as a worm. Encourage the children to use the words that were used in *Activities A* and *B* to describe worms. Refer to the charts for prompting.
2. Next, group the children in pairs. Have one of the children use the finger puppet and describe him/herself as a worm. Then have the other child do the same.
3. Ask the children to take their worm puppets home and share with their family what they did today.
4. End the day by having the children summarize what they did. Tell them when you will be back again and what they will be learning in the second session.

WORM NAME TAG PATTERNS

Punch Holes and String Yarn



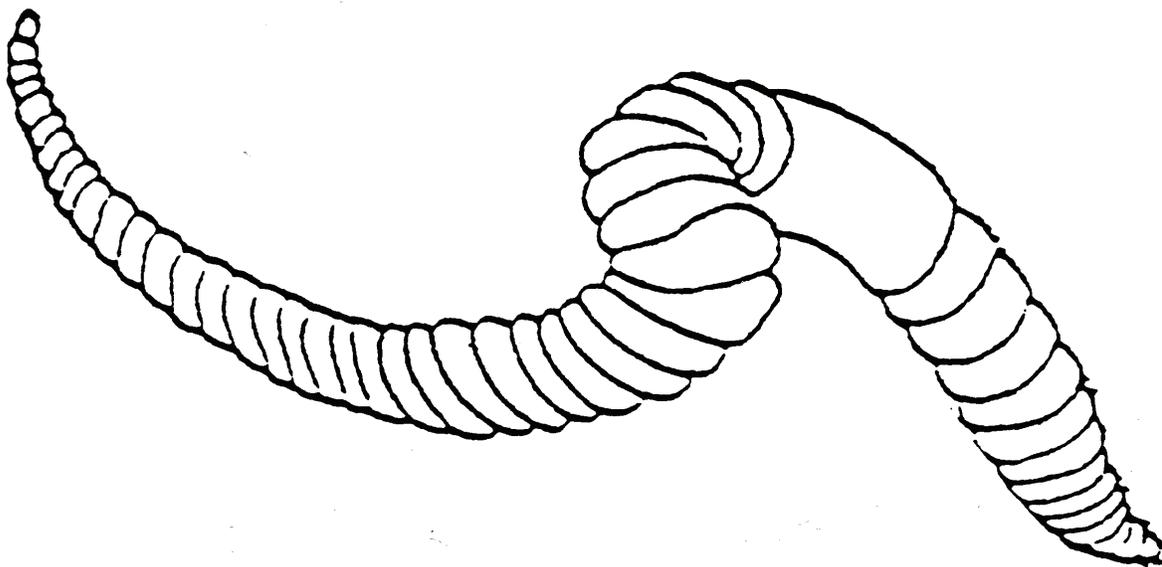
SAMPLE SENSES CUTOUTS



WORM BODY SHEET

DIRECTIONS:

Cut out the **Worm Body Parts** below and glue them on the correct place on the worm.



head

segments

saddle
(clitellum)

mouth

tail

COMPARISON CHART

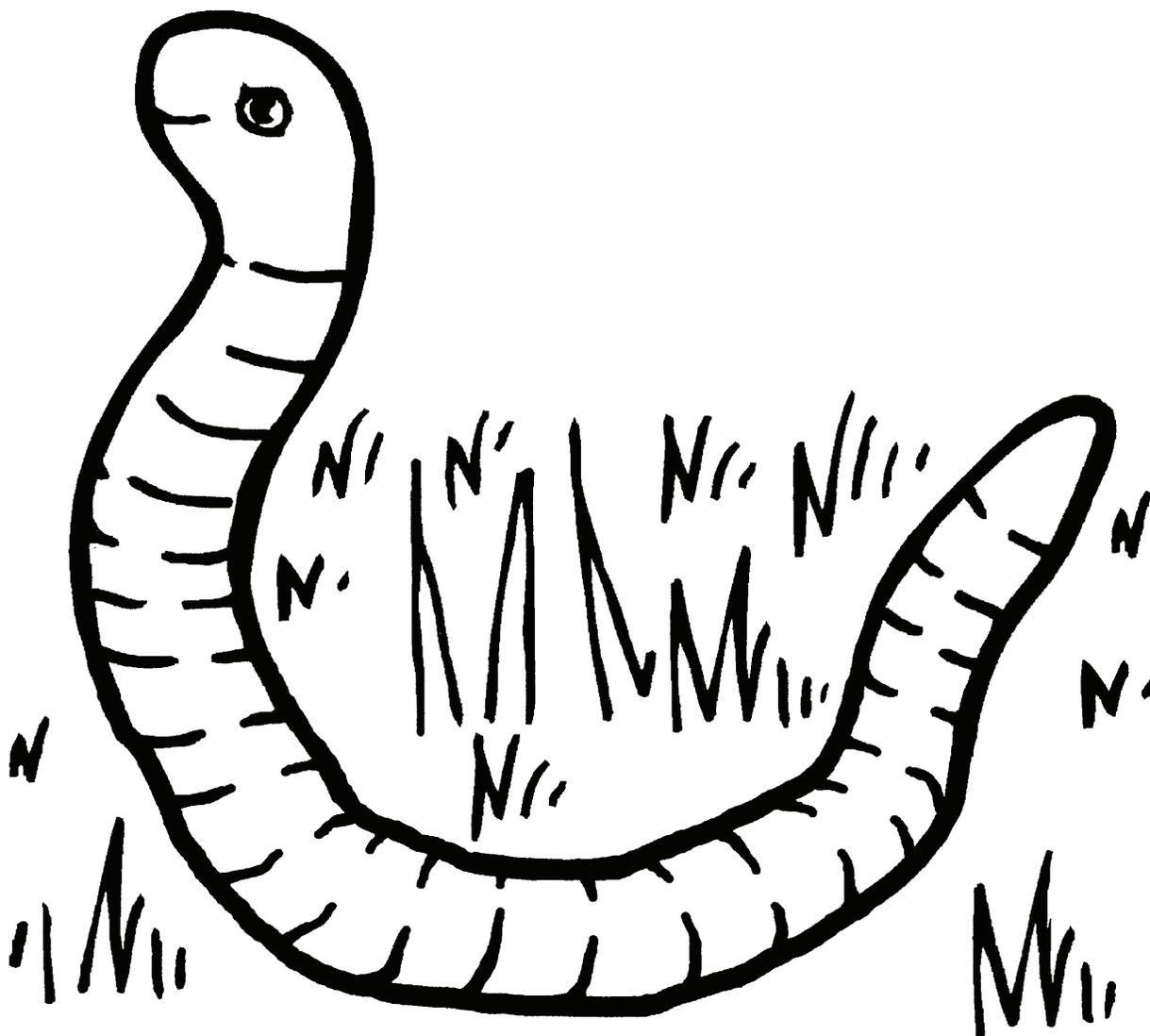
Compare the Body Parts of People and Worms

People	Worms
1	1
2	2
3	3
4	4
5	5

WORM STICK PUPPET

DIRECTIONS:

1. Color the Worm.
2. Cut out along the dark lines.
3. Tape or glue a popsicle stick on the make of the puppet.
4. Use the stick to make the worm wiggle.



WHERE DO WORMS LIVE?

Approximate Time Required for Session: 1 hour

Purpose

- Through *observation*, children will learn where worms *live* in the natural environment.
- Children will learn that worms *eat* decaying leaves and rotting material and turn it into enriched soil.

Overview of the Day's Activities

In this session, children will have an opportunity to observe worms in several environments (a worm box, under decaying debris, and in a garden or lawn.) The children will also create a *Worm Observation Jar* to further explore the behavior and environment of worms. Finally, children will have fun constructing and playing the *Wiley Worm Game*.

Background Information

There are hundreds of different kinds of worms. Throughout this unit you will be discussing primarily **earthworms**. Children in your group most likely have observed field worms (*known as garden worms*), night crawlers (*large worms used for fishing*), and redworms (*often found in decaying matter or compost piles*). Earthworms avoid light and prefer moist places. Most worms create underground or covered burrows.

Earthworms are very helpful to the environment. Worms eat rotting and decaying material and turn it into organic residues that enhance the soil. Burrowing worms also aerate the soil through their constant tunneling and turning of the soil. In today's activities you will help the youngsters observe these useful aspects of worms.

ACTIVITY A

WONDERFUL WORMS

Time Required
10–15 minutes

Suggested Grouping
Small or large group

*In this activity, you will first read the book *Wonderful Worms* by Linda Glaser, and discuss with the children what they learned about where worms live, that is, their habitat. Then, you will take the children outside in search of worms. You will record the youngsters responses about worm environments.*

Materials You Will Need

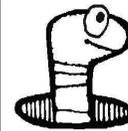
- Wonderful Worms* by Linda Glaser
- Chart paper
- Markers
- Worm bins
- Senses cutouts from Session 1

Getting Ready

- ❶ Read *Wonderful Worms* before you lead the session. Practice holding the book and turning the pages so all children can see the illustrations.
- ❷ Gather all the needed supplies.

ACTION: OBSERVING, COMMUNICATING, AND COMPARING

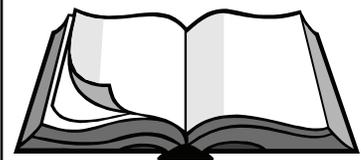
1. Start the session by inviting the children to a comfortable area.
2. Briefly review the prior session with the children by asking them questions. Allow time for sharing if children brought any items to the session.
3. Then read the story *Wonderful Worms*. Allow enough time for the children to observe the illustrations as you read the story.



Tip
Remember
to read
through
the Tips for
Successful Oral
Reading.

Tips for Successful Oral Reading

- **Setting the stage** - Have children sit in a semicircle with your chair slightly higher. Ask some brief questions to build enthusiasm and encourage responses. Keep the book face down or out of sight.
- **Presenting the book** - Show the book so the cover is clearly visible. Make sure the children can see the pictures easily. Tell them the name of the book, the author, and the illustrator. Discuss the illustrations.
- **Reading the book** - Use plenty of expression. If possible, change your voice to fit the dialogue. Adjust your voice and speed of reading the story. **The most common mistake is reading too fast.** Read slowly enough for the children to build mental pictures.



Activity B

WORM HUNT

Time Required
30 minutes

Suggested Grouping
Groups of four to six
children with one teen

In this activity, you will be leading the children in a hunt for worms. Children will map their worm hunt and describe the worms that they found.

Materials You Will Need

- Shovel or small hand tool - 1 per group
- Containers to carry worms (*paper plates, pie tin, etc.*)
- Worm bin
- Large sheet of chart paper - 1 for each group of 4 children
- Colored marker - 1 per child

Getting Ready

- ❶ Get permission and directions from the program staff as to where to dig for worms with the children. Have a worm bin available for observation in case you are unsuccessful in your outdoor explorations.
- ❷ Observe the outside area you will be exploring with the children. Note areas that will make good observation sites.
- ❸ Look for areas that may be unsafe for children.
- ❹ Determine how you will divide the children into groups for the expedition.
- ❺ Gather all needed supplies.

Where We Can Look for Worms	

- ⑥ Read through the words of the song *Going On A Worm Hunt*. Add other verses. Practice singing the chant.

ACTION: OBSERVING, COMPARING, AND COMMUNICATING

1. Tell the children that you will be going on a worm hunt. **Carefully explain any safety precautions that need to be observed.**
2. Before leaving on the *Worm Hunt*, ask the children to brainstorm where they think they should look for the worms. Write down their predictions on the chart.
3. Before you go outside, sing *Going on a Worm Hunt* using the words on the next page. Use hand motions to lead the singing.

Presentation Notes

GOING ON A WORM HUNT

Sing as a call and response song. Teens first chant a line and then children respond. Hand tapping and clapping, feet stamping, and other movements can be added to the song.

Going on a Worm Hunt (Children Repeat)

Gonna find a BIG ONE (Children Repeat)

I'm not afraid (Children Repeat)

What's that up ahead? (Children Repeat)

It's a BIG WORM!

Better go catch it! (Children Repeat)

Going on a Worm Hunt

Add lines and verses of your own. Include things you'd find on a Worm Hunt such as a mud puddle, a dark worm tunnel, squishy compost, etc.



Tip
Remember
to avoid
giving

direct answers to
children's
questions.
Expand children's
exploration by
asking more
questions.
However, be sure
to provide answers
or assistance to
children with
disabilities.

4. Divide the children into teams that will have at least one teen or SACC staff to provide adequate assistance and supervision. Lead the children outside to begin the *Worm Hunt!*
5. If the children have difficulty in starting their search, encourage them to investigate the places they identified as possible “homes” for worms.
6. After the children find worms, carefully remove the worms from their environment and bring them into the classroom.

SCIENCING: OBSERVING, COMMUNICATING, AND COMPARING

1. After returning from the *Worm Hunt*, lead a discussion on what the children observed and where the children found the worms by making a *Worm Hunt Map* following the instructions below.
 - Divide the children into groups of four and ask them to sit on the floor around a sheet of poster paper. Give each child a crayon or marker.
 - Using the paper in front of them, ask the children to draw where they found their worms. Allow a few minutes for drawing.
 - Now show the children how to spin the paper 1/4 turn. Then ask them to draw something else they saw on the worm hunt.
 - After a few minutes, repeat the activity by turning another 1/4 turn and drawing other things they observed. Repeat one more time.

2. Ask each group to hold up their drawing and share what they observed. Hang the *Worm Hunt Maps* on the wall.
3. Next, ask each group to bring the worms they found to the table to observe. Ask the children questions to help them describe what they observed.
 - Using the *Worm Hunt Maps*, ask each group to show where they found their worms.
 - Ask the children to use descriptive words to tell what their worms look like and how their worms move.
 - Ask the children to describe how the worms they found outside compare to the worms they have observed in their worm bins. How are they alike? Different?
4. Before moving on to the next activity, help the children return their worms to the places where they found them.

Presentation Notes



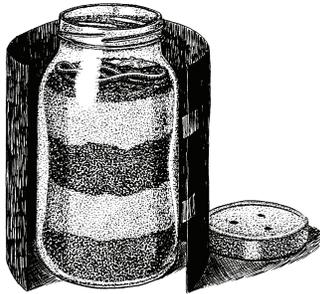
ACTIVITY C

WORM WITH A VIEW

Time Required
20 minutes

Suggested Grouping
Three to four
children per work area

In this activity, children will create their own worm jars for observing how worms burrow and tunnel.

**Materials You Will Need**

For one work area of four to six children:

- One quart jar
- Jar lid with holes
- Nail/hammer
- Soil - 2 cups
- Sand - 2 cups
- Dark construction paper - 1 piece
- Tape
- Cups for scooping
- Scissors
- Night crawlers or other earthworms - 2
- Fruit and vegetable scraps

Getting Ready

- ❶ Determine if children will make their own observation jars or if they will be shared in groups or pairs. Gather the appropriate amount of supplies.
- ❷ Set up work area (*this can be messy; you may want to do this outside*). **NOTE: Exercise caution if you are using glass jars.**
- ❸ Cut construction paper lengthwise, the height of the jar to the lid. Cut one strip for each child's jar.



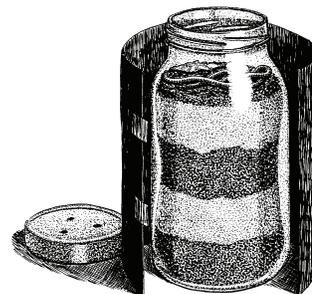
Tip
Remember
to
determine
in advance if each
child or a group
of children will
make the
observation jars.

- 4 Use a nail and hammer to punch several holes in the jar lids. You may want to do this with the children. If so, you will need to allow extra time and provide careful supervision.

NOTE: Prepare one jar following the instructions below. However, do not add worms or food. Save this jar to demonstrate how to create the observation jar and use as a comparison.

ACTION: OBSERVING, COMMUNICATING, AND COMPARING

1. Discuss with the children what they have learned about a worm's environment. Tell them that they are now going to create *Worm Observation Jars*, to learn more about how worms move and work the soil.
2. Show the children the completed observation jar. Tell them that you will be giving them step-by-step instructions for making the observation jars. Tell them they will need to follow the instructions carefully.
3. Divide the children into groups of four to six. Have all the materials ready at each table. Follow the steps below to help each group make observation jars.
 - Measure out 1 cup of moistened soil and pour it into the jar.
 - Next, measure 1 cup of moistened sand and pour it into the jar.
 - Add another cup of soil, followed by another cup of sand.



- Fill to the top of the jar neck with soil. Leave some room at the top to add two worms and a little worm food.
- Add water (*about 1 cup*) to moisten the sand and soil.
- Place two worms inside the jar with a little fruit or vegetable scrap.
- Put on the lid. (*Remember to punch 2–3 holes in the lid.*)
- Have the children carefully observe their neat soil layers.
- Ask the children to write their names on the construction paper.
- Tape the paper around jar to keep out light.
- Next, put the worm observation jars in a safe place. Explain to the children that when you return for Session 3, you will observe what the worms have done in the jar.

SCIENCING: COMMUNICATING AND OBSERVING

1. Ask the children to predict what they think will happen in the observation jars. Write down their responses and save them for the next session.

Presentation Notes

FOLLOW-UP ACTION AND SCIENCING: OBSERVING, COMPARING, AND COMMUNICATING

On your next visit to the program

1. Ask the children to brainstorm what they think they will observe when the paper is removed. Record their responses. Compare these responses to what the children indicated at the prior session.
2. Remove the paper from the observation jars and allow time for the children to observe the tunnels.
3. Ask the children to describe what they have observed. Ask questions that probe their discovery.
 - What has happened?
 - How did it happen? Why?

Other questions

4. Use your demonstration jar as a comparison. Ask the children to compare the neat layers in your jar to the changes in their jars.
5. Compare the children's predictions with their observations.
6. Replace the construction paper around the jars and encourage the children to observe them every day or two. Remember to keep the soil moist and provide additional food. Record the observations.

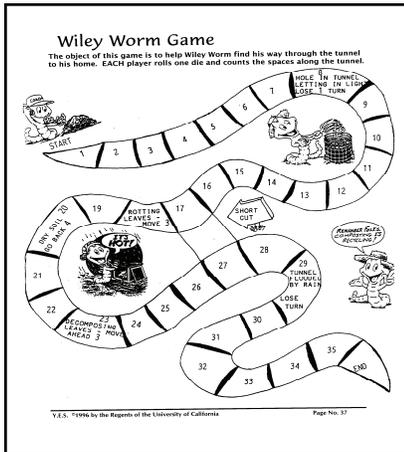
NOTE

This section is to be completed at Session 3. Read it carefully so you understand the project.

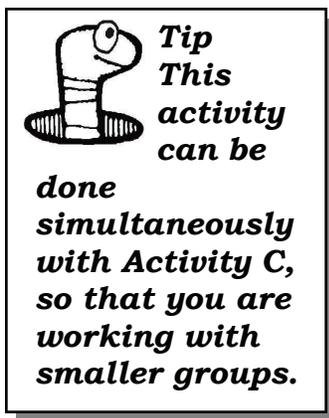


Tip
Ask the child care staff to keep the soil moist and to feed the worms!

Sample



See page 32



Tip
This activity can be done simultaneously with Activity C, so that you are working with smaller groups.

ACTIVITY D

WIGGLY WORM GAME

(OPTIONAL)

Children will have fun creating and playing the Wiggly Worm Game. Older children can even create their own rules for playing the game.

Materials You Will Need

- Wiggly Worm Game handout
- Dice
- Buttons, beans, or other markers

Getting Ready

- 1 Determine if you will assist the children in making their own game boards or if they will use the boards you have prepared.
- 2 In advance of the activity, make a game board and mount it on heavier paper. You may want to enlarge the game board and make your own additions.
- 3 Play the game so you are familiar with the rules.
- 4 Gather all needed supplies and set up the work area.

ACTION: OBSERVING AND COMMUNICATING

1. Set up an area where the children can create their own game boards and play the *Wiggly Worm Game*.

2. If the children will be making their own game board, pass out a game sheet to each child. Give them color crayons to decorate the game board sheet.
3. After the game boards are made, provide each team with a die and each child with a marker (*a bean, circle cut out, button, etc.*)
4. Explain the game rules. The game is played like most standard board games. The die is thrown and the child moves his/her marker along the spaces following any instructions listed on the board spaces.
5. After the children have played the game several times, encourage them to create new rules for the game. Let them try playing the game by the new rules.
6. After the children have played a while, ask them to list things they learned today about worm environments. (*Refer to the charts and maps.*)
7. Encourage the children to take their game board home to play with their family.



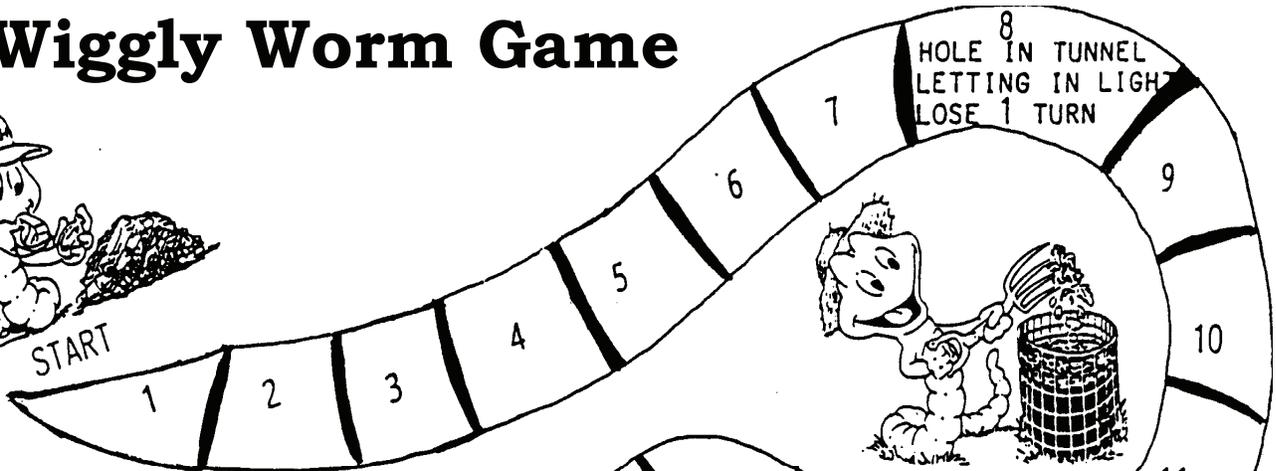
**Tip
The
Wiggly
Worm
Game**

***can become part
of the Worm
Learning Center
that is left at
the program
site.***

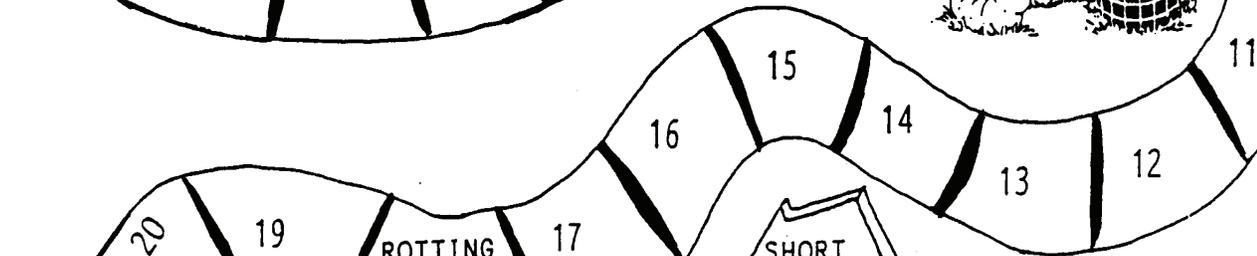
Wiggly Worm Game



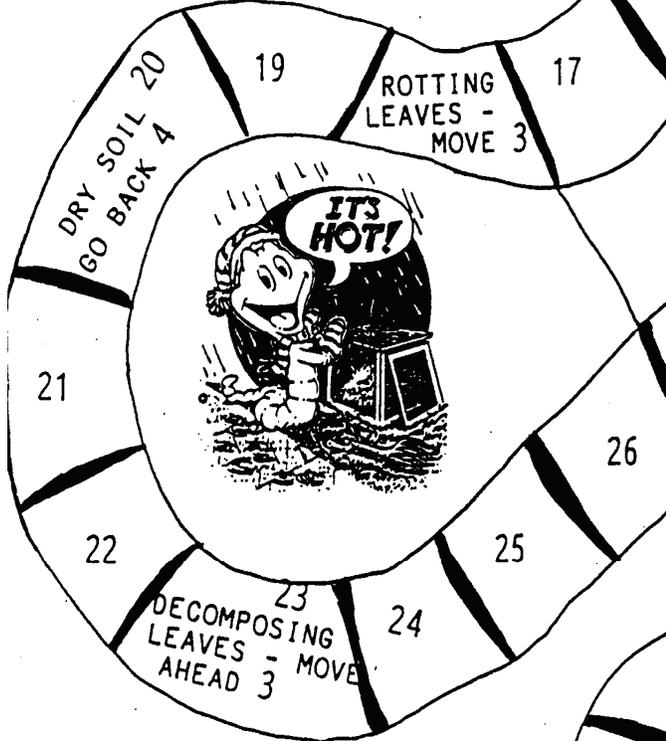
START



8
HOLE IN TUNNEL
LETTING IN LIGHT
LOSE 1 TURN



SHORT CUT



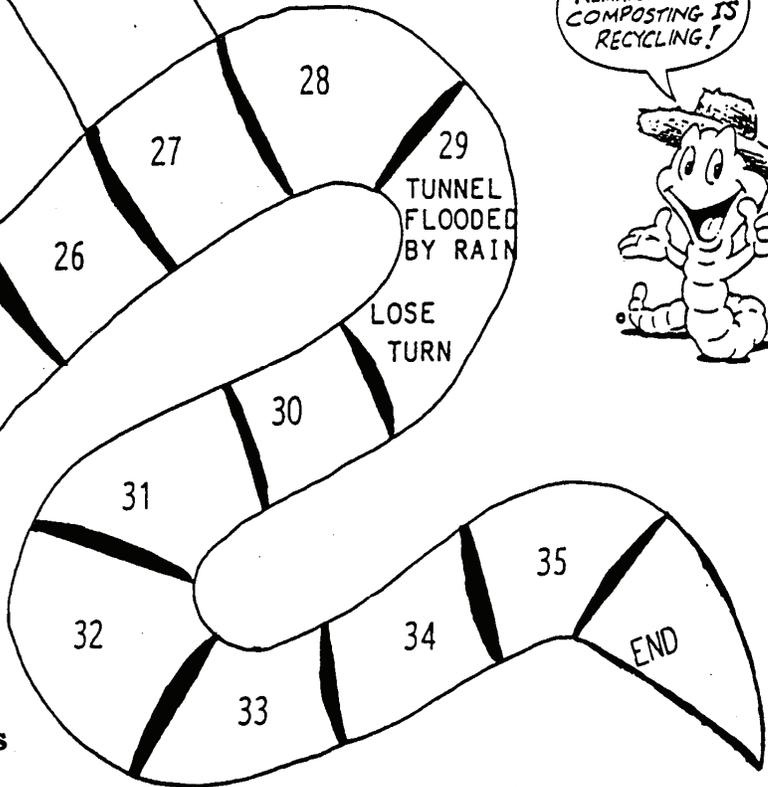
IT'S HOT!

20
DRY SOIL
GO BACK 4

17
ROTTING
LEAVES -
MOVE 3

23
DECOMPOSING
LEAVES - MOVE
AHEAD 3

REMEMBER FOLKS.
COMPOSTING IS
RECYCLING!



29
TUNNEL
FLOODED
BY RAIN

LOSE
TURN

END

The object of this game is to help Wiggly Worm find his way through the tunnel to his home. EACH player rolls one die and counts the spaces along the tunnel.

CREATING WORM BINS

Approximate Time Required for Session: 1 hour

Purpose

- Children will learn how to *make* a worm bin and how to add worms to it.
- Children will *maintain* a worm bin.
- Children will *learn* what types of vegetation and other foods are eaten by redworms.
- Children will *observe* changes over time in the composition of the food placed in the worm bin.
- Children will *select* food to feed to their worms.

Overview of the Day's Activities

Children will enjoy creating worm bins that can be observed during the entire year. This session will focus on helping children apply what they've learned in prior sessions about worm habitats, while creating the bins for recycling compostable garbage.

Background Information

Redworms, also called manure worms or red wigglers, are the type of worm used in worm composting systems. These worms process large amounts of organic material and reproduce quickly in confinement. *Lumbricus rubellus* is the scientific name for the most popular type of redworm used for composting.

Redworms are not the type of worms that will thrive in the garden. They are not normally a soil dwelling worm and require large amounts of organic material to live. Redworms eat all types of vegetable and fruit scraps, pasta, bread, cooked beans, and other kitchen leftovers.

Redworms eat from 50 percent to 100 percent of their weight in organic material each day. The castings they produce are five to eleven times richer in available N-P-K (nitrogen, phosphorus, potassium) than the material they consume. Various secretions of their intestinal tracts act chemically to release major plant nutrients. They also release most of the needed micronutrients. Best of all, they consume all of the organic material offered to them.

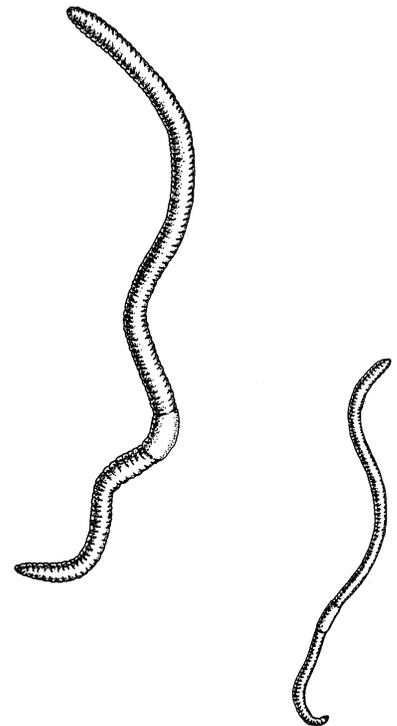
It takes about 2 pounds of redworms to process an average of 1 pound of material per day. A good rule of thumb is to set up a worm bin with about 1/3 pound of worms for every cubic foot, with a minimum of one pound of worms.

In setting up a worm bin, the first step is to prepare the worm's bedding. Worm bedding holds moisture and provides a medium in which the worms can work, as well as a place to bury materials. In nature, redworms are litter dwellers; that is, they are found among masses of decaying vegetation such as fallen leaves, manure piles, or under rotten logs.

Worm bedding should be high in cellulose similar to natural litter, such as newspaper, cardboard, leaves, and manure. Shredded corrugated boxes make one of the best beddings for worm bins. It is light, fluffy and is easy to dampen to the proper moisture content.

The least expensive and most readily available bedding is hand-shredded newsprint. The ink is not toxic to worms. The slick, glossy sections and ad supplements, however, can be harmful. They may contain inks with heavy metal-based pigments.

Preparation Notes



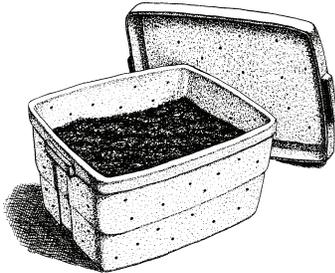
ACTIVITY A

MAKING WORM BINS

Time Required
30–45 minutes

Suggested Grouping
Two to ten children (See
Getting Ready.)

Students will enjoy creating worm bins that can be observed throughout the entire year.

**Materials You Will Need**

- Plastic tubs for bins (See Getting Ready for the number and size.)
- Newspaper
- Water
- Redworms - 2 to 1 pound per bin
- Dirt
- Dried leaves or dried grass
- Nail
- Hammer or drill

Getting Ready

- ❶ There are several ways you can present this activity. Discuss the following options with the program director and your adult mentor prior to gathering supplies.

a. Create one program bin - This will require a 12" x 16" solid-color, plastic tub with a lid. This size can accommodate about 1–2 pounds of compostable garbage per week. It can be set up as a program center. Worms can be fed snack or lunch leftovers.

b. Create group bins - This method divides the children into four or five groups that can maintain and study the worm bin as a cooperative effort.

c. Create individual bins - In this method, each child starts a worm bin. Individual observations and differences can be observed. The bin can then be sent home to involve the entire family in vermiculture.

Some programs use method c. described above, with the addition of one program worm bin. It allows for further program observations and exploration, while the students can replicate the activities at home.

- 2 Gather the needed supplies and organize work stations. Because you will be using soil, leaves, and newspaper scraps, you may want to organize an outside work area, to make cleanup easier.

Preparation Notes

ACTION: OBSERVING, COMPARING, AND COMMUNICATING

1. Tell the children that today they will be making a *Worm Bin*.

If you are making several bins, divide the children into smaller groups before you begin. If you are making individual bins, you may want to have half the children begin *Activity A* and the other half start with *Activity B*.

NOTE
Adapt your presentation to making one large bin, several group bins or individual bins. (Refer to Getting Ready.)

NOTE
Holes can also be drilled in plastic bins.

2. Show the children the materials you will need to create a worm bin. (*Bin container, newspaper, dried leaves or grass, soil, and, of course, worms!*)
3. Start by having each child pound nail holes in the bottom, sides and lid of the worm bin. (*If you are working with younger children, you may want to do this for them or have it done in advance.*)
4. Next, gather children around the bin, demonstrate how to tear the newspaper and the approximate size the strips and pieces should be when put into the worm bin (*2" wide or less*). As the children tear the strips, have them place them in the bin. Fill the bin with the shredded newspaper.

a. Open newspaper to centerfold



b. Tear it lengthwise down the centerfold



c. Gather the two halves



d. Tear lengthwise again



e. Repeat process four or more times until long shreds are 2" wide.



 **Tip**
Tear with the grain of paper.
If you can't tear long strips, then you are probably tearing against the grain.

5. To add texture to the bin, have the children add a handful of dried leaves, dried grass, or some shredded cardboard. Mix this with the newspaper strips.
6. Add about 1 cup of garden soil or sand to the mixture. This provides grit for the worms.
7. Next, add water, one cup at a time, to the bin. Mix with the shredded bedding to create a 75% moisture environment (that is approximately the same moisture content of the worm's body).
8. Let the newspaper mixture "rest" while the children take a break or work on *Activity B*. This "rest" will allow the newspaper time to absorb the moisture. It will help you determine if the contents are too wet (*add more newspaper*) or too dry (*add more water*).
9. Add the worms to the bin. If the worms are in a clump, separate them gently. Leave the lid off the bin; the exposure to the light will cause the worms to migrate down into the bedding. (*Refer to the Introduction for the amount of worms to add depending on the size of the bin.*)
10. When the worms are no longer visible on the top of the bin, have the children feed the worms some compostable materials at two ends of the bin. (*Kitchen scraps such as leftover melon, vegetables, or fruits should be used.*) Show the children how to bury the food by digging a hole in the bedding with their hand or small spade, placing the food scraps and then covering with an inch or two of bedding.



Tip
75%
moisture
can be
gauged when the
newspaper is
thoroughly wet
but not dripping
when squeezed
in your hand.
The newspaper
should have the
feel of a wrung
out sponge.

NOTE
Don't add a lot
of food to the
bin at first.
Allow the worms
several days to
acclimate to
their
environment.

ACTIVITY B

WORM FOOD MEMORY GAME

Memory and concentration games are favorites that promote memory and logical thinking skills of children of all ages.

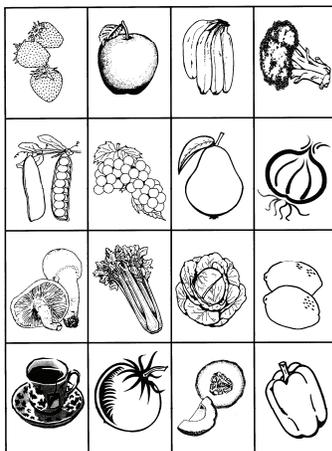
In this activity, you will reinforce the discussion about the foods worms eat by helping the children play this concentration and memory game.

Materials You Will Need

- Redworm Concentration Cards handout - 2 per team
- Scissors
- Crayons
- Construction paper
- Glue

Sample

Redworm Concentration Cards



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Page No. 51

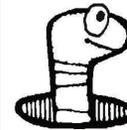
See page 45

Getting Ready

- ❶ Practice playing the game before you introduce it to the children.
- ❷ Gather all the needed supplies.
- ❸ Duplicate two sets of the *Red Worm Concentration Cards* for each set of children.
- ❹ If you want to play the memory game as one large group, enlarge the memory squares to 8 1/2" x 11", see *Action no. 6, page 41*.

ACTION: COMPARING AND COMMUNICATING

1. Start this activity by explaining that worms eat a variety of organic (*once living*) materials. Ask the children to brainstorm a list of fruits and vegetables that worms might like. (*Refer to the Background Information for greater detail on appropriate foods for a worm bin.*)
2. Pass out the concentration cards to each pair of children. Have the children color in the game squares.
3. Glue the sheets onto construction paper to make them more durable.
4. Cut along the lines to create “food squares.”
5. Play the game according to the following directions.
 - Players lay the cards facedown on the table.
 - One at a time, each player turns two cards faceup.
 - If the cards match, the player picks them up, puts them in his or her pile and has another turn.
 - If a match is not made, the player places the cards facedown in the original position, and the next player takes a turn.
 - The player who has the most cards when all the cards have been picked up wins the game.
6. **Optional Application:** *The Memory Game can also be played as a large group game on the floor. To play, enlarge each square on the memory card to 8 1/2” x 11”; mount on construction paper. Place cards on floor. Divide children into teams and play by above rules.*



Tip
If you are making several worm bins and are concerned about time, you can have a set of the Memory Game completed so the children can play it. (The handouts can be sent home for the children to make with their family.)

ACTIVITY C

WORM JAR OBSERVATION FOLLOW-UP

This activity is a follow-up to Session 2, Activity C, Worm Observation Jars.

Materials You Will Need

- Observation jars
- Chart paper
- Markers

Getting Ready

- ❶ Locate the demonstration observation jar (the one without worms).
- ❷ Gather the children's observation jars that contain worms.
- ❸ Review the burrow progress in the *Worm Observation Jars*. (Refer to Session 2, Activity C, progressin questions, page 29.)



ACTION: OBSERVING, COMPARING, AND COMMUNICATING

1. Ask the children to brainstorm what they think they will observe when the paper is removed. Record their responses. Compare these responses to what the children indicated at the prior session.
2. Remove the paper from the observation jars and allow time for the children to observe the tunnels.

**SCIENCING: OBSERVING, COMPARING,
AND COMMUNICATING**

1. Ask the children to describe what they have observed. Ask questions that probe their discovery.

- What has happened?
- How did it happen?
- Is this what worms do in the ground?
- How does this help the soil?

Other questions

Remember to encourage the children to use their senses.

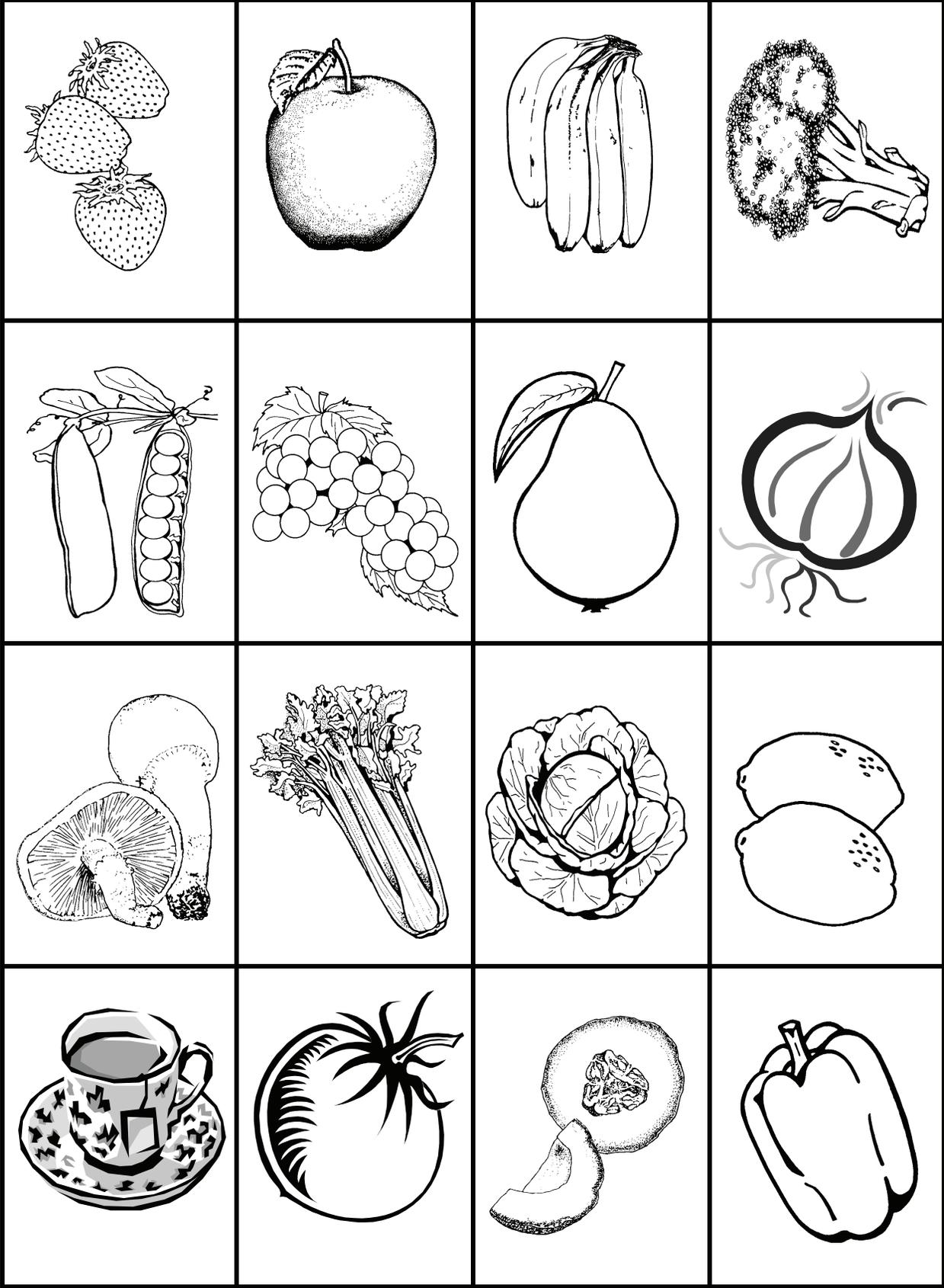
2. Use your demonstration jar as a comparison. Ask the children to compare the neat layers in your jar to the changes in their jars.

Presentation Notes

3. Compare the children's predictions with their observation.
4. Replace the construction paper around the jars and encourage the children to observe them every day or two. Remember to keep the soil moist and provide additional food. Record the observations.
5. Discuss with the group what they have learned so far about how worms live and what they like in their environment.
 - Where did you find worms living?
 - What did you observe about their environment?

Other questions

Redworm Concentration Cards



WORMSERVATION

Approximate Time Required for Session: 45 minutes
to 1 hour

Purpose

- Through *observation*, children will learn about worm behavior.
- Children will conduct experiments to *observe* how worms react to changes in their environment.

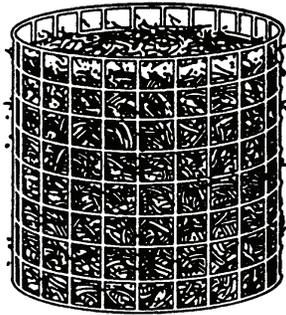
Overview of the Day's Activities

In this session, children will observe worms in several settings. They will make predictions about how worms react to moisture, light, and texture. They will also have an opportunity to create other experiments to determine how worms behave.

Background Information

Worms can adapt to a variety of environmental conditions, such as variations in temperature, light, moisture, and soil compaction. Earthworms have no legs, but they can still move around in the soil. They move by contracting their muscles.

They have two sets of muscles: long muscles that can be squeezed together to make the worm shorter and fatter, and short muscles that can be squeezed to make it longer and thinner. Through squeezing these muscles, worms are able to move forward and backward.



Earthworms inhabit dark, moist places with lots of vegetation or decaying materials. *Earthworms have no eyes but they are sensitive to light.* Their skin is able to sense even small changes in the amount of light that is present. Earthworms come out of their burrows at night when it is dark. When an earthworm is exposed to prolonged sunlight, it becomes stiff. It cannot crawl away and will die.

Earthworms also have no ears. Their skin, however, is very sensitive to movement. They can feel vibrations and try to escape if they perceive a threat.

Preparation Notes

ACTIVITY A

WORMATHON

Time Required
30 minutes

Suggested Grouping
Four to six children

In this activity, children will observe the effects of light, moisture, and texture on worms. They will make predictions about how the worms will respond and then will compare their observations to their predictions.

Materials You Will Need

- Earthworms - at least 1 per child
- Clear lid or plate - 1 per child or pair of children
- Flashlight - 1 per group
- Black construction paper - 1 sheet per group
- Water
- Sandpaper - 1 sheet per group
- Wormservation Chart* - 1 per group
- Paper clip - 1 per group
- Pencil - 1 per child
- Paper towels - 1 roll
- Paper - 1 sheet per group

Getting Ready

- ❶ Gather all the needed supplies.
- ❷ Prepare a workspace for each team of participants.
- ❸ Set up the *Wormathon* materials.
- ❹ Try each of the *Wormathon* events prior to the session so you are familiar with the activities and the outcomes.

What We Know About Worms	
1.	
2.	
3.	
4.	
5.	

ACTION: OBSERVING, COMPARING, AND COMMUNICATING

1. Spend a few minutes reviewing the ideas and activities covered in the prior session. Encourage the participants to share their ideas and information with the group. If any of the children have brought items to share, allow ample time for this discussion.

2. Start this session by asking the children questions about worm behavior.

- How will worms react to wet and dry surfaces?
- How will worms react to rough and smooth surfaces?
- How will worms react to light and dark?

Record the children’s predictions about the above questions. Ask the children if they want to make other predictions about other behaviors of the worms. If they do, write them on the chart.

3. Next, ask the children to move to the observation tables. Ask each child or team of children to choose a worm to observe. Explain that they will need to work quickly on each observation. Have them record their observation in the right column next to their predictions. *(They can choose a new worm for each activity and return the first worm to the container.)*

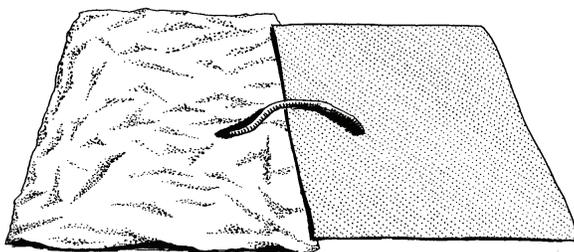
Have each team prepare their event, or you can have the observation area already prepared.

Event 1 - The Moisture Challenge

In this experiment, children will observe how worms react to wet and dry environments.

Preparation: Dampen a paper towel and lay it on the table. Next to the wet paper towel, lay a dry towel with edges slightly overlapped.

Event: Place an earthworm on the center of the two overlapped towels so that part of the worm is on the wet side and part is on the dry side. Observe. Record responses.



Event 2 - The Roughness Challenge

In this experiment, children will observe how worms react to rough and smooth surfaces.

Preparation: Lay a sheet of sandpaper on the table. Next to the sandpaper, lay a piece of smooth paper such as notebook or drawing paper. Have the edges of the two papers slightly overlapped.

EVENT 1

**Moisture Challenge
 Wet/Dry**

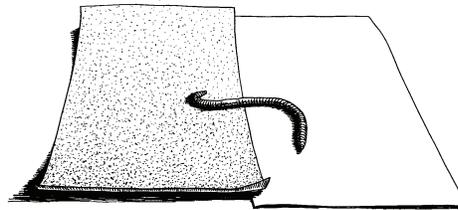
Prediction	Observation
1	
2	
3	
4	

EVENT 2

**Roughness Challenge
 Rough/Smooth**

Prediction	Observation
1	
2	
3	
4	

Event: Place an earthworm on the center of the papers so it is touching both the rough and smooth surfaces. Observe. Record responses.



EVENT 3

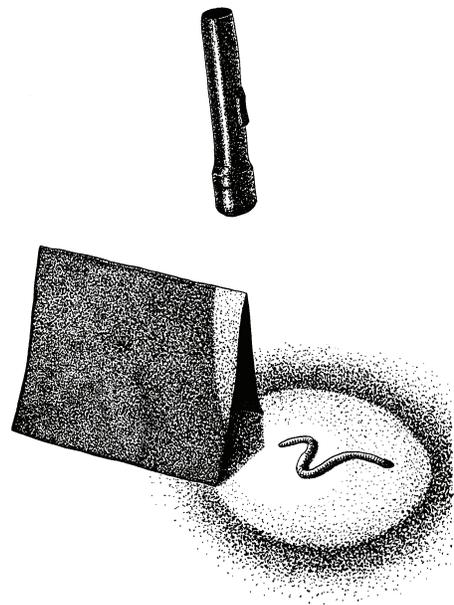
Light Challenge Light/Dark	
Prediction	Observation
1	
2	
3	
4	

Event 3 - The Light Challenge

In this experiment, children will observe how worms react to light and dark environments.

Preparation: Fold a piece of black construction paper in half to form a tent. Stand it up on a table.

Event: Place an earthworm on the table next to the opening of the tent. Shine the light from a flashlight directly over the end of the tent where the worm is placed. Observe. Record response.



Event 4 - The Obstacle Challenge

In this experiment, children will observe how worms can detect obstacles in their path and whether they will avoid them.

Preparation: On a small section of table, place several objects (*paper clip, pencil, crayon, etc.*).

Event: Place an earthworm in the center of the objects. Observe. Record responses. Next, as the earthworm moves, place your index finger about 1 2" in front of the worm. Observe. Record responses.

When the observations have been completed, put the worms back into their container and move the children to a discussion area.



SCIENCING: OBSERVING, COMPARING, AND COMMUNICATING

1. Ask the children the following questions:
 - How did the worms respond to wetness and dryness?
 - How did the worms respond to roughness and smoothness?
 - How did the worms respond to light and dark?

EVENT 4

Obstacle Challenge Yes/No	
Prediction	Observation
1	
2	
3	
4	

- How did the worms respond to obstacles?
 - What does this tell us about worm habitat?
2. Ask the children if they were able to observe other behavior in the worms.
 3. Ask if the children have other questions about the worm’s behavior. Could they create an experiment to measure the worms response?
 4. Return to the observation tables for further observation and discussion.

Presentation Notes

ACTIVITY B

DIRT CUP SNACKS

Time Required

15 to 20 minutes

Suggested Grouping

Ten to twelve children

Children will enjoy making these tasty snacks and pretending they're worms feasting on their meals!

Materials You Will Need

- Milk - 2 cups
- Chocolate instant pudding - 1 small package (3.9 oz)
- Mixer or wire whisk
- Whipped topping - 1 tub (8 oz), thawed
- Chocolate sandwich cookies - 1 package (16 oz)
- Gummy worms - 8 to 10 (7 oz)
- Clear cups - 10 to 12
- Plastic Ziplock bag

Getting Ready

- ❶ The provided *Worm Dirt Cup* recipe serves 10 to 12 children. Determine in advance how many batches of the recipe you will need to prepare with your group of children.
- ❷ Gather all the needed supplies.
- ❸ Prepare a clean workspace for preparation of the snack.
- ❹ Identify an area where children can wash their hands.



Tip
Some children may have food allergies or other health conditions. Check with site staff prior to the session to see if you will need to substitute any ingredients for some children.

- 5 Determine how you will divide up the tasks among the children in preparing the snack so everyone has a role in the preparation.

ACTION: OBSERVING AND COMMUNICATING

1. Review briefly with the children what they have learned about the kinds of food that worms eat. Explain that now they will have the chance to make a *Worm Dirt Cup* snack.
2. Prior to preparing the snack, help the children wash their hands with soap and water.
3. Prepare the *Worm Dirt Cups* according to the following instructions.
 - Pour milk into large bowl, add instant pudding.
 - Beat until well blended. Let sit for five minutes.
 - Place cookies in the zip-lock bag and crush.
 - Stir the whipped topping and 1/2 of the crushed cookies into the pudding mixture.
 - Place one tablespoon of crushed cookies into the cups. Fill cups: full with pudding mixture. Top with remaining cookies.
 - Decorate with the gummy worms.

Review

Discuss with the children what they discovered today. If time permits, the children may want to draw a picture about one thing they discovered about worms today.

Share with the children what you will be doing in *Session 5*.

WORMSERVATION CHART

Predictions

Observations

1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
10	10

WORMS IN REVIEW

Approximate Time Needed for Session: 45 minutes to 1 hour

Purpose

- Children will *observe* other creatures that share the worm bin environment.
- Children will *review* the concepts introduced in prior sessions.
- Children will have further opportunity to *apply* concepts.

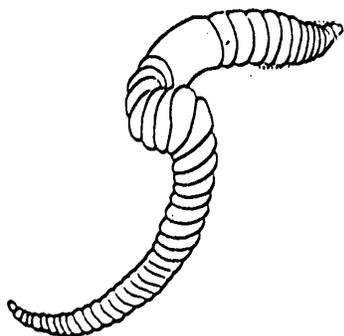
Overview of the Day's Activities

In this final session, the children will have an opportunity to explore the worms in the worm bin and make other observations and predictions. They will also have a chance to practice their logic skills when they play the *Worm Bin Game*. Through the puppet project activity, the children will be able to summarize some of the things they have learned about worms over the past weeks.

Review all of the prior sessions for important points to emphasize. Refer to the *Unit Introduction* for further background information.

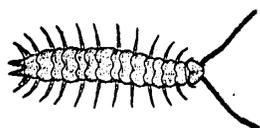
Background Information

Redworms won't be the only decomposers found in mature and developing worm bins. Following is a discussion of other creatures that can be found in the worm bin.



ECHYTRAEIDS (En kee tray' id). More commonly known as white worms, these are small (2"-1" long), white, very thin, segmented worms which look as if they might be newly hatched redworms. However, redworms have red blood so even newly hatched redworms are reddish. Echytraeids eat well-decomposed material and are not a problem in the worm bin.

CENTIPEDES. These are fierce hunters and prey on redworms. Fortunately, redworms are such copious reproducers that having a few centipedes in the bin is usually no problem.

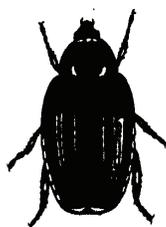


SPRINGTAILS. In the worm bin, you may see a sprinkling of hundreds of tiny (1/16"), white creatures against the dark background of the decomposing bedding. When you reach your hand toward them, some spring away in all directions. These are springtails. Springtails feed on molds and decaying matter, are important producers of humus, and are considered to be one of the most important soil organisms.



MITES. These are also a common critter in worm boxes. Mites are so small it is difficult to see them, except as minute, round dots moving across the surface of the bedding. To prevent a problem with earthworm mites, don't allow the bin to become too soggy. Keep the lid off a soggy bin for a few days to allow it to dry out or add more dry bedding material.

ANTS. Ants are important decomposers and can be found in some worm boxes.



MILLIPEDES, SOW BUGS, PILL BUGS, AND BEETLES. These are other common beneficial decomposers found in worm boxes.

ACTIVITY A

WORM BIN DETECTIVES

Time Required
20 minutes

Suggested Grouping
Small groups of four to six children

In this activity, children will further explore their worm bins. They will observe where the worms are when they open the lid, the condition of the food that has been fed to the worms, and other changes in the bedding. They will also feed the worms.

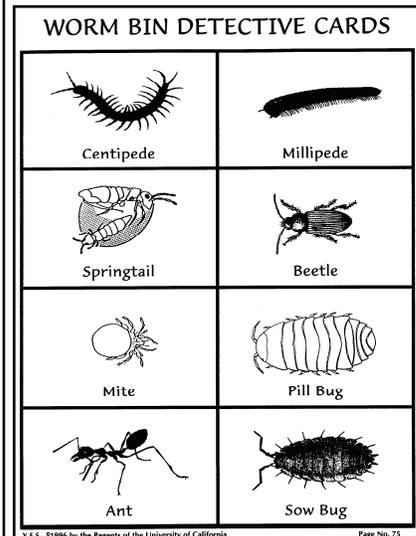
Materials You Will Need

- Worm bins
- Chart paper
- Markers
- Trowel
- Paper towels
- Pie plate
- Worm Bin Detective Cards*

Getting Ready

- ❶ Gather all of the supplies listed.
- ❷ Place the *Worm Bins* in an area where four to six students can easily observe the bins.
- ❸ Have chart paper ready to observe their findings.
- ❹ Determine whether you will prepare in advance the *Worm Bin Detective Cards* or involve the children in their preparation.

Sample



See page 67



Tip
If the worm bins started in the program are too new, use your worm bin to observe some of the changes.

ACTION: OBSERVING, COMMUNICATING, AND COMPARING

1. Tell the children that today they are going to examine some of the changes that are taking place in their worm bins.
2. Gather the children around the worm bin. Before the lid is removed, ask the children to predict what they think they will see.
3. Remove the lid. Ask the children to be detectives and look for changes. Have the children first observe changes on top of the bin. Then encourage them to use the trowel to gently move the bedding and observe changes.

SCIENCING: OBSERVING, COMPARING, AND COMMUNICATING

1. Move the children from the exploration area and ask questions that help them describe what they observed. Encourage them to use their senses in describing the changes and observations.
 - Are there changes in the bedding? Describe.
 - Are there changes in the food? Describe.
 - Did you observe any other changes?
 - What other changes are there? Describe.

Other questions

2. Ask the children if they observed any other creatures in the worm bin. Explain that as the worms begin to recycle the food scraps, other creatures join the worm bin and help in the process.

MORE ACTION: OBSERVING,
COMMUNICATING, AND COMPARING

1. Pass out the *Worm Bin Detective Cards*. (Or the sheets for the children to color and cut apart.) Ask if the children observed any of the insects on the cards in the bins.
2. Return to the bins and have the children look for more evidence.
3. Discuss what they observed. Have the children hold up the *Detective Card* for each item they were able to observe.

Presentation Notes

ACTIVITY B**WORM BIN GAME****Time Required**

30 minutes

Suggested Grouping

Pairs

In this game, pairs of students try to catch a Magic Worm, the last of ten worms in a worm bin. Catching worms is fun, but there's lots more to the game than that!

Materials You Will Need**For class:**

- Worm Bin Game Board, enlarged
- Plastic worms - 10 large
- Marker or crayons
- Tagboard or matte board - 12" x 18" or 18" x 26"
- Rubber cement

For each pair of students:

- Worm Bin Game Board
- Plastic worms - 10 small **or**
- Paper worm cutouts

Getting Ready

- ➊ Prepare one set of game materials. Enlarge the game pieces and playing board so that children can easily observe the demonstration.
- ➋ Practice playing the game several times so you are familiar with the rules and concept.
- ➌ Gather all the needed supplies and place them on the work table.

ACTION: OBSERVING AND COMMUNICATING

Gather the children in an area away from the tables where all will be able to see the game board. Tell them that you have a new game to teach them called *Worm Bin*. Show them the game board. Ask how many worms are on the board (*ten*). Count the worms. Place the ten large worms on the game board.

1. Explain how the game is played.

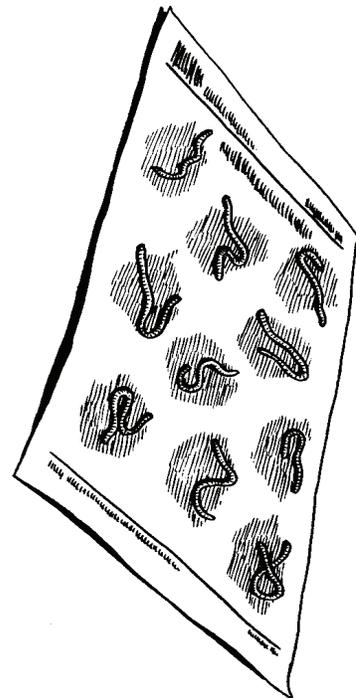
- Two people play the game at a time. They are both *worm catchers*.
- Each player may catch either one or two worms at a time.
- As long as there are still worms in a bin, players must catch worms.
- The last worm is the magic worm. It is the one you want to catch.

2. Ask for a volunteer to play the game with you. Ask the volunteer if he/she wants to go first or second in the game. Before the first player takes any worms, ask the group how many worms a person can take (*one or two*).

Play the game until one player has taken the last worm. The person who does not catch the magic worm chooses to go first or second in the next game.

Play another full game with the same children. (*This shows the children how to play with a partner.*)

3. Show the group the child-size *Worm Bin Game Board* and worms (*or markers*). Compare it with the large game board. Count the worms on the small board. Show the children how to set up their game boards.



4. Tell the children that they will play the game with a partner. Ask for a volunteer to explain again how the game is played. Send the children to work spaces that are already set up, or distribute the game boards, each with a cup of markers.
5. After 10 to 15 minutes of play, use a signal to get the children's attention and announce that they should finish up the game they are playing and then stop.

* This game has been adapted from *Frog Math*, Lawrence Hall of Science, University of California, Berkeley.

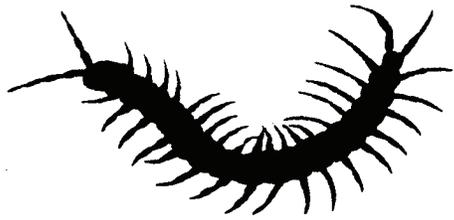
SCIENCING: OBSERVING AND COMMUNICATING

1. Regain their attention and ask, by a show of hands, how many children have won a game. Ask what strategy (*plan*) they have developed to catch the magic worm.
2. List strategies on a large sheet of butcher paper. Have children go back to their games.
3. Ask the group to try out one particular strategy. For example, if someone said that a player must go second to win the game, have each pair of children take turns going second. What were the results? Is there conclusive evidence that going second guarantees that a player will win?
4. Again, use your signal to get the group's attention. Ask if anyone has come up with any new strategies. Add these to the list.
5. Stop at this point. Put the game in the *Wonderful Worms Science Center* so children can play the game during the week. Keep the list up so they can test strategies and add new findings to the list. Use the large game board with the class to try out strategies.



Tip
You may want to have children switch partners at this time.

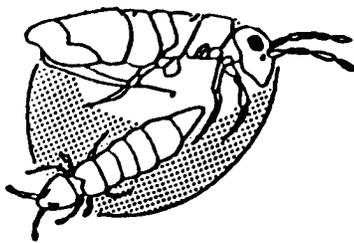
WORM BIN DETECTIVE CARDS



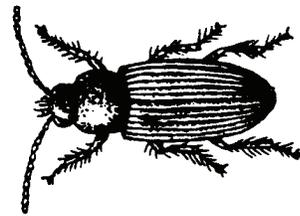
Centipede



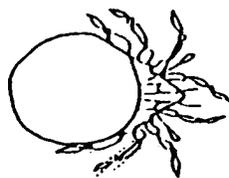
Millipede



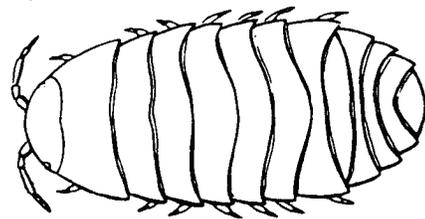
Springtail



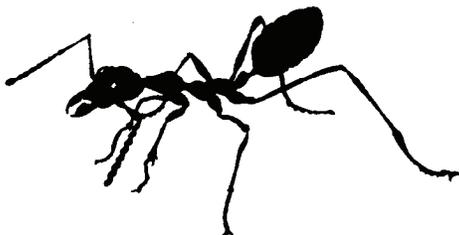
Beetle



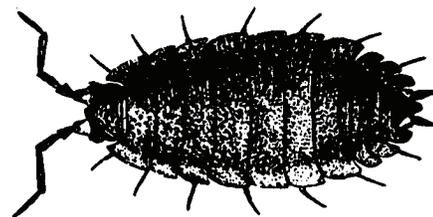
Mite



Pill Bug



Ant



Sow Bug

Millipede

My name means “one thousand legs,” but I really don’t have that many. See how many legs you can count. I am reddish in color and usually 1 to 3 inches long. I am a vegetarian.

Centipede

I am an enemy of earthworms. I hunt and eat them. I move quickly on my many legs.

Beetle

I am a hunter. I am shiny black with a tough shell and wings. I hunt mostly at night. I eat slugs and snails.

Springtail

I am white and very tiny. I get my name because I jump into the air when I am disturbed. I eat mold and decaying material.

Pill bug or Roly Poly

I am grayish in color and about 2” long. I eat vegetation and decaying materials. If I am frightened, I can roll myself up in a ball.

Mite

I am very tiny. I am very round and flat. I have eight legs but they are hard to see. I can sometimes be harmful to earthworms.

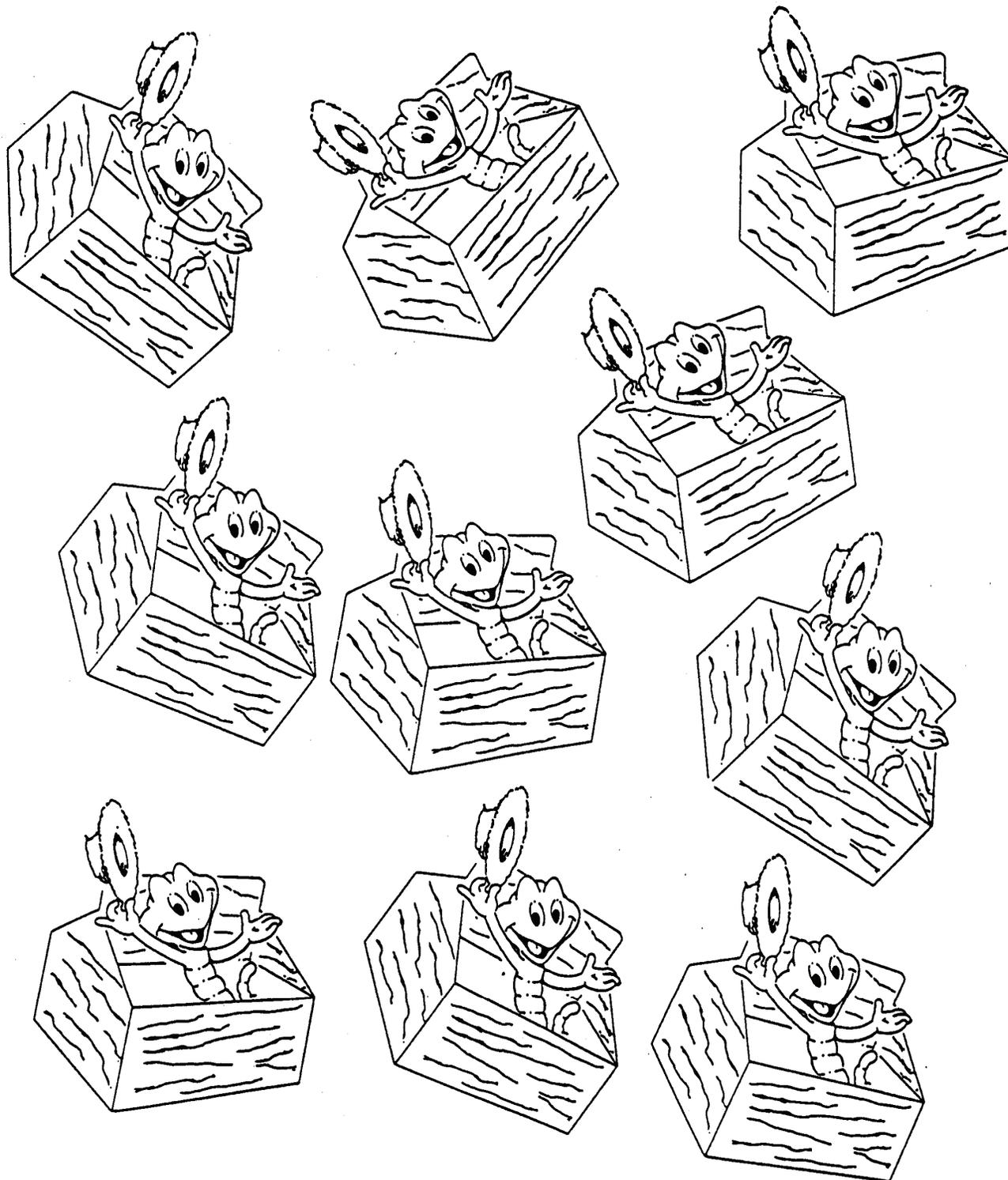
Sow Bug

I like damp, moist places like worm bins. I don’t eat worms. I eat decaying vegetation. I am about 2” long. I’m related to the roly-poly but I can’t roll up.

Ant

I am an insect with six legs. Many people think I am a pest, but I help compost materials by digging tunnels and breaking down materials.

WORM BIN GAME BOARD



WONDERFUL WORMS BIBLIOGRAPHY

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WONDERFUL WORMS SUPPLY LIST

Session 1 GETTING TO KNOW WORMS

Activity A - Let's Look at Worms

Worm Name Tag handout
Writing material
Hole punch
Yarn - 1 skein
Redworms and worm bin
Night crawlers
Plate or shallow pan - 1 per child
Water
Spray bottles - 1 per table
Trowel or scoop - 1 per group
Hand lens - 1 per group
Worm Body Sheet handout
Flip chart paper
Pencils
Senses cutouts

Activity B - Worm Body Parts

Worm Body Sheet handout
Worms
Worm Comparison Chart
Flannel board (*optional*)

Activity C - Wiggly Worm Stick Puppet

Wiggly Worm Puppet handout - 1 per child
Markers or crayons
Scissors - 1 for every 2 to 4 children
Popsicle sticks
Glue or tape

Session 2 WHERE DO WORMS LIVE?

Activity A - Wonderful Worms

Wonderful Worms by Linda Glaser
Chart paper
Markers
Worm bins
Senses cutouts from Session 1

Activity B - Worm Hunt

Shovel or small hand tool - 1 per group
Containers to carry worms (paper plates, pie tin, etc.)
Worm bin
Large sheet of chart paper - 1 per group of 4 children
Colored marker - 1 per child

Activity C - Worm with a View

Quart jar - 1
Jar lid with holes
Nail/hammer
Soil - 2 cups
Sand - 2 cups
Dark construction paper - 1 piece
Tape
Cups for scooping
Scissors
Night crawlers or other earthworms - 2
Fruit and vegetable scraps

Activity D - Wiley Worm Game (optional)

Wiley Worm Game handout
Dice
Buttons, beans, or other markers

Session 3 CREATING WORM BINS

Activity A - Making Worm Bins

Plastic tubs for bins
Newspaper
Water
Redworms - 2 to 1 pound per bin
Dirt
Dried leaves or dried grass
Nail
Hammer or drill

Activity B - Worm Food Memory Game

Redworm Concentration Cards handout - 2 per team
Scissors
Crayons
Construction paper
Glue

Activity C - Worm Jar Observation Follow-Up

Observation Jars

Chart paper

Markers

Session 4 WORMSERVATION

Activity A - Wormathon

Earthworms - at least 1 per child

Clear lid or plate - 1 per child or pair of children

Flashlight - 1 per group

Black construction paper - 1 sheet per group

Water

Sandpaper - 1 sheet per group

Wormservation Chart - 1 per group

Paper clip - 1 per group

Pencil - 1 per child

Paper towels - 1 roll

Paper - 1 sheet per group

Activity B - Dirt Cup Snacks

Milk - 2 cups

Chocolate instant pudding - 1 small package (3.9 oz)

Mixer or wire whisk

Whipped topping - 1 tub (8 oz), thawed

Chocolate sandwich cookies - 1 package (16 oz)

Gummy worms - 8 to 10 (7 oz)

Clear cups - 10 to 12

Plastic Ziplock bag

Session 5 WORMS IN REVIEW

Activity A - Worm Bin Detectives

Worm bins

Chart paper

Markers

Trowel

Paper towels

Pie plate

Worm Bin Detective Cards

Activity B - Worm Bin Game

For class:

Worm Bin Game Board, enlarged

Plastic worms - 10 large

Marker or crayons

Tagboard or matte board - 12" x 18" or 18" x 26"

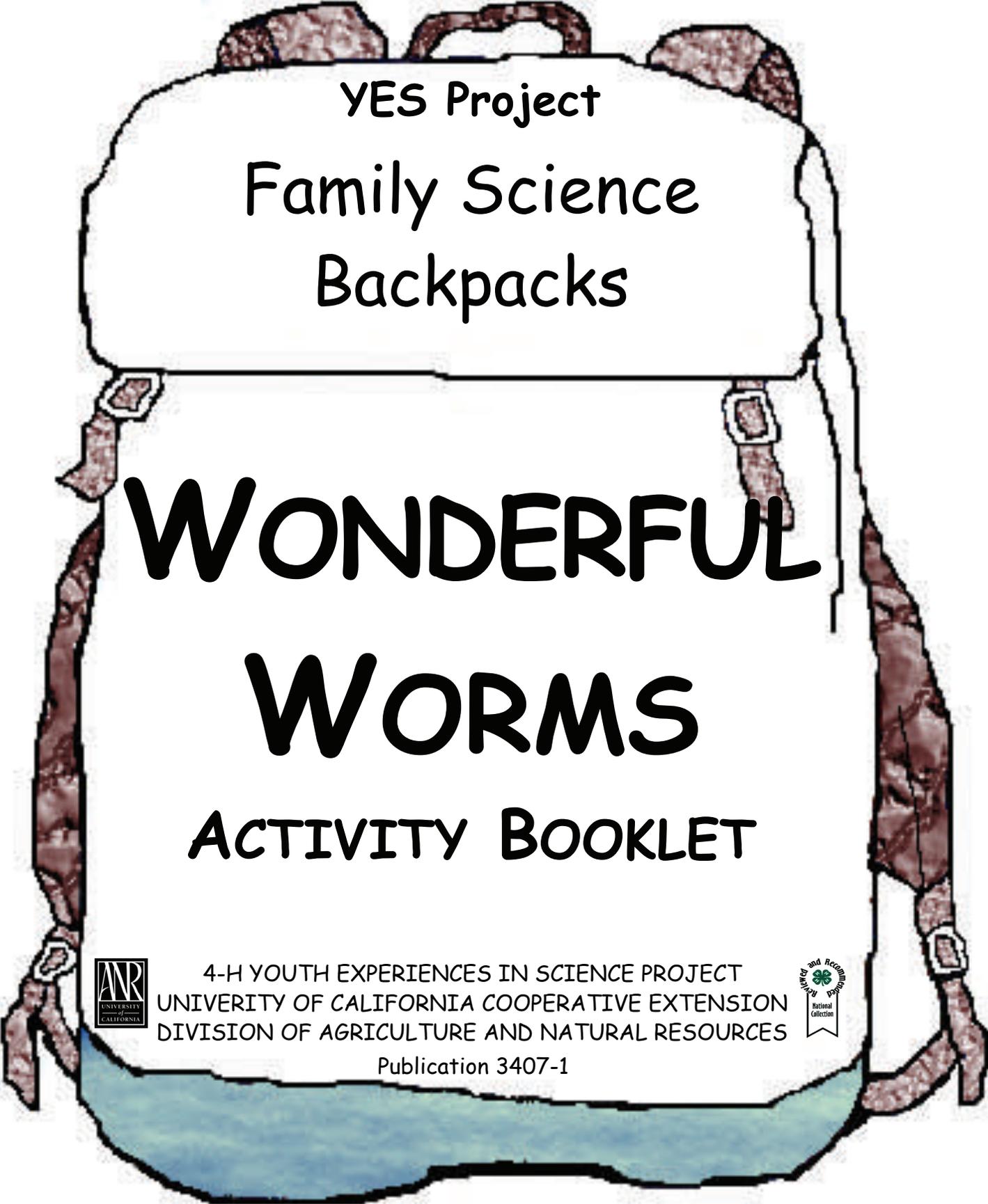
Rubber cement

For each pair of students:

Worm Bin Game Board

Plastic worms - 10 small **or** paper worm cutouts

Note: Balance scales and hand lenses are available from
Marshall Montgomery
1021 Delbrook Dr.
Napa, CA 94558
Ph. (707) 252-2381



YES Project
Family Science
Backpacks

**WONDERFUL
WORMS
ACTIVITY BOOKLET**



4-H YOUTH EXPERIENCES IN SCIENCE PROJECT
UNIVERSITY OF CALIFORNIA COOPERATIVE EXTENSION
DIVISION OF AGRICULTURE AND NATURAL RESOURCES



Publication 3407-1



WELCOME FAMILIES

The *Wonderful Worms* YES Family Science Backpack provides numerous opportunities for you to assist your child in learning about worms, their natural habitat, and how important they are to our environment. The accompanying activities encourage hands-on learning and integrate literature, math, music, and arts and crafts with important science exploration.

WONDERFUL WORMS FAMILY ACTIVITY BACKPACK BY

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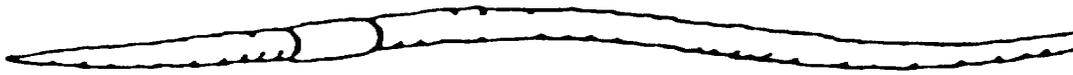
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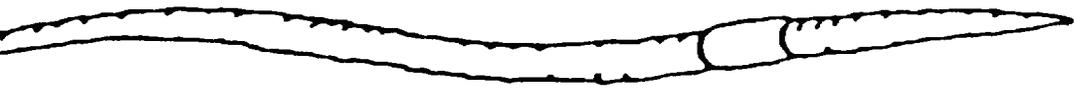
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ALL ABOUT WORMS

Worms themselves provide a wonderful medium to spark children's natural curiosity. Remember when you first touched a worm? Do you remember how it felt in your hand as it tried to wiggle away? Maybe you were even one of the thousands of children who even tasted a worm. As you use this material, we encourage you to draw on your own childhood experiences and share your enthusiasm with your child!

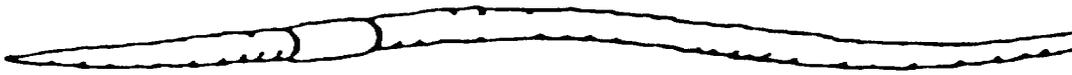
Did you know that there are nearly 3,000 different kinds of earthworms? There are thousands of other types of worms, but earthworms have special characteristics and live in soil and decaying organic matter. They vary in size from less than 1 inch to a variety that lives in Australia that grows to over 9 feet long. Earthworms can have patterned bodies and can vary in color—although most are usually shades of red, brown, or gray.

The Beneficial Worm. Earthworms are often referred to as "nature's plowmen" because of the super amount of soil they move. As they tunnel through the ground, they mix up the soil. They carry rotting and decaying material called *humus* into the lower layers of the soil. This is good for plants. The tunneling done by worms also aerates the soil and provides for better penetration of water to plant roots.

Redworms are also beneficial because they help in disposing of decaying matter. They can eat about half of their body weight each day. This process of turning decaying materials into useful products is essential to the balance of life.

WHERE WORMS LIVE

Earthworms like dark, moist places where plenty of plants are growing. Most earthworms live in burrows in the top 18 inches of the soil. The earthworm digs its own burrow by eating its way through the soil.



WONDERFUL WORMS

In hot, dry weather, the earthworm digs deeper into the soil to find a cooler and moister environment. **However, worms can't withstand extremely cold temperatures.** They protect themselves by burrowing below the frozen ground and often plug their burrow openings with leaves, pebbles, sticks, or mud. Worms can stay deep in their burrows until spring when the soil begins to warm.

Worms cannot tolerate too much moisture. When it rains, some worms escape to the pavement to prevent being drowned. Once outside of their burrows, especially in the daylight, worms must protect themselves from sunburn. Too much sun causes a worm to become stiff and die.

WORM ANATOMY

Earthworms have no eyes; however they are sensitive to light. When worms are suddenly exposed to bright light they quickly try to move away from it. **Worms also have no teeth;** instead, they have a muscular gizzard which functions similarly to that of birds. Small grains of sand and mineral particles lodge in this gizzard. Muscular contractions compress these hard materials against each other and the food, mix it with some fluid and grind it into small particles.

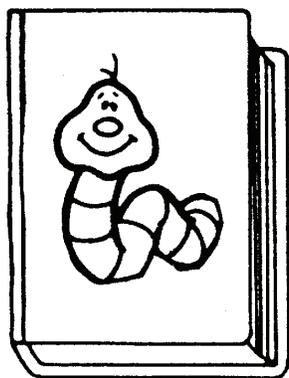
Worms also have no lungs; respiration occurs directly through their skin. A worm's skin must be kept moist, therefore, to allow it to breathe or it will die.

Worms are **hermaphrodites**, equipped with both male and female reproductive organs. When temperatures, moisture, and food are favorable, a mature redworm can mate and produce two to three cocoons per week. Two to five baby worms can hatch from each cocoon produced by a 2 month-old redworm. Worm cocoons are lemon-shaped and about the size of a match head.



Wonderful Worms

Reading together is both fun and educational! Books can make children think, wonder, and want to know more. *Wonderful Worms* is a story by Linda Glaser about a boy and his adventures in discovering wonderful worms. It will lead to lots of active discussion between you and your child.



WHAT YOU NEED

-  *Wonderful Worms* by Linda Glaser
-  Pencils, markers, or crayons
-  Paper

HOW TO DO IT



When reading to your child, put life into your reading! Change your voice for different characters. Let your voice get soft and loud.



Involve your child in your reading. Let your child turn the pages. Ask him to guess what will happen in the story. Encourage him to retell the book from the pictures, or share in the reading.



After you have read the story, ask him some of the questions below.



If your child is still interested, ask him to draw a picture of some part of the story, or a time that he saw a worm.



QUESTIONS TO ASK YOUR CHILD

Ask open-ended questions that encourage further exploration by your child.



What was the story about? Who were the characters?



What happened first (second, or last) in the book?



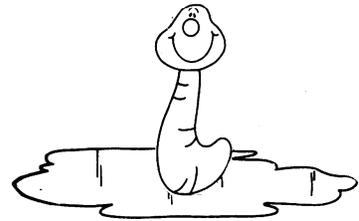
Describe an experience that you have had with worms.



Ask questions about the senses. How do you think worms feel? Smell? Can worms hear? Do worms make noises? Do worms smell?

Worm Hunt

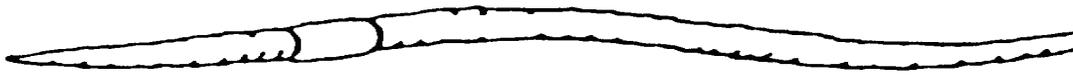
Earthworms live in burrows wherever there is soil or decaying matter. After a rain, we see them wiggling in puddles on the sidewalk. You and your child will have fun exploring where worms live in your own backyard!



WHAT YOU NEED

-  Trowel or shovel
-  Empty coffee can
-  String
-  4 popsicle sticks, or other stakes
-  Flashlight
-  Red cellophane
-  Rubber band
-  Water and a hose, or a watering can





HOW TO DO IT

- 
- Start your worm hunt by asking your child where she thinks you might find worms around your house.
- 
- Help your child investigate some of the locations she suggested. If you find worms, ask questions that help your child observe what the worms look like and how they behave.
- 
- Carefully collect several of the worms and a little soil so you can do some further observations in the next activities.
- 
- For further investigation you can conduct the following *night hunt*:
- ⇒ Using the four popsicle sticks and string, mark off a 3-foot-square grassy area.
 - ⇒ At sunset, thoroughly wet the stringed off area.
 - ⇒ Place the red cellophane over the top of the flashlight and secure it with the rubber band.
 - ⇒ At dark use the flashlight to observe the worms that crawled to the moistened surface.
 - ⇒ Ask your child to predict how many worms are in the 3-foot-square area. Carefully collect all the worms that you find. After you have counted them, compare the number with your prediction. Return the worms to the grassy area.



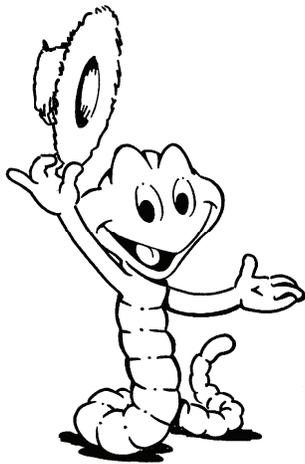
QUESTIONS TO ASK YOUR CHILD

Ask open-ended questions that encourage further exploration by your child.

- 
- Describe where we found the worms.*
- 
- What were the steps that we used to find the worms?*
- 
- What did the worms look like? How did the worms act?*
- 
- How did the worms feel? How did the worms move?*

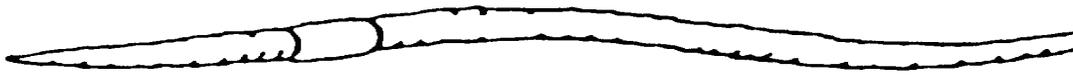
Getting to Know Worms

Do worms have eyes, ears, feet, or a nose? Do worms have body parts that you don't have? You and your child will find out in this exploration activity.



WHAT YOU NEED

-  Several earthworms from your garden
-  Shallow pan
-  Clear glass or plastic saucer or plate
-  Water
-  Hand lens
-  Worm Body Parts Chart — *in backpack*
-  Paper and pencil



HOW TO DO IT

- 
- Before starting this activity, ask your child to describe how he thinks worms are alike and different from people. Write down the responses.
- 
- Next, help your child put a small amount of water on the saucer and carefully place a worm on it to observe.
- 
- Hold the clear saucer up so your child can see the worm from underneath. Use the hand lens to more closely observe the worm and its movements.
- 
- While still observing the worm, ask your child to describe the body parts he observes on the worm. Ask him to describe how the worm is alike and different from people. Compare the answers to your child's first responses.
- 
- Return the worm to its environment. Use the *Worm Body Parts Chart* to reinforce your child's learning. Ask him to place the names of the body parts on the worm in the chart.



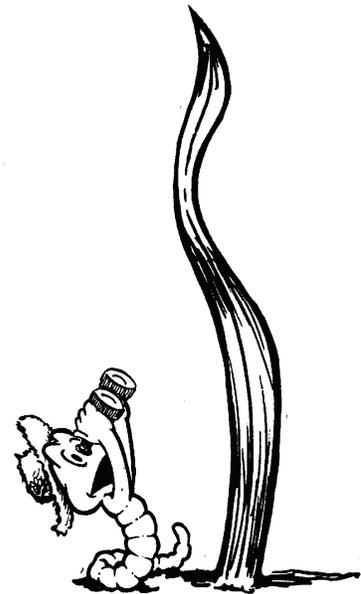
QUESTIONS TO ASK YOUR CHILD

Ask open-ended questions that encourage further exploration by your child.

- 
- Describe the methods used to observe the worm. Could you tell the tail from the head? How?*
- 
- Could you see different parts of the worm? What parts did you see?*
- 
- How are worms like people? How are they different?*

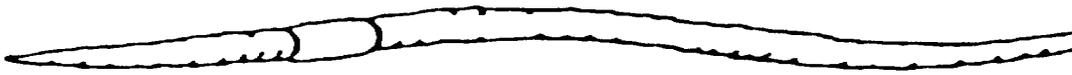
Wiggle Worms

How do you describe how a worm moves? Can you imitate how a worm moves? In this activity your child will have fun acting out worm movements.



WHAT YOU NEED

-  Container of marbles or gravel
-  Pencil
-  Cup of water
-  Grassy area



HOW TO DO IT

- 
-  Ask your child why she thinks earthworms are called *earthworms*. (Because they live in the earth!) Ask your child to pretend to be a worm and lie on the grass and wiggle around like a worm.
 -  Explain that when it rains, worms come out of the ground. Shake the jar of marbles (as if it's raining) and ask your child to sit up on her knees, pretending to come out of her worm tunnel. When you stop shaking the jar, have her squirm back into her tunnel.
 -  Explain that worms don't see and hear like people do. They sense through vibrations on the ground. Ask your child to close her eyes and hold her hands over her ears, pretending to be a worm. Jump up and down on the ground. Ask your child to respond when she feels the vibrations.
 -  Earthworms dig tunnels in the ground. Give your child a pencil and ask her to poke several holes in the ground. Give her a cup of water and ask her to pour it into the tunnel she just dug. Observe how the water runs through the tunnel.
 -  Repeat the above movement activities if your child is still interested.

QUESTIONS TO ASK YOUR CHILD

Ask open-ended questions that encourage further exploration by your child.

-  *How did it feel to pretend to be worm?*
-  *What do you think it is like for a worm to crawl out of its tunnel?*
-  *Describe how worms hear and see.*
-  *How do the worm tunnels help the soil?*

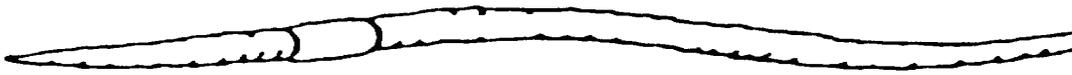
Worms With A View

Did you know that worms, in an acre of land, turn over 18 tons of soil a year? That's a lot of dirt to move for these tiny creatures. By turning and aerating the ground, worms create better soil for growing plants. In this activity you and your child will be able to observe just how quickly these natural plowmen turn the soil.

WHAT YOU NEED

-  Clear quart jar
-  Jar lid with holes punched in the top
-  Dark construction paper
-  Scissors and tape
-  Soil
-  Sand
-  2 or 3 earthworms
-  Measuring cup
-  Fruit or vegetable scraps
-  Water





HOW TO DO IT



Help your child measure 1 cup of soil and place it in the jar. Next, have him measure 1 cup of sand, and pour it into the jar making a neat layer over the soil.



Continue alternating soil and sand until the mixture reaches the neck of the jar.



Pour about 1 cup of water into the jar to moisten the soil and sand layers. Observe the neat layers.



Place a few pieces of vegetable or fruit scraps on top of the soil.



Measure and cut the dark construction paper to fit around the jar so no light can reach the inside. Tape the paper securely around the jar.



Place two or three worms in the jar and place the lid on the jar. (Make sure the lid has holes in it to allow for air.)



Observe the jar every day or two, by removing the construction paper. Make sure to replace the paper after each observation.



QUESTIONS TO ASK YOUR CHILD

Ask open-ended questions that encourage further exploration by your child.



Describe the steps we used to create the worm observation jar. What did we do first (second, last)?



What do you think we will find when we remove the paper from the jar?



What did we find? Describe what happened?



How does the tunneling help the soil?

Composting with Worms

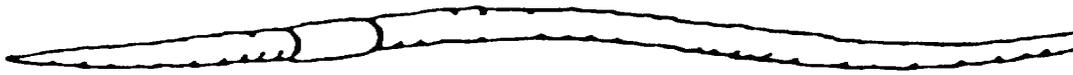
You and your child can help the environment and reduce the amount of waste going into your local landfill by recycling with worms!



This activity shows you how to create a simple worm bin for recycling kitchen waste. You'll enjoy using and observing the worm bin all year-round!

WHAT YOU NEED

-  Solid color plastic tub with lid — *approximately 12" x 16"*
-  Hammer and nail, or drill
-  Newspaper
-  Handful of soil and dried leaves (or straw)
-  Water
-  Redworms — *you can get these from compost bins, bait shops, or order them through the mail*



HOW TO DO IT

- 
- Punch holes in the bottom and lid of the plastic tub using the hammer and nail (or a drill).
- 
- Shred newspaper into 2" or 3" strips. Fill the bin firmly with newspaper.
- 
- Add a handful of soil and a handful of dried leaves or straw. Mix with the newspaper.
- 
- Add about 2 quarts of water. Mix with the newspaper. It should be as moist as a wrung out sponge (add more water if necessary).
- 
- The moistened newspaper should fill about one-third to one-half of the bin. Add more newspaper if necessary. Let the bin sit for a few hours or overnight.
- 
- Add about 1 pound of redworms to the bin. (Redworms are different from earthworms or night crawlers that live in the ground.) Place the worms on the top of the newspaper and replace the lid. The worms will burrow below the newspaper.
- 
- Begin by burying a few kitchen scraps (leftover fruit or vegetables) in the newspaper. After a day or two you can add more food.
- 
- In this size worm bin, you can feed about 1 pound of scraps per week.
- 
- Do NOT** put meat, bones, fish, or dairy products in your worm bin.
- 
- If your worm bin gets too moist, just add more newspaper strips. If it gets too dry, add more water.
- 
- Refer to the enclosed *Worm Composting* brochure for more information.
- 

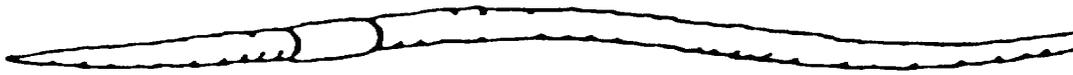
Dirt Cups

You and your child will enjoy making and tasting this delicious worm-inspired dessert. This activity also helps your child practice measuring and reading skills.



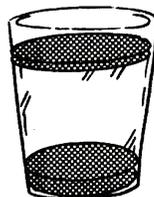
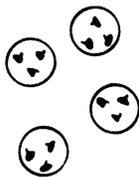
WHAT YOU NEED

-  2 cups milk
-  3.9-ounce package of instant chocolate pudding
-  8-ounce tub of whipped topping
-  1 package of chocolate sandwich cookies
-  Gummy worms
-  Clear cups or glasses



HOW TO DO IT

-  Help your child make the chocolate pudding according to the package instructions. Encourage your child to read the instructions and do all the measuring of ingredients.
-  Place the sandwich cookies in a Zip-lock plastic bag. Crush the cookies.
-  Add the whipped topping and one-half of the crushed cookies to the pudding, and stir.
-  Help your child pour in about 1 tablespoon of the cookie crumbs into the clear glasses. Fill the cups three-fourths full with the pudding mixture.
-  Sprinkle more of the crushed cookies on top and place several gummy worms in the pudding. Enjoy!



QUESTIONS TO ASK YOUR CHILD

Ask open-ended questions that encourage further exploration by your child.

-  *Describe the steps in making the dirt cups.*
-  *What did you do first (second, last)?*
-  *How was the texture of the pudding different from the crushed cookies?*
-  *Describe how the dirt cups tasted.*

What's for Dinner?

Did you know that a worm can eat half its weight each day? This is extremely important to the environment since worms eat decaying foods and organic matter. Worms are very useful in home composting. In this activity, you and your child will discover all the

WHAT YOU NEED

 **Redworm Concentration Cards** — *provided in backpack*

 **My Favorite Meal Activity Fun Sheet** — *see page 22*

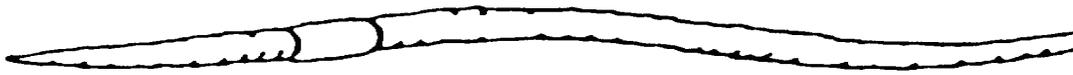
 **Worm Food Logic Game Activity Fun Sheet** — *see page 23*

 **Crayons or markers**

 **Scissors**

 **Glue**





HOW TO DO IT



Start this activity by asking your child what foods he thinks worms eat. Record his responses.



Next, with your child, play the *Hungry Redworm Concentration Game* — found in the backpack. Discuss the different foods on the cards as you play the game.



Help your child construct the *Worm Food Logic Game* found on page 23. Follow the instructions on the sheet.



Play the game several times with your child. Logic activities teach important thinking and reasoning skills that are valuable for learning math, science, and reading.



Compare your child's first responses with what you have both learned by playing the two games.



Ask your child to complete the *My Favorite Meal Activity Fun Sheet*. Discuss your child's favorite foods and those of the redworms.



QUESTIONS TO ASK YOUR CHILD

Ask open-ended questions that encourage further exploration by your child.



Describe the foods that are eaten by redworms.



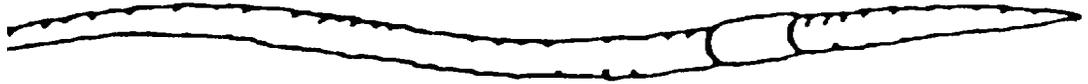
Why do you think redworms like these types of foods?



Do we ever throw away these types of foods? What could we do with our food scraps that would be better for the environment?



Describe how you played the concentration and logic games.

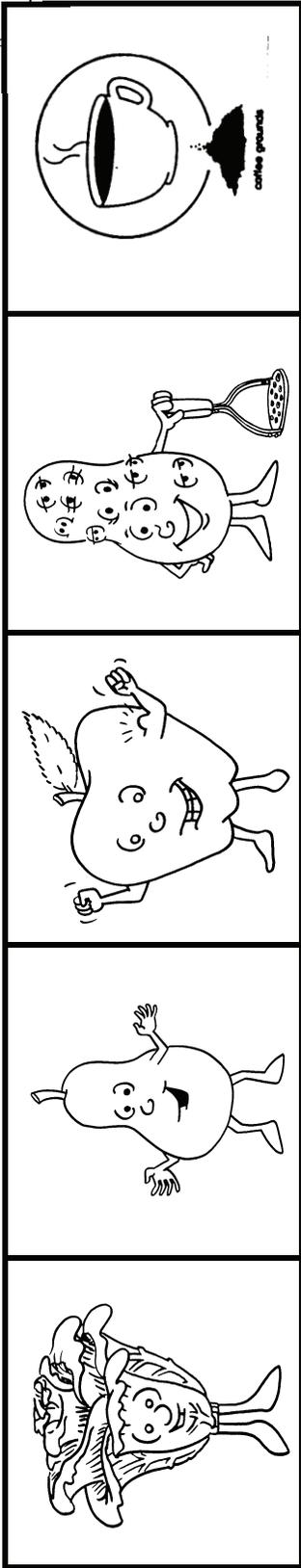


My Favorite Meal

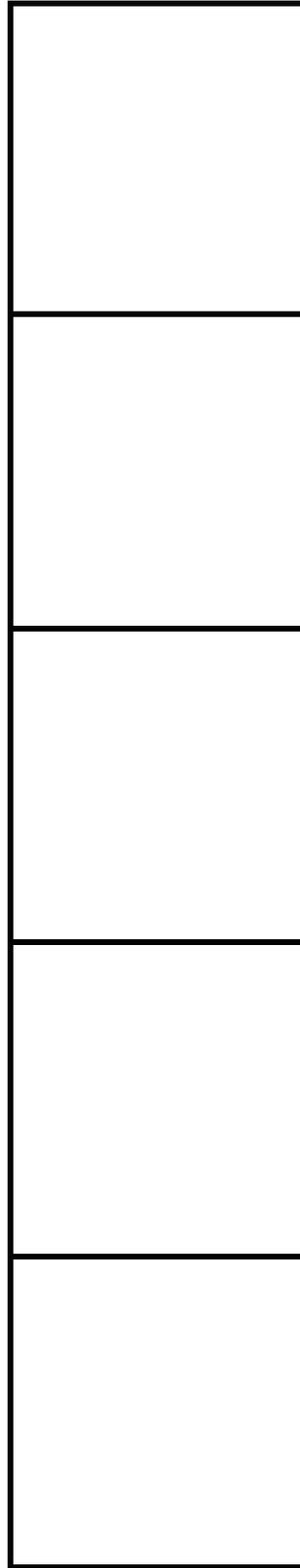
Make a picture of your favorite meal. Write something about your favorite meal. Would redworms like this meal?

A large, empty rounded rectangular box intended for drawing a picture of a favorite meal.

Worm Food Logic Game

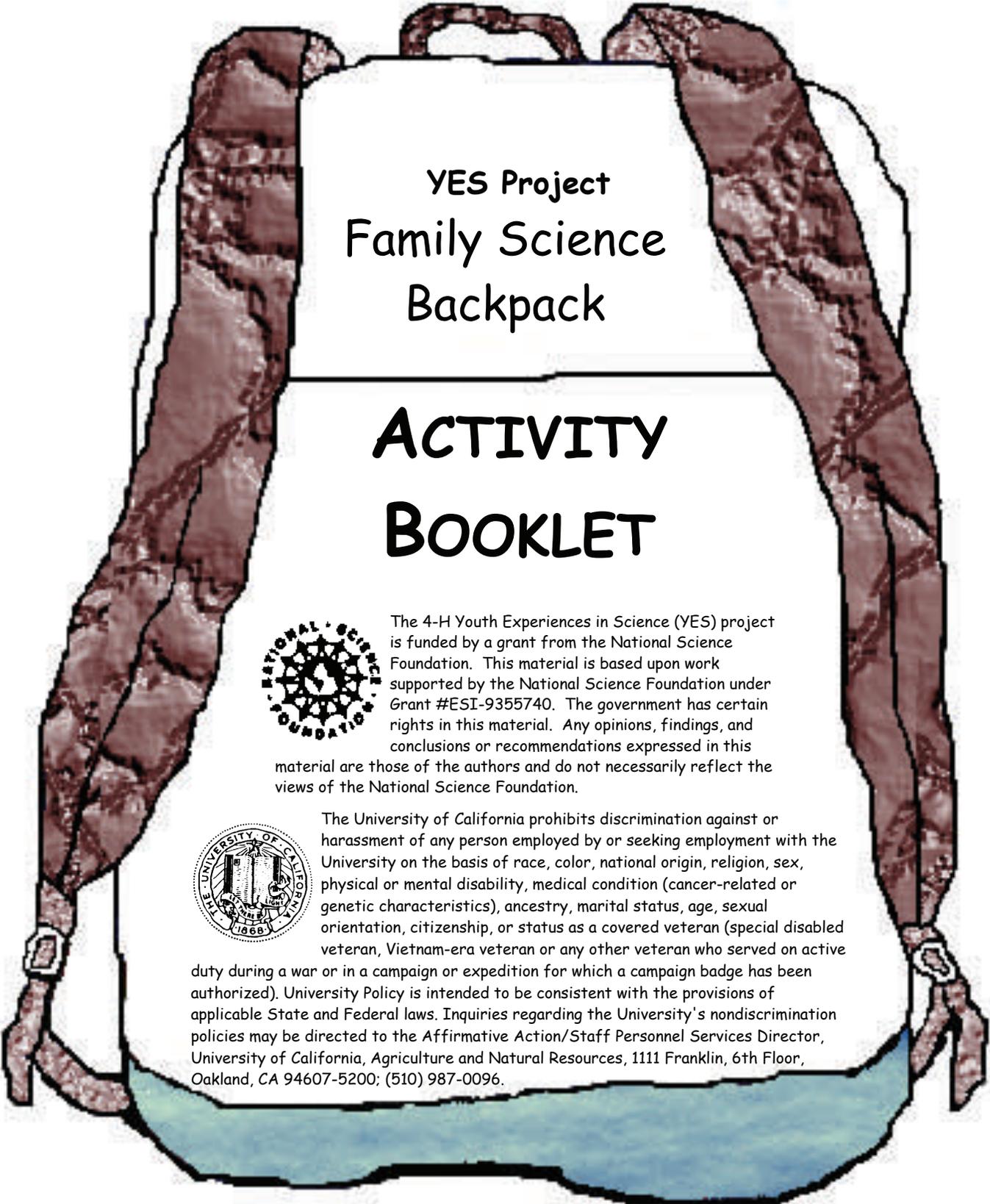


Cut this page along the dotted line. Cut out the food boxes in the top half along the heavy black lines. Pick one of the three problems below and read the instructions. Place the foods on the five squares of the bottom piece according to the instructions. Then try another problem.



1. The potato is next to the lettuce.
The potato comes first.
The apple comes third.
The apple is between the lettuce and pear.
The coffee grounds are next to the pear.
2. The pear is next to the potato.
The pear comes last.
The lettuce comes third.
The lettuce is between the potato and the apple.
The coffee grounds are next to the apple.
3. The apple is next to the coffee grounds.
The pear comes first.
The coffee grounds come third.
The coffee grounds are between the apple and the lettuce.
The potato is next to the lettuce.





YES Project Family Science Backpack

ACTIVITY BOOKLET



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Wee-Cyclo- Saur-Us

Teen Guide



4-H YOUTH EXPERIENCES IN SCIENCE PROJECT
UNIVERSITY OF CALIFORNIA COOPERATIVE EXTENSION

DIVISION OF AGRICULTURE
AND NATURAL RESOURCES

PUBLICATION 3410



4-H Youth Experiences in Science Project
Division of Agriculture and Natural Resources
Department of Human and Community Development

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Wee-cyclo-saur-us

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This title is one of 15 publications in the 4-H Youth Experiences in Science Set, ANR Publication 3404-A, and is not sold separately. For information on ordering this set, call 1-800-994-8849 or (510) 642-2431, or FAX 510) 643-5470. Or, visit the ANR Communication Services catalog online at <http://anrcatalog.ucdavis.edu>.

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Welcome to the 4-H Youth Experiences in Science Project!

There is nothing like the **4-H YES Project** for providing high-quality children's science education in after-school settings. *4-H YES* uses specially trained teenage volunteers to conduct the hands-on science curriculum for children 5 to 8 years of age enrolled in school-age child care programs.

Each *YES* Theme Unit contains five or more 1- to 1½- hour sessions. Each session contains three or more activities that build upon the session's theme.

The session instructions provide an **Overview of the Day's Activities**, **Background Information** on the session's subject, a list of **Materials You Will Need** to conduct the session, a detailed outline on **Getting Ready**, the **Action** required, and specific **Sciencing** questions. When reading the curriculum, be sure to look for the **Tips** in the side column. They give valuable information on setting up and conducting the activities. At the end of the curriculum is a listing of all the supplies needed to conduct each activity.

The *YES* Curriculum incorporates inquiry-based activities with cooperative learning. It focuses on learning the scientific thinking processes and features the learning cycle model of instruction.

The **Scientific Thinking Processes** are built into each of the sessions. The processes of **observing**, **communicating**, **comparing**, and **organizing** are most commonly used in this curriculum aimed at younger children. The processes are indicated in small bold type after the **Action** and **Sciencing** sections of each activity.



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For the Teen Leader
AN INTRODUCTION TO THE YES
WEE-CYCLO-SAUR-US ACTIVITIES

The *YES WEE-CYCLO-SAUR-US* activities provide children with an opportunity to help young people (ages 5 to 8) understand what they can do to help recycle, and how recycling helps other things that live in the world. The unit is designed to help young people learn about the effects of throwing things away and how, in many cases, discarded items can be re-used as well as recycled.

The instructions, experiences, and activities in this *YES WEE-CYCLO-SAUR-US* activity guide helps young children examine how to recycle and reuse products that are discarded daily, charting their observations and findings and keeping a history or record.

The model is experiential learning that involves *Exploring, Concept Development, and Concept Application*. The children will also investigate changes. Things are constantly changing...like getting older, ice melting, grass being eaten by cows. Experiences such as exploring the different properties of a known substance and those properties change when mixed or treated differently are also included.

The unit includes many facts from the *California Division of Recycling* for the children to experience and learn. The children should be encouraged to bring in supplies and recycled materials from their homes as the unit progresses. Sharing experiences with family members or friends is also a strong element in the learning process. Encouraging the children to process, generalize, and then apply what they have accomplished will sometimes be a challenge for you. All of these steps will also enable you to practice skills that need to be mastered to become a productive citizen.

The day-by-day changes in the development and behavior of the children, as well as what they notice and are curious about, will determine the direction and pace of the activities far better than any imposed lesson plan. You may want to explore your own ideas about recycling and reusing and include these as expeditions when the children are applying the concept at home or in the community. Many of these activities have been modified and “recycled.”

DISCOVERING A RECYCLO-SAUR-US

Approximate Time Required for Session: 1 to 1¼ hours

Purpose

- To use the processes of science and develop scientific thinking skills.
- To investigate how materials can be used to make another product or item through reuse and recycling.
- To consider one's relationship to the environment.



Overview of the Day's Activities

In this session, children will have the opportunity to discover the remains of a Recyclo-Saur-Us. They will put the pieces together to make the Recyclo-Saur-Us however they think it should be (there is no “right” way—it’s up to them). They will also describe their Recyclo-Saur-Us as they complete the guided story for the Recyclo-Saur-Us. Children begin their mural about the Recyclo-Saur-Us family and how they lived.

Background Information

We are increasingly aware that we are slowly being buried by the trash we throw away. Landfills are reaching their capacity, toxic wastes are polluting our water, even our roadways are littered by things we've thrown away. The purpose of this entire unit of study is to help young people understand what they can do to help recycle and how recycling helps other things that live in the world.

The *WEE-CYCLO-SAUR-US* unit is designed to help young people learn about the effects of throwing things away and how in many cases discarded items can be re-used as well as recycled. This first session begins the process by having the young children examine how to recycle and reuse products that are discarded daily. They will use discarded items to build a Recyclo-Saur-Us.

Archeologists dig through sites to study the remains of buried artifacts, including bones, tools, jewelry, clothing. These are items that help them reconstruct history. In order to find the artifacts without damaging them, they must look very carefully.

During this session we suggest you place a large piece of butcher paper on the wall or on the floor for the children to begin a mural of the habitats where the Recyclo-Saur-Us lived and what the Recyclo-Saur-Us did.

Preparation Notes

ACTIVITY A

THE DISCOVERY OF A RECYCLO-SAUR-US

Time Required

30–45 minutes

Suggested Grouping

8 to 10 children

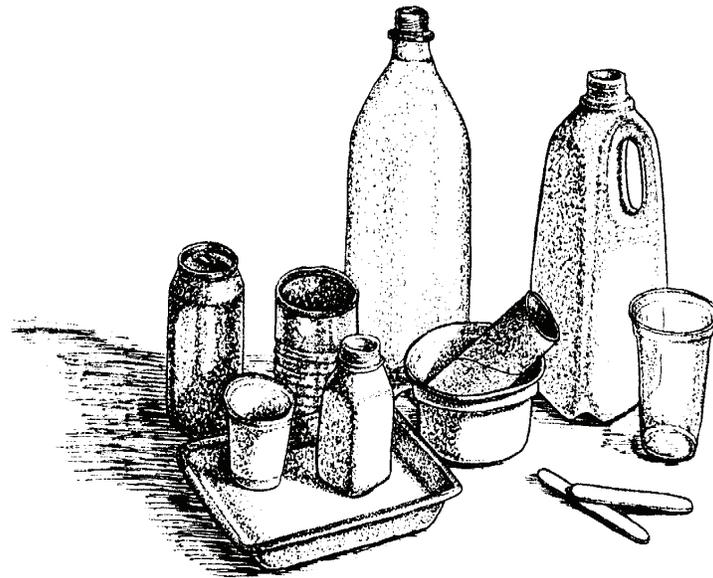
In this activity, the children will dig for the buried remains of one of the Recylo-Saur-Us family. After discovering their find, the group will assemble the pieces together and recreate the Recylo-Saur-Us. After the creation is finished, the group will complete the guided story about the Recylo-Saur-Us they discovered.

Materials You Will Need

- A 15-to 18-gallon plastic tub with lid (or a large cardboard box)
- Styrofoam packing peanuts, or other packing materials (enough to fill the tub or box $\frac{3}{4}$ full)
- Recycled items (*pieces of chicken wire, newspapers, cups, clean cans, rubber bands, paper, straws, food wrappers, worn out clothes, empty, clean bottles, soda containers, paper towel rolls, etc.*)
- Glue
- Masking tape
- String, wire, or pipe cleaners
- Large newsprint pad
- Colored markers
- Guided Story for Recylo-Saur-Us* (see page 10)
- Large sheet of butcher paper for mural

Getting Ready

- ❶ Collect as many clean trash items as possible. Be sure to use clean trash (wash out cans, bottles, etc.). Be sure to eliminate all sharp edges.



- ② Place a layer of Styrofoam peanuts or packing material in the bottom of the plastic container. Add a few recycled items. Add another layer of packing materials, and then a few more items. Continue until the tub is full and you have at least one item per child.
- ③ Be prepared to explain what an archeologist does.

Introduction

Below are some sample questions that you may want to use when introducing this activity.

- Have you ever heard of dinosaurs? What were they? What did they look like?
- Have you ever seen one?
- What is an archeologist? What do they do? (refer to page 2).
- How is an archeologist similar to a detective?
- What is a "family"?

ACTION: OBSERVING AND COMMUNICATING

1. Explain to the children that they are going to take the role of an archeologist. They will dig to find the remains of one of the Recyclo-Saur-Us family that has been buried in the plastic tub (or box).
2. Children will then work as a group to put the pieces they uncover together to make a Recyclo-Saur-Us family member. **Note:** *Children might decide that some pieces found may not be part of the Recyclo-Saur-Us. They decide which are part of it and which are not.*
3. Ask each child to come to the site and to dig for a piece of the Recyclo-Saur-Us.
4. Each child should work with the group to determine how their piece will become part of the Recyclo-Saur-Us. The children can identify the part and where it might be located.
5. Appoint one or two lead archeologists to guide the group.
6. As the group is sorting and assembling their pieces, encourage them to discuss their piece and what it was before.

Developing the Concept

1. You might want to use the following question to help the children share their observations and experiences and to help them understand that reusing materials can be fun.
 - Have you ever used something that was thrown away by someone else to build something new?



**FACT!
AMERICANS
DISCARD
ENOUGH
ALUMINUM TO
REBUILD OUR
ENTIRE
COMMERCIAL
AIR FLEET
EVERY 3
MONTHS!**



Tip
Don't
assume the
youngsters
know what
is recyclable. You
may need to spend
some time talking
with them about
what items are
recyclable and
what items might
be reusable.

Applying the Concept

1. Ask the children to study the trash that their family produces for a day. Sort the trash and recycle what is appropriate. How do you recycle? Have the children talk with their family about ways of using the recycled objects again.
2. Ask them to bring some clean recyclable items to the next session (to be used as parts for making additional Recyclo-Saur-U's family members).

Presentation Notes

ACTIVITY B

THE RECYCLO-SAUR-US STORY AND FAMILY MURAL

Time Required

15–20 minutes

Suggested Grouping

individuals; small
groups; whole group

In this activity the children will begin work on the Recyclo-Saur-Us family mural. The mural will begin after completion of the Recyclo-Saur-Us. The children will work together to generate the history of their Recyclo-Saur-Us and to plan and illustrate the mural of how and where the Recyclo-Saur-Us family lived. The mural will include the landscape, different types of Recyclo-Saur-Us family members, other plants and animals, etc. The mural will be an ongoing project that the children can add to as the Wee-Cyclo-Saur-Us unit progresses.

Materials You Will Need

- Newsprint – 2 large sheets
- Several dark-colored, felt-tip markers
- Guided Story for Recyclo-Saur-Us* (copied from page 10)
- Crayons and paper (plain white paper or drawing paper) for each explorer (to make a personal Recyclo-Saur-Us drawing)
- Large sheet of butcher paper for the wall mural
- Masking tape or push pins to hold up the mural

Getting Ready

- ❶ Using the two large sheets of newsprint, print



Tip
Insert
the word/
name
provided

by the group into
the story. Copy
the story outline
(page 10) onto
two large pieces
of newsprint or
butcher paper
before beginning
the Guided Story.

the *Guided Story for Recyclo-Saur-Us* for the children to complete.

- ② Be prepared to explain what an archeologist or paleontologist does.
- ③ Tape or pin up a large sheet of butcher paper for the children to begin their Recyclo-Saur-Us mural. (You might put the paper on a table or floor if that seems like a better idea than using a wall.)

Presentation Notes

ACTION: COMMUNICATING AND COMPARING

1. Gather the children in a circle sitting down and facing the newsprint with the *Guided Story* outline. You may want to have the Recyclo-Saur-Us they just made in a spot where they can see it.
2. Go over the outline, asking the children to decide on what answers you should use to fill in the blanks on the *Guided Story for Recyclo-Saur-Us*.

3. After the story is complete, some of the children can work on the mural while others do individual drawings with the crayons and pieces of paper. After a few minutes, you may want to rotate the groups.

Developing the Concept

You may want to discuss what was drawn on the Recyclo-Saur-Us family mural and how those things affect the life of the Recyclo-Saur-Us family.

- Ask: How is the Recyclo-Saur-Us family similar to dinosaurs? How are they different?
- Ask: What else should we draw on the mural during future *Wee-Cyclo-Saur-Us* sessions?
- Have all of the children draw a picture of Recyclo-Saur-Us after completing the *Guided Story* about it and its habitat. Be sure to write their names on their pictures if they cannot. Have them take their individual pictures home to share with their family.

GUIDED STORY FOR RECYCLO-SAUR-US

We have made a scientific discovery. We dug for recycled objects in our large container, and we combined all of our finds to create our Recyclo-Saur-Us that we have named _____.

It is _____ feet tall and probably weighs about _____.

It lives in _____. The family (last) name is _____.

Some of the items that it eats are

✂ -----

(Copy the above onto first page of newsprint.)

It eats _____ times per day, and about _____ pounds of food each day.

For entertainment, it likes to

Some other important information about it is

✂ -----

(Copy the above onto second page of newsprint.)

RECYCLE-OR-NOT

Approximate Time Required for Session: 1¼ to 1½ hours

Purpose

- To experience different states of matter.
- To learn how matter can change in use and appearance.
- To begin discussing findings as part of a group of investigators.

Overview of the Day's Activities

In this session, the children will learn about how things they use can change in use and appearance and how changes are found everywhere. Children will become detectives by investigating an unknown substance (“Oobleck”) that has arrived from another planet in a space capsule. It will also include materials that the unknown planet has sent.

Background Information

This session provides the children an opportunity to observe and explore various changes. Things are constantly changing: we are getting older, ice is melting into water, the wind is blowing dust from one part of the world to another, grass is being eaten by cows that produce milk, and familiar materials are being used for other purposes through change. The list of changes is endless. Today, we will take on the role of *Recycle-or-nots* and examine a space capsule from an unknown planet. We will try to determine whether to reduce, reuse, repair, recycle, compost, or trash it. We will also be exploring and describing an unusual material (Oobleck).

Matter generally exists in three states: solid, liquid, and gas. Different materials, by their very nature, look, feel, and behave differently. Most materials can exist as a solid, a liquid, or a gas.

When we mix different elements or things together, we create a certain mixture. For example, what we call *water* is a certain mixture in its liquid state. That same mixture as a solid is called *ice*, and when it is a gas we call it *steam* or *water vapor*.

The activities in this session will begin the process of encouraging the children to investigate materials for reuse, to look at different properties of known and unknown substances and to examine how they can change when mixed or treated differently. When a material is reused or recycled, the matter may remain the same, but it will be used in an entirely different way.

Preparation Notes

ACTIVITY A

THIS APPEARS TO BE A SPACE CAPSULE

Time Required

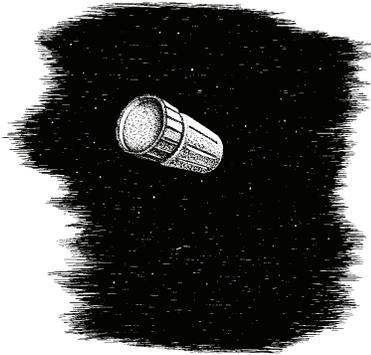
25 minutes

Suggested Grouping

6 teams, 3–4 children per team

Materials You Will Need

- Cornstarch — 2 16-oz boxes plus 1 extra 16-oz box
- Large bowl or bucket for mixing
- Old newspaper — a lot
- Water
- Paper towels
- Newsprint
- Markers (dark colors)
- Plastic Zip-lock bags (snack size)
- Large 13-gallon trash bag
- Green food coloring, *optional*
- Various clean, recycled trash items to fill bag (clean milk containers, clean cans and plastic bottles, used plastic silverware, clean used cups, old magazines, discarded boxes and packaging from products, etc.) **NO GLASS!**



Getting Ready

- ❶ Start by mixing the Oobleck about 1 hour before beginning, if possible. If that is not possible, you may mix it shortly before beginning, but allow enough time to make adjustments in the mixture. It will take approximately 30 minutes to prepare the Oobleck and to set up the science area. *(This time is not included in the time required for the activity above.)*

- 2 The proportions used here are 2 boxes of cornstarch to 3 1/3 cups of water. This will make enough for 6 teams to have about 3/4 cup of Oobleck. Keep your extra box of cornstarch handy to thicken the mixture in case it becomes soupy.
- 3 To prepare the Oobleck, pour 2 cups of water into a mixing bowl or bucket and add 2 boxes of cornstarch. Then add the rest of the water and mix thoroughly. Swirl and tip the bowl or bucket to level the contents, then set it aside.
- 4 About 15 minutes before you begin the activity, mix the Oobleck by hand to make an even consistency. *Do not try to punch through the mixture (as if mixing batter); that will be very difficult.* Instead, lift the mixture from the bottom of the bowl or bucket to the top by slipping your fingers under it. Keep mixing until an even consistency is reached. Pour about 1/4 cup of Oobleck into each Zip-lock bag and close. Make sure that there are at least 3 bags for each team. These bags are to be added to the “space capsule” that you will now prepare.
- 5 Take a large 13-gallon or larger plastic bag and fill with the cleaned trash and Oobleck bags that you have prepared. This bag will now become a mystery space capsule.
- 6 With the group assembled, take 6 sheets of newsprint and tape 2 together at the end. Do this with the other 4 sheets, so that you have 3 (2-sheet) sections. Tape these together on the long edge to form one large sheet with 6 sections. *(Make one of these for each group or team.)* Using the dark markers, label each box with one of the following words:

REDUCE	REPAIR	RECYCLE
REUSE	TRASH	COMPOST



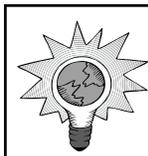
Tip
In the story of Oobleck by Dr.

Seuss, the Oobleck is green. If you want the Oobleck you're making to be green, add some of the green food coloring while you're mixing it as part of step 3.



Tip
Some brands of cornstarch may require

slightly different amounts of water, so always test the Oobleck as follows: It should flow when you tip a bowl, but feel like a solid when you hit it or rub your finger across the surface. If it is too thick to flow, add a little more water. If it is too soupy, add a little cornstarch.



Tip
Oobleck
can be
swept up
or
vacuumed when it
is dry.



FACT!
IN THE U.S.,
YARD
TRIMMINGS AND
FOOD SCRAPS
MAKE UP ABOUT
ONE-FOURTH OF
OUR WASTE
STREAM.
COMPOSTING IS
AN EFFECTIVE
WAY TO
DECREASE
LANDFILLS!

Below are some sample questions that you may want to use when introducing this activity.

- Ask: What do you think this is? (*Hold up plastic space capsule.*) Explain that you have been told that this is a space capsule and that you have been asked to have this group look at it to try to identify and classify its contents.
- Ask: Where do you think it came from?

ACTION

1. Ask the children to imagine that they are a group of scientists gathered to investigate this space capsule that has just fallen to earth.
2. Explain that some of the materials will look familiar, but their job is to determine if the objects can be reused, recycled, etc.
3. Using the large grid of newsprint, have the teams watch as you point to each section and say each word. You may also make a little picture or figure so that non-readers may identify the boxes, as necessary. Place the sheet on the floor or table by each team. If the group is small enough, one set will be enough.
4. Have the children empty the contents of the space capsule onto the floor or table, next to the chart.
5. Ask the children to take turns selecting an item and placing it on one of the six sections. Some items can be placed on more than one square, but the children can choose. The child is then asked to explain why they placed that item there and what they predict their find is. The bags of Oobleck are to be kept sealed but can be used on the chart. (Children will investigate them further and in more detail in *Activity C* of this session.)

SCIENCING

1. After all of the children have sorted and identified the contents of the capsule, have the group count together the number of items in each section. Mark the number in each square.
2. Discuss where the items have been placed and other sections where they could be placed. Also, engage the children in a dialogue that will give them an opportunity to tell what item they would move and where if their prediction differs from the chart.

Applying the Concept

1. Have the children bring in additional items to add to the space capsule for future groups to use.
2. Save the chart and redo the activity with the new items added.
3. Compare the charts with two different capsule contents.
4. Observe if the item numbers have changed after doing this activity more than once.
5. Have the children make their own space capsules at home, in a smaller version, and share this activity with their family and class.



Tip
You may want to write what children

say on the chalkboard or on newsprint.



FACT!
ONE POUND

OF RED WORMS CAN CONSUME HALF A POUND OF WASTE EVERY DAY!



Tip
Experimenting with Oobleck is

so engaging that the only way to get the attention of the entire group after they have begun exploring is to remove the containers.

ACTIVITY B

READ *BARTHOLOMEW AND THE OOBLECK* (OPTIONAL)

Time Required

10 minutes

Suggested Grouping

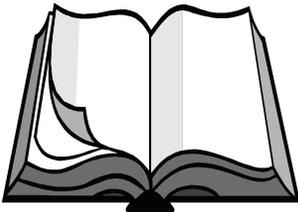
large group

Materials You Will Need

- Copy of Dr. Seuss' s *Bartholomew and the Oobleck*

Getting Ready

- ❶ Read the book, *Bartholomew and the Oobleck* to yourself. Practice reading the story before reading it out loud to the children.
- ❷ Make a small note to ask specific questions such as the following: “What do you think will happen next?” (*prediction*) “Who are the main characters in this story?” “What do you think made that happen?” If working with a partner or in teams, decide who will read what, etc.



(Read the book, *Bartholomew and the Oobleck* several times prior to this activity so that you are familiar with the story and the words.)

ACTION

1. Gather the children in an area where you can quietly read the story. Have them sit on the floor or on chairs.
2. Show pictures on the pages as you read.

3. If working in partners or teams, change the reader at appropriate locations.
4. Ask questions of the listeners as you read.
5. Discuss the book briefly at the conclusion of the reading.

Tips for Successful Reading

- ***Setting the stage***

Have the children sit in a semicircle, with your chair slightly higher. Ask some brief questions to build enthusiasm and encourage responses. Keep the book face down or out of sight.

- ***Presenting the book***

Show the book so the cover is clearly visible. Make sure the children can see the pictures easily. Tell them the name of the book, the author, and the illustrator.

- ***Reading the book***

Use plenty of expression. Adjust your voice and speed of reading to fit the story. Keep children involved by asking “What do you think is going to happen?” ***The most common mistake is reading too fast.*** Read slowly enough for the children to build mental pictures.



SCIENCING

1. After reading, ask the children to draw pictures about the story or to create their own picture of Bartholomew or Oobleck.
2. Have the children share their artwork with the group. Hang the pictures on the wall for all to see.
3. Ask the children questions that relate to the story and to some of their discoveries in investigating the Oobleck.

- Was there any difference in the Oobleck?
- How did it rain green Oobleck?

Developing the Concept

You might want to use the following questions to help the children share their observations and experiences. This will help them to develop a better understanding of how recycling and reusing materials can be fun and also a learning experience.

- Is Oobleck similar to anything that you already have or have seen at home?
- What supplies were used to make the space capsule?
- Were any recycled items used? What were these?
- Could you use the Oobleck in another way? For what?
- Do you know anyone like Bartholomew? Who? How are they alike?

Applying the Concept

1. Ask the children to look at some of their books they have at home. Have them talk to family members or neighbors about a book they have read.
2. Have children share their book with someone else and make up a game or activity about the book.
3. Ask children to write a book about an imaginary person or animal and use Oobleck as the main item.

**FACT!
ABOUT 75% OF
THE GLASS USED
IN THE U.S. IS
USED FOR
PACKAGING!**

ACTIVITY C**OUBLECK (Oo [AS IN SUIT]-BLEK)*****Time Required***

20 minutes

Suggested Grouping

4–5 children

Materials You Will Need

- Plastic Zip-lock bags from *Activity A* with Oobleck inside
- Old newspaper – lots
- Masking tape – 1 roll
- Water
- Paper towels
- Newsprint pad
- Dark color markers
- Recycled plastic silverware
- Paper cups – small size
- Straws
- Paper clips

Getting Ready

- ❶ Place newspaper on table tops and floor of work and investigation areas. Clear all supplies, books, and equipment from the area.
- ❷ Place one or two Zip-lock bags of Oobleck at each group station (taken from the space capsule bag). Place plastic silverware, straws, paper clips, etc. randomly around the investigation area for the children to use in their work.
- ❸ Place water and paper towels in a central location for cleanup.

Introduction

Below are some sample questions that you may want to use when introducing this activity.

- What do you think this is? (*Hold up Zip-lock bags of Oobleck for children to see.*)
- Where do you think it came from? (*space, earth, home, etc.*)
- Does it look like a solid, liquid, or gas?
- How do you think it feels?



ACTION

1. Ask the children to imagine that they are a group of scientists gathered to investigate this unknown substance.
2. Explain that the material has been named Oobleck since it looks like the green rain in Dr. Seuss's book, *Bartholomew and the Oobleck*.
3. Mention that the Oobleck is safe to handle, and that as scientists, we don't know for certain what it is made of, but it seems to have a lot in common with some sort of powder mixed with water. Have the children name other substances that may resemble Oobleck.
4. Explain to the group that their job as scientists is to investigate the properties of Oobleck. (*A property is a characteristic of something that can be seen, heard, smelled, felt by the sense of touch or detected by instruments.*) Today, we will be using our senses.
5. Urge the children to use all of their senses *except taste* to investigate Oobleck.



Tip
You will probably have to explain

what senses are (sight, touch, taste, smell, and hearing). You will also have to describe what you mean by properties (words that describe Oobleck's attributes or characteristics).

6. Organize the children into teams of four to five. Have each team sit or stand around a table or work area. Give each team one container of Oobleck placing it on the newspaper. Explain that they should attempt to keep the mixture on the paper. Have them be careful not to get Oobleck on their clothes.
7. As the teams investigate the Oobleck, circulate from group to group, encouraging them to touch the mixture with their fingers.
8. After the teams have investigated for about 5 minutes, begin asking them what observations they made using their senses. Ask them to discuss ways to describe what they noticed about the Oobleck. Record these observations on newsprint.
9. Place a large assortment of plastic, metal, and wood items on tables so that the teams may investigate with other objects.
10. After approximately 10 minutes of additional group work, ask the teams to clean up their work areas. One member should be responsible for returning the container of *Oobleck* to a central location. Another should put all the objects away. The other members can fold or roll up the newspaper.

Note: *You may have the children take some of the Oobleck home to see what happens to it. Plastic Zip-lock type snack bags are best for transporting Oobleck. Tell them that if their Oobleck dries out, they can add a little water to restore it.*



Tip
In case the children forget, you might want

to bring in more materials similar to the ones you brought in last time: (pieces of chicken wire, newspapers, cups, clean cans, rubber bands, paper, straws, food wrappers, worn out clothes, empty clean bottles, soda containers, etc.) plus some new items such as cardboard wrapping paper or paper towel tubes.



Tip
Put the containers of Oobleck aside or dump them into your bucket. Set aside to dry for a day or two. Dry Oobleck can be dumped into the garbage. DO NOT POUR OOBLECK INTO THE SINK AS IT WILL CLOG THE DRAIN OR TOILET. Do not attempt to mop up a large spill; scoop up most of it first, then wipe up the remaining Oobleck with a sponge.

SCIENCING

Use the questions below or some of your own to help the children share their observations and experiences. This will help them to develop a better understanding of unknown substances, their properties, investigation, and findings. Record their findings on newsprint.

- How does Oobleck behave when you press on it?
- When did Oobleck behave like a solid? (*You may have to give examples of a solid: something that keeps its shape.*)
- When did Oobleck behave like a liquid?
- What do you think Oobleck is made of?
- What happened when you used different objects to investigate Oobleck?
- How could Oobleck be used in another way, that is, reused?
- How could Oobleck be recycled?

Applying the Concept

- Adjust the recipe to one box of cornstarch and 1-2/3 cups of water, and give a copy of the Oobleck recipe to anyone who would like to use it at home.
- Have the children share the Oobleck with a family member or friend and encourage them to help that person investigate the mysteries of Oobleck.

EAT OR NOT

Approximate Time Required for Session: 1¼ to 1½ hours

Purpose

- To experience how substances can change state.
- To experience how foods can be combined to make new foods.
- To understand that some changes are irreversible.
- To experience how to change substances from one state to another.

Overview of the Day's Activities

During this session we will review *Bartholomew and the Oobleck* and explore changing a liquid into a solid.

Background Information

You will begin this session by reviewing the Oobleck activity. In the activity for the session, the children will use heavy cream, ice, and cups to make ice cream. They will examine ways to make the cream freeze and change from a liquid to a solid state.

ACTIVITY A

A CHANGE WE CAN EAT (ICE CREAM)

Time Required

30–40 minutes

Suggested Grouping

groups of 4 children

Materials You Will Need
(per 4 children)

- Coffee can with plastic lid, 1-lb or 18-oz size – 1 per 4 children
- Coffee can, 3-lb size with plastic lid – 1 per 4 children
- Heavy whipping cream – 8 oz (1 cup)
- Sweetened condensed milk – 1 can **cold**
- Milk – ½ gallon
- Sugar – 1 cup
- Vanilla – 1 tablespoon
- Crushed ice – about 20 lb
- Rock salt – 1 box or 5 lb bag
- Strawberry jam or fresh crushed fruit
- Plastic bag – 1-gallon size
- Hammer or wooden mallet
- Measuring cup – 1 cup size
- Dixie cup, small size – 1 per child
- Plastic spoon, small – 1 per child
- Container – large, 4-quart – for mixing ingredients
- Can opener – hand model

Getting Ready

- ❶ Collect all of the supplies and materials needed.
- ❷ Clean off work areas so that a team of four can either sit on the floor in a circle or at a table across from one another.



- ③ Check to see that there is enough work area for all of the teams.

Introduction

Below are some sample questions that you may want to use when introducing this activity.

- What is ice?
- What is salt?
- Where does milk come from?
- What is cream?

ACTION: OBSERVING, COMMUNICATING, AND COMPARING

1. Explain to the children that they are going to take cream (the thick part of milk) and other ingredients and make it into a frozen food.
2. They will each be given two cans of different sizes (one fits inside the other).
3. Mix the cream, milk, sugar, condensed milk, and vanilla together in a large bowl or container.
4. Divide the milk mixture among all the group's small cans; don't fill more than half full. Add two tablespoons of the crushed fruit or the strawberry jam and have children replace the lid.
5. Ask them to place this small covered can into the large covered can.
6. Ask one member of each team to bring the large coffee can with the small can inside to a central location. Have the group representatives add crushed ice, then a little rock salt, more crushed ice, then another layer of rock salt, until the space between the small and large can is filled.

7. Instruct the group members to replace the plastic lid on the large can and then return to their work areas.
8. Have the teams roll the can from team member to team member for approximately 20 minutes. You may wish to play some marching music or other rhythm while they are rolling the can. The teams could also count the number of times in 20 minutes that they rolled the can.



9. After 20 minutes have the teams set the large can upright, remove the lid, and then carefully remove the lid of the smaller can. Have one person check the liquid in the smaller can. It should now be of ice cream consistency.
10. If the liquid is not firm enough, instruct the group to add more ice and salt and to continue rolling the can for 10 more minutes. Then check it again.
11. After the liquid has changed into ice cream, have it divided equally among the team into smaller serving cups.



Tip
Before
tasting
ask if
anyone is
allergic to ice
cream. Some
children will
really like the
ice cream and
some might be
allergic to it.



**FACT!
RECYCLING
A GLASS
BOTTLE SAVES
ENOUGH
ENERGY TO
LIGHT A 100
WATT BULB
FOR 4 HOURS!**



**FACT!
MOST
BOTTLES
AND JARS
CONTAIN AT
LEAST 25%
RECYCLED
GLASS. GLASS
NEVER WEARS
OUT; IT CAN
BE RECYCLED
FOREVER!**

12. After everyone has finished eating their newly formed solid (ice cream), have them clean up the area, dump out the water, ice, salt mixture, throw away garbage, and wipe the area. Be sure to wash out the cans and spoons for use again. Return all of the supplies to a central location.

Developing the Concept

You might want to use the questions below to help the children share their observations and experiences. This will help them to develop a better understanding about how substances can change by doing different things to them and by subjecting them to different situations.

- What happened to the cream?
- What do you remember about the ice and salt? Was there as much ice and salt when we finished as when we began? Where did it go?
- What do you imagine happened to the liquid cream?
- Have you ever seen a liquid turn into a solid before? What? Where? How?

Applying the Concept

- To better understand the concept, look for items in the freezer and refrigerator sections of the grocery store.
- Test the different temperatures with your hand. Are the areas different? How?
- Investigate your home freezer. Put different liquids into the freezer in a container. Predict

how long it will take for them to freeze or change from a liquid into a solid inside the containers.

- How accurate were your predictions?

Applying the Concept at Home and in the Community

- Share your findings from the *Eat or Not* session with a family member or friend.
- Explain the changes that you observed in these activities.
- Make ice cream for an older person or neighbor and share it with them.
- Teach someone else about changes.

INVENTING

Approximate Time Required for Session: 1¼ to 1½ hours

Purpose

- To learn about how materials that are purchased or found for one use can be used for an entirely different purpose.
- To uncover ways of creating games using a pre-determined list of materials (recycling products for another use).
- To find options to buying prepared, packaged games.
- To create a new way to reuse a product in a different way.

Overview of the Day's Activities

In this session the children will discuss the uses for a pre-determined list of materials. Then they will use their imaginations to develop the materials into a game that may be played with a group.

Children will first take a set of cards that have been preprinted with recycled items on them, color them in, cut them apart, and learn the rules to play a connecting game.

They will invent a new game with a group of other children, which will enhance their teamwork skills; recycle prior knowledge that they have acquired of purchased, packaged games; share their recycled knowledge with another person; and reinvent another use for the reusable materials. They will also reuse their ability to recreate.

Background Information

This unit will continue the focus on reuse by encouraging the children to develop new games using recycled goods. Native Americans and many other cultures have played simple rock, stick, and string games for many years. They have used materials that were in the environment for another reason, and have created a game or a form of amusement. Many of these games or tasks were used by the adults or elders to develop and teach life skills (self understanding, social interaction, decision making, learning to learn, and mastering skills) to children.

Many of the objects that we use in our daily lives, such as light bulbs, television sets, CD players, and pencils, were all invented by a person who had learned to look at an item and to work on ways to improve it or to make it easier for others to use. All of the games that are now sold at the store were invented, too. This session is an opportunity for each child to discover the inventor in each of them.

Presentation Notes

ACTIVITY A

CONNECTOS

Time Required

30 minutes

Suggested Grouping

3–5 children per group

Materials You Will Need

- Card stock 8 2" x 11" – 3 sheets per child
- Color crayons, pencils, markers
- Scissors
- Envelopes or rubber bands

Getting Ready

- ❶ Take the master for the playing pieces and photocopy each one on a sheet of card stock for each child. (Try to reuse card stock that was used for another project if possible.) (There are three masters for each person.)
- ❷ Collect enough crayons, pencils, and markers so that each group has adequate coloring implements.
- ❸ If the age of the group is too young to cut out the cards, cut the cards apart and place each set in an envelope or rubber band each packet together.
- ❹ Review the rules (see page 37) for playing and check that there is an adequate space for each group to have a clean playing area (either floor or table).

ACTION

1. Explain to the children that they will each be receiving an envelope or packet containing 3 sheets of card stock or 18 cut-out card pieces. (If reusing card stock have the children draw an X on the wrong side.)
2. Ask them to cut apart the cards with a scissors on the dotted black lines around the outside of each picture (if this has not already been done for them). Do not cut the card in half on the bold line that divides each card. (Show an example.)
3. After all of the cards (18) have been cut apart, ask each child to find a card that looks like one you are showing them. Read the word on the bottom, and as they find the correct match, have them hold up the card for an OK. If they do not match your example card, give more clues to making a match, like the picture is of a bottle and the word begins with *B*.

Do this with several of the cards to practice the words and the pictures for the group. Then ask each child to color in the picture and to trace the word with a colored pen, marker, pencil, or crayon.
4. When all of the children have completed the coloring task, have them place their game pieces together; clean up the coloring area and paper scraps; and then reassemble as a large group in a set location.
5. Divide the large group into small groups of 4 to 5 members for game play.



The Game Rules

- a. Each group member will bring their own game pieces to their game group. The total number of pieces for each game group should be 36. So, if there are three players, each will use 12 of their own game pieces. If there are two players, each would use 18 of their own game pieces. If there are four players, each will use 9 of their pieces.
- b. Now, each group should turn the pieces face down (picture/word side down) on a flat surface. All of the members in the group should help.
- c. When all of the pieces are face down, play may begin. Have one child gently mix the game pieces into a pile.
- d. To determine who plays first, each child in the group counts aloud: 1,2,3.
- e. On 3, each player puts up 1 through 5 fingers on one hand.
- f. First, determine if the higher or lower number is first and announce that the play shall be from right to left or vice versa. (Be prepared to explain right and left at this time, if necessary.)
- g. The first player will then select a card and turn it over (picture side up) on the playing surface.
- h. The next player then chooses a card from the middle pile of cards. If this card matches either the picture or word on the first card played, the player puts the picture or word to the matching one, either end, to end, left to end, or right to end, etc.



**FACT!
IF YOU'RE
AN
AVERAGE
AMERICAN, IT'S
GOING TO
TAKE 465
TREES TO
PROVIDE YOU
WITH A
LIFETIME OF
PAPER.**



**FACT!
ONE
QUART OF
OIL HAS THE
POTENTIAL TO
POLLUTE ONE
ACRE OF LAND
1 INCH DEEP!**

- i. If no match is made, that card piece is placed back (face down) in the middle of the pile of cards, and the turn then passes to the next player.
- j. The playing continues until the last card is played and matched successfully. The last player who matches, wins.
- k. If one of the groups finishes before the rest, ask them to play the game over again.

SCIENCING

1. After each group has played the entire game, have each child pick up their own game cards, and if time permits, have the groups play another round of the game.
2. The children can add to their game pieces and make new cards with their own designs by cutting out pictures and words from old magazines and gluing them to cardstock pieces. Use recycled cardstock or the inside of old greeting cards to make new game pieces.
3. Hold a discussion with the group about the rules for the game that were read to them. Ask if they followed them exactly as they were read. Did they change the rules of their own game? Did they take the original rules and change them to do something else (taking a rule, reusing it in another way)? Did they recycle or reuse anything in making this game or playing it?
4. Ask if it was necessary for the game group to talk or discuss any of the rules or game play. Why did they have to talk or discuss the game? (Did everyone hear and understand the rules the same way?) When people hear things, do they all hear the same group of words and understand them all the same?



**FACT!
IF YOU'RE
AN
AVERAGE
AMERICAN, IT'S
GOING TO TAKE
465 TREES TO
PROVIDE YOU
WITH A
LIFETIME OF
PAPER.**

Did anyone in the group reuse or reinvent this game in a different way from how it was originally designed to play? Ask them to tell the group the original rule and how they understood it.

5. Give the children an opportunity to share their ideas for adding or changing their game cards or playing the game.

Presentation Notes

Applying the Concept

1. Have the children cut out or draw pictures on blank (recycled) card stock game cards. Suggest that they change the color of the card stock if they are having difficulty identifying their game pieces from the large group pile.
2. As the children become more familiar with the game, have them adapt the rules (reuse the original rules by changing them) and then share the new rules with another person or group. *(Social interaction and decision making)*
3. Have the children add to their Connecto sets and share the game with a family member or friend. *(Social interaction and mastering physical skills)*
4. Have the children play a game of solitaire Connectos with their game pieces and use the game as a memory game. (If they miss three matches in a row, the game is over and they start the game over again.) *(Self understanding and learning to learn, mastery)*
5. Have the children keep a record of how many times they change the rules or the playing pieces. Have them share their records with the other children. How many times did they recycle or reuse the original game rules in a set number of days? *(Mastering skills, adaptations, learning to learn, and social interaction)*

Presentation Notes

ACTIVITY B

GAMES USING RECYCLED MATERIALS

Time Required
50–60 minutes

Suggested Grouping
2–4 children

In this activity, the children will each be given a minimal amount of each material, and, along with two to three other children, will invent a new game or games using these pieces. After the games are invented, children will play their game for a while; then they will join another group and play the other groups game.

Children will also learn to make simple rules for their game and learn how to explain their game and rules so that another team can play it.

Materials You Will Needs

- Small stones or pebbles of various sizes — 3–5 per group of 4 children
- Small sticks or twigs of various sizes — 5–7 per group of 4 children
- Pieces of yarn or string of various lengths
- Recycled sheets of paper 8 ½” x 11”, one side blank
- Marking pens — various colors
- Bottle caps
- Bread bags with twist ties
- Buttons
- Beans (large size)

Getting Ready

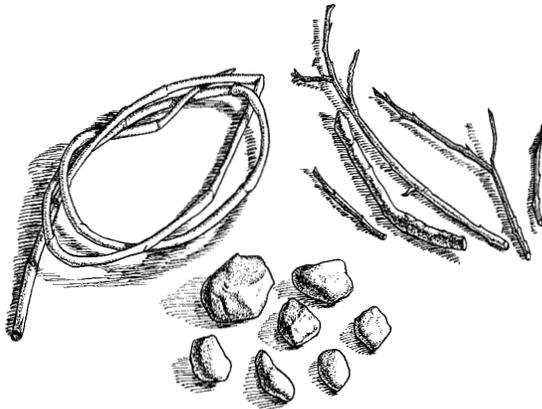
- ❶ Collect all of the supplies needed. Be creative and gather enough so that there are extras.

- ② Place enough of the materials for each group in separate plastic or paper bags.

Introduction

Below are some sample questions that you may want to use when introducing this activity.

- What is a game? What is one of your favorite games?
- What makes a game fun?
- Tell us about a game that you have enjoyed playing recently. Can you tell why you enjoyed playing the game? Did you play the game alone or with others?
- Do you have a favorite family game? How many of you have played a game or games like this? Did your family invent this game? Did they buy or receive the game as a gift?
- What would make a game boring? Why wouldn't you play a game again?
- What does it take to make a game? Create a list of examples that make a game a game, such as rules and strategies.
- Why are we reusing materials for game pieces and boards?



ACTION: OBSERVING, COMMUNICATING, AND COMPARING

1. Explain to the group that today they will be inventing a game using only a few simple materials.
2. They will be working in a small group of two to four children to invent their game. Take time to divide the group into groups of two to four children.
3. Explain to the children that the game may be as simple or as complicated as they agree upon. For example, it can be as simple as sizes, shapes, colors, etc.
4. Pass out one materials bag to each group.
5. Ask each person to pick a single item from the paper or plastic bag. This will be their contribution to the future game.
6. Explain that each group will now work as a team to invent a game using the four pieces they have selected. They may use all of the materials if they choose.

Then instruct the groups to each find a location within the room that is comfortable and has enough room for them to create and play their game. (If the group consists of younger than eight- year-olds, an older youth or teen will need to assist the group of younger children.)

7. While they are inventing their games, walk around to the different groups and assist where needed. Encourage the groups to work as a team and to create rules for their game.
8. After about 10 minutes, direct the children to play one round of their game among themselves

in order to try it out or experiment with their invention. Give the groups about 5 to 7 minutes to play their game.

9. When playing seems to be slowing down, have two players from each group move to the group either on their right or left so that at least one of the original players is remaining and two are moving. If there are only three to a group, one remains and two move. Encourage the children to be supportive of their new group game leaders and play by their rules.
10. If time allows, move two players again. Everyone should be given the opportunity to move at least once to experience a new game.
11. Then, ask the groups to collect their game pieces and to come into one large group.
12. The teens should attempt to compile a booklet with the names of the games invented. Include the instructions, rules, inventors' names, and the date for later reference. (It may take a little extra time to gather all of this data, but recording it in some form is important for documentation and also to record the day's activities and outcomes.)

This information may be used at a later time or date to reuse or recycle the games, rules, information, etc. This will keep a record for the group of all the inventing that took place on this session time.

Developing the Concept

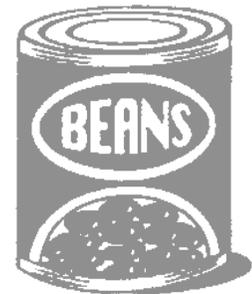
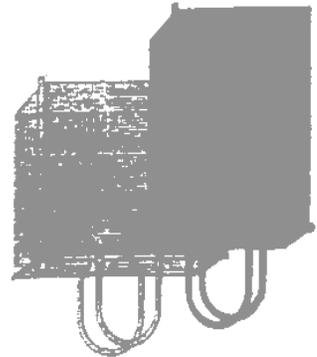
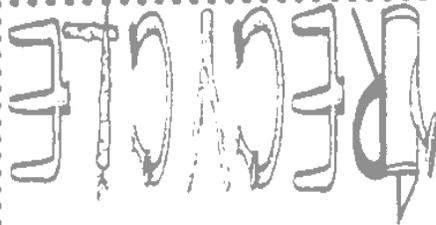
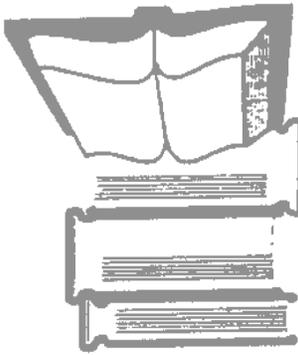
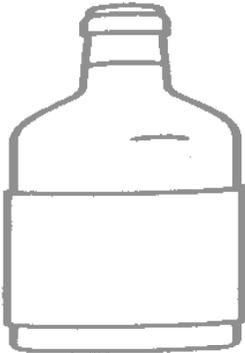
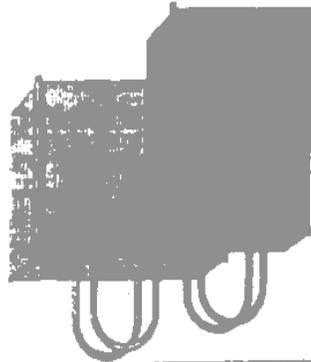
You might want to use the questions below to help the children share their observations and experiences. This will help them to develop a better understanding of how reusing materials can be fun and also a learning experience.

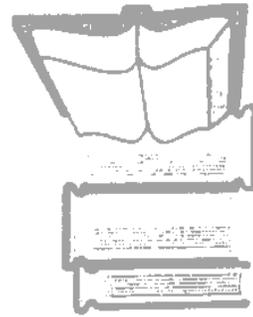
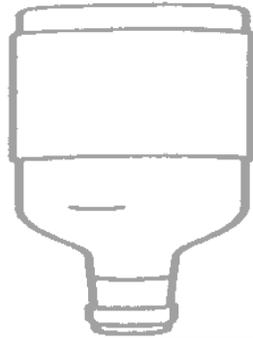
- What supplies did you use for your game?
- How many pieces did you use?
- Were any recycled or reused items used? What were they?
- What were some of the rules that you invented for your game?
- How are purchased games and the games we just invented different (or the same)? (Have the group discuss new articles and packaging.) (Discuss why an inventor would package a game for sale and the amount of product that is put into a new game and its packaging.)
- How are these new games from today different from other games? (Discuss reusing and recycling used materials.)
- Did every game have the same rules? Why did some games have different rules?
- How did the group decide on the rules for their first game?
- Did anyone play the same game twice? Did you play the game exactly the same, including the rules, as the first time it was played? (Talk about reusing rules in different ways or possibly reusing game pieces in ways other than originally planned.)

- What made a game fun to play?
- What made a game hard to play?

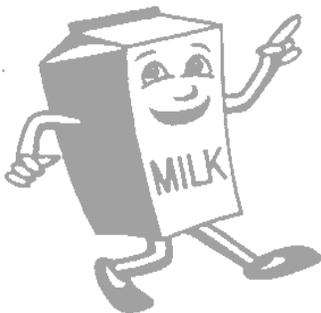
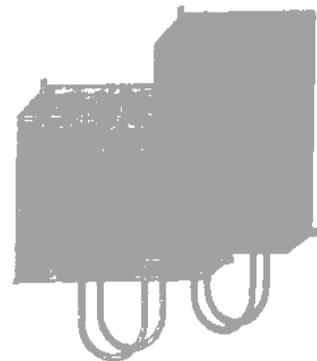
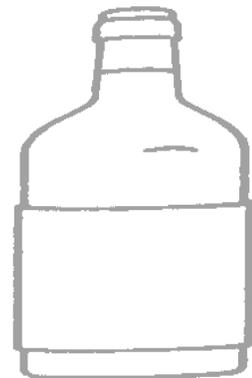
Applying the Concept

- Have the children look at some of the games that their family has at home. Talk with their family about these games and find out how often they are played. Share your game with someone in your family or friends at school.
- Ask the children to invent a new game to share with their family or friends.
- Ask the children to take a game that they already have played a lot and change the rules or the playing pieces. Change or reuse the rules in a different way. Have the children share this new game with a family member or friend.



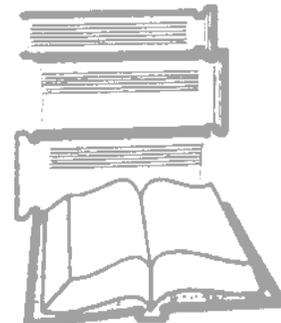
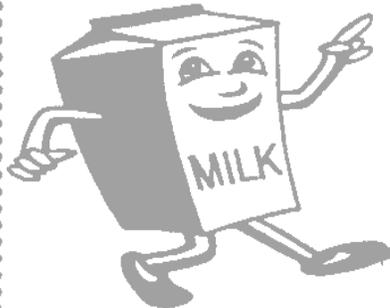
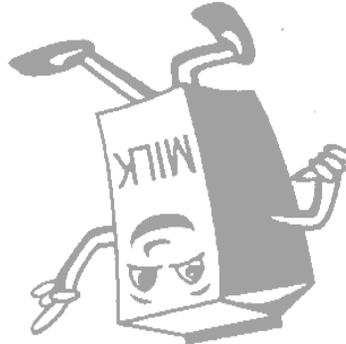
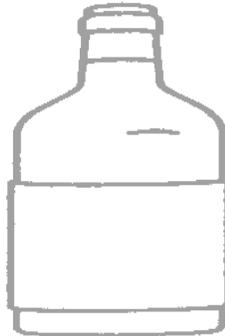
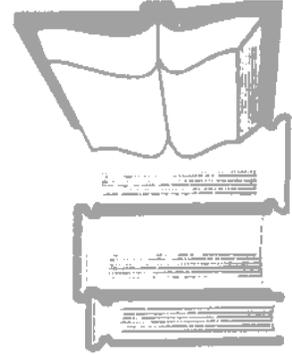
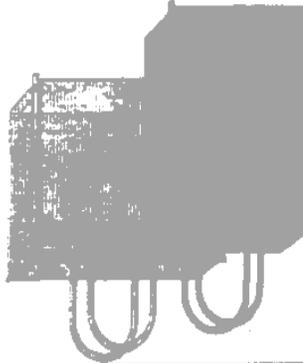


RECYCLE



RECYCLE





RECYCLE – RECOVERY

Approximate Time Required for Session: 1¼ to 1½ hours

Purpose

- To develop a list of discarded materials to recycle and recover.
- To use the processes of science and develop problem solving skills.
- To design a piñata that reflects an image of something related to this unit.

Overview of the Day’s Activities

In this session, the children will be making a piñata. The session also includes packaging a Recyclo-Saur-Us egg to keep it safe. This final activity will be a chance to complete the Recyclo-Saur-Us mural depicting the life and times of the Recyclo-Saur-Us family.

Background Information

In this session, the children will begin the process of making a piñata for their final celebration. The first activity involves building something that will be used in the group and family celebration. Another activity has them again discover and build a second Recyclo-Saur-Us. Remember to save some time for early arrivals or children who have finished parts of the activities to work on the mural.

ACTIVITY A**RECYCLO-SAUR-US EGG
PIÑATA****Time Required**

30 minutes

Suggested Grouping

5–6 children

In this activity, the children will design and build a piñata that represents a Recyclo-Saur-Us egg for their re-celebration at the conclusion of this unit.

Materials You Will Need

- Large mixing container (an old dish pan, large plastic bucket, etc.)
- Flour (amount varies according to the size of the piñata being built) **or** wallpaper paste
- Water (amount varies according to the size and the amount of flour used)
- Mixing utensil, such as a large spoon or fork
- Measuring cup — 1 cup size
- Large balloon (one that will get as big as a basketball)
- Paper pulp, such as brown grocery bags, paper towels, newspapers, or recycled paper
- String or yarn

Getting Ready

- ❶ Gather all of the materials that are needed.
- ❷ Tear or cut paper into strips about 1" wide and about 4" long (measurement does not have to be exact).

Introduction

Below are some sample questions that you may want to use when introducing this activity.

- What is a piñata?
- What is a piñata used for?
- What do you imagine that a *Recyclo-Saur-Us* egg might look like?

ACTION: OBSERVING AND COMMUNICATING

1. Ask the children to gather around and then describe the action as you do it. In the mixing container, combine 3 parts of water with 1 part of flour. (The necessary amounts of each depends on the amount of mixture that will be needed; for example, 3 cups of flour to every 9 cups of water.) **Or** follow the directions on the package to make wallpaper paste.
2. With the mixing utensil, stir the water and flour mixture. Continue to stir until the mixture has reached a smooth, pasty consistency.
3. Ask for a volunteer to inflate the balloon to its maximum state and tie off the end. Have a volunteer tie a piece (length will vary) of string or yarn to the tied end. This will be used as a hanging piece for your piñata.
4. Ask each child to dunk the strips of paper into the mixture, wiping off any excess. They should take turns using the mixture container.
5. As the children finish dunking their strips, have them begin applying the strips of paper to the balloon until it is completely covered with one layer. Continue this process until there

are 5 to 8 layers. String or yarn should not be covered.

- 6. Explain that they will now have to allow the covered balloon to dry. Complete drying may take several days.

Presentation Notes



**FACT!
WHEN
BURIED,
SOME
PLASTIC
MATERIALS
MAY LAST
FOR 700
YEARS!**

ACTIVITY B

THE RECYCLO-SAUR-US EGG DROP

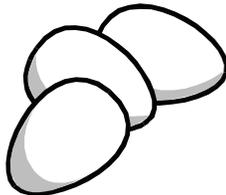
Time Required
30 minutes

Suggested Grouping
2–3 children

In this activity, the children will take a Recyclo egg (small, water-filled balloon) and create a packaging design so that when the egg is dropped from a certain height it will not break. It is assumed that Recyclo-Saur-Uss laid the eggs, and because it is not known from what height these eggs were dropped, it will be a challenge for the children to develop a plan to accomplish this feat.

Materials You Will Need

- Ladder, chair, or step stool
- Balloons, small sized – 1 for each team of 3 children
- Water to fill balloons $\frac{1}{2}$ full
- Recycled Styrofoam packing pieces
- Tissue paper or recycled (used) paper
- String
- Masking tape – 1 roll
- Recycled pieces of paper
- Brown bags, used
- Paper towels
- Old newspapers (for packing and cleanup)
- Zip-lock bags, quart size – 1 for each team
- Wash tub or large container
- Plastic soft drink bottles – various sizes



Getting Ready

- ❶ Gather all of the materials that are needed.

- ② Fill the balloons $\frac{1}{2}$ full with water.
- ③ Tie end of balloons so water does not leak out.
- ④ Check all balloons for water leaks.

Introduction

Below are some sample questions that you may want to use when introducing this activity.

- Have you ever seen an egg? What size are they? What do they look like?
- What happens when an egg is dropped?
- Is there a way to drop an egg and not have it break?

ACTION: OBSERVING AND COMMUNICATING

1. Explain to the children that they are going to act as scientists to develop a plan to protect and package a Recyclo-Saur-Us egg so that when it is dropped it will not break.
2. They will be working in teams of three to design protection for their egg. Show them an example of a Recyclo-Saur-Us “egg” (the $\frac{1}{2}$ -full balloons).
3. Divide the group into teams of three and give each group an “egg.” Explain that their task is to keep the “egg” from breaking. Have them take a few minutes to discuss how they are going to design a package to protect their “egg.”
4. Have the teams come to a central location to look over the recycled items that are available to design their package.
5. Each team should take about 15 minutes to make their package around their egg. Walk

around the room to guide and assist, as necessary.

6. After the teams have completed their packaging, set up a step stool, ladder, or sturdy chair. Have one representative from each group bring their egg to the drop site. With the rest of the group looking on, have them drop their egg into a wash tub or large container.
7. As eggs are dropped, discuss the different packaging designs and why they worked or didn't work.



FACT!
IF YOU LINED
UP ALL THE
POLYSTYRENE
FOAM CUPS MADE
IN JUST ONE DAY,
THEY WOULD
CIRCLE THE
EARTH!



Developing the Concept

You might want to use the questions below to help the children share their observations and experiences.

Record their findings on newsprint.

- How did the egg behave when you dropped it?
- What packaging worked? What were the designs that were used?
- What packaging didn't work? What were the designs used?
- What would you do differently if you did this activity again?

Applying the Concept

- Discuss with the children ways that packaging protects items.
- Discuss the way that some items are over-protected and what is done with this packaging when it is removed.
- Investigate with the children items that are over-packaged and bring in some ideas to decrease the amount of packaging.

Applying the Concept at Home and in the Community

- Ask children to share your findings about packaging designs with their family or a friend.
- Show a friend or family member how to package or protect an egg so that it will not break when dropped. Share what you have learned.
- Work with a family member or friend on trying different ideas and designs for packaging and protecting an item.
- How can we recycle or reuse packaging materials?

ACTIVITY C

ADDING TO THE RECYCLO FAMILY (OPTIONAL)

Time Required

20–30 minutes

Suggested Grouping

whole group

In this activity, the children will dig for the buried remains of yet another one of the Recyclo-saur-us family (to be made up of the recycled materials brought in by you and the children at the beginning of this day).

After discovering their find of a new member of the Recyclo-Saur-Us family, the group will assemble the pieces to recreate the newest Recyclo-Saur-Us. Then the group will complete the guided story for the family history book. This will be the new member of the family in the book.

Materials You Will Need

- A 15- to 18-gallon plastic tub with lid, or a large cardboard box, (probably the one you used in *Session 1*)
- Styrofoam packing peanuts, or other packing materials (enough to fill the tub or box $\frac{3}{4}$ full)
- Recycled items brought in by the children (homework from the previous session)
- Glue
- Masking tape
- String, wire, or pipe cleaners
- Large newsprint pad
- Colored markers
- Guided Story for Recyclo-Saur-Us* (see page 60)



Tip
In case the children forgot, you might want

to bring in more materials similar to the ones you brought in for Session 1 (pieces of chicken wire, newspapers, cups, clean cans, rubber bands, paper, straws, food wrappers, worn out clothes, empty, clean bottles, soda containers, etc.) plus some new items such as cardboard wrapping paper or paper towel tubes. A whole bunch of stuff should be around by now!

Getting Ready

1. Gather all of the supplies and materials needed.
2. Check to see that there is enough work area for all of the teams.

Introduction

Below are some sample questions that you may want to use when introducing this activity.

- Have you ever heard of different types of dinosaurs? What were they? What did they look like? Have you ever seen one?
- What is a *family*?

ACTION: OBSERVING, COMMUNICATING, COMPARING, AND ORGANIZING

1. Explain to the children that they are going to again take the role of an archeologist and dig to find the remains of one of the Recyclo-Saur-Us family that has been buried in the plastic tub or box.
2. Explain that some of the pieces they find may not be a part of this Recyclo-Saur-Us.
3. They will then work as a group to put the uncovered pieces together to make this Recyclo-Saur-Us family member.
4. Ask each child to come to the “site location” and to dig for a piece of the newest Recyclo-Saur-Us.
5. Each child should work with the group to determine how their piece will become part of the Recyclo-Saur-Us. The children can identify the part and where it might be located.

6. Appoint one or two lead archeologists to guide the group.
7. As the group is sorting and assembling their pieces, encourage them to discuss their piece and what it was before.
8. Ask the children to bring some clean recyclable items to the next session to be used as parts for making additional Recyclo-Saur-Us family members. You may want to brainstorm with the children about what types of things they might bring to become part of the next Recyclo-Saur-Us.
9. Allow the children time to work on their Recyclo-Saur-Us mural.

Note: Insert the word/name provided by the group into the story. Copy the story outline (below) onto a large piece of newsprint before beginning the guided story.

GUIDED STORY FOR RECYCLO-SAUR-US

We have made another scientific discovery. We dug for recycled objects in our large container, and we combined all of our finds to create our *Recyclo-Saur-Us* that we have named _____.

It is _____ feet tall and probably weighs about _____.

It lives in _____. The family (last) name is _____.

Some of the items that it eats are

It eats _____ times per day, and about _____ pounds of food each day.

For entertainment, it likes to

Some other important information about it is

Have all of the children draw a picture of *Recyclo-Saur-Us* after completing the guided story about it and its habitat. They may want to draw a picture of it in the *Recyclo-Saur-Us* mural before they leave, or before the next session.

RE-CELEBRATION

Approximate Time Required for Session: 1½ hours

Purpose

- To plan an event for a Family Activity Night celebration.
- To complete and decorate a Recyclo piñata for the Family Activity Night.
- To investigate and experiment with different foods that undergo a change before they are eaten.

Overview of the Day's Activities

In this session, the children will begin planning for the celebration. Family Activity Night is an integral part of this unit. The activities are designed to bring together all the previous activities and knowledge that has developed in this unit. Children will plan a celebration to include food items that change from one form to another.

Background Information

The children have participated in activities that were designed to develop a sense of invention and problem solving. They have examined cycles, recycling, and reusing through inquiry and cooperative learning. They have applied what they have learned in their homes and communities. It is now time to reflect and re-celebrate what they have learned and to share their excitement and enthusiasm with their families.

In this session, children will complete and decorate the piñata created in *Session 5* and then fill it. They will plan a celebration using food that changes when prepared. The site teachers should be included in the planning of the re-celebration as it should be held at a time when the families of the children can attend. Care should be taken to alert children about the food so if allergies are known, children don't consume the item. Site teachers and children will be aware of known allergies to milk, nuts, etc.

ACTIVITY A

COMPLETING THE RECYCLO-SAUR-US PIÑATA

Time Required
20 minutes

Suggested Grouping
whole group

In this activity, the children will finish and decorate their piñata for the re-celebration. The piñata should be decorated with recycled materials and colors. Be creative. It should also be filled with recycled prizes that each child can bring from home. Small items that may have come in a “Happy Meal” or some other small toy could be someone else’s treasure.

Materials You Will Need

- Recycled buttons, string, yarn, fabric scraps, leftover supplies from previous sessions, assorted scraps of paper, beans, rocks, twigs, milk carton tops, plastic ware, etc.
- Paint, markers, and crayons used in previous sessions
- Scissors
- Tape
- Glue or paste



Getting Ready

- ❶ Gather all of the needed supplies and materials.
- ❷ Check to see that the piñata is dry and ready for decorating.
- ❸ Prepare the work area.

Introduction

Below are some sample questions that you may want to use when introducing this activity.

- What steps did we follow to make the piñata?
- How did the paper feel when it was wet?
- How do you think the paper feels now that it is dry?
- Why did we have to wait for the piñata to dry before decorating it?
- Could we have decorated it when it was wet?
- How do you think we should decorate the piñata?

ACTION: OBSERVING AND COMMUNICATING

1. Ask the children to gather around a central work area to decorate the piñata.
2. Cut a flap in the bottom of the piñata, about the size of your fist, so that items may be inserted into it after decoration. Be sure to leave one side of the flap attached to the piñata, so that it can be taped closed when all of the items are inside.
3. Discuss what items should be put on the piñata first, then next.
4. Have the children discuss the decorating of the piñata. Have each child select two or three items to decorate the piñata.
5. Take turns having the children put their decorations on the piñata.
6. After each child has had two turns, have the group stand back and look over the piñata.



**FACT!
AMERICANS
USE 4
MILLION PLASTIC
BOTTLES EVERY
HOUR! YET ONLY
1 BOTTLE OUT OF
4 IS RECYCLED!**

7. Ask them to identify areas of the piñata that still need to be decorated. Depending on the area remaining, tell the children how many turns they have left to decorate.
8. Move the piñata to a safe, clean area and clean up (or recycle) the remaining supplies.



Developing the Concept

You might want to use the questions below to help the children share their observations and experiences.

- How did taking turns work in decorating the piñata?
- What do you think would have happened if everyone had decorated at the same time?
- How do think the piñata turn out after decorating it?

- What other recycled supplies could we have used to decorate it?
- Why was it good for the environment that we used leftover and recycled supplies?
- Do you think we could call our piñata a Recyclo-Saur-Us?
- What would you do differently in making a piñata another time?

Applying the Concept

- Discuss with the children ways that piñatas are like packaging or presents.
- Discuss other recycled supplies that could be used to make a piñata or another party item.

Applying the Concept at Home and in the Community

- Ask the children to share with their family and friends how they made the piñata.
- Have them show a friend or family member how to make a piñata at home using recycled materials found at home.
- Ask children to work with a friend or family member to design and decorate a piñata for a family or community event.
- Investigate the history of the piñata and share it with their family or classmates.

ACTIVITY B

PLANNING THE RE-CELEBRATION

Time Required
20 minutes

Suggested Grouping
whole group

In this activity, the children will plan a party for their family and friends. They will take food products that are purchased in one form, examine their packaging, and then change the food into another form for consumption. They will also discuss how the packaging of items could be reduced and how they could help in reducing the amount of waste to landfills.

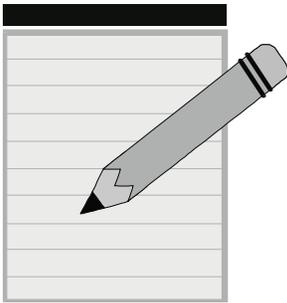
Children will also plan the re-celebration with the piñata and a display of many of the items that were completed in this unit.

Materials You Will Need

- Newsprint
- Dark markers
- Assorted sheets of paper
- Pencils or pens

Getting Ready

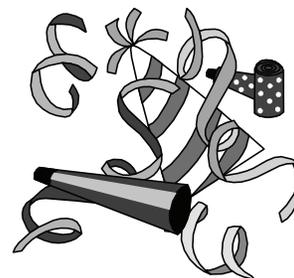
- ❶ Gather all of the needed supplies and materials.
- ❷ Choose a date and time (after consulting center staff) for the re-celebration.
- ❸ Prepare the work area.



Introduction

Below are some sample questions that you may want to use when introducing this activity.

- What is needed for a celebration?
- Who should we invite besides our families?
- What food should we bring?
- What should we have to drink?
- What should we use to display and then serve the food?
- How many of each item will we need?
- Who will volunteer to bring these items?



ACTION

1. Who should be invited to the celebration?
2. How will these people be invited?
3. Plan an agenda or schedule for the event. Schedule the piñata breaking and assign each child one area to host, to answer guests' questions about the display.
4. Plan the food, celebration, and cleanup.
5. Discuss the menu for the re-celebration. The food and drink items should be ones that change when prepared, e.g., Jello from liquid to solid; pudding powder from liquid to solid; popcorn from kernel to an edible item; peanuts into peanut butter; Kool-aid powder into a drink; coffee into a liquid drink; cookie dough into cookies; bread dough into biscuits.
6. Give each child a copy of the list and their assignment for the celebration.

7. Discuss again what all the children are expected to do and to bring. Discuss what will happen if they forget.

Developing the Concept

You might want to discuss the following to help the children share their observations and experiences. Sharing will help develop a better understanding of ways to plan a successful re-celebration.

- Ask for volunteers to tell everyone the plans for the re-celebration.
- Ask for children to find their name and what they are doing and bringing on the master list.
- Discuss the importance of sharing the re-celebration information with family members and invited guests and marking the date on a calendar.
- Discuss the consequences of what will occur if someone, e.g., cup monitor, does not bring an item.

WEE-CYCLO-SAUR-US SUPPLY LIST

Session 1 DISCOVERING A RECYCLO-SAUR-US

Activity A - The Discovery of Recyclo-Saur-Us

A 15-to 18-gallon plastic tub with lid (or a large cardboard box)
Styrofoam packing peanuts, or other packing materials (enough to fill the tub or box $\frac{3}{4}$ full)
Recycled items (pieces of chicken wire, newspapers, cups, clean cans, rubber bands, paper, straws, food wrappers, worn out clothes, empty, clean bottles, soda containers, paper towel rolls, etc.)
Glue
Masking tape
String, wire, or pipe cleaners
Large newsprint pad
Colored markers
Guided Story for Recyclo-Saur-Us
Large sheet of butcher paper for mural

Activity B - The Recyclo-Saur-Us Story and Family Mural

Newsprint — 2 large sheets
Several dark-colored, felt-tip markers
Guided Story for Recyclo-Saur-Us
Crayons and paper (plain white paper or drawing paper) for each explorer (to make a personal Recyclo-Saur-Us drawing)
Large sheet of butcher paper for the wall mural
Masking tape or push pins to hold up the mural

Session 2 RECYCLE-OR-NOT

Activity A - This Appears to Be a Space Capsule

Cornstarch — 2 16-oz boxes plus 1 extra 16-oz box
Large bowl or bucket for mixing
Old newspaper — a lot
Water
Paper towels
Newsprint
Markers (dark colors)
Plastic Zip-lock bags (snack size)
Large 13-gallon trash bag

Green food coloring, *optional*

Various clean, recycled trash items to fill bag (clean milk containers, clean cans and plastic bottles, used plastic silverware, clean used cups, old magazines, discarded boxes and packaging from products, etc.) NO GLASS!

Activity B - Read *Bartholomew and the Oobleck* (optional)

Copy of Dr. Seuss' s *Bartholomew and the Oobleck*

Activity C - Oobleck

Plastic Zip-lock bags from *Activity A* with Oobleck inside

Old newspaper – lots

Masking tape – 1 roll

Water

Paper towels

Newsprint pad

Dark color markers

Recycled plastic silverware

Paper cups – small size

Straws

Paper clips

Session 3 EAT OR NOT**Activity A - Change We Can Eat (Ice Cream)**

Coffee can with plastic lid, 1-lb or 18-oz size – 1 per 4 children

Coffee can, 3-lb size with plastic lid – 1 per 4 children

Heavy whipping cream – 8 oz (1 cup)

Sweetened condensed milk – 1 can **cold**

Milk – ½ gallon

Sugar – 1 cup

Vanilla – 1 tablespoon

Crushed ice – about 20 lb

Rock salt – 1 box or 5 lb bag

Strawberry jam or fresh crushed fruit

Plastic bag – 1-gallon size

Hammer or wooden mallet

Measuring cup – 1 cup size

Dixie cup, small size – 1 per child

Plastic spoon, small – 1 per child

Container – large, 4-quart – for mixing ingredients

Can opener – hand model

Session 4 - INVENTING

Activity A - Connectos

Card stock 8 2" x 11" – 3 sheets per child
Color crayons, pencils, markers
Scissors
Envelopes or rubber bands

Activity B - Games Using Recycled Materials

Small stones or pebbles of various sizes – 3–5 per group of 4 children
Small sticks or twigs of various sizes – 5–7 per group of 4 children
Pieces of yarn or string of various lengths
Recycled sheets of paper 8 ½" x 11", one side blank
Marking pens – various colors
Bottle caps
Bread bags with twist ties
Buttons
Beans (large size)

Session 5 - RECYCLE-RECOVERY

Activity A - Recyclo-Saur-Us Egg Piñata

Large mixing container (an old dish pan, large plastic bucket, etc.)
Flour (amount varies according to the size of the piñata being built) **or**
wallpaper paste
Water (amount varies according to the size and the amount of flour used)
Mixing utensil, such as a large spoon or fork
Measuring cup – 1 cup size
Large balloon (one that will get as big as a basketball)
Paper pulp, such as brown grocery bags, paper towels, newspapers, or
recycled paper
String or yarn

Activity B - The Recyclo-Saur-Us Egg Drop

Ladder, chair, or step stool
Balloons, small sized – 1 for each team of 3 children
Water to fill balloons ½ full
Recycled Styrofoam packing pieces
Tissue paper or recycled (used) paper
String
Masking tape – 1 roll
Recycled pieces of paper

Brown bags, used
Paper towels
Old newspapers (for packing and cleanup)
Zip-lock bags, quart size – 1 for each team
Wash tub or large container
Plastic soft drink bottles – various sizes

Activity C - Adding to the Recyclo Family (optional)

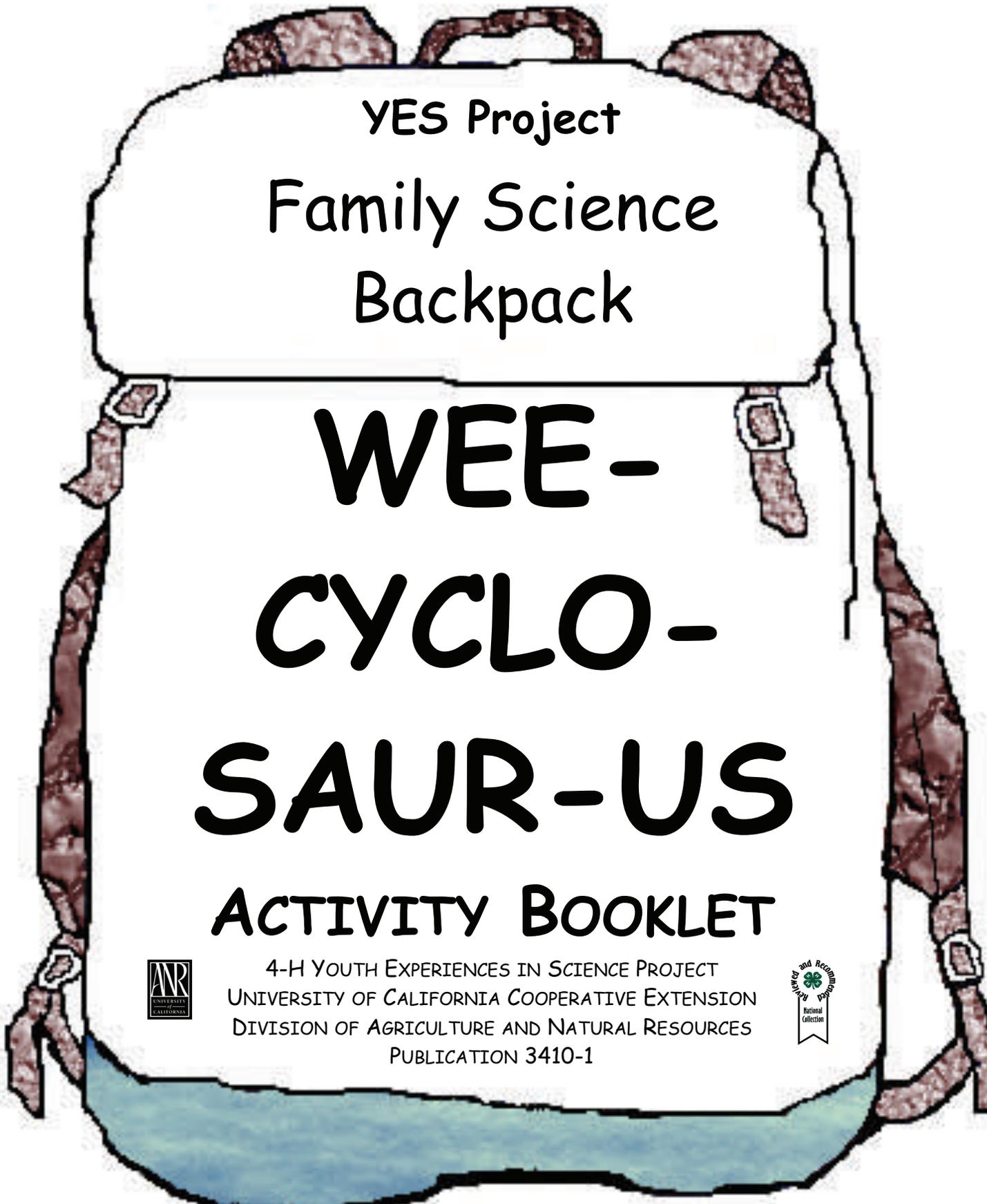
A 15- to 18-gallon plastic tub with lid, or a large cardboard box, (probably the one you used in *Session 1*)
Styrofoam packing peanuts, or other packing materials (enough to fill the tub or box $\frac{3}{4}$ full)
Recycled items brought in by the children (homework from the previous session)
Glue
Masking tape
String, wire, or pipe cleaners
Large newsprint pad
Colored markers
Guided Story for Recyclo-Saur-Us

Session 6 - RE-CELEBRATION**Activity A - Completing the Recyclo-Saur-Us Pināta**

Recycled buttons, string, yarn, fabric scraps, leftover supplies from previous sessions, assorted scraps of paper, beans, rocks, twigs, milk carton tops, plastic ware, etc.
Paint, markers, and crayons used in previous sessions
Scissors
Tape

Activity B - Planning the Re-Celebration

Newsprint
Dark markers
Assorted sheets of paper
Pencils or pens



YES Project
Family Science
Backpack

**WEE-
CYCLO-
SAUR-US**

ACTIVITY BOOKLET



4-H YOUTH EXPERIENCES IN SCIENCE PROJECT
UNIVERSITY OF CALIFORNIA COOPERATIVE EXTENSION
DIVISION OF AGRICULTURE AND NATURAL RESOURCES
PUBLICATION 3410-1





WELCOME FAMILIES

In this Family Science Backpack, you will find lots of activities and ideas for learning about how we can recycle or reuse many of the things we often throw away. You and your child will engage in activities that involve cycles: how things are connected in cycles (e.g., *seed* > *plant* > *flower* > *fruit* > *seed*), and how reusing and recycling help fulfill cycles. You will learn the science related to recycling and reusing in a fun and interesting way. Through exploration activities, you will *observe*, *communicate*, *compare*, and *organize* information about recycling, reusing, and ultimately reducing the number of things that get thrown into landfills. Through your actions, interpretations, and reactions to WEE-CYCLO-SAUR-US activities, you and your children will create a new base of knowledge and form new questions about our environment.

For your enjoyment, and to make it easier to do the activities, we have included many of the items needed to do the backpack. Each activity has a "What You Need" section. The items that are included in the backpack have an * in front of them. Other items such as spoons, water, etc., are not included but are probably available in your home. The WEE-CYCLO-SAUR-US activities are about recycling and reusing items we often throw away, so in several activities you will be using trash...have fun with it!

WEE-CYCLO-SAUR-US FAMILY ACTIVITY BACKPACK by

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Publication 3410-1

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WEE-CYCLO-SAUR-US Safety

Exploring with reused household items can be interesting, fun, and messy. Because some of the items you will be reusing may be out of the wastebasket or garbage, we suggest that you wash those items that are dirty. *You should also caution your child in advance about safe behavior, and that not all things in the garbage or waste baskets are safe to play with or reuse.*



ACTIVITY
ONE

INVENT-A- GAME

People of all cultures have played games for many centuries.

Playing is a natural part of growing up, and games are an important part of play.

This first activity is an opportunity to reuse some things that are often thrown away. You and your child will be using your creativity to invent a game (or games) that will be fun and exciting, maybe even more fun than TV!

WHAT YOU NEED

- ◇ *The plastic bag in the backpack labeled "Invent-A-Game" that includes:
 - Pieces of string
 - Beans
 - Plastic buttons
 - 5 yogurt cups
 - Pieces of colored paper
 - Marking pen
 - Bottle caps
 - Sticks

- ◇ Your imagination and creativity!

HOW TO DO IT



-  Take the items out of the plastic bag and look at each piece carefully. Think of how this might be used in a game.
-  Talk with your child about their favorite games. Work with them to use (some or all of) the items in the bag to invent a game that you can play together.
-  Make up the game rules. We suggest that you use eight or more of the items. Write the rules down so you can remember them. We suggest that you and your child agree to make sure it is a safe game to play.
-  Make up a name for your game. Have fun playing the game you've invented.
-  After you and your child have played the game, you might invite other family members or friends to play the game, too.

QUESTIONS TO ASK YOUR CHILD

Ask open-ended questions that encourage further exploration by your child.

- ✓ *How is our invented game similar to games we have bought? How is it different?*
- ✓ *What makes this game special?*
- ✓ *Do you think we could reinvent another game using these same pieces?*
- ✓ *What other games have we invented?*



OUBLECK COMES TO TOWN

Readng together is both fun and educational. In this activity, you and your child will have an opportunity to read the Dr. Seuss book *Bartholomew and the Oobleck*, and to play with a material — Oobleck— that sometimes acts like a solid, and other times like a liquid.

You and your child can have exciting discussions about what Oobleck is, and what it could be.

WHAT YOU NEED

- ◇ **Oobleck** (*The recipe is on the next page and most of the materials are in a plastic bag in the backpack.*)
- ◇ **The book *Bartholomew and the Oobleck** (*in the backpack*)

HOW TO DO IT



-  Read the book *Bartholomew and the Oobleck* to your child.
-  After you've read the story together, you will explore Oobleck together in a hands-on activity.
-  When you're done with OOBLECK, you can put it back into the self-sealing plastic bag to use again later. If it dries out, just add a little water, and it will be as good as new. If you don't want to use it again, you can give it away to someone else, or discard it.

OOBLECK

- ◆ ** $\frac{1}{4}$ cup cornstarch*
- ◆ *2 tablespoons water*
- ◆ *bowl or self-sealing plastic bag*
- ◆ *spoon*
- ◆ **green food coloring (optional). Note: the green food coloring can stain things.*

Pour 1/4 C cornstarch into the bowl or self-sealing plastic bag. Add 2 tbsp water and mix until blended. As you blend, the mixture will change. It will flow like a liquid, but will break or crumble like a solid. You may have to add a few drops of water for the mixture to flow. Scoop some up in your hands. You have the right consistency if the mixture is liquid when cupped in your hand, but is a solid when you play with it or squeeze it.

You may want to add a few drops of green food coloring to the OOBLECK as you are mixing it, to make it look more like the OOBLECK in the story.

QUESTIONS TO ASK YOUR CHILD

Ask open-ended questions that encourage further exploration by your child.

- ✓ *What did Oobleck do when you pushed on it?*
- ✓ *Can you make it keep its shape?*
- ✓ *What else do you want to try to do with Oobleck?*
- ✓ *How is this Oobleck like the Oobleck Bartholomew found?*

NOTE: The site will need to renew the cornstarch and check the food coloring each time the backpack goes to another home.



"FINDING" A RE-CYCLO-SAUR IN YOUR HOME

You and your child are encouraged to describe your Re-Cyclo-Saur in the WEE-CYCLO-SAUR-US Journal so the next family to use the backpack has an opportunity to see what you've discovered and what other members of the Re-Cyclo-Saur family looked like *and how they lived*.

With some items from the backpack and some things from your household trash, you and your child can put together a dinosaur-like creature called a Re-Cyclo-Saur. Whatever you use and however you and your child put together the Re-Cyclo-Saur is fine. There is no right way.

WHAT YOU NEED

- ◇ ***The plastic bag labeled "Re-Cyclo-Saur activity"** that contains string, paper clips, toothpicks, popsicle sticks, buttons, bread wrapper, twists etc.
- ◇ **Some items from your household trash** - such as cardboard paper towel rolls, orange juice cans, bottle caps, pieces of paper, soft drink cans, styrofoam meat trays or other clean items you may find. Make sure they're all clean, and have no sharp edges.
- ◇ ***Scissors, string, tape, and glue** will also help you put together the Re-Cyclo-Saur.

HOW TO DO IT



-  You may want to begin this activity by asking your child if they have ever heard of dinosaurs, what they were, and what they looked like. You may want to tell them that you will be making an imaginary animal called a Re-Cyclo-Saur that, in some ways, resembles a dinosaur.
-  Put the materials from the plastic bag labeled "Re-Cyclo-Saur activity" and the clean materials you've gathered from the household trash into a paper grocery bag.
-  You and your child can take turns picking things out of the bag that will become the Re-Cyclo-Saur.
-  As the things are taken out of the bag, lay them on the table. When all the items have been taken out of the bag, talk about what part of the Re-Cyclo-Saur each might be.
-  Now begins the fun part. You and your child will create a Re-Cyclo-Saur, however you want it to look. When you and your child decide how the Re-Cyclo-Saur might look, begin gluing or taping the Re-Cyclo-Saur pieces

QUESTIONS TO ASK YOUR CHILD

Ask open-ended questions that encourage further exploration by your child.

- ✓ *How was the Re-Cyclo-Saur like a dinosaur, how was it different?*
- ✓ *How did you use your imagination to put the Re-Cyclo-Saur together?*
- ✓ *Is the Re-Cyclo-Saur a baby or an adult?*
- ✓ *How did it eat? How many times a day did it eat?*
- ✓ *For fun this Re-Cyclo-Saur likes to....?*
- ✓ *What are some important things to know about this Re-Cyclo-Saur?*
- ✓ *What story would it tell about its family?*

When you are done, you may either take the Re-Cyclo-Saur apart, keep it as it is, or add to it as you find new items for it.



ACTIVITY
FOUR

Thinking Words

Make a list using words that begin with the Latin beginning RE which means *again or anew*.

For example:

RENEW

REUSE

RECYCLE

REDUCE

REINVENT

RECHARGE

Example:

When you have finished your list of words, reuse the list of words to build a word frame.

Question: Which "re" words in the frame are not on the list above the frame?

Challenge: Try and use all the "re" words in a different word frame.

									R					
					R	E	U	S	E					
R	E	D	U	C	E				W					
					C		R	E	I	N	V	E	N	T
					Y				N					
					C				D					
					L									
				R	E	G	A	I	N					
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			R	E	C	H	A	R	G	E				
				W										

ACTIVITY
FIVE

Word Search



Find as many recycling and environmental words as you can on this page. Then after you think you have found them all, compare the ones you found to the ones listed at the bottom of the page. If you find other words related to recycling, write the YES office and tell us about it. (Solution is on page 16.)

G	E	L	D	E	N	V	I	R	O	N	M	E	N	T	O	M	R
J	L	K	S	L	M	S	H	R	T	S	B	T	S	L	U	F	E
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W	E	V	T	I	S	W	T	C	S	P	U	W	D	G	B	S	A
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A	N	T	E	O	E	S	I	E	A	S	I	S	Q	P	G	H	L
P	O	N	Q	R	D	T	K	L	T	L	U	T	R	E	E	J	E
E	I	M	U	L	U	E	P	N	L	J	S	E	L	I	G	J	E
R	T	L	W	Q	C	Y	E	K	B	O	T	T	L	E	C	A	N
R	C	O	N	S	E	R	V	A	T	I	O	N	Y	A	R	X	H
J	A	Q	S	X	P	L	Z	W	P	Y	R	P	A	R	S	K	A
N	V	K	P	R	E	S	O	U	R	C	E	S	R	T	U	V	B
H	A	L	U	M	I	N	U	M	Y	D	A	B	L	H	O	R	G

CAN
EARTH
OIL
WASTE

RECYCLE
BOTTLE
RESOURCES
PAPER

ENVIRONMENT
REDUCE
TREE
PLASTIC

GARBAGE
RENEWABLE
CONSERVATION
ALUMINUM



The Mini Space Capsule and the Trash Detectives

This activity finds you and your child playing the role of detective or scientist by investigating a "Mini Space Capsule" that's landed at your home.

WHAT YOU NEED

Actually, you will both be looking through a bag full of items you've selected from the family trash, and have made sure they are safe and clean.

- ◇ ***The Trash Detective's Sorting Grid** (you can use pages 14 & 15 of this booklet)
- ◇ ***The plastic garbage bag labeled "Space Capsule"**
- ◇ **The items you collect from your family trash that are safe and clean.** *(We suggest you start collecting these items as soon as possible, so you have an interesting assortment when you do this activity.)*

HOW TO DO IT



-  Make sure you have the Space Capsule bag filled with the items to sort and that the Sorting Grid is handy.
-  Invite your child (and other family members, if you want) to help you investigate the contents of the mysterious space capsule that landed in your home. (This is, in some ways, similar to the story of *Bartholomew and the Oobleck*.)
-  Ask your child what they think is inside the space capsule. After they have guessed a few times, open the bag and have them pull out an item.
-  Have your child place the item on one of the six categories of the Sorting Grid: *1. things that can be recycled; 2. things that can be reused in some way; 3. things that can be repaired; 4. things that can be composted, 5. things (such as excess packaging material) that can be reduced or eliminated; and 6. things that do not fit any of those categories and are trash.*
-  You and your child (and other family members) take turns selecting an item from the space capsule and identifying what they think it is and what Sorting Grid category it belongs in. Then place the item on that category of the grid. The next member can agree or disagree with the placement. They can then use their turn to replace and reidentify the item, or they can select another item.

QUESTIONS TO ASK YOUR CHILD

Ask open-ended questions that encourage further exploration by your child.

- ✓ *What can you tell about the "civilization" that sent us the space capsule? What foods do you think they eat? What do they do for fun?*
- ✓ *What language do they speak? How do you know?*
- ✓ *What tools do they use? How do you know?*
- ✓ *Which sorting grid category has the most things from the space capsule on it?*



Sorting Grid

RECYCLE

REUSE

REPAIR



Sorting Grid



REDUCE

COMPOST

TRASH



Word Search Answers



Find as many recycling and environmental words as you can on this page. Then after you think you have found them all, compare the ones you found to the ones we list at the bottom of the page. If you find other words related to recycling, write the YES office for a special YES pin.

G	E	L	D	E	N	V	I	R	O	N	M	E	N	T	O	M	R
J	L	K	S	L	M	S	H	R	T	S	B	T	S	L	U	F	E
V	F	A	Z	T	N	J	P	E	N	J	V	L	P	S	G	L	N
P	L	A	S	T	I	C	V	C	Q	G	I	T	I	K	A	T	E
S	D	I	R	O	K	A	U	Y	V	O	N	M	D	N	R	O	W
W	E	V	T	I	S	W	T	C	S	P	U	W	D	G	B	S	A
P	I	N	H	L	R	A	Q	L	N	L	Y	A	O	S	A	W	B
A	N	T	E	O	E	S	I	E	A	S	I	S	Q	P	G	H	L
P	O	N	Q	R	D	T	K	L	T	L	U	T	R	E	E	J	E
E	I	M	U	L	U	E	P	N	L	J	S	E	L	I	G	J	E
R	T	L	W	Q	C	Y	E	K	B	O	T	T	L	E	C	A	N
R	C	O	N	S	E	R	V	A	T	I	O	N	Y	A	R	X	H
J	A	Q	S	X	P	L	Z	W	P	Y	R	P	A	R	S	K	A
N	V	K	P	R	E	S	O	U	R	C	E	S	R	T	U	V	B
H	A	L	U	M	I	N	U	M	Y	D	A	B	L	H	O	R	G

CAN
EARTH
OIL
WASTE

RECYCLE
BOTTLE
RESOURCES
PAPER

ENVIRONMENT
REDUCE
TREE
PLASTIC

GARBAGE
RENEWABLE
CONSERVATION
ALUMINUM

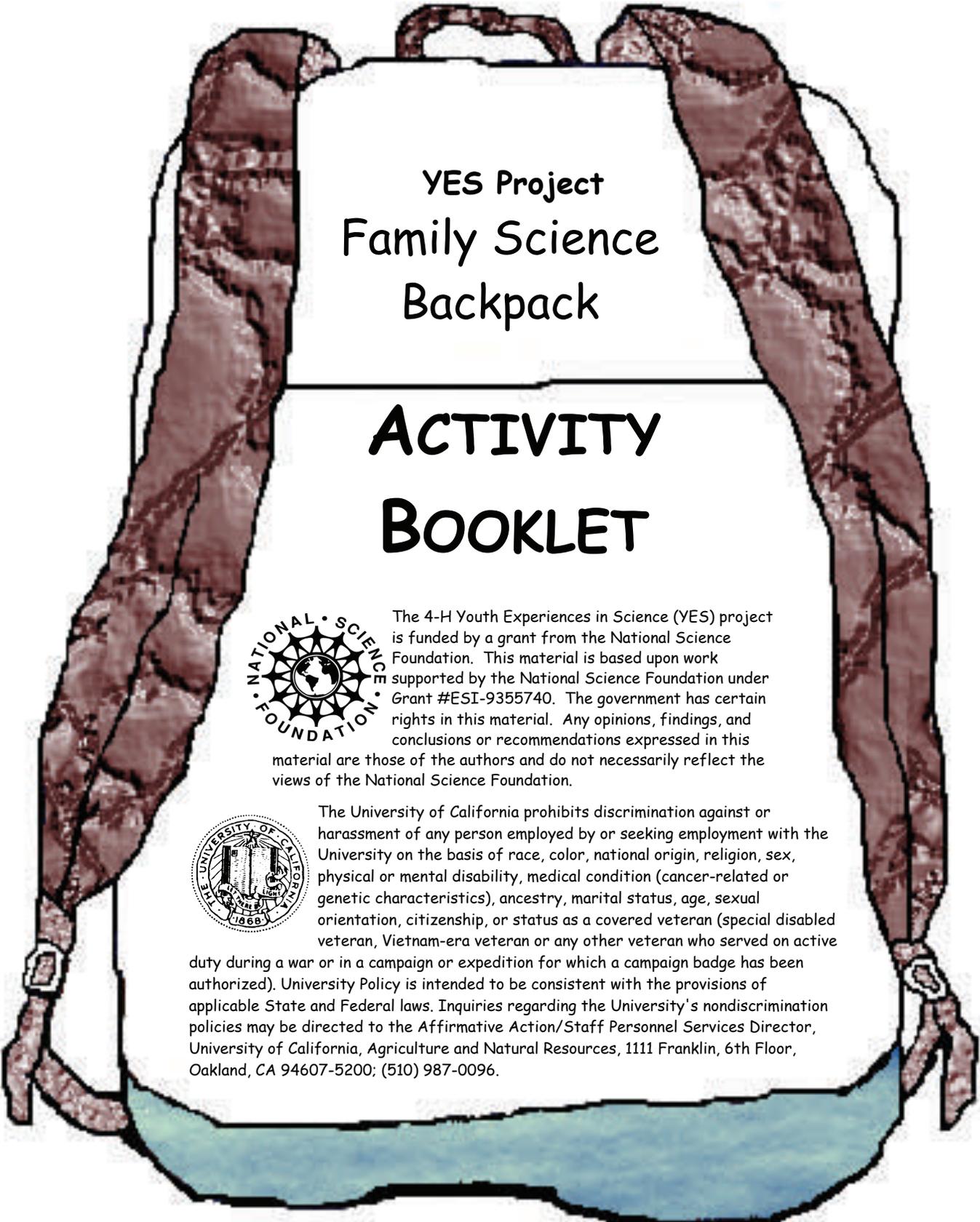
JOIN CALIFORNIA'S RECYCOOL CLUB



For lots more fun with recycling activities, the California Department of Conservation has started a RecyCool Club that is free to any young person who wants to join. To become a member, just send in the return section of the RecyCool Club brochure that is in the backpack. If there is not a RecyCool Club brochure in the backpack, ask your Wee-Cycle-Saur-US teen leader for one, or call the YES office at 530-752-8824.

As a new RecyCool Club member, the California Department of Conservation will send you several items that will provide hours of fun and interesting things to do. And you will learn more about recycling. For example, you will receive the RecyCool Activity Book, a poster, a membership card, and a refrigerator magnet. You will also be on the mailing list for new information and other things that become available.

We hope you have enjoyed using this activity book and that you fill out and return the evaluation form to help us make it better. Thank you for reusing, reducing, and recycling.



YES Project Family Science Backpack

ACTIVITY BOOKLET



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Clue

Children Looking Undercover for Energy Teen Guide



**4-H YOUTH EXPERIENCES IN SCIENCE PROJECT
UNIVERSITY OF CALIFORNIA COOPERATIVE EXTENSION**

**DIVISION OF AGRICULTURE
AND NATURAL RESOURCES**

PUBLICATION 3409



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Division of Agriculture and Natural Resources
Department of Human and Community Development

University of California
Davis, California 95616-8599

CLUE

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Welcome to the 4-H Youth Experiences in Science Project!

There is nothing like the **4-H YES Project** for providing high-quality children's science education in after-school settings. *4-H YES* uses specially trained teenage volunteers to conduct the hands-on science curriculum for children 5 to 8 years of age enrolled in school-age child care programs.

Each *YES* Theme Unit contains five or more 1- to 1½- hour sessions. Each session contains three or more activities that build on the session's theme.

The session instructions provide an **Overview of the Day's Activities**, **Background Information** on the session's subject, **Materials You Will Need** to conduct the session and a detailed outline on **Getting Ready**, the **Action** required, and specific **Sciencing** questions. When reading the curriculum, be sure to look for the **Tips** in the side column. They give valuable information on setting up and conducting the activities. At the end of the curriculum is a listing of all the supplies needed to conduct each activity.

The *YES* Curriculum incorporates inquiry-based activities with cooperative learning. It focuses on learning the scientific thinking processes and features the learning cycle model of instruction.

The **Scientific Thinking Processes** are built into each of the sessions. The processes of **observing**, **communicating**, **comparing**, and **organizing** are most commonly used in this curriculum aimed at younger children. The processes are indicated in small bold type after the **Action** and **Sciencing** sections of each activity.



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For the Teen Leader
AN INTRODUCTION TO THE YES
CLUE - CHILDREN LOOKING UNDERCOVER
FOR ENERGY

As a teen leader in this project, you will have lots of opportunity to assist in each child's learning. Through exploration, you will be providing opportunities for the children to create the foundations upon which scientific understanding is built. The children, through their own actions, interpretations, and reactions to the CLUE activities, will be creating a new base of knowledge and questions.

You will be introducing science concepts and principles about energy each session. The children will learn more about these concepts through their further exploration and "messaging about."

You will be tempted many times to tell the children *what, how, and why something is happening. Resist this temptation.* It is important for the children to find these answers on their own. You can, however, greatly assist and direct some of the discovery through the questions that you ask.

Ask open-ended questions (that is, questions that don't have any easy *yes* or *no* answer). Ask questions that help the children compare. Ask questions that help them put the information they are learning in some order. For example: *What did you do first?*

Getting Started

Before starting the CLUE unit, read the following tips and *CLUE - Children Looking Undercover for Energy* script for helpful ideas to make your delivery of the CLUE unit even more successful.

Name Tags - To help make your job run more smoothly, we suggest you have the children make name tags in the shape of the sun, light bulbs, or anything else energy-related. If you have decided to work in smaller groups, use different colors of yarn (to hang the name tag around the child's neck) to identify members of each group.

CLUE CHILDREN LOOKING UNDERCOVER FOR ENERGY

Visual Aides - Whenever you are making charts or diagrams to help you in your presentations, remember to:

- use large pieces of poster board or butcher paper;
- print neatly;
- write in large letters;
- use differently colored markers (bold colors work best);
- use symbols if children do not read well; and,
- display your charts or diagrams prominently.

Working With 5-8 Year Olds - Prior to starting your work with the children, review the materials you were given at the orientation on working with 5-8 year old children. If behavioral problems arise or if you have difficulty in effectively presenting one of the activities, refer to the list of the developmental characteristics for the age of the children with whom you are working. Often times you will be able to identify a new strategy or approach to delivering the activity. Presenting abstract concepts in a concrete manner is not easy. Also discuss other methods with your 4-H coach or the afterschool or child care staff.

Gaining the Attention of Children - When working with groups of young children, the energy level can be very high! Although this can be good, you will need to get their attention from time to time. Trying to speak over the noise of a crowd isn't each, so we suggest developing a signal (e.g., hand raised in the air; rhythmic clapping sequence; hand motion) that you use consistently. (Remember: Consistency is important to young children!)

Teams - During any of the sessions, if you believe it will enhance the activities and assist in keeping the children's attention, divide the overall group into smaller groups of four or five.

Tips - In each of the sessions, you will find Tips in the margin of the text. These give further suggestions for preparing or presenting the activity.

“S” IS FOR SOUND

Approximate Time Required for Session: 1 hour

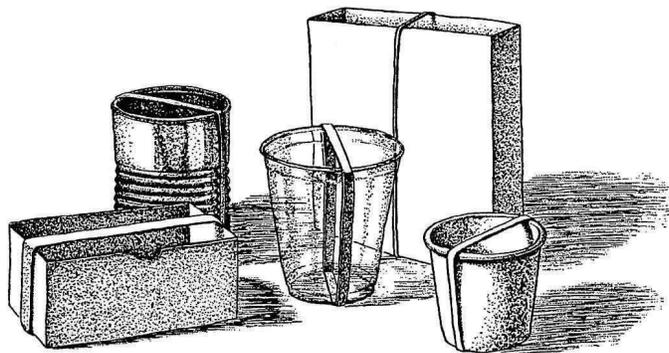
Purpose

- To communicate children’s observations about different sounds.
- To make inquiries into the sources of sound energy.
- To compare different sounds (e.g., loudness, pitch, and quality).
- To organize sounds into different groups.

Overview of the Day’s Activities

What can you make but cannot see? What can travel through a wall, but not make a hole? What can be high, but still on the ground? What are the answers to these questions? **SOUND!**

In this session, children will have the opportunity to explore different types and characteristics of sound, indoors and outside. They will have the chance to make music using common household items. Through their observations, they will have the opportunity to discover that sound energy is related to motion.



Background Information

Energy comes in many different forms; that’s part of its “mystery.” Sound energy is produced by making an object vibrate (*move back and forth*). These vibrations are then transmitted to anything that the object touches, including the air that surrounds it, thus producing sound.

Sound has several unique attributes. It has different:

- pitches (high; low);
- volumes (levels of loudness); and
- qualities (e.g., a door bell sound different from cat’s meow).

Sound can travel through water, air, wood, steel, and bones! Some sounds are pleasing to our ears, such as music, while unwanted sound is referred to as noise. By investigating these different traits, children will better understand what sound is and how it works.

So if a tree falls in a forest, does it make a sound? You be the judge!

ACTIVITY A

INTRODUCTION TO CLUE

Time Required

20 minutes

Suggested Grouping

entire group

You will use a skit to introduce the children to the concept of energy and CLUE units.

Materials You Will Need

- CLUE script
- Poster with the word SCREAM written vertically
- Markers

Getting Ready

- ❶ Review the CLUE script at the end of this unit (see pages 16-17). Enhance the script with ideas of your own.
- ❷ Assign script speaking parts to each teen.
- ❸ Prepare a poster with the word SCREAM written on it vertically (or write on chalkboard).

ACTION: OBSERVING COMMUNICATING, AND ORGANIZING

S
C
R
E
A
M



Tip
In each of the Sessions, you will find Tips in the margin of the text. These give further suggestions for preparing or presenting the activity.

ACTIVITY B

ENERGY AND YOU

Time Required

1½ hours

Suggested Grouping

teams of 10 children

In this activity, you will help the children learn energy terms by creating an interactive poem.

Materials You Will Need

- Poster board, butcher paper, or chalkboard
- Colored markers, crayons, or colored chalk

Getting Ready

- ① Gather needed supplies.
- ② Read through the activity instructions and identify energy words that you can suggest to the children, in case they are stumped.

ACTION: OBSERVING AND ORGANIZING

1. To begin our investigation, we would like to ask you some questions: What do you know about energy?
 - What is it?
 - Where is it?
 - Who is it?
 - How is it?
 - Why is it?
2. Can you help by supplying us with some clues that will help us understand energy? Words, pictures, anything? **Remember, good undercover work looks for details!**



Tip
Ask the children what sort of information detectives need when they start an investigation. Where might they begin when gathering information?

3. Let’s talk about energy. Let’s draw about energy. Let’s show some energy!

To encourage a team effort in the activity, have the children brainstorm an **“A, B, C - Downer”** group poem by describing evidence of their personal experiences of energy. For example: **“E”** might stand for the **electricity** relating to the light in my room; **“N”** could be the **noise** of an airplane; **“E”** may be the **echo** of my voice in a canyon; **“R”** might be **rays** from the sun; **“G”** could be **gasoline** that powers my family’s car; **“Y”** could be **yellow**, the color of the sun. All ideas are relevant! Have fun!

Use a large piece of paper or poster board (try to reuse old paper). Encourage the children to draw this *“evidence.”* Have the children take turns pantomiming the action verbs (e.g., to run; to jump; to drive) they use to describe their energy experiences. If time permits, children can decorate the paper around the poem they have created.

E

N

E

R

G

Y

ACTIVITY C

SOUNDS ALL AROUND*

Time Required
20-30 minutes

Suggested Grouping
individuals or pairs

What is this thing called sound? How do you know it exists? What senses would you use to observe sound? In order to investigate the mystery of energy, it is important to describe observations in detail.

Materials You Will Need

- Poster board, flip charts, butcher paper, or chalkboard
- Colored markers, crayons, or colored chalk
- Cassette tape player, blank cassette, *optional*

Getting Ready

- ① Gather the needed supplies and read the activity instructions.
- ② Check with the program staff for a safe outdoor location to do the Outdoor Sounds activity.

ACTION: OBSERVING, COMMUNICATING, COMPARING, AND ORGANIZING

Indoor Sounds

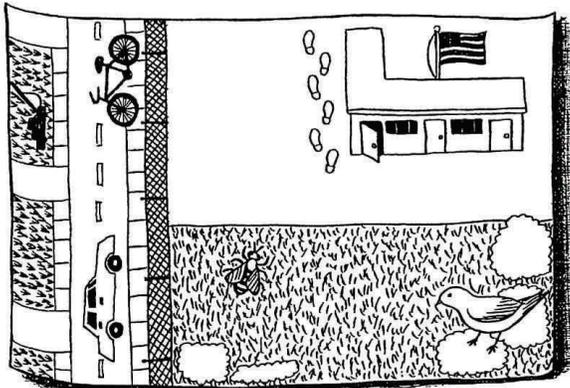
1. Have the children sit in a circle in the classroom. Ask them to close their eyes and be very, very quiet. Listen to the sounds in the room/building and describe them.

**Adapted from Indoor/Outdoor Sound Around The Everyday Science Sourcebook. Lowery, Allyn and Bacon.*



Tip
The children hear the sounds; many people/animals can also feel the vibrations that cause some sound.

- Were they loud? Were they soft?
 - From where do they come? Were they made by machines? Were they made by people or other animals?
 - Where are they located? In front of you? Behind? Overhead?
 - Were they loud? Were they soft?
2. Make a “*sound map*” of the room/building that shows the sources of the sounds. Give each group a large sheet of paper and ask them to draw symbols for the sounds they heard and where they came from in the room.



3. Have the children “act out” these sounds. For example: A loud sound might be illustrated by a great deal of movement or a soft sound demonstrated by using very slight motions. Does the sound have an uneven (rhythm) or even pattern (beat)? Is it fast or slow? High or low? Try to imitate these patterns through body movements.


Tip

*This activity might be introduced by making a short **Mystery Sounds** audio cassette tape of various sounds that the children can identify (e.g., car horn, dog’s bark, cat’s meow, a door closing, music).*

Outdoor Sounds

1. Have the children sit in a circle outdoors. Ask them to close their eyes and be very, very quiet. Listen to the sounds and describe them.
 - Are they loud? Are they soft?
 - From where do they come? Were they made by machines? Were they made by people or other animals?
 - Where are they located? In front of you? Behind? Overhead?
2. Make a "sound map" of the outside area that shows the sources of the sounds. Give each group a large sheet of paper and ask them to draw the outside area and identify the source of the various sounds they heard.
3. Have the children "act out" these sounds. For example: A loud sound might be illustrated by a great deal of movement; or, a soft sound, by very slight motions. Does the sound have an uneven (rhythm) or even pattern (beat)? Is it fast or slow? High or low? Try to imitate the patterns of the sounds you heard. Take turns.

**SCIENTIFIC: OBSERVING, COMPARING,
AND COMMUNICATING**

1. Using the sound maps, compare indoor sounds to outdoor sounds.
 - Were they the same? Were they different?
 - Which were louder? Which were softer?
 - Did they come from the same things?
 - Did children hear the sounds differently?
 - Where were there more sounds: indoors or outdoors?

ACTIVITY D

A RUBBER BAND BAND*

Time Required
10-15 minutes

Suggested Grouping
pairs or groups of 3-4

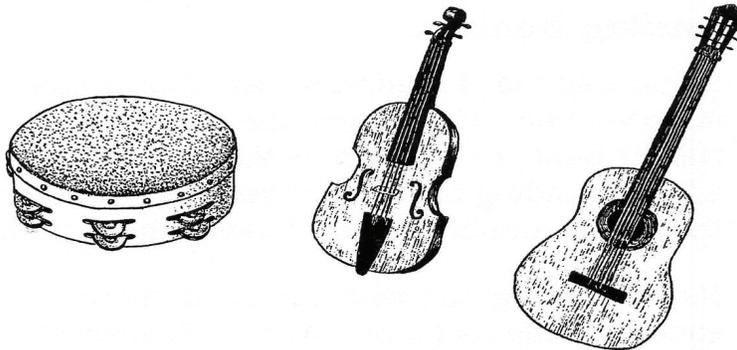
*What's the difference between noise and music?
Hmm...now that's a mystery! How do we make
music out of sound? Let's investigate!*

Materials You Will Need (for each pair or group)

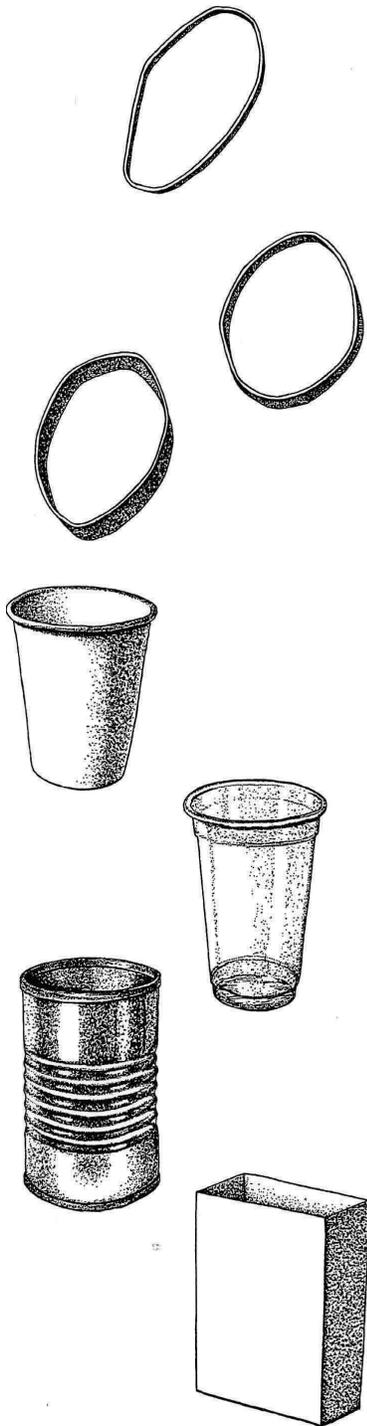
- Rubber bands, different sizes (long and short;
wide and narrow) - several per group
- Cups (paper or plastic), cans, or boxes of
different sizes - 4-5

Getting Ready

- ❶ Gather the needed supplies and read the activity instructions.
- ❷ Reproduce the Sound Comparison Chart on a poster or chalkboard.



*Adapted from: *Investigating Science with Rubber Bands*, Laurence B. White, Jr. Addison-Wesley, 1969.



ACTION: OBSERVING, COMMUNICATING, COMPARING, AND ORGANIZING

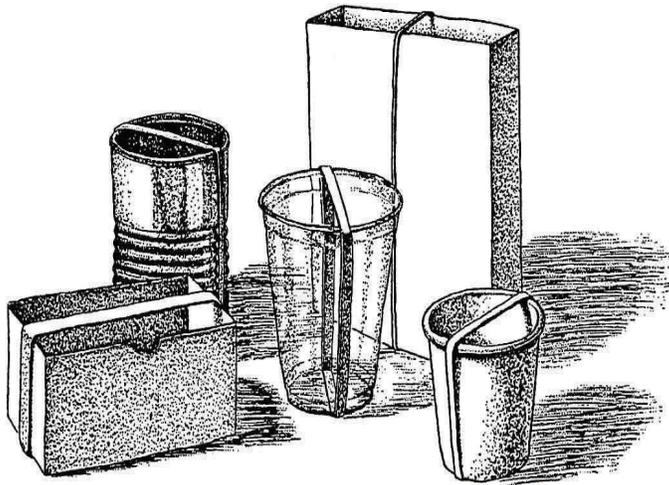
Sound Test

1. Before passing out the materials, ask the children to brainstorm a list of “Rubber Band Safety Rules” (e.g., no shooting rubber bands). Make a chart of the Safety Rules and post it.
2. Divide children into pairs. Provide each pair with one of the several different types of rubber bands (long, short, wide and thin).
3. Ask one child in the pair to stretch one rubber band between his or her thumbs. Ask the other child to pluck at it with one finger. Listen to the sounds. Repeat the exercise using other sizes of rubber band.
 - Which of the rubber bands makes the lowest sound? Which one makes the highest sound? Can you order the sounds from low to high?
 - Can you “see” the sound? Observe the rubber band when you pluck it with your finger.
 - Can you “feel” the sound? Explain!

Sounding Boards!

1. When a sound is louder, we say that it has more volume. To increase the sound of a rubber band, or turn up its volume, we can add a sounding board, a physical structure that helps amplify (makes louder) the sound.
2. Provide each group with several different sounding boards (cups, cans, or boxes) to go along with their rubber bands.

3. Now, have the children experiment! Loop the different rubber bands around the various sounding boards.
4. What happens when you pluck the rubber bands?
5. Listen to the sounds and describe them.



**SCIENCING: OBSERVING, COMPARING,
AND COMMUNICATING**

1. Compare the sounds made by the different rubber bands and sounding boards.
 - Is one louder or softer?
 - Higher or lower? Describe the sounds that you hear. Can you organize the sounds from lowest to highest (pitch)? From loudest to softest (volume)?

- What ways can you order these sounds?
- Can you think of any musical instruments that have sounding boards?

2. Make a comparison chart. In each box, record if the sound was LOUD or SOFT. Make a second chart and record whether the sounds were HIGH PITCHED or LOW PITCHED. (Sample *Comparison Chart* on page 18.)

Optional Activity

Form a “**Rubber Band Band!**” Using sounding boards and rubber bands of different sizes and shapes, have the children accompany a favorite song, or even compare their own!

Presentation Notes

ACTIVITY E

CHICKEN IN A CUP*

Time Required
15-20 minutes

Suggested Grouping
individuals

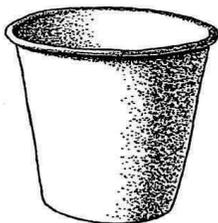
Children will enjoy making these fun, sound instruments and experimenting to create different sounds with the same materials.

Materials You Will Need

- Cups, paper or Styrofoam (sizes may vary; compare the sounds of differently-sized cups) - 1 per child
- String approximately 15" in length (use different types of string for comparison, too) - 1 per child
- Large paper clip - 1 per child
- Sharp pencil - 1 per child
- Paper towel or small sponge, shared
- Small amount of water in a cup

Getting Ready

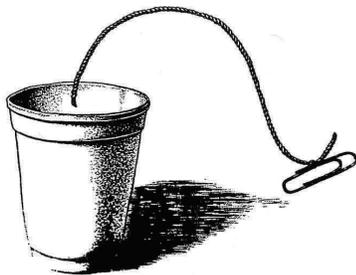
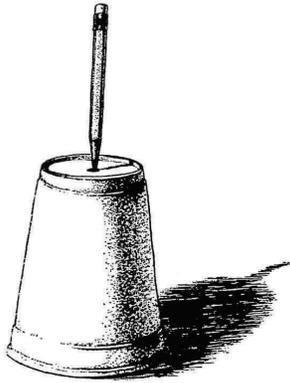
- ① Gather the needed supplies.
- ② Read the instructions and construct several sample *Chicken in a Cup* instruments.



*Adapted from *Energy: Simple Experiments for Young Scientists*. Larry White. Millbrook Press.

ACTION: OBSERVING, COMMUNICATING,
COMPARING, AND ORGANIZING

1. How to Make a Cluck!



- a. Turn the cup upside down and poke a small hole in the center of the cup's bottom with the pencil.
- b. Tie the paper clip to one end of the string and pass the other end of the string through the hole in the bottom of the cup. Pull it all the way through the cup until the paper clip comes to rest on the bottom of the cup.
- c. Next, moisten the paper towel (or sponge) with water; wring it out so it's damp, being careful not to tear the paper towel.
- d. Holding the cup in one hand, wrap the damp paper towel around the string near the cup with the other hand. While squeezing the towel against the string, pull it downward in short, quick tugs. What sound does it make? Close your eyes and imagine yourself in a barnyard!
- e. Compare the sounds made by different types/sizes of cups (paper, plastic, Styrofoam). Can you organize them into different groups based on the sounds that they make? (High or low; loud or soft?)

Optional Activity

Form a **“Barnyard Band!”** Using their rubber band sounding boards, their chicken cups, and other homemade instruments (e.g., boxes with seeds for maracas, boxes for drums, and bottles with different amounts of water for a xylophone or marimba), have the children accompany a favorite song (e.g., Old McDonald), or even compose their own! (See page 19.)

SCIENCING: OBSERVING, COMMUNICATING, COMPARING, AND ORGANIZING

1. It’s time to review our evidence and see what the detective have learned about sound energy. Based on their experiences with these activities, ask the children some of the following questions and record their responses.
 - What were some of your observations about sound?
 - Which *senses* did you use? How did you use them?
 - How did you communicate your observations?
 - What comparisons did you make about sound?
 - How did you organize you observations about sound into different groups?
2. Do the children have any other questions? If so, let’s record them.



Tip
***The more
detectives
inquire, the easier
it is to solve
“mysteries.”***

CLUE SCRIPT

The “Script” on the following two pages is designed to help you develop the storyline that is woven throughout the CLUE curriculum. Use this text, or your own words, to develop the story of the Energy Mystery, searching for clues to help solve the case! Have Fun!

Speaker 1. Hello. My name is “Wattsun”; this is my partner, “Ohms.” We’re Energy Detectives.

Speaker 2. We’ve heard that there are a lot of different types of energy in the world, and we’re in search of clues, evidence that they exist.

Speaker 1. But first, what is evidence? Where and how do we find it? Or, better yet, how do we “sense” it?

Speaker 2. Evidence is information, or data, about something we observe. The more information we have, the more we know about something. And, you see, evidence can be gathered in many different ways. For example, someone might tell us something, a tip that will help us solve a case, so we hear the evidence. What other senses might help up observe clues about energy?

Speaker 1. Then, once we gather some evidence, we need to communicate (tell) that information to other members of our detective team. By sharing our evidence and making comparisons, we can organize it in such a way that we solve our case. Detective teams operate best when they work together.



**Tip
Wattsun
and**

Ohms are word-plays around the energy theme. Watts and ohms are units used to measure different aspects of electricity.



**Tip
Sight;
smell;**

**touch; and
taste.**

- Speaker 2.* We've heard a secret energy code and we'd like you to help us investigate it more! The secret code is S.C.R.E.A.M. (Write this word vertically for the children to read.)
- Speaker 1.* Each letter in the word SCREAM stands for one type of energy.
- Speaker 2.* **S** stands for Sound Energy.
- Speaker 1.* **C** stands for Chemical Energy.
- Speaker 2.* **R** stands for Radiant Energy.
- Speaker 1.* **E** stands for Electrical Energy.
- Speaker 2.* **A** stands for Air or Wind Energy.
- Speaker 1.* **M** stands for Mechanical Energy.
- Speaker 2.* All of these are, in one way or another, types of Energy; they make things move (like when the wind blows leaves, or your legs pedal your bicycle.)
- Speaker 1.* Or they help change things from one form to another (like when the sun melts ice into water).
- Speaker 2.* In order to prove this, though, we need clues, or evidence. So, let's inquire; let's investigate the SCREAM and find information or evidence, for ourselves.
- Speaker 1.* We need to work together to develop a strong case and solve the mystery. It's time to begin our search!

SOUND COMPARISON CHART

Rubber Band Sounding Board	Thin	Medium	Thick
Paper Cup			
Plastic Cup			
Metal Can			
Cardboard Box			
Other			

OLD MCDONALD HAD A BAND

1. Old McDonald had a band,
Eeiii, Eeiii, O.
And in this band he had some
strings,
Eeiii, Eeiii, O.

With a (twang, twang) here,
And a (twang, twang) there.
Here a (twang); there a (twang);
Everywhere a (twang, twang).
Old McDonald had a band,
Eeiii, Eeiii, O.



2. Old McDonald had a band,
Eeiii, Eeiii, O.
And in this band he had some
drums,
Eeiii, Eeiii, O.

With a (rat-a-tat) here,
And a (rat-a-tat) there.
Here a (rat); there a (tat);
Everywhere a (rat-a-tat).
Old McDonald had a band,
Eeiii, Eeiii, O.



3. Old McDonald had a band,
Eeiii, Eeiii, O.
And in this band he had
chicken cups,
Eeiii, Eeiii, O.

With a (cluck, cluck) here,
And a (cluck, cluck) there.
Here a (cluck); there a (cluck);
Everywhere a (cluck, cluck)
Old McDonald had a band,
Eeiii, Eeiii, O.



4. Old McDonald had a band,
Eeiii, Eeiii, O.
And in this band his band
played sounds,
Eeiii, Eeiii, O.

With a (sound, sound) here,
And a (sound, sound) there.
Here a (sound); there a (sound);
Everywhere a (sound, sound).
Old McDonald had a band,
Eeiii, Eeiii, O.



Etc. (Continue with other verses.)

“C” IS FOR CHEMICAL

Approximate Time Required for Session: 1 hour, 30 minutes

Purpose

- To inquire about foods as sources of chemical energy that nourish people.
- To communicate children’s observations about chemical energy.
- To introduce the concept of food as a form of energy.

Overview of the Day’s Activities

A plan needs energy in order to grow. Where does it get this energy? Children need energy to run around the yard to play a game of tag. What does this have to do with the food they eat for breakfast, lunch, or dinner?

In this session, children will have the opportunity to explore foods they eat as a form of chemical energy. They will have the chance to make their own miniature plant “laboratory.” They will even see how the kitchen can be a place for scientific experiments on energy!

Background Information

To move something requires energy. Coal, oil, natural gas, and gasoline, all forms of sources of potential CHEMICAL ENERGY, are capable of making things move. Think of your car without gasoline -- it won’t go anywhere! There’s not much of a mystery to that! A car is a machine that needs fuel, a chemical, to help move it.

Living things, like plants and animals, also require fuel. Plants make their own food from the sun’s energy; this helps them grow. Animals, like humans, eat food to use as fuel so they can grow, run, jump, work, and play. Therefore, food is a source of chemical energy.

ACTIVITY A

WHEAT FIELD IN A BAG*

Time Required 30 minutes preparation time
Suggested Grouping individuals

This activity will be started today, but it will take 3-5 days before the wheat berries begin to sprout.

Materials You Will Need (per child)

- Untreated wheat berries - 20-30
- Clear plastic sandwich bag
- Cotton balls - 2
- Magnifying glasses, shared
- Masking tape, shared
- Butcher paper or poster, shared
- Colored markers
- Water

Getting Ready

- 1 Gather the needed supplies. (Determine if you will be sprouting the wheat berries or the other seeds in the alternative activity on Page 24.)
- 2 Make a Chemical Observation Chart.

ACTION: OBSERVING, COMMUNICATING, COMPARING, AND GROUPING

1. The secret code is SCREAM. What do the letters mean? Ask the children to review the SCREAM code at the beginning of the session.

*Adapted from *Green Thumb Garden*, Michelle Awad. Agriculture in the Classroom, Virginia Farm Bureau Federation. Richmond, Virginia, 1996.



Tip
Untreated wheat berries can be found in the spice section of food co-ops and natural food stores.

S
 C
 R
 E
 A
 M

2. What kind of energy are "Wattsun" and "Ohms" investigating today? Using your own words, continue the story of the *Energy Mystery*, searching for clues to help solve the case!
3. Provide each child with 20-30 wheat berry seeds per child for observation.
4. Look at the seeds under a magnifying glass for closer investigation. Have the children use their senses to feel the seeds, smell them, and try dropping them on the table, listening to the sound. What do the children observe?
5. Ask them to compare several seeds. Are they similar in size? Shape? Color?
6. Record the children's observations by drawing or listing their characteristics on butcher paper or poster board.
7. Tell the children that they are going to grow green sprouts in a "portable laboratory".
 - Provide each child with a clear plastic sandwich bag; have each write his or her name on it.
 - Moisten two cotton balls for each child (wring them out slightly; they do not have to be dripping wet).
 - Dip the cotton balls into the wheat berry seeds so there are several seed on each one.
 - Place one cotton ball with seeds into each bottom corner of the plastic bag.
 - Tape the "Wheat Field in a Bag" to a window, a chalkboard, or a wall. (If taken home, refrigerator magnets will display this experiment nicely in the kitchen!)
 - The seeds will germinate in three to five days.



Tip

Wheat stalks with wheat berries are available at craft stores, health food stores, and farmers' markets.



NOTE

The sprouts may be transplanted after 10-14 days. Cut off the corners of the plastic bag and remove the cotton balls and their sprouts; transplant the entire cotton ball with the young plants into a rich, moist soil.

- At the next session make some observations about the sprouts. What color are they? How do they smell? Taste? Feel? Record children’s observations!
- How have the wheat berries changed? Do they look, feel, and taste the same? Do they sound the same when dropped on the table?
- Ask the children to describe how these sprouts grew from seeds. What helped them grow?

SCIENCING: OBSERVING, COMMUNICATING, COMPARING, AND ORGANIZING

1. It’s time to review our evidence and see what the detectives have learned about plants and chemical energy. Based on their experiences with this activity, ask the children some of the following questions and record their responses on the Chemical Observation Chart.

- What were some of your observations about wheat berry seeds? What different senses did you use?
- What ways did you communicate your observations? Can you think of other ways?
- What comparisons did you make?
- What happened to the wheat berry seeds inside of the “portable laboratory”? What did you observe?
- What do you think helped the sprouts grow?
- Review the steps on Page 23. What were important parts of the process?

2. Do the children have any other questions? If so, record them. Help the children use the evidence to answer the questions.



NOTE

As an alternative you may want to use different types of seeds. In addition to wheat berries, other suggested seed types include: lettuce, radish, carrot, alfalfa, and parsley. Once all of the seeds have germinated, make observations and comparisons of how the different sprouts look, smell, and taste. Then, harvest the sprouts and prepare a delicious and nutritious salad!

ACTIVITY B

SODA BREAD: FOOD ENERGY FOR US*

Time Required

20 minutes (preparation)

30 minutes (baking)

Suggested Grouping

groups of 6-8

In this session, children will first use their energy to grind the wheat berries. They, they will prepare the tasty Soda Bread. Finally, they will power up by eating the Soda Bread.

Did you know that one of the most common types of food all around the world is bread? (Remember: Food is a form of chemical energy!) An important ingredient in bread is flour. Where does it come from?

Materials You Will Need (for each group)

- Mortar and pestle (or any other grinding implement - even 2 spoons!)
- Oven or toaster oven, shared
- Measuring cup
- Measuring spoons - 1 set
- Large mixing bowl
- Large mixing spoon
- Metal pie pan
- Wheat stalks with wheat berries - 3-4
- All-purpose flour - 4 cups
- Baking soda - 1 teaspoon
- Salt - 1 teaspoon
- Buttermilk - 1½ cups
- Cooking oil - 1 teaspoon
- Potholder
- Knife for cutting bread
- Raisins - 1 cup, *optional*
- Cinnamon - 1 teaspoon, *optional*

*Adapted from *Messing Around with Baking Chemistry*, Bernice Zubrowksi.

 **Tip**
If the facilities don't lend themselves to preparing and baking the soda bread, consider substituting peanut butter sandwiches. You can also grind peanuts into peanut butter!

Getting Ready

- ❶ Determine if there are facilities to prepare the Soda Bread. If not, substitute a nutritional snack that the children can prepare on site (such as peanut butter and bananas sandwiches.)
- ❷ Practice grinding the wheat berries.
- ❸ Set up stations for preparing the Soda Bread.

ACTION: OBSERVING, COMMUNICATING, AND COMPARING

1. Provide each group of children with stalks of wheat with wheat berries (*the seeds*).
 - Explain that wheat is used to make flour for foods, such as bread, cereals, and cakes.
 - Ask the students if they know of any other foods made from flour. Make a list.
 - Using a mortar and pestle (or other grinding implement), have the children grind some wheat berries.
 - What do they discover? Have them compare the flour they grind with that from the store.
 - Ask them to observe the differences (sight; smell; touch; and taste). Record their observations.
2. Prepare the Soda Bread Recipe.
 - Preheat oven to 375° Fahrenheit.
 - Mix dry ingredients together in a large bowl. Add cinnamon (optional).

 **Tip**
While the soda bread is in the oven, encourage the children to help with the clean up.

- Stir in the buttermilk with a large spoon until all of the liquid is absorbed (stir in a little extra flour if necessary); work the dough with your hands for a few minutes (it should not be sticky). Add raisins (optional).
- Place the dough into the metal pie pan that has been oiled lightly; form the dough into a circular mass approximately 1” thick.
- Bake for 35-40 minutes until it is brown. Let cool. Be careful; it’s hot! ENJOY!

SCIENCING: OBSERVING, COMMUNICATING, AND COMPARING

1. It’s time to review more evidence and see what else the detectives have learned about plants and chemical energy. Based on their experiences with the activity, ask the children some of the following questions and record their responses.
 - What were some of your observations about wheat and wheat seeds? What different sense did you use?
 - What happened to the wheat seeds after they were ground by the mortar and pestle? What did you observe?
 - What ways did you communicate your observations:
 - What comparisons did you make? (e.g., ingredients in unbaked dough vs. baked bread.)
 - Energy can cause things to change. What do you think caused the bread dough to change when you baked it? (*Heat from the oven.*)



Tip

What other types of energy are the children observing here?

MECHANICAL:

Muscle power needed to grind the wheat berries;

SOUND: *The mortar and pestle make a noise when grinding the wheat berries; and*

RADIANT HEAT:

The oven must be heated to a higher temperature to bake the soda bread. Energy is everywhere!!

- Children and adults need energy to run, jump, think, and grow. Where do you think we get our energy? (*Chemical reactions from the food we eat.*)
 - Why do you think it's important for us to eat healthy food like fruits, vegetables, lean meat, and grains? (*They provide a variety of chemicals and other nutrients that are good sources of energy for our bodies.*)
2. Do the children have any other questions? If so, record them where appropriate. Help the children use the evidence to answer the questions.

Presentation Notes

ACTIVITY C

FROZEN FOOD TAG*

Time Required
20-30 minutes

Suggested Grouping
entire group

Children will enjoy burning off “energy” in this spirited modification of “freeze tag.” In search of healthy foods, children have to avoid being tagged by “Junk Food Pirates” who lurk somewhere between them and their nutritious sources of energy.

Materials You Will Need

- Large, open space (playground, gymnasium, or multi-purpose room)
- Wooden tongue depressors - 40-50
- Drawing paper - 1 sheet per child
- Assorted markers or crayons

Getting Ready

- ❶ Set up the playing field by identifying two “safe zones” (e.g., two trees on a playground; the end lines in a gymnasium).
- ❷ Label the tongue depressors as Healthy Foods (e.g., fruits, vegetables, eggs, lean meats, milk).
- ❸ Gather the other materials needed for the activity.

ACTION: OBSERVING, COMMUNICATING, AND COMPARING

1. Spread the Healthy Foods (wooden tongue depressors) on the ground/floor in one “safe zone,” which is the “store.” The safe zone at the other end of the playing field is “home.”

*Adapted from *Project WILD’s Quick Frozen Critters* activity.



Tip
This is a great activity to play while the soda bread is baking. The children will really work up an appetite!

2. Divide the children into two groups: *Healthy Food Eaters* and *Junk Food Pirates*. There should be approximately one Junk Food Pirate for every 10 Healthy Food Eaters.
3. Explain to the Healthy Food Eaters that they need to leave “home” to go “shopping” for healthy food. Along the way, though, are Junk Food Pirates who might prevent them from getting to the store and back.
4. Each trip to the store, a Healthy Food Eater is only allowed to pick up one healthy food item to bring home. Their goal is to get as many pieces of healthy food as they can, which will take several trips back and forth!
5. The only way a Junk Food Pirate can force a Healthy Food Eater out of the game, however, is to tag him or her while he or she is moving. If a Healthy Food Eater “freezes” in place, he or she is safe. The Junk Food Pirates are also not able to tag a Healthy Food Eater who is in a “safe zone.”
6. All of the Junk Food Pirates now begin to roam around the playing field; the Healthy Food Eaters gather in their “home.”
7. At the signal (“Ready, Set, Go!”), the game begins. See how many healthy food items each Healthy Food Eater can get!
8. When the game is over, record the healthy foods that the children selected. What types? How many?
9. Switch roles and play the game several times.

SCIENCING: OBSERVING,
COMMUNICATING, AND COMPARING

1. It's time to review the evidence and see what the detectives have learned so far about chemical energy. Based on their experiences with these activities, ask the children some of the following questions and record their responses.
 - What did you observe about yourself after running and playing hard? Were you tired, hungry, or thirsty? If so, why do you think that is? If you want to run and play more, what might you need to do?
 - How do you think food helps give us energy?
 - Why is it important to eat healthy foods?
2. Do the children have any other questions? If so, record them and ask the group to help find the answer.

SODA BREAD RECIPE

Ingredients

- Wheat stalks with wheat berries
- All-purpose flour - 4 cups
- Baking soda - 1 teaspoon
- Salt - 1 teaspoon
- Buttermilk - 1½ cups
- Cooking oil - 1 teaspoon
- Raisins - 1 cup (optional)
- Cinnamon - 1 teaspoon (optional)

Procedure

1. Preheat oven to 375° Fahrenheit.
2. Mix dry ingredients together in a large bowl. Add cinnamon (optional).
3. Stir in the buttermilk with a large spoon until all of the liquid is absorbed (stir in a little extra flour if necessary); work the dough with your hands for a few minutes (it should not be sticky). Add the raisins (optional).
4. Place the dough into a metal pan that has been oiled lightly; form the dough into a circular mass approximately 1" thick.
5. Bake for 35-40 minutes until it is brown. Let cool. Be careful; it's hot! ENJOY!

"R" IS FOR RADIANT

Approximate Time Required for Session: 1 hour

Purpose

- To observe evidence of light and heat as radiant energy.
- To communicate observations about radiant energy.
- To investigate the sources of radiant energy.
- To make comparisons using light and shadow; make comparisons of things that affect temperature.

Overview of the Day's Activities

RADIANT (light) ENERGY is all around us, so what's the mystery? What can we discover about it? In this session, children will explore *shadows* by watching the "move" and measuring the distance they travel. Solar mitts help children experience the phenomenon of heat absorption. Ice cube "races" build upon the children's explorations of shadows, as well as the relationship between light and heat.

Energy Detectives investigating radiant energy will be searching for clues in a variety of areas and under different conditions. If it's a sunny day, there are plenty of activities to do outside; if it's cloudy or rainy, we suggest you investigate the indoor options. GOOD LUCK, DETECTIVES!

Background Information

Radiant energy is found in heat and light. Fires, light bulbs, and fireflies all give off radiant energy. Can you think of any other sources?

The sun is the earth's largest source of radiant energy. We call this *solar energy*. What do you think the earth might be like without the sun? Ask the children to draw or paint a picture of what their backyard or school yard might look like without the sun (e.g., nighttime). Or, make a list of their ideas on a chart.

ACTIVITY A

BEAR SHADOW

Time Required
10 minutes

Suggested Grouping
entire group

Children will enjoy hearing the story of the bear and his shadow as they are introduced to the concept of sun and light as energy.

Materials You Will Need

- Bear Shadow* by Frank Asch
- Drawing paper - 1 sheet per child
- Assorted markers or crayons

Getting Ready

- ➊ Read the book *Bear Shadow* several times so you are familiar with the story line.
- ➋ Gather the other materials needed for the activity.



ACTION: OBSERVING, COMMUNICATING, AND COMPARING

1. The secret energy code is SCREAM. What do the letters mean? Ask the children to review the SCREAM code at the beginning of the session.
2. What kind of energy are “Wattsun” and Ohms” investigating today? Using your own words, continue the story of the *Energy Mystery*, searching for clues to help solve the case!
3. Gather the children and have them sit in a semicircle. Ask some brief questions about

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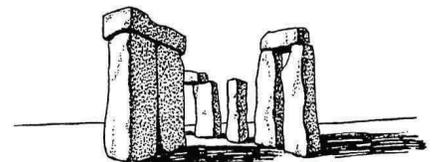
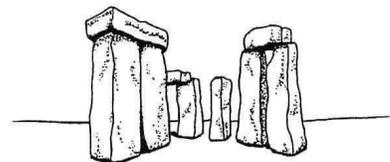
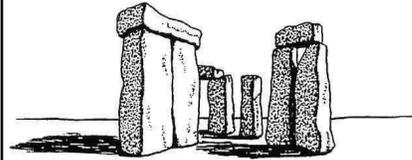
shadows to build their enthusiasm; encourage responses. Read the book *Bear Shadow* to the group.

Tips for Successful Oral Reading

- **Setting the stage** - Have the children sit in a semicircle, with your chair slightly higher. Ask some brief questions to build enthusiasm and encourage responses. Keep the book facedown or out of sight.
- **Presenting the book** - Show the book so the cover is clearly visible. Make sure the children can see the pictures easily. Tell them the name of the book, the author, and the illustrator. Discuss the illustrations.
- **Reading the book** - Use plenty of expression. Adjust your voice and speed of reading to fit the story. Keep children involved by asking: “What do you think is going to happen?” **The most common mistake is reading too fast.** Read slowly enough for the children to build mental pictures.

SCIENCING: OBSERVING, COMMUNICATING, AND COMPARING

1. It’s time to review our evidence and see what the detectives have learned from the story about light. Ask the children some of the following questions and record their responses.
 - What was the story about?
 - In the story, what scared the big fish?
 - How did the bear hide from his shadow?



- What makes shadows? Do they ever move?
- What happened to the bear’s shadow when he tried to nail it to the ground? When he tried to bury it in a hole?
- Why didn’t the bear have a shadow at 12:00 noon?
- Why did the bear’s shadow scare the big fish in the afternoon?
- Go outside and look for shadows. Count how many different ones you see. Organize and record them into groups (e.g., long/tall; short/wide).

Presentation Notes

ACTIVITY B

SHADOW STICKS*

Time Required

20 minutes

Suggested Grouping

pairs or groups of 3-4

Did you know that many years ago people learned to tell time by the sun? It's true! In the morning, the sun rises in the east; it makes long shadows that point westward. As the sun rises higher in the sky, the shadows become shorter.

In the evening, the sun sets in the west and makes long shadows that point eastward. So, at different times during the day, we can measure shadows and know what time it is. You might say that the sun is our oldest clock!

Materials You Will Need (for each group or pair)

- Pencils - 2
- Modeling clay
- Ruler
- Sheet of paper
- Chalk - 1 piece
- Compass (optional)
- Wristwatch (with second hand) or kitchen timer
- Markers, crayons, or colored chalk

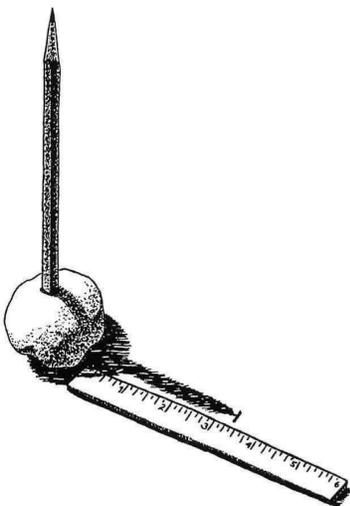
Getting Ready

- ❶ Gather needed supplies and materials.
- ❷ Try the activity before presenting it to the children.
- ❸ Identify an outside area where you can complete the activity.



Tip
If this activity is to be done inside, you will need a bright light hanging from the ceiling to serve as a substitute for the sun.

*Adapted from *Sun Fun*. Caroline Arnold, 1981.



ACTION: OBSERVING, COMMUNICATING, AND COMPARING

1. Working in pairs or in small groups, have the children place a pencil upright in a piece of clay on an open area of sidewalk or cement/ asphalt playground (*see diagram*).
2. Measure the shadow cast by the pencil and record it on a piece of paper. **(Optional Question:** Which direction is the shadow pointing? Does this mean it’s morning or afternoon? How can you tell? *Check by using a compass.*)
3. Make a mark at the tip of the shadow with a piece of chalk. Return every 15 minutes, make a mark at the tip of the shadow and remeasure it. Has the shadow moved? If so, how far? Did the length of the shadow change? Compare! What is the distance between marks? Record your observations.
4. Play *Shadow Tag* in between shadow measurements.

Tip

Shadows move when either the source of light or the object casting the shadow moves relative to each other.

Shadow Tag Instructions

Our shadows move wherever we go. On a sunny day, play a game of tag by having whoever’s “IT” touch someone else’s shadow.

Establish a “free zone” within the large shadow of a tree or building (where people do not cast a shadow). Where is it warmer? In the sunlight? In a shadow?

**SCIENCING: OBSERVING,
COMMUNICATING, AND COMPARING**

1. It’s time to review more evidence and see what the detectives have learned so far about radiant energy and shadows. Based on their experiences with these activities, ask the children some of the following questions and record their responses.
 - What were some of your observations about shadows? How are they made? Can they move? How?
 - How did you communicate your observations? What comparisons did you make using shadows? What were they? As shadows long? Are they short? Are they dark? Are they light? Are they warm? Are they cool?
2. Do the children have any other questions? If so, record them and ask the group to help find the answers.



Tip
*The more
detectives
inquire, the easier
it is to solve
“mysteries.”*

Presentation Notes

ACTIVITY C

SOLAR MITTS*

Time Required
20-30 minutes

Suggested Grouping
individuals or pairs

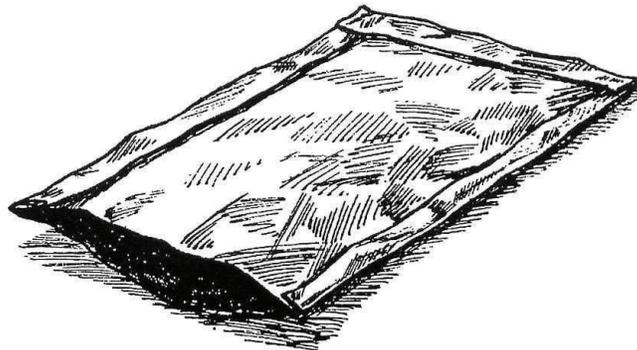
Children will enjoy feeling the energy of the sun when they make the solar mitts in this activity.

Materials You Will Need (for each pair)

- Aluminum foil - 12-inch, square sheet
- Black construction paper - 2 to 4 sheets
- Cellophane tape dispenser, shared
- A sunny day (even in winter!)
- Indoor/Outdoor thermometer (optional)

Getting Ready

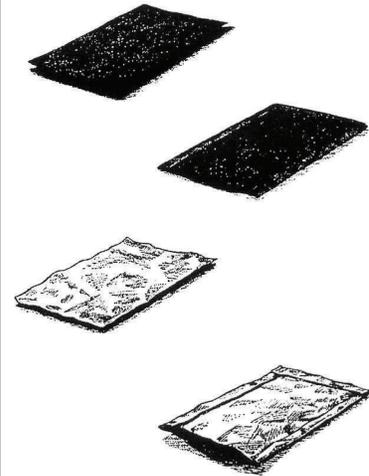
- ❶ Gather the needed supplies.
- ❷ Make one of the solar mitts in advance of the activity and conduct the experiment so you understand how it works.



*Adapted from *Energy: Simple Experiments for Young Scientists*, Larry White. Ills. by Laurie Hamilton. The Millbrook Press, Brookfield, CT.

ACTION: OBSERVING, COMMUNICATING, AND COMPARING

1. Working in pairs make two solar mitts, one of black construction paper and one of aluminum foil.
2. By laying one piece of paper of the same color over the top of another, connect three edges by using scotch tape. (Note: Children's hands are small enough that folding a piece of black construction paper in half will probably work, too.)
3. Make the aluminum foil solar mitt approximately the same size by crimping the edges together.
4. Take the two solar mitts outdoors. Place one hand in the black mitt and the other hand in the foil mitt; hold both hands toward the sun.
(Safety Note: Don't look at the sun! It can damage your eyes!)
5. What do you observe? Do you notice any differences? Compare your observations with others.
6. **Optional Extension:** Try this with a thermometer in the mitts instead of your hands. Measure the temperature after 10 minutes.



SCIENCING: OBSERVING, COMMUNICATING, AND COMPARING

1. Review the evidence in this activity and see what the detectives have learned about solar power.
 - What were some of the observations?
 - Which mitt was warmer?
 - What made one mitt warmer than the other?

ACTIVITY D

ICE CUBE RACES*

Time Required
15-20 minutes

Suggested Grouping
individuals

In this activity, it is a race against the clock! Children will try to find what’s the quickest way to melt an ice cube.

Materials You Will Need

- Ice cubes - 1 per child, all approximately the same size
- Watch (with a second hand) for the teen leader to time the “race”
- Butcher paper, poster board, or a chalkboard - 1 large piece, shared
- Assorted colored markers, shared
- A warm, sunny day (*An alternative would be to do this activity indoors, placing the ice cubes inside yogurt cups or on small plates or in plastic Ziplock bags.*)

Getting Ready

- ❶ Gather the materials and supplies.
- ❷ Check with the program staff for a safe outside area to conduct this activity.

ACTION: OBSERVING, COMMUNICATING, AND COMPARING

1. Have everyone choose a spot outside that each thinks will be the best for melting an ice cube.

*Adapted from *Simple Science Experiments*, Andrea McLoughlin. Ill. by Lynn Adams. Scholastic, Inc., 1996.

2. Distribute one ice cube to each child quickly; have them place their ice cubes in their chosen spots. Start the clock!
3. What are your observations? How long did it take each ice cube to melt? Compare one spot to another.
4. As the group, make a “temperature map” of the playground or classroom using a piece of butcher paper and colored markers. Identify cool areas with *blue*, and warm areas with *red*!

**SCIENCING: OBSERVING,
COMMUNICATING, AND COMPARING**

1. It’s time to review the evidence and see what the detectives have learned so far about radiant energy and shadows. Based on their experiences with these activities, ask the children some of the following questions and record their responses.
 - What were some of the observations about heat from the sun?
 - When is it warmest outside?
 - When is it coolest?
 - Where is it warmest on the playground (in the classroom)?
 - Where is it the coolest?
 - How did you communicate your observations?
 - What comparisons did you make? (Tip: Senses; thermometers.)



Tip
Remind the children to think about what they have learned about shadows. (This will help them choose a spot for the ice cube.)



Tip
There are no winners or losers!



Tip
While the children wait for their ice cubes to melt, this is an opportunity to play another round of Shadow Tag.

**CLOUDY DAY ALTERNATIVE
ACTIVITY A**

WHO’S ASLEEP WHEN*

Time Required
10 minutes

Suggested Grouping
large group

The Earth is like a big ball that spins in space. As the Earth spins, one part faces toward the sun, and the people in that part of the world have daylight. When it spins away from the sun, it becomes nighttime. This activity will help children grasp this concept.

Materials You Will Need

- Large ball (basketball, beach ball) or globe
- Flashlight

Getting Ready

- ❶ Gather the materials needed for this activity.
- ❷ Practice holding the globe and shining the light.

ACTION: OBSERVING AND COMMUNICATING

1. Hold the ball/globe up in front of the group of children (seated on the floor).
2. Shine the flashlight (the sun) on one side of the ball/globe.
3. Ask: If this is the world, where is it daytime? Where is it nighttime? How do you know?
4. Spin the ball slowly and show that, as it moves, areas move into and out of daytime/ nighttime.

*Adapted from *What Makes a Shadow?*. Bulla and Otani, 1994.

CLOUDY DAY ALTERNATIVE ACTIVITY B

SHADOW PUPPETS*

Time Required
 20-25 minutes

Suggested Grouping
 pairs or groups of 3-4

Help the children explore more about shadows by creating the Shadow Play.

Materials You Will Need (per group)

- Cardboard - 1 large sheet per group, or construction paper - 1 sheet per child (recycled cardboard boxes make a great option)
- Pencils - 1 per child
- Scissors - 1 per group
- Wooden tongue depressors - 1 or 2 per child
- Masking tape - 1 roll per group
- White bed sheet
- Rope or long piece of heavy string - 12-15 feet
- Small table
- Table or floor lamp with 100 watt bulb

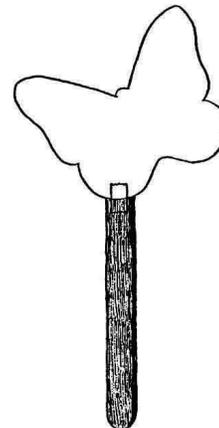
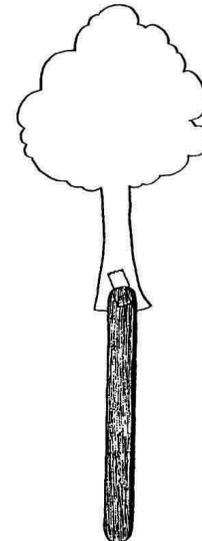
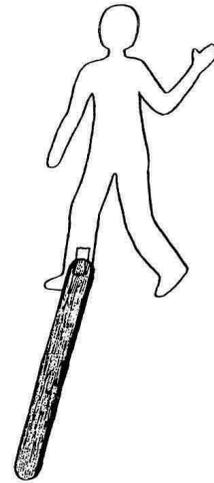
Getting Ready

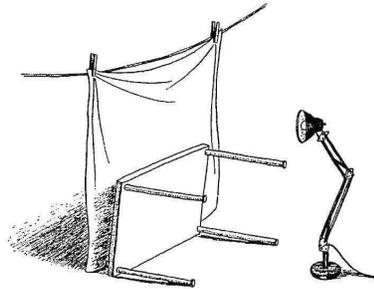
- ① Gather the needed supplies
- ② Practice the activity before presenting it, so you can easily demonstrate it to the children.

ACTION: OBSERVING AND COMMUNICATING

1. Working in pairs or in small groups, have the children draw a figure of their choice (a person, an animal, a tree, etc.) on the cardboard or paper.

*Adapted from *Sun Fun*. Caroline Arnold. 1981.

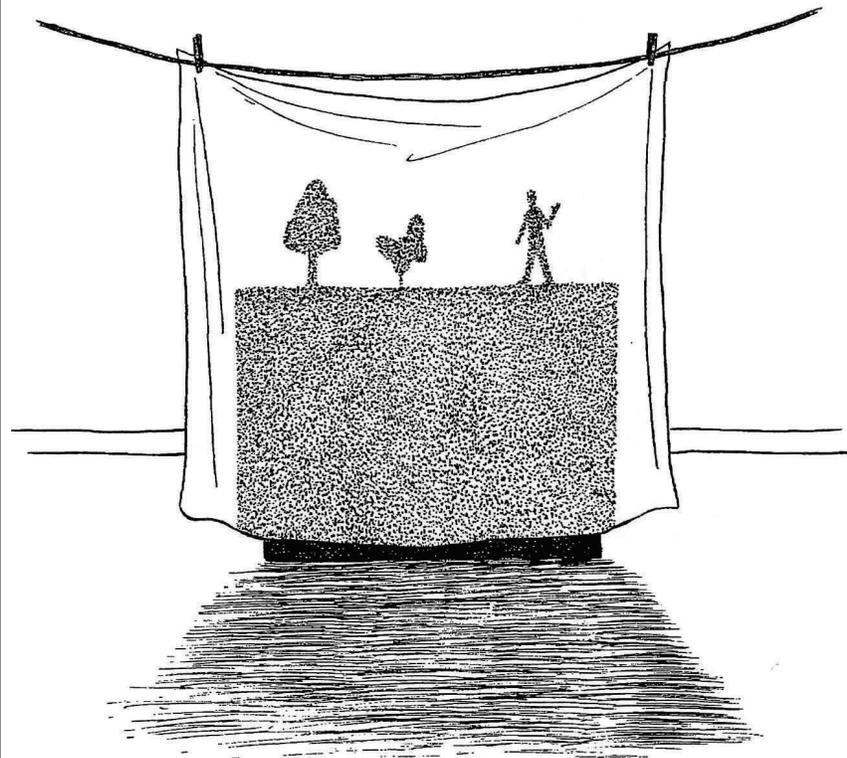




Tip
Have the children try the puppets close to the sheets, as well as farther away. What happens?

2. Have the children cut out the puppet and tape it to a wooden tongue depressor near the bottom of the figure. (Note: Younger children may need some help.)
3. Hang the sheet in an open space. Turn the table on its side behind the sheet; place the light source behind the table.
4. Have the children think of a story about energy that they can turn into a two or three minute puppet show. Have the children experiment with the puppets and make up their story.
5. Taking turns, have the children sit behind the table, hold their puppets up near the sheet and start their story.

Sit back and relax, “Shadow Theater” is about to begin!



SCIENCING: OBSERVING AND COMMUNICATING

1. Ask the children to describe the process they used to create their puppet show.
2. Ask other questions.
 - What caused the shadows?
 - Could they make their figures larger and smaller? How?
 - What would happen if all the lights were turned out?

“E” IS FOR ELECTRICAL

Approximate Time Required for Session: 1 hour

Purpose

- To observe evidence of electrical energy.
- To communicate children’s observations about electrical energy.
- To inquire about static electricity.
- To compare different objects as they relate to electricity/ magnetism.
- To organize materials into different groups based on magnetic properties.

Overview of the Day’s Activities

What’s the mystery of a magnet? Children explore the unusual properties of magnets while making a unique art “masterpiece.” Children also have the opportunity to explore the effects of static electricity as they decorate balloons.

Background Information

Have you ever walked across a rug on a dry day and received a shock when you touched a doorknob? Have you observed lightning on a dark and stormy night? What about rubbing a balloon on a person’s hair and having the balloon stick to the wall or ceiling? These phenomena are all caused by ELECTRICITY.

Magnets are charged pieces of iron or steel that attract and repel one another and attract other materials made from iron. Magnets do not attract objects composed of materials other than metals.

ACTIVITY A

MAGNET MAGIC

Time Required
15-20 minutes

Suggested Grouping
pairs

Children will enjoy exploring the energy of magnets in this activity.

Materials You Will Need (per pair)

- Strong magnet - 1 per pair
- Metal objects such as paper clips, washers, nuts, bolts; or metal filings - several
- Non-metal objects made of wood, paper, or plastic - several (e.g., paper, cardboard, thread, or leaves)
- White paper, *optional*

Getting Ready

- ❶ Gather the needed supplies and materials making sure you have plenty of non-metal and metal objects for the experiment.

ACTION: OBSERVING, COMMUNICATING, COMPARING, AND GROUPING

1. The secret energy code is SCREAM. What do the letters mean? Ask the children to review the SCREAM code at the beginning of the session.
2. What kind of energy are “Wattsun” and Ohms” investigating today? Using your own words, continue the story of the *Energy Mystery*, searching for clues to help solve the case!
3. Discuss the terms *attract* and *repel* before starting the activity.



Tip
The magnets will not attract many metals such as brass, copper, aluminum, and stainless steel.

4. Working in pairs, have the children experiment with the magnet. Does it attract any of the objects on the table? Wood or plastic? The cardboard? Metal objects? Paper or thread? What do you observe? How are the objects the magnet attracts different from those it does not? Record the observations!
5. Will the magnet attract more than one object in a row? Arrange several objects in a line and see if the magnet will attract them all from one end. What do you observe?
6. Will the magnetic attraction pass through materials? Place different objects inside a paper or plastic cup. Move the magnet on the outside of the cup and see what happens! What do you observe?
7. Ask the children to place the objects that are attracted to the magnet in one group, and those objects that it does not attract in a second group. What comparisons can be made? Record their comparisons. (List or draw the items on the comparison chart below.)

Optional: Place the magnet on the table and lay the white paper over it. Sprinkle metal filings on the paper. What do you observe? Move the magnet around under the paper. What happens?

OBJECT	ATTRACTED TO MAGNET	NOT ATTRACTED TO MAGNET
STRING		
PAPER CLIP		
LEAF		
PAPER		
BOLT		



Tip
Emphasize to the

children that the electricity from wall sockets used to run household appliances (called current electricity) can be very dangerous if not used properly. Energy Detectives never experiment with household appliances and electricity.



Tip
You may choose to

make small groups of metal (e.g., paper clips, washers) and non-metal (e.g., paper dots, pieces of string); or, try mixing the metal and non-metal objects together in one group (for each pair of detectives) for the children to investigate with the magnet.

ACTIVITY B

MAGNET MASTERPIECES*

Time Required
20-30 minutes

Suggested Grouping
pairs or groups of 3-4

Children will further explore the energy of magnets as they use magnets and paint to create their own personal masterpiece.

Materials You Will Need (for each pair or small group)

- Cardboard box - medium-sized (16-18 cubic inches) - 1 box for every four children
- Strong magnet
- Metal objects such as washers, nuts, or bolts
- Embroidery floss, thread, or string - cut into 4-6 inch pieces
- Tempera paints - 4-5 colors
- White paper - 1 sheet per individual
- Cellophane tape
- Scissors

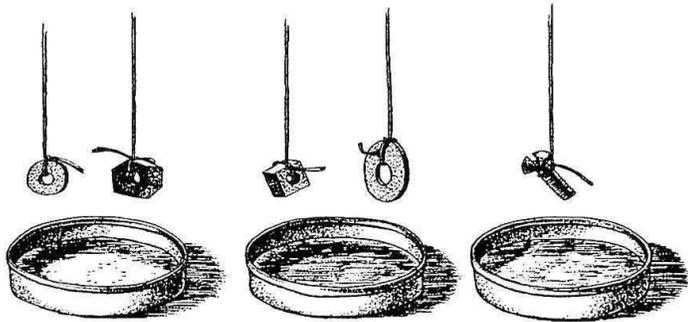
Getting Ready

- ❶ Gather the needed supplies and materials.
- ❷ Assemble the “paint stations” in advance. Make sure you have enough area and materials for the children to explore.
- ❸ Make certain you try the magnet ahead of time to be certain that it is strong enough to move objects through cardboard.

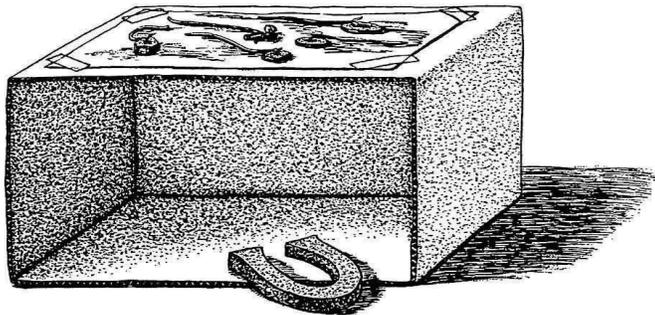
*Adapted from *Science Arts*, Mary Ann Kohn and Jean Potter. Bright Ring Publishing, 1993.

ACTION: OBSERVING AND COMMUNICATING

1. Place the inverted cardboard boxes in an elevated position to make a “paint station.” Make certain that there is enough room under the cardboard for the children to move their hands and the magnet. Tape a piece of paper (at the corners only) on top of the cardboard.
2. Tie varying lengths of embroidery floss or thread to the washers, nuts, or bolts. Dip these metal objects and the thread in the paint and lay them on the paper.



3. Hold a magnet on the underside of the cardboard box and begin to move it. The magnet will “paint” a picture as the metal objects and thread move over the paper.



4. Change colors and objects until your masterpiece is complete.

**SCIENCING: OBSERVING,
COMMUNICATING, AND COMPARING**

1. It's time to review more evidence and see what the detectives have learned so far about magnets. Based on their experiences with these activities, ask the children some of the following questions and record their responses.
 - What were some of your observations about magnets? Do magnets attract all objects? What was attracted?
 - How did you communicate your observations?
 - What comparisons did you make?
 - What groups did you organize using magnets?
2. Do the children have any other questions? If so, record them. Help the children find the evidence to answer the questions.

Presentation Notes

ACTIVITY C

STATIC ELECTRICITY: “ELECTRIC” ART BALLOONS*

Time Required

20 minutes

Suggested Grouping

individuals

There will be lots of interest in this activity as the children explore the energy in static electricity.

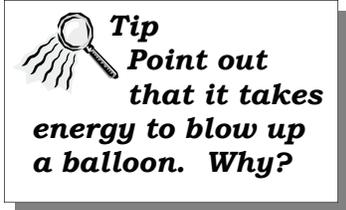
Materials You Will Need

- Balloons of different shapes and sizes - 2 balloons per child
- Small pieces of colored paper confetti, shared
- Tiny bits of decorative items such as glitter, lace, sequins, sugar (colored, if possible), and/or salt, shared
- Tray or baking pan - 1 per 2-3 children
- Woolen cloth - 1 per 2-3 children

Getting Ready

- ❶ Gather the needed materials.
- ❷ Practice the activity in advance of the session.
- ❸ Blow up some balloons in advance for the children who cannot blow or tie their balloon.

*Adapted from *Science Arts*, Mary Ann Kohn and Jean Potter. Bright Ring Publishing, 1993.



ACTION: OBSERVING, COMMUNICATING,
AND COMPARING

1. Have the children try to blow up the balloons. You will need to help the younger children tie the balloon knot and may need to blow and tie balloons for some children.
2. Sprinkle the decorative items and confetti into the tray or baking pan.
3. Have the children rub each balloon with a woolen cloth.
4. Have the children hold the balloon approximately 2 to 3 inches above the decorations in the tray. What happens?
5. Encourage the children to decorate the balloons as they desire.

Note: Give the balloons an extra rubbing with the woolen cloth and "hang" them from the ceiling.

Optional Activity: Make decorative "electric" balloons fit a special holiday or theme (e.g., orange and black for Halloween; red, white, and blue for the Fourth of July).

Presentation Notes

**SCIENCING: OBSERVING,
COMMUNICATING, AND COMPARING**

1. It's time to review the evidence and see what the detectives have learned so far about static electricity. Based on their experiences with this activity, ask the children some of the following questions and record their responses.
 - What were some of the observations about static electricity? Was it already on the balloons when they were inflated?
 - Can you see the electricity? Feel it? Smell it? Hear it?
 - How do you know static electricity exists?
 - How did you communicate your observations?
 - What comparisons did you make?
2. Do the children have any other questions? If so, record them. Help the children use the evidence to answer the questions.

"A" IS FOR AIR (WIND)

Approximate Time Required for Session: 1 hour

Purpose

- To communicate children's observations about wind energy.
- To make inquiries into sources of wind energy.
- To compare the effects of varying wind speeds.

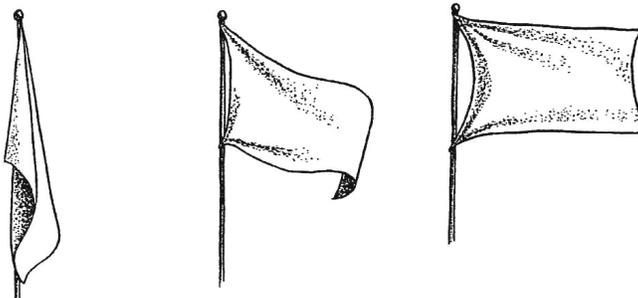
Overview of the Day's Activities

In this session, children explore how air moves when the temperature changes. They also have the opportunity to construct wind socks and wind mills, observing and comparing the effects of wind as a source of mechanical energy.

Background Information

Wind, like sound, is an "invisible" form of energy. It can be felt but not seen, so we will be looking for clues/evidence that wind is present. Wind is moving air caused by changes in temperature. As warm air rises, colder air rushes in to take the place of warm air.

WIND ENERGY can be transformed into other forms of energy. For example, it can be used by sailboats as a source of power (a form of mechanical energy), and wind generators can produce electricity.



ACTIVITY A

BREEZY BOA

Time Required
20-25 minutes

Suggested Grouping
individuals

In this activity, each child will make a Breezy Boa and explore the effect of heat on its movement.

Materials You Will Need (per child)

- Copies of *Breezy Boa* pattern (Use recycled office paper, if possible)
- Scissors
- Pencil
- Piece of thread - 12-15 inches in length
- Straight pin
- Table lamp, shared
- Assorted crayons or colored markers, shared

Getting Ready

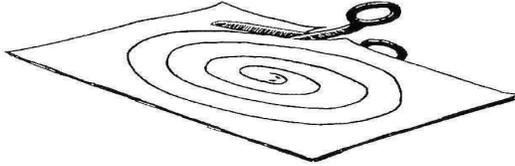
- ❶ Gather the needed materials.
- ❷ Make extra handouts of the *Breezy Boa* pattern (page 70) to send home with the children so they can do the activity with their families.

S
C
R
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A
M

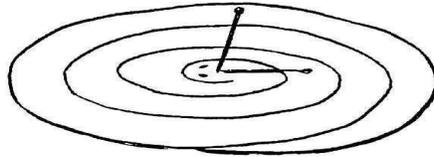
ACTION: OBSERVING, COMMUNICATING, AND COMPARING

1. The secret energy code is SCREAM. What do the letters mean? Ask the children to review the SCREAM code at the beginning of the session.
2. What kind of energy are “Wattsun” and Ohms” investigating today? Using your own words, continue the story of the *Energy Mystery*, searching for clues to help solve the case!

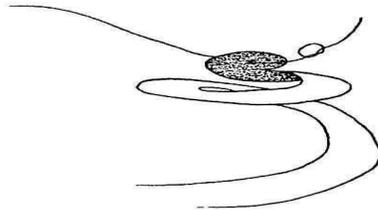
- Using the boa pattern provided, cut along the solid line. Your finished produce will look like a coiled snake with its head in the center.



- Have the children make eyes for the head; attach a tongue if you'd like! Decorate it using crayons or colored markers!



- Using the straight pin, poke a hole through the head region; attach a 12-15 inch piece of thread by tying a knot on the underside of the boa's head.



- Suspend the tail of the *Breezy Boa* approximately six inches above the bulb of the table lamp. What do you observe? (Note: Younger children will need help tying the knot.)



- Turn off the lamp. What happens? Compare!

**SCIENCING: OBSERVING,
COMMUNICATING, AND COMPARING**

1. It’s time to review the evidence and see what the detectives have learned so far about wind and temperature. Based on their experiences with this activity, ask the children some of the following questions and record their responses.

- What were some of your observations?
- What caused the *Breezy Boa* to move? Could you feel it? Smell it? Hear it? See it? Taste it? What clues did you have that wind was there?
- How did you communicate your observations?
- What comparisons did you make?
- How could you make the boa spin faster or slower? How could you prove this to someone?

2. Do the children have any other questions? If so, record them. Help the children use the evidence to answer the questions.

Presentation Notes

ACTIVITY B

WIND CATCHERS - VIETNAMESE MOON LANTERNS

Time Required
20-30 minutes

Suggested Grouping
individuals

Children will learn more about wind energy as they make colorful wind catchers in the style of Vietnamese Moon Lanterns.

Tet-Trung-thu, the Moon Festival, is an important Vietnamese holiday. A celebration of the moon’s beauty, Tet-Trung-thu is observed in late September or early October.

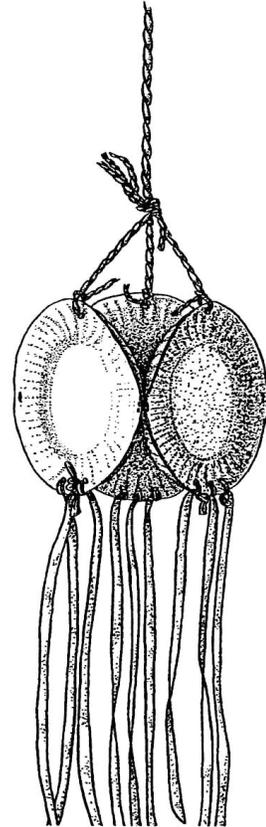
On the night of Tet-Trung-thu, children march through the streets of their towns or cities carrying their Moon Lanterns and singing their favorite songs.

Materials You Will Need

- Paper plates - 3 per child
- Stapler or cellophane tape, shared
- Colored crepe paper strips - 6-9 pieces, 18”-24” in length, per child
- Paper punch, shared
- String - three 8-inch pieces and one 12-inch piece, per child
- Assorted colored markers or crayons, shared

Getting Ready

- ❶ Gather the needed supplies.
- ❷ Check with the program staff for a safe outside area to conduct this activity.
- ❸ Reproduce the Wind Comparison Chart (page 71) or copy onto a poster or chalkboard.



 **Tip**
Try different areas of the playground; try different days. Map the playground for wind catchers success. Make a chart for comparisons.

ACTION: OBSERVING AND COMMUNICATING

1. Decorate the paper plates with colored markers or crayons.
2. Using a stapler or tape, attach the paper plates as shown.
3. At one end, punch one hole per paper plate (site where string will be attached); at the other end, punch two or three holes per paper plate (sites where crepe paper strips are attached).
4. Attach strings as shown.
5. Attach crepe paper strips as shown.
6. Hang the *Moon Lantern* outside. Watch the wind go to work!
7. Where does your wind catcher work the best? How do you know?

Optional Extension

WHO HAS SEEN THE WIND?

Christina Rossetti

1. Write the words to the poem on a large piece of butcher paper or on a chalkboard. Read each line out loud, slowly and carefully, since some children may not read well.

Teens: Who has seen the wind?

Children: Neither I nor you:

Teens: But when the leaves hang trembling

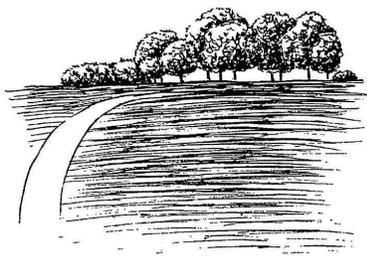
Children: The wind is passing through.

Teens: Who has seen the wind?

Children: Neither you nor I:

Teens: But when the trees bow down their heads

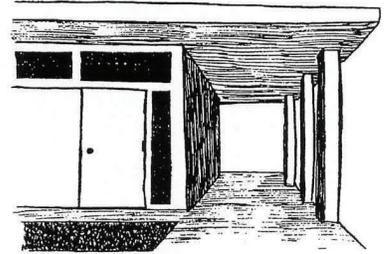
Everyone: The wind is passing by.



2. Once the children learn this poem, recite it together while holding your wind catchers.

**SCIENCING: OBSERVING,
COMMUNICATING, AND COMPARING**

1. It's time to review more evidence and see what the detectives have learned so far about wind energy. Based on their experiences with these activities, ask the children some of the following questions and record their responses.
- Observe different places to catch the wind. Compare!
 - How did you communicate your observations?
 - What comparisons did you make?
 - What made a place better to catch the wind?



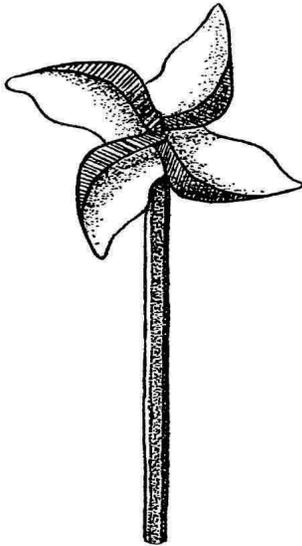
Presentation Notes

ACTIVITY C

WINDMILL FUN

Time Required
20-30 minutes

Suggested Grouping
individuals



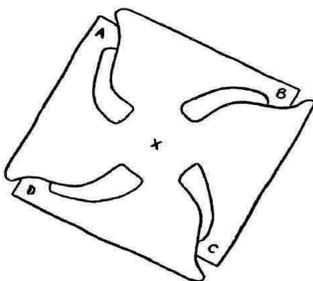
Children will use the windmill pattern to create another wind machine.

Materials You Will Need (per child)

- Copies of the pinwheel pattern (Use recycled office paper, if possible.)
- Paste or glue, optional
- Thumbtack, stick pin, or straight pin
- Pencil with eraser
- Scissors

Getting Ready

- ❶ Gather the needed materials.
- ❷ Make extra handouts of the pinwheel pattern. (See page 72.) Send some home with the children so they can do the activity with their families!
- ❸ Make a pinwheel in advance to show the children the finished product.



ACTION: OBSERVING, COMMUNICATING, AND COMPARING

1. Show the children how to cut out the pinwheel diagram provided. (**NOTE:** Cut along all solid lines, removing the shaded areas within the pinwheel.)

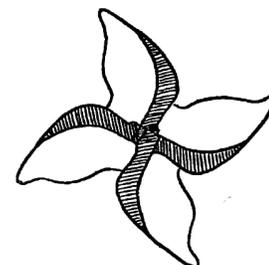
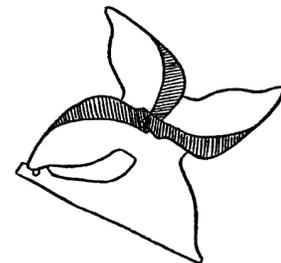
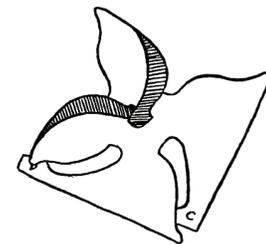
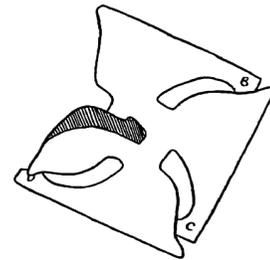
2. Overlap the corners labeled **A, B, C,** and **D** so they meet at the spot marked **X**.
3. Attach the corners **A, B, C,** and **D** at the point **X** by carefully sticking a thumbtack or stick pin through the center of the pinwheel into the eraser of a pencil. The pinwheel should be attached firmly, but have just enough “play” to allow it to spin freely when you blow on it, or expose it to the wind outside.
4. Blow slowly on the pinwheel. What do you observe? Take a deep breath and blow hard on the pinwheel. What do you observe? Compare!
5. Take your pinwheel to different places or outside on different days, or at different times on the same day. Investigate when you find wind. Do you notice any differences? Can you tell if the wind is always blowing from the same direction? How?
6. Can you make wind for your pinwheel? How? (By blowing or running!)

SCIENTICING: OBSERVING AND COMPARING

1. Ask the children to describe the steps in making the Windmill Pinwheels.
2. Ask what they observed when they blew on the pinwheels.
 - What happened when you blew hard?
 - Could you make it go different speeds? How?
 - Take the pinwheels outside in the wind. Make more observations.



Tip
Some children will need help cutting and pinning their pinwheels.



ACTIVITY D

PINWHEEL HELICOPTERS*

Time Required
20-30 minutes

Suggested Grouping
individuals

This activity build upon the exploration in Activity C.

Materials You Will Need (per child)

- Pinwheel from the previous activity
- Long, straight pin with a round head
- Plastic drinking straw - cut ½" long
- Bottle cork

Getting Ready

- ❶ Gather the needed materials.
- ❷ Make a Pinwheel Helicopter (see page 72) in advance of the activity and practice throwing and dropping it.

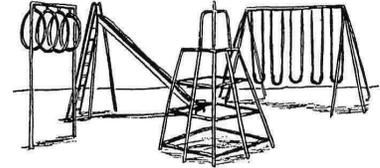
ACTION: OBSERVING AND COMMUNICATING

1. Make another pinwheel or use one from the Windmill activity.
2. Once you have completed your pinwheel, stick the point of the straight pin through its center.
3. Slip the piece of drinking straw onto the sharp end of the pin; push the pin into the side of the cork approximately ¼ of an inch from one end.

*Adapted from *Science Crafts for Kids*. Diehn and Krautwurst. Sterling Publishing Co., Inc, 1994.

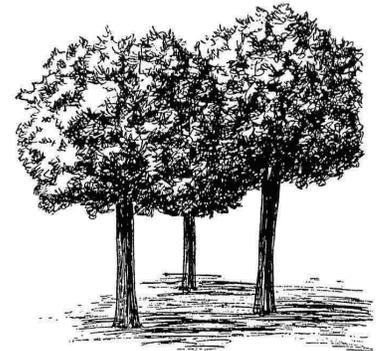
Push the pin in firmly, but allow the straw to move up and down slightly (*the wheel should feel springy*).

4. Throw the helicopter into the air. What happens?
5. Drop the helicopter from the top of a set of stairs, from a balcony, or from the top of a slide on the playground. What do you observe?

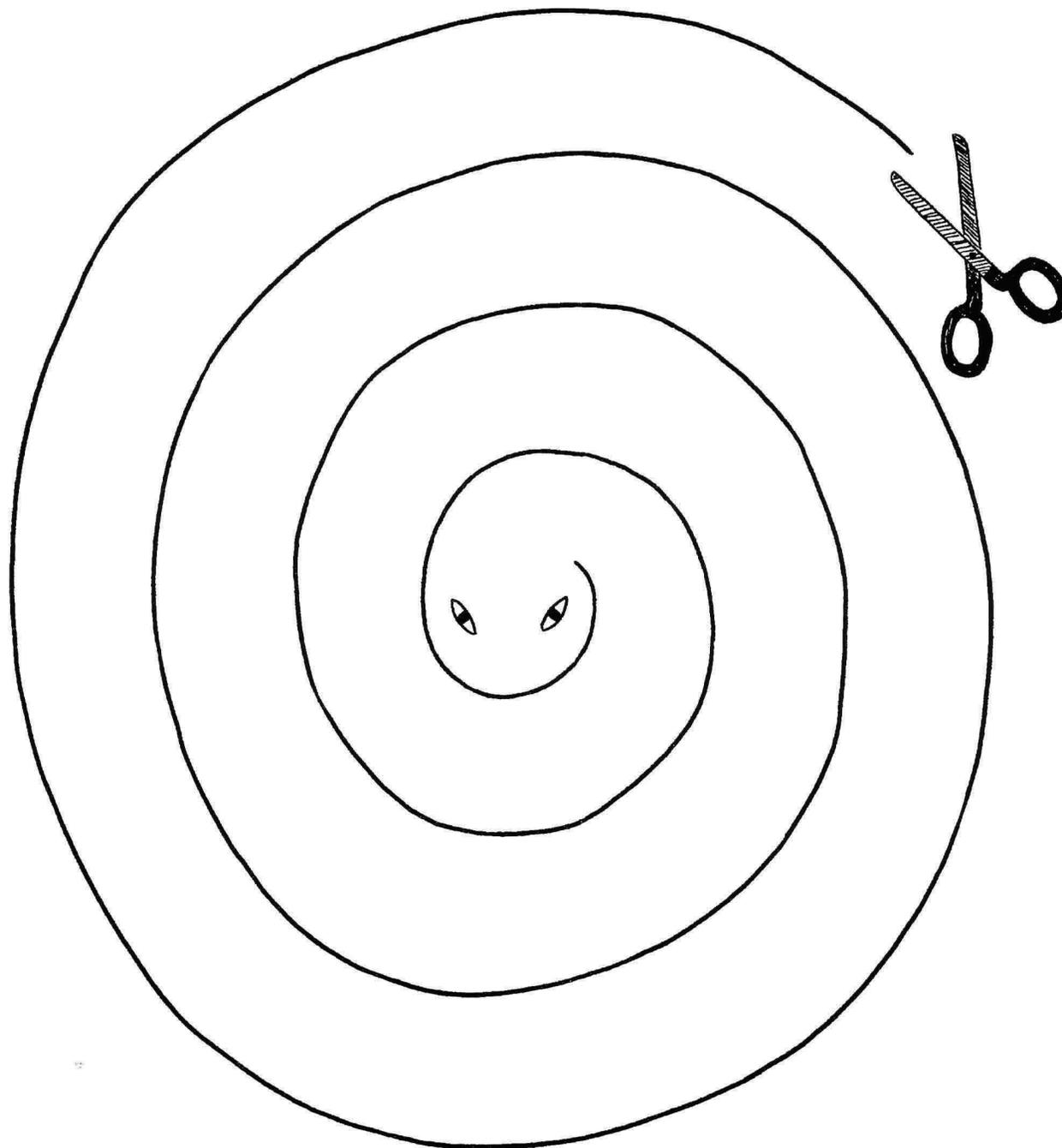


SCIENCING: OBSERVING, COMMUNICATING, AND COMPARING

1. It’s time to review the evidence and see what the detectives have learned so far about wind energy. Based on their experiences with these activities, ask the children some of the following questions and record their responses.
 - What were some of your observations about wind energy? Could you see the wind? Feel it? Smell it? Hear it? Taste it? Was it strong? Was it weak? What happened to the *Wind Catcher* when the wind blew? What happened to the *Windmill*? Did they always blow in the same direction? Explain!
 - How did you communicate your observations?
 - What sort of comparisons did you make? What happened when the wind was strong? When it was weak?
2. Do the children have any other questions? If so, record them. Help the children use the evidence to find the answers.



BREEZY BOA

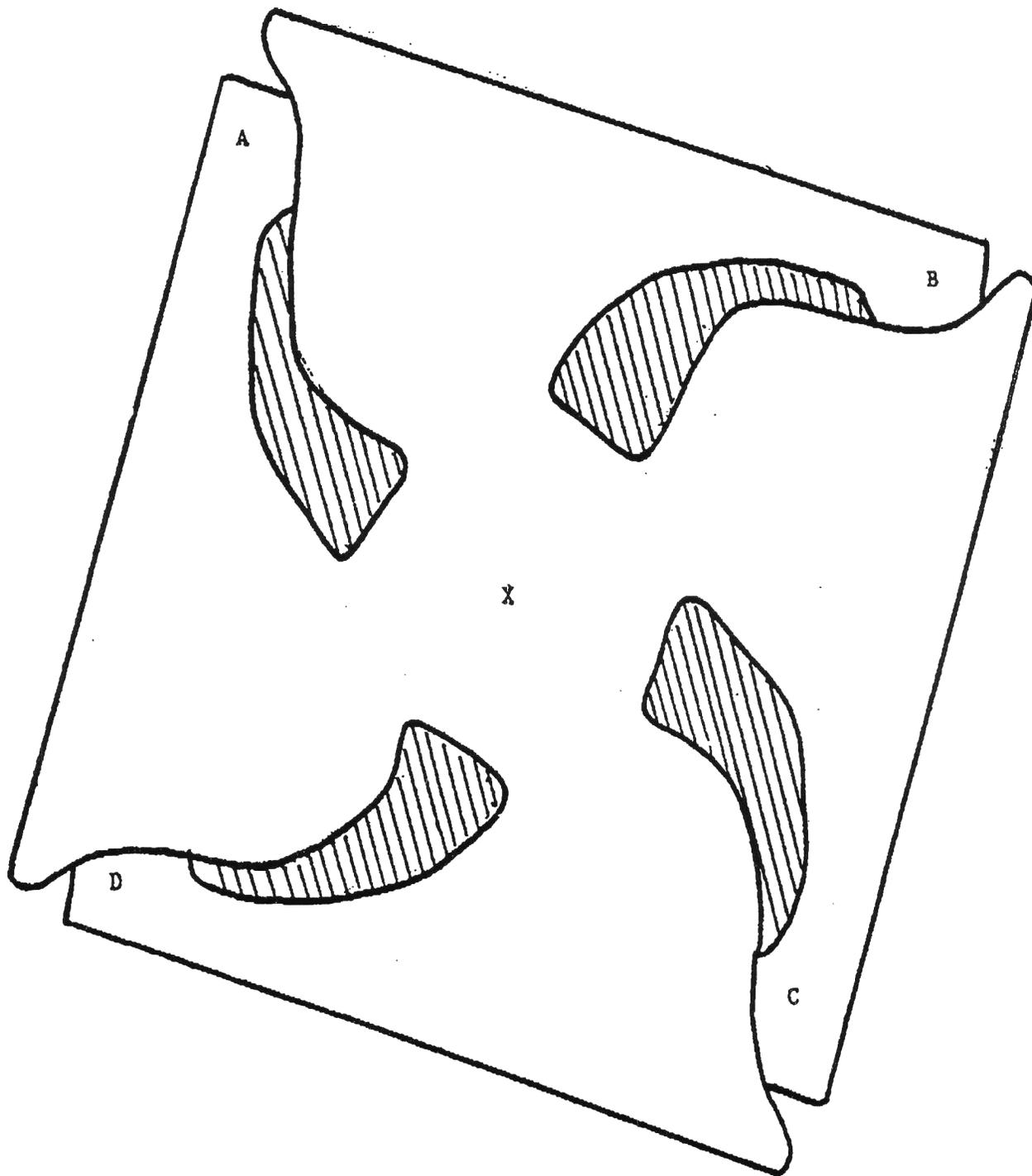


WIND COMPARISON CHART

LOCATION	CALM	WINDY	VERY WINDY
NEAR THE BUILDING			
UNDER THE TREES			
ON THE PLAYGROUND			
IN THE OPEN FIELD			

PINWHEEL

Enlarge on the photocopier.



“M” IS FOR MECHANICAL

Approximate Time Required for Session: 1 hour

Purpose

- To observe evidence of mechanical energy.
- To communicate children’s observations about mechanical energy.
- To make inquiries into the sources of mechanical energy.
- To make comparisons using different sources of mechanical energy.

Overview of the Day’s Activities

In this session, children will have the opportunity to practice different forms of *locomotion* other than walking. Air-powered rockets will demonstrate how the amount of “fuel” affects performance. By building their own boats, children can explore different types of propellers that power their crafts forward or backward.

Background Information

MECHANICAL ENERGY is, for most people, the most identifiable form of energy. If something is moving, it has mechanical energy. The “mystery” is, however, that behind every body in motion is another form of energy! For a car to move it requires chemical energy (gasoline or diesel fuel); a sailboard needs wind; a runner need food (chemical energy); a battery-powered toy car uses electricity. Can you think of any other examples of how energy makes things move?

ACTIVITY A

CATERPILLAR OVER THE MOUNTAIN*

Time Required
10 minutes

Suggested Grouping
groups of four, eight,
or the entire group

Start today’s session by having the children make a human caterpillar. Observe how energy is needed to make the caterpillar move.

Materials You Will Need (per each group)

- Carpeted floor; smooth, uncarpeted floor; or soft, preferably grassy, outdoor surface
- A “mountain” (large play blocks, a bench, tumbling mats, old throw rugs, etc.; if outdoors, a play area with small, preferably grassy hills)

Getting Ready

- ❶ Identify a safe indoor or outdoor area for the children to do this activity. Remove any sharp objects that could cause injury if the children fell on them.

S
C
R
E
A
M

ACTION: OBSERVING, COMMUNICATING, COMPARING, AND GROUPING

1. The secret energy code is SCREAM. What do the letters mean? Ask the children to review the SCREAM code at the beginning of the session.

*Adapted from *The Cooperative Sports and Games Book*, Terry Orlick. Pantheon Books, 1978.

2. What kind of energy are “Wattsun” and *Ohms* investigating today? Using your own words, continue the story of the *Energy Mystery*, searching for clues to help solve the case!
3. If indoors, have the children work together to construct a “mountain” out of large play blocks, a bench, tumbling mats, etc. **(Note: Make certain that there are no sharp corners!)** Once the “mountain is complete, drape a mat or old rug over it; this is “grass” on the top of the hill. If outdoors, proceed to the next step.
4. To form a sixteen-legged caterpillar, have four children line up on their hands and knees, each holding the ankles of a child in front of them. Try moving around the room/ playground. Try climbing the mountain! Coil up and form a cocoon.
5. Repeat the activity with a 32-legged caterpillar. Link the whole class and try it!
6. What do you observe? It is easy to move?

SCIENCING: OBSERVING, COMMUNICATING, AND COMPARING

1. It’s time to review the evidence and see what the detectives have learned so far about mechanical energy. Based on their experiences with this activity, ask the children some of the following questions and record their responses.
 - What were some of your observations about moving like a caterpillar?
 - Let’s make some comparisons. How does it compare to walking? Was it easier to walk like a small caterpillar, or like a big one?

ACTIVITY B

CLASSROOM ROCKET*

Time Required
20-25 minutes

Suggested Grouping
pairs or groups of 3-4

Using balloons children will observe the powerful effect of mechanical energy.



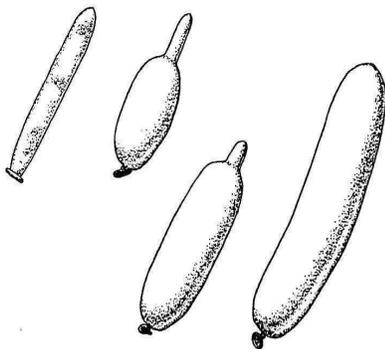
Tip
When working with younger children (5-6 year-olds), consider substituting the straws in this activity with the cardboard paper towel rolls. They are much easier for the children to manipulate.

Materials You Will Need (for each pair or small group)

- Toy oblong balloons - 2
- Kite string - 10-12 feet in length - 2 pieces
- Drinking straws or cardboard paper towel rolls - 2
- Masking tape, shared
- Balloon Comparison Chart
- Two chairs
- Large, unobstructed space

Getting Ready

- 1 Gather the needed supplies.
- 2 Identify an area in the room to conduct the activity.
- 3 Practice taping the balloon to a straw and letting it push itself along the string.
- 4 Photocopy the Balloon Comparison Chart on page 82, or replicate on a poster or chalkboard.

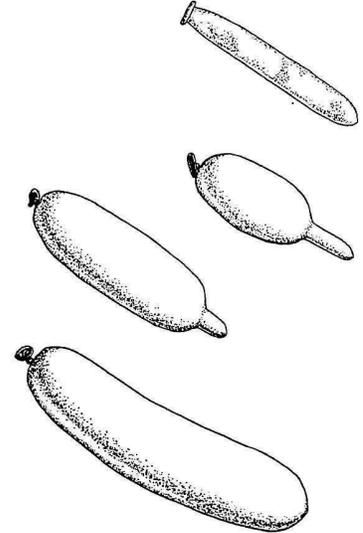
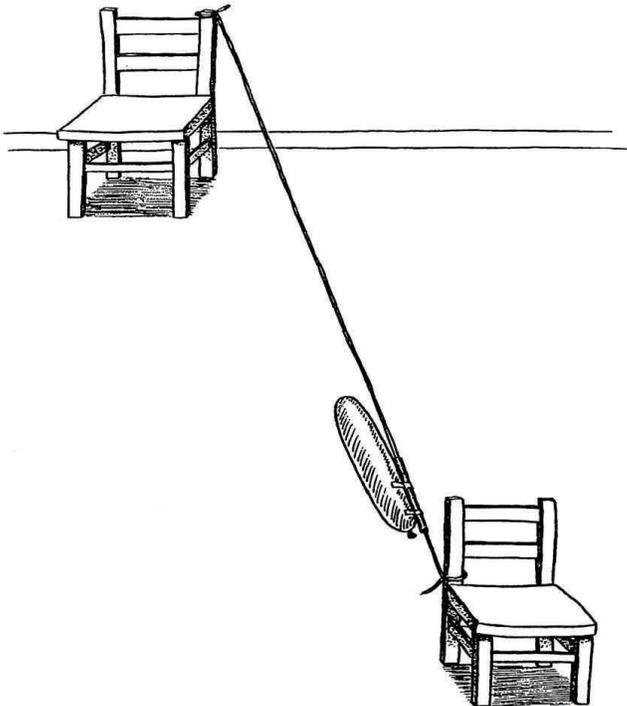


ACTION: OBSERVING AND COMMUNICATING

1. Have the children blow up the balloons; pinch the neck of the balloon to hold it the air. (Help younger children blow up the balloons.)

*Adapted from *Creative Science for Young Children*, Betty Foster, et. al. Ills. by Mina Gow McLean. The Child’s World, 1988.

2. Next, let the neck of the balloon go so that it “rockets” around the room. Ask the children: What makes the balloon move? (**Safety Tip:** Remind the children that they are not to let their balloons go toward another person.)
3. Now, thread the kite string through a straw; stretch the string tautly across the room and secure both ends (between two chairs, tables, or desks). One end may be lower than the other.
4. Blow up an oblong balloon and ask the child to hold the neck tightly closed.
5. Tape the balloon to the drinking straw and slide the straw to the lower end of the string with the neck of the balloon toward the lower end, keeping the balloon tightly closed.
6. Release the neck of the balloon. Observe how the air in the balloon pushes the balloon and straw along the length of the string.



7. Repeat this experiment, but inflate the balloons with different amounts. Compare! Measure distances. Measure times. Complete the Balloon Comparison Chart. (See page 82.)

Optional Activity: Have the children take a deep breath (as if they were a balloon) and, as they let it out, run around the room/schoolyard imitating the balloon’s movement.

SCIENTIFIC: OBSERVING, COMMUNICATING, AND COMPARING

1. Based on their experiences with this activity, ask the children some of the following questions.
 - What did you observe?
 - What does the Balloon Comparison Chart tell us about how fast or slow the balloon moves with no air? A little air? Half full of air? Full of air?

Presentation Notes

ACTIVITY C

RUBBER BAND BOAT*

Time Required
30-40 minutes

Suggested Grouping
individuals or pairs

Many of the same supplies used in the prior activity will be used to energize a milk carton boat across the water.

Materials You Will Need (for each individual or pair)

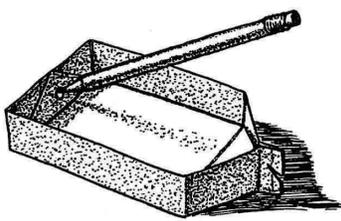
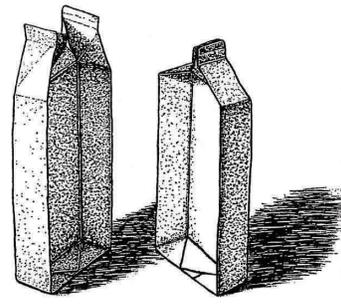
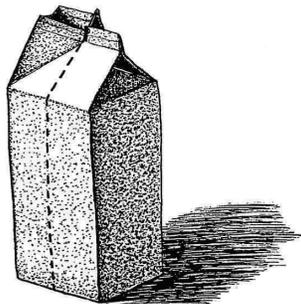
- Milk carton - pint-sized
- Scissors
- Drinking straw - plastic, large diameter
- Pencil
- Medium-sized rubber band
- Wooden bead - ½" diameter (available in craft stores)
- Paper clip
- Plastic milk jugs, shared
- Propeller Chart
- Propeller Designs
- Large tub of water (a children's wading pool is a excellent option), shared
- Stapler, *optional*

Getting Ready

- ❶ Gather the needed materials.
- ❷ Using the Propeller Designs (see page 84) provided, cut several "samples" of each from the plastic milk jugs
- ❸ Practice making a rubber band boat to see how it works.

*Adapted from *Constructing for Children*, Barbara Eichelberger and Connie Larson. Seymour Publications, 1993, and Holmes McDougall Ltd., Edinburgh, 1984.

 **Tip**
 Younger children will need some assistance with the construction of the boat.



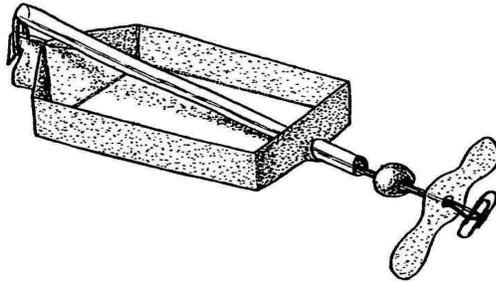
ACTION: OBSERVING, COMMUNICATING, COMPARING, AND PREDICTING

1. Help the children construct rubber band boats using the following instructions (diagram page 85).
 - Cut the pint-size milk carton in half lengthwise. If necessary, staple together the sides of the carton with the open end (boat's bow).
 - Cut a notch in the boat's bow as shown.
 - Using a pencil, poke a hole (at the downward angle from the inside) in the center and near the bottom of the back (boat's stern) of the milk carton.
 - Cut several propellers using the patterns provided as guidelines.
 - Cut the straw to fit the length shown in the diagram.
 - From the inside of the boat, insert the one end of the straw through the hole in the boat's bow.
 - Insert the rubber band through the straw, attaching one end of the notch in the boat's stern.
 - Thread the other end through the hole in the wooden bead, through the hole in the propeller (whichever design the children choose to use), and attach it to the paper clip as shown.
 - The boat should now be ready for a trip on the high seas!

2. Have the children wind their propellers, place their boats in the water, and let them go. What happens?

Can they make it go faster? Make predictions! Slower? Can they make their boats change directions? Forward? Backward? Compare different propellers. Do they work similarly? How far will your boat travel?

3. Use the Propeller Chart to compare the different propellers. (See page 83.)



SCIENCING: OBSERVING, COMMUNICATING, AND COMPARING

1. It's time to review the evidence and see what the detectives have learned so far about mechanical energy. Based on their experiences with these activities, ask the children some of the following questions and record their responses.
 - What were some of your observations?
 - How did you communicate your observations?
 - What sort of comparisons did you make?
 - How does more power affect the movement of these crafts?
2. Do the children have any other questions? If so, record them. Help the children use the evidence to answer the questions.

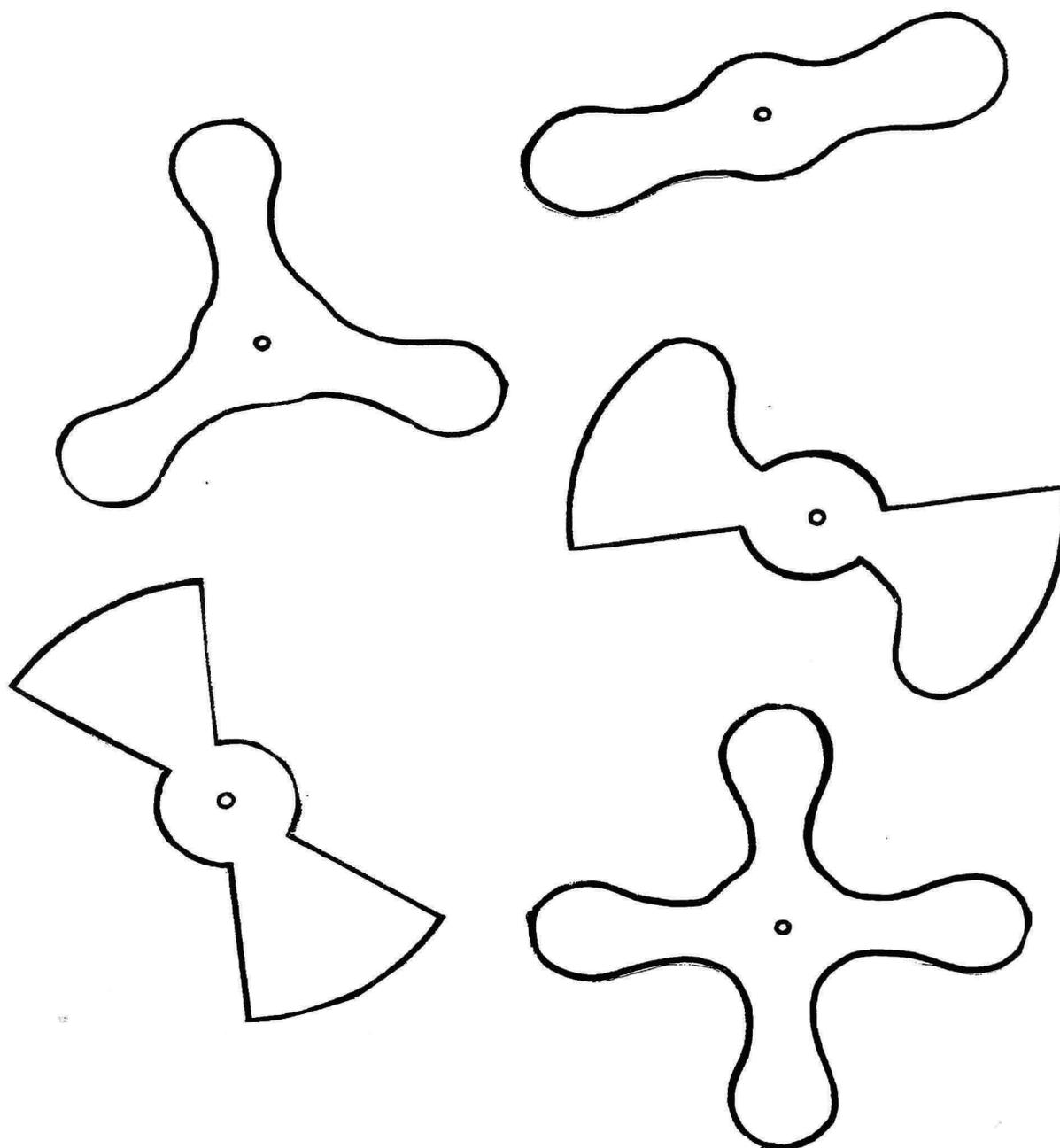
BALLOON COMPARISON CHART

BALLOON	SLOW	FAST	CLOSE	FAR
NO AIR				
A LITTLE AIR				
HALF FULL OF AIR				
FULL OF AIR				

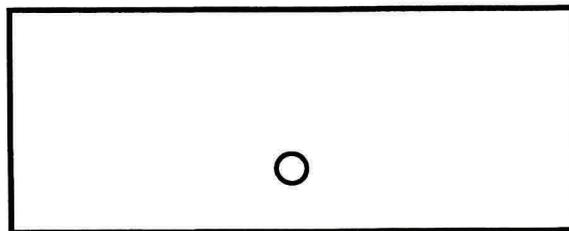
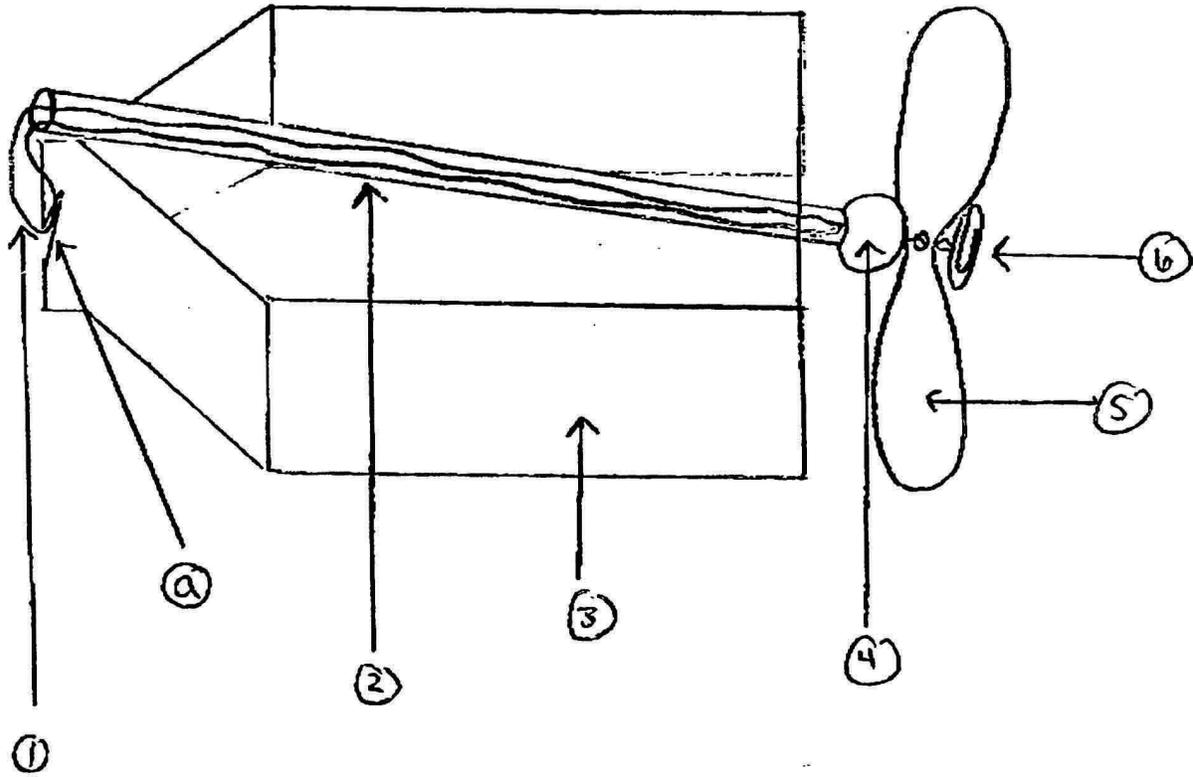
PROPELLER CHART

Propeller	SLOW	FAST	CLOSE	FAR	FOR- WARD	BACK- WARD
Propeller #1						
Propeller #2						
Propeller #3						
Propeller #4						
Propeller #5						

PROPELLER DESIGNS



RUBBER BAND BOAT



BOAT STERN

CLUE BIBLIOGRAPHY

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CLUE - Children Looking Under for Energy

Session 1 "S" IS FOR SOUND

Activity A - Introduction to CLUE

CLUE script

Poster with the work SCREAM written vertically

Markers

Activity B - Energy and YOU

Poster board, butcher paper, or chalkboard

Colored markers, crayons or colored chalk

Activity C - Sound All Around

Poster board, flip charts, butcher paper, or chalkboard

Colored markers, crayons, or colored chalk

Cassette tape player, blank cassette, *optional*

Activity D - A Rubber Band Band

Rubber bands - different sizes (long and short; wide and narrow) - several per group

Cups - (paper or plastic), cans, or boxes of different sizes - 4-5

Activity E - Chicken in a Cup

Cups - paper or Styrofoam (sizes may vary; compare the sounds of differently-sized cups) - 1 per child

String approximately 15" in length (use different types of string for comparison, too) - 1 per child

Large paper clip - 1 per child

Sharp pencil - 1 per child

Paper towel or small sponge, shared

Small amount of water in a cup

Session 2 "C" IS FOR CHEMICAL

Activity A - Wheat Field in a Bag

Untreated wheat berries - 20-30

Clear plastic sandwich bag

Cotton balls - 2

Magnifying glasses, shared

Masking tape, shared

Butcher paper or poster board, shared

Colored markers
Water

Activity B - Soda Bread: Food Energy for Us

Mortar and pestle (or any other grinding implement - even 2 spoons!)
Oven or toaster oven, shared
Measuring cup
Measuring spoons - 1 set
Large mixing bowl
Large mixing spoon
Metal pie pan
Wheat stalks with wheat berries - 3-4
All-purpose flour - 4 cups
Baking soda - 1 teaspoon
Salt - 1 teaspoon
Buttermilk - 1½ cups
Cooking oil - 1 teaspoon
Potholder
Knife to cut bread
Raisins - 1 cup, *optional*
Cinnamon - 1 teaspoon, *optional*

Activity C - Frozen Food Tag

Large, open space (playground, gymnasium, or multi-purpose room)
Wooden tongue depressors - 40-50
Drawing paper - 1 sheet per child
Assorted markers or crayons

Session 3 “R” IS FOR RADIANT**Activity A - Bear Shadow**

Bear Shadow by Frank Asch
Drawing paper - 1 sheet per child
Assorted markers or crayons

Activity B - Shadow Sticks

Pencils - 2
Modeling clay
Ruler
Sheet of paper
Chalk - 1 piece
Compass, *optional*

Wristwatch (with second hand) or kitchen timer
Markers, crayons, or colored chalk

Activity C - Solar Mitts

Aluminum foil - 1 2-inch, square sheet
Black construction paper - 2-4 sheets
Cellophane tape dispenser, shared
A sunny day (even in winter!)
Indoor/outdoor thermometer, *optional*

Activity D - Ice Cube Races

Ice cubes - 1 per child, all approximately the same size
Watch (with a second hand) for the teen leader to time the “race”
Butcher paper, poster board, or a chalkboard - 1 large piece, shared
Assorted colored markers, shared
A warm, sunny day (*An alternative would be to do this activity indoors, placing the ice cubes inside yogurt cups or on small plates or in a plastic Ziplock bags.*)

Cloudy Day Alternative Activity A - Who’s Asleep When?

Large ball (basketball, beach ball) or globe
Flashlight

Cloudy Day Alternative Activity B - Shadow Puppets

Cardboard - 1 large sheet per group, or construction paper - 1 sheet per child
(recycled cardboard boxes make a great option)
Pencils - 1 per child
Scissors - 1 per group
Wooden tongue depressors - 1 or 2 per child
Masking tape - 1 roll per group
White bed sheet
Rope or long piece of heavy string - 12-15 feet
Small table
Table or floor lamp with 100 watt bulb

Session 4 “E” IS FOR ELECTRICAL

Activity A - Magnet Magic

Strong magnet - 1 per pair
Metal objects such as paper clips, washers, nuts, bolts; or metal filings -
several

Non-metal objects made of wood, paper, or plastic - several (e.g., paper, cardboard, thread, or leaves)

White paper, *optional*

Activity B - Magnet Masterpieces

Cardboard box - medium-sized (16-18 cubic inches) - 1 box for every four children

Strong magnet

Metal objects such as washers, nuts, or bolts

Embroidery floss, thread, or string - cut into 4-6 inch pieces

Tempera paints - 4-5 colors

White paper - 1 sheet per individual

Cellophane tape

Scissors

Activity C - Static Electricity: “Electric” Art Balloons

Balloons of different shapes and sizes - 2 balloons per child

Small pieces of colored paper confetti, shared

Tiny bits of decorative items such as glitter, lace, sequins, sugar (colored, if possible), and/or salt, shared

Tray or baking pan - 1 per 2-3 children

Woolen cloth - 1 per 2-3 children

Session 5 “A” IS FOR AIR (WIND)

Activity A - Breezy Boa

Copies of *Breezy Boa* pattern (*Use recycled office paper, if possible*)

Scissors

Pencil

Piece of thread - 12-15 inches in length

Straight pin

Table lamp, shared

Assorted crayons or colored markers, shared

Activity B - Wind Catchers - Vietnamese Moon Lanterns

Paper plates - 3 per child

Stapler or cellophane tape, shared

Colored crepe paper strips - 6-9 pieces, 18”-24” in length, per child

Paper punch, shared

String - three 8-inch pieces and one 12-inch piece, per child

Assorted colored markers or crayons, shared

Activity C - Windmill Fun

Copies of the windmill pattern (*Use recycled office paper, if possible*)

Paste or glue, *optional*

Thumbtack, stick pin, or straight pin

Pencil with eraser

Scissors

Activity D - Pinwheel Helicopters

Pinwheel from the previous activity

Long, straight pin with a round head

Plastic drinking straw - cut ½" long

Bottle cork

Session 6 "M" IS FOR MECHANICAL

Activity A - Caterpillar Over the Mountain

Carpeted floor, smooth, uncarpeted floor; or soft, preferably grassy, outdoor surface

A "mountain" (large play blocks, a bench, tumbling mats, old throw rugs, etc.; if outdoors, a play area with small, preferably grassy, hills)

Activity B - Classroom Rocket

Toy oblong balloons - 2

Kite string - 10-12 feet in length - 2 pieces

Drinking straws or cardboard paper towel rolls - 2

Balloon Comparison Chart

Masking tape, shared

Two chairs

Large, unobstructed space

Activity C - Rubber Band Boats

Milk carton - pint-sized

Scissors

Drinking straw - plastic, large diameter

Pencil

Medium-sized rubber band

Wooden bead ½" diameter (available in craft stores)

Paper clip

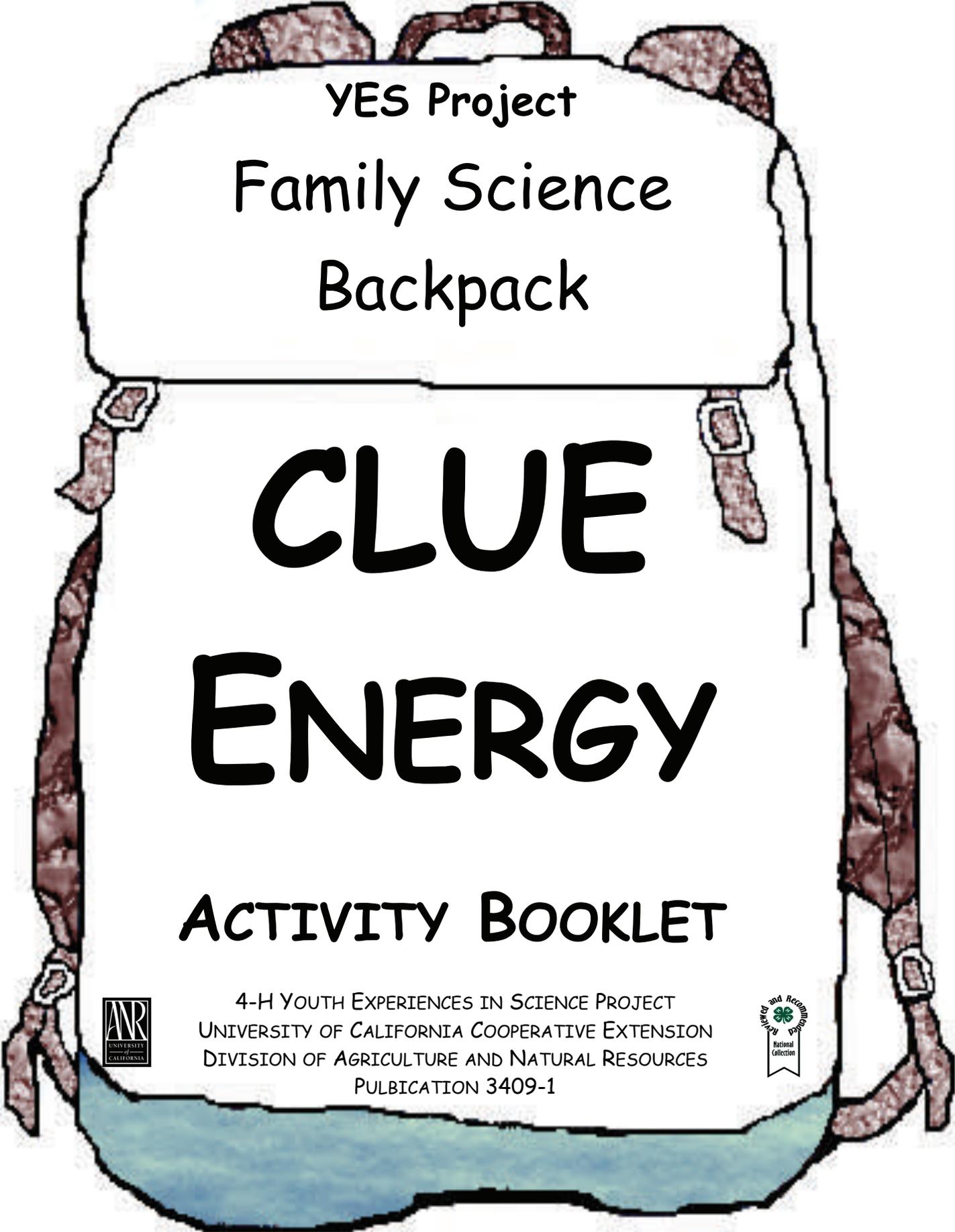
Plastic milk jugs, shared

Propeller Chart

Propeller Designs

Large tub of water (a children's wading pool is an excellent option), shared

Stapler, *optional*



YES Project
Family Science
Backpack

**CLUE
ENERGY**

ACTIVITY BOOKLET

4-H YOUTH EXPERIENCES IN SCIENCE PROJECT
UNIVERSITY OF CALIFORNIA COOPERATIVE EXTENSION
DIVISION OF AGRICULTURE AND NATURAL RESOURCES
PUBLICATION 3409-1





WELCOME FAMILIES



In this Family Science Backpack, you will find a variety of hands-on/minds-on activities about energy that you can enjoy at home. By exploring the "mystery" of energy, you will observe, communicate, compare, and organize information, helping you to build a new base of knowledge. By exploring science in this fun and interesting way, new discoveries about energy in your everyday lives will lead you and your child to new questions and further inquiry.

You will also explore ways you can conserve energy around your home. *Enjoy!*

YES ENERGY FAMILY ACTIVITY BACKPACK BY

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Publication 3409-1

LAYOUT AND DESIGN

Judy Ranheim

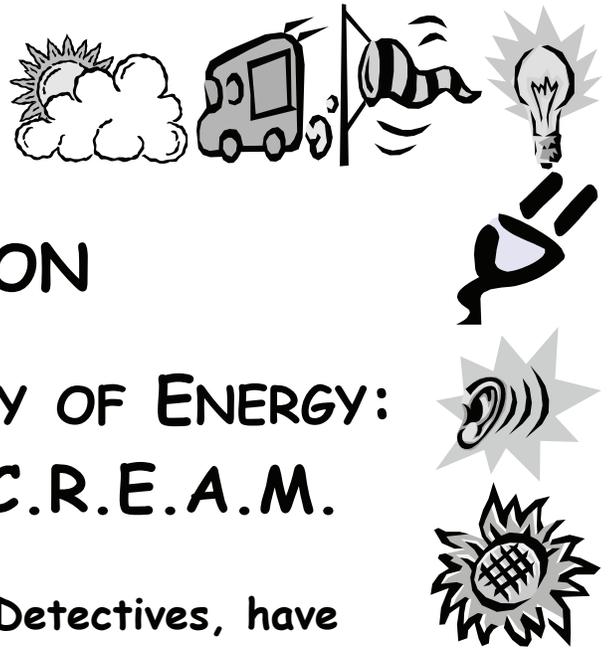
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INTRODUCTION

THE UNSOLVED MYSTERY OF ENERGY: IT BEGAN WITH A S.C.R.E.A.M.

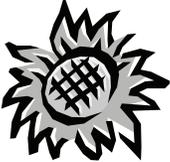
"Wattsun" and *"Ohms,"* two Energy Detectives, have found a secret energy code, and they'd like you to help them investigate it more! The secret code is:

S.C.R.E.A.M.

- ⊙ **S**ound
- ⊙ **C**hemical
- ⊙ **R**adiant
- ⊙ **E**lectrical
- ⊙ **A**ir (Wind)
- ⊙ **M**echanical

All of these are, in one way or another, types of energy. But we need clues to prove this; we need evidence. So, let's inquire, let's investigate the **S.C.R.E.A.M.** and find information, or evidence, for ourselves. We need to work together to develop a strong case and solve the mystery.

**IT'S TIME TO
BEGIN OUR SEARCH!**



LISTEN TO THE BEAT!

S

ound comes from many sources,

even from inside our own bodies! Let's discover the
sound of our heartbeat!



WHAT YOU NEED

- ⦿ Homemade stethoscope (two plastic funnels and rubber hose) provided in the Family Science Backpack.

HOW TO DO IT



- ☼ Using the homemade stethoscope in your backpack, place one funnel flat against your chest and the other funnel over one ear.
- ☼ Listen to other family members' hearts.
- ☼ Listen to other sounds: refrigerator, clock, etc.



QUESTIONS TO ASK YOUR CHILD

Ask open-ended questions that encourage further exploration by your child.

- ⇒ *Did you hear a sound?*
- ⇒ *Is it loud? Is it soft?*
- ⇒ *Is it fast? Is it slow? Compare the heartbeats of different family members. Organize them from fastest to slowest, or loudest to softest.*
- ⇒ *Can you locate the area on your chest where the sound is the strongest?*
- ⇒ *Can you describe the sound you hear?*
- ⇒ *What do you think is making the sound you hear?*
- ⇒ *Can you hear this sound without the stethoscope? (Place your ear on someone's chest; listen from a short distance away from another person.) COMPARE.*
- ⇒ *Does the heartbeat of your dog or cat sound similar? COMPARE.*

SOUND OUT AT HOME!

Unwanted sound energy is called NOISE. Noise pollution at home can be addressed in a variety of ways:

- ◆ Tune your car engine so that it runs quietly.
- ◆ Replace your car's worn-out muffler!
- ◆ Reduce the volume on home stereos and televisions.
- ◆ Designate family "quiet times" during the day/week.





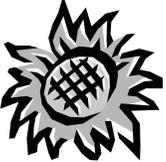
ACTIVITY 2

CHEMICAL ENERGY

ENERGY FOR THE



HUMAN MACHINE!



How is a car without gasoline like a person without food? *Neither has fuel!* A car needs gasoline in order to move. People also need fuel in order to move; the food that we eat gives us energy so we can run, jump, work, and play.

The ingredients in our fuel (*food*) sometimes need to be changed in order for us to eat them. For example, cookies just don't happen; their contents must be mixed together and baked (adding a different form of energy-*heat*) before we eat them. This is called *CHEMICAL* change.

Let's experiment by trying some REFRIGERATOR COOKIES!



WHAT YOU NEED

- ⊙ one cookie sheet
- ⊙ one large mixing bowl
- ⊙ measuring cup
- ⊙ measuring spoons
- ⊙ one cup of margarine
- ⊙ one-half cup of sugar
- ⊙ one teaspoon of vanilla extract
- ⊙ one teaspoon of almond extract
- ⊙ two cups of all purpose flour
- ⊙ one-half cup of chopped nuts (almonds make an excellent choice!)

HOW TO DO IT



- ☼ Using your hands, mix all of the ingredients (except the sugar) together in a large bowl. Split the dough in half and mold it into two rolls. Spread the sugar on a counter and roll the dough in it.
- ☼ Slice each dough roll into cookies (one-half inch thick) and place on an ungreased cookie sheet. Bake at 375 degrees Fahrenheit for 8-10 minutes, or until done.

Note: The cookie dough can be wrapped in foil and frozen for baking at a later date!



QUESTIONS TO ASK YOUR CHILD

Ask open-ended questions that encourage further exploration by your child.

- ⇒ *What did the ingredients look like **BEFORE** they were mixed together? COMPARE!*
- ⇒ *What did the ingredients look like **AFTER** they were mixed together? COMPARE!*
- ⇒ *Compare an unbaked cookie to a baked one. Describe the difference in the way they look, feel, and smell.*

KITCHEN CLUES

Saving energy in the kitchen is not as much of a mystery as it may seem. Did you know that:

- ◆ The reflectors under your stove-top burners will reflect better if they are clean? This can help you save as much as 33% more energy when cooking!
- ◆ Heat escapes from ovens if there is a small tear or gap in the door's seal. Better heat retention means more energy saved!
- ◆ Because glass and ceramic dishes retain heat better, the required baking temperature can be reduced by as much as 25 degrees Fahrenheit!
- ◆ Try composting! Approximately 70% of the garbage in the U. S. is compostable, much of which is food waste. The finished product adds nutrients and humus to the soil in your garden!

**Ladies and gentlemen, boys and girls:
FILL YOUR TANKS WITH COOKIE FUEL!**



ACTIVITY 3
RADIANT ENERGY

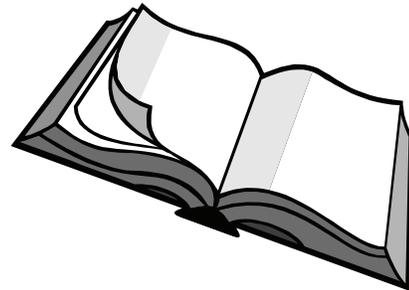


WHAT MAKES A SHADOW?

Read together with your children! It's
fun and educational!

This story follows the discoveries that
a young bear makes about shadows!

- ⚙ Read the book beforehand to become familiar with it.



What You Need

- ⦿ *Bear Shadow* by Frank Asch

HOW TO DO IT



- ☼ Be animated when reading to your child; make the story "come alive"! Use different voices for different characters, or change the tone of your voice in relation to what's happening in the story.
- ☼ Involve your child in the reading. If he/she can already read, share by alternating pages. Or, let your child turn the pages if he/she is too young to read. Ask him/her to predict what might happen next in the story. Encourage him/her to retell the story, or draw pictures that relate to what's been read.

QUESTIONS TO ASK YOUR CHILD

Ask open-ended questions that encourage further exploration by your child.

- ⇒ *What was the story about?*
- ⇒ *In the story, what scared the big fish?*
- ⇒ *How did the bear hide from his shadow?*
- ⇒ *What makes shadows?*
- ⇒ *Do shadows ever move?*
- ⇒ *What happened to the bear's shadow when he tried to nail it to the ground? When he tried to bury it in a hole?*
- ⇒ *Why didn't the bear have a shadow at 12:00 noon?*
- ⇒ *Go outside and look for shadows. How many different ones did you see? Organize them into groups (e.g., long/tall; short/wide).*

HERE COMES THE SUN!

How can you use more solar energy at home? Some tips include:

- ◆ By insulating your home properly, and installing specially-designed, double-pane windows, sunlight energy can help heat your home in the winter by simply opening the curtains! This can reduce your gas or electric bills significantly.
- ◆ More expensive options involve the installation of solar collectors for some form of sun-driven heating.
- ◆ Use reflective stickers or glow-in-the-dark outlet covers as substitutes for night lights.



ACTIVITY 4
ELECTRICAL ENERGY

BATTERIES



Electricity that flows through wires

connected to batteries or generators can be used to light lamps, run motors, and power computers. This is something we take for granted today, but was not so common just a few decades ago!

Electricity from batteries that powers toys, flashlights, or portable radios and televisions is safe; it will not produce dangerous electrical shocks. However, electricity from wall sockets that runs household appliances (e.g., lamps, refrigerators) can be very dangerous if not used properly.

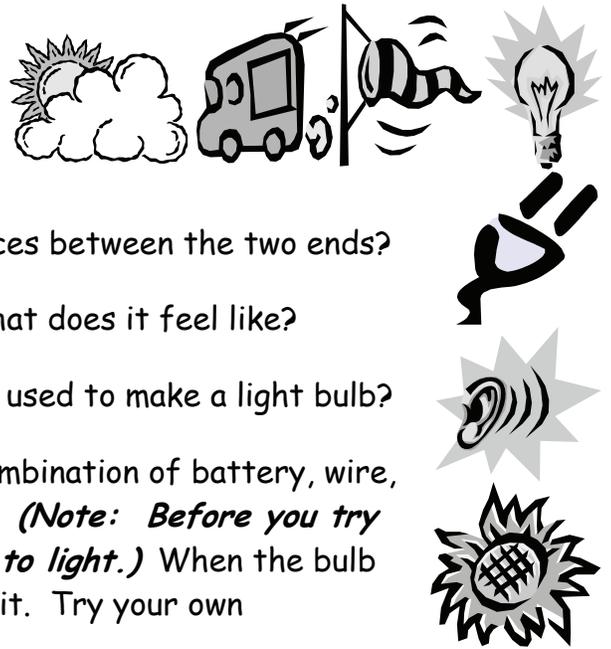
Energy Detectives never experiment with household appliances and electricity!

INVESTIGATE SAFELY!

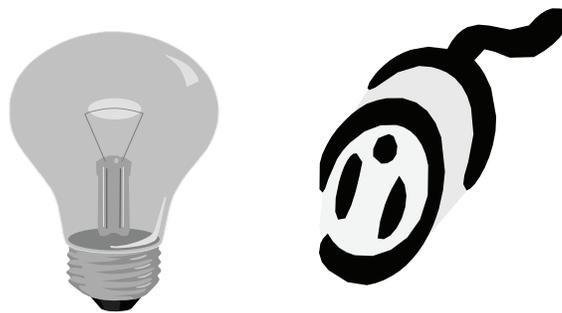
What You Need

- ⊙ two size D batteries (alkaline or regular)
- ⊙ two flashlight bulbs
- ⊙ two six-inch (15 cm) sections of insulated copper wire

HOW TO DO IT



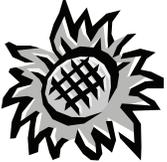
- ⚙️ Observe the battery. Are there any differences between the two ends?
- ⚙️ Observe the wire. What does it look like? What does it feel like?
- ⚙️ Observe the bulb. What kind of materials are used to make a light bulb?
- ⚙️ Using the activity sheet on page 12, try any combination of battery, wire, and/or bulb to form a simple electrical circuit. (**Note: Before you try them, predict which one will cause the bulb to light.**) When the bulb lights, the path you have made is called a circuit. Try your own combinations! Draw them and keep a record.



QUESTIONS TO ASK YOUR CHILD

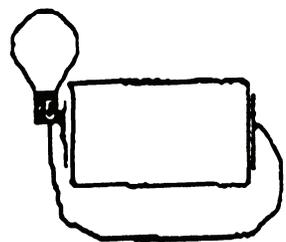
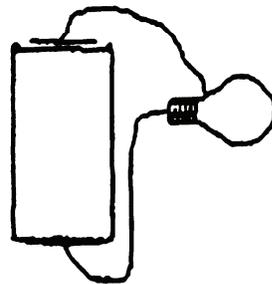
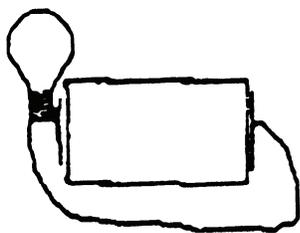
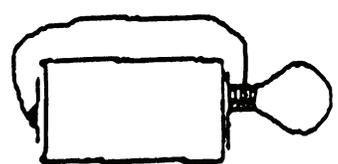
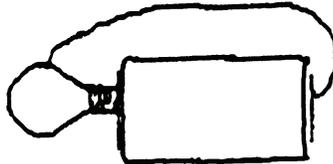
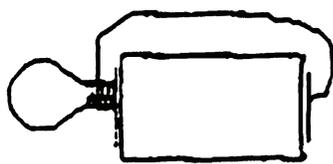
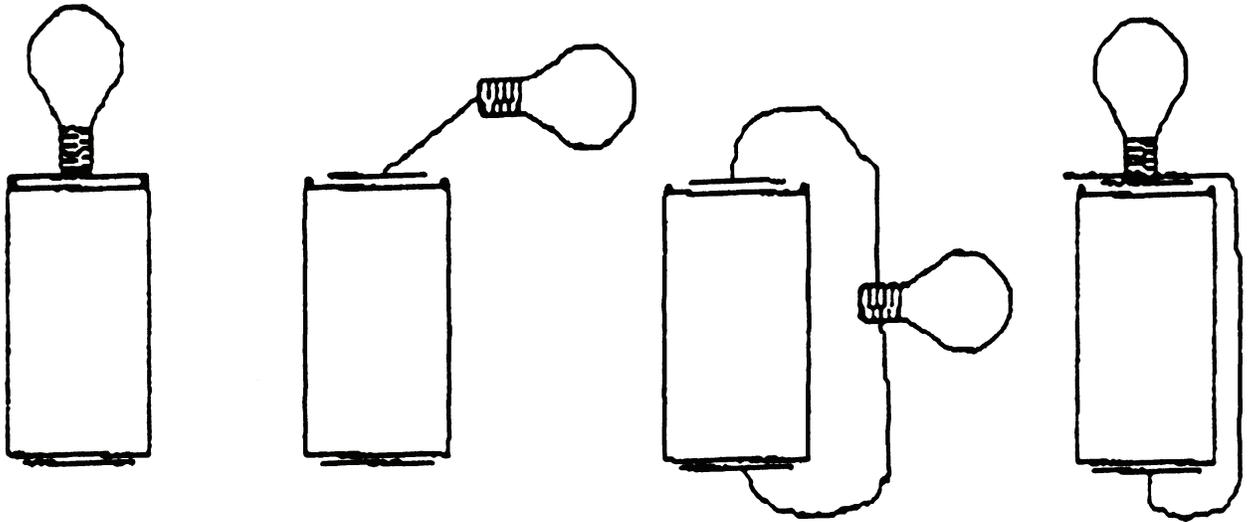
Ask open-ended questions that encourage further exploration by your child.

- ⇒ *Does it matter whether the bulb touches the positive or negative end of the battery?*
- ⇒ *What happens to the brightness of the lit bulb if you use two batteries?*
- ⇒ *What happens if you use more than one bulb? More than one wire?*



BATTERIES AND BULBS

ACTIVITY SHEET



HOW TO DO IT



SAFETY CONSIDERATIONS!

- ⇒ **REMEMBER:** *The voltage of one, two, or even three size D batteries is not dangerous.*
- ⇒ *Participants need to be aware that the ends of copper wires are sharp and can be hazardous. Don't poke yourself or anyone else!*
- ⇒ *If the wire is connected directly to the positive and negative terminals of the battery without the bulb in the path (i.e., a short circuit), the wire may get warm. However, chances are that the children will not leave these connected long enough for the wire to get too hot. But, be aware of this!*



Clues to the Electricity Blues

- ◆ Conserving electricity at home isn't a mystery, it just requires a little effort on everyone's part!
- ◆ DID YOU KNOW THAT: Opening the curtains during the day can save electricity. Direct sunlight is 100 times brighter than a strong reading lamp!
- ◆ Wash clothes in cold water. Up to 90% of the energy consumed by washing machines goes to heating the water.
- ◆ Install fluorescent bulbs in your home. They provide the same amount of light for 75% less energy and last up to 10 times longer than incandescent bulbs.



ACTIVITY 5
AIR (WIND) ENERGY

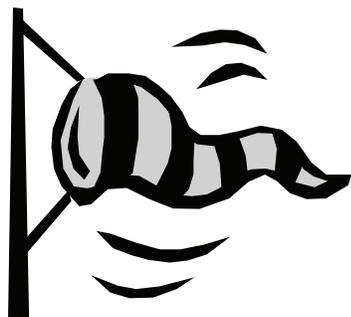
WIND-POWERED MOBILE



Warm air is not as dense as cool air; so, when warm air rises, cooler, "heavier" air sinks (*think of how smoke rises out of a chimney*).

When the cooler air in the sky is warmed by the sun, it rises, being replaced by more cool air. It's this type of air movement that brings us our weather -- winds, clouds, rain, and snow.

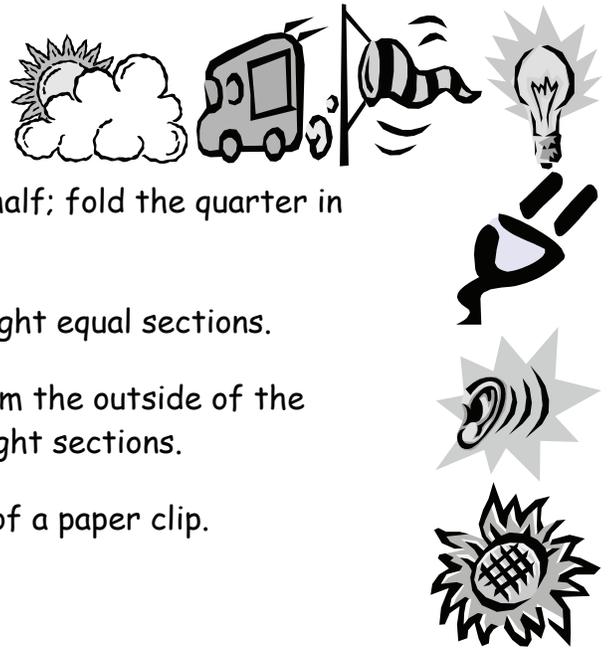
(NOTE: YOU MIGHT SAY THAT WIND, ANOTHER TYPE OF ENERGY, IS SOLAR-POWERED!)



What You Need

- ⊙ 4-inch to 6-inch circle of construction paper
- ⊙ scissors
- ⊙ thread
- ⊙ paper clips
- ⊙ coat hanger
- ⊙ electric light

HOW TO DO IT



- ⊗ Fold the circle in half; fold the semi-circle in half; fold the quarter in half again.
- ⊗ Open the paper circle; it will be divided into eight equal sections.
- ⊗ On each fold line, make a one-half inch cut from the outside of the circle. Fold down one corner of each of the eight sections.
- ⊗ Attach a 12-inch strand of thread to the end of a paper clip.
- ⊗ Poke a hole in the center of the paper circle.
- ⊗ Thread the free end of the strand through the hole so the paper clip hangs down from the middle. Make certain that the folded corners on the paper circle point downward.
- ⊗ Attach the free end of the thread to a hanger.
- ⊗ Suspend the mobile a safe distance over the lighted bulb of a lamp.

QUESTIONS TO ASK YOUR CHILD

Ask open-ended questions that encourage further exploration by your child.

- ⇒ *What happens to the paper circle when it's suspended over a lighted bulb?*
- ⇒ *What happens when the bulb is turned off? COMPARE.*
- ⇒ *Try folding the corners down in the opposite direction. What happens when it's suspended over a lighted bulb? COMPARE.*

THE WIND AND YOU!

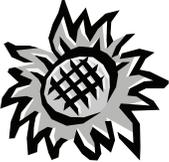
Do ways that you can use the wind seem mysterious? Try these ideas:

- ◆ Hang your laundry on a clothesline and let Mother Nature do her thing! It saves electricity, and your clothes will last longer.
- ◆ Ceiling fans consume as little energy as a 60 watt bulb. This translates to about 98% less energy than what most central air conditioners use!
- ◆ On cool days, open the windows in your home rather than using a fan or air conditioning.



ACTIVITY 6
MECHANICAL ENERGY

Rocket Sleds!



If something is moving, it has mechanical energy. The "mystery" is, however, that moving things need another form of energy! For a car to move, it requires gasoline (chemical energy); a sailboat needs wind power to push it across the water; a runner needs food (chemical energy); a battery-powered toy car uses electricity.

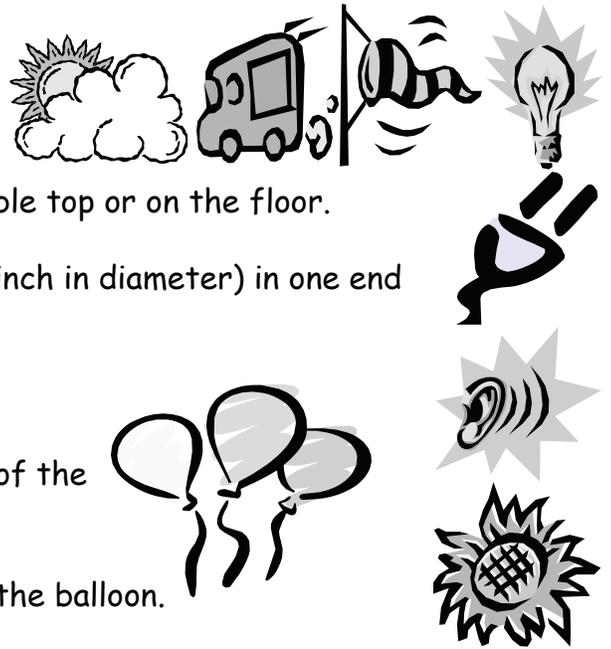
Can you think of any other examples?



What You Need

- ⦿ one lightweight paper/ cardboard box (e.g., children's shoe box)
- ⦿ one balloon
- ⦿ 20-30 plastic drinking straws

HOW TO DO IT



- ☼ Arrange 20-30 straws in a parallel row on a table top or on the floor.
- ☼ Make a small hole (approximately one-quarter inch in diameter) in one end of the paper box.
- ☼ Inflate the balloon; hold it closed.
- ☼ Place the balloon inside the box, and the neck of the balloon through the hole (don't let go, yet!).
- ☼ Set the box on the row of straws and release the balloon.

QUESTIONS TO ASK YOUR CHILD

Ask open-ended questions that encourage further exploration by your child.

- ⇒ *What happens when you release the balloon?*
- ⇒ *Can you make the Rocket Sled go faster or slower?*
- ⇒ *Measure the distance your Rocket Sled travels.*
- ⇒ *Why do you use the straws? What happens if you try this experiment without the straws? COMPARE.*

MECHANICAL ENERGY OPTIONS!

Movement is a natural function of the human body, yet sometimes we forget! Things to do include:

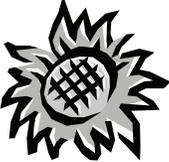
- ◆ Take public transportation or car pool to work or school. Save energy, and money, in the process! If every commuter car in the U.S. carried just one more person, over 600,000 gallons of gasoline would be saved daily, not to mention the air pollutants from the exhaust!
- ◆ Ride a bike or walk to work, to school, or to the store. It's fun, as well as great for your health!
- ◆ Trim your hedges by hand! Save money and electricity on those electric hedge trimmers.



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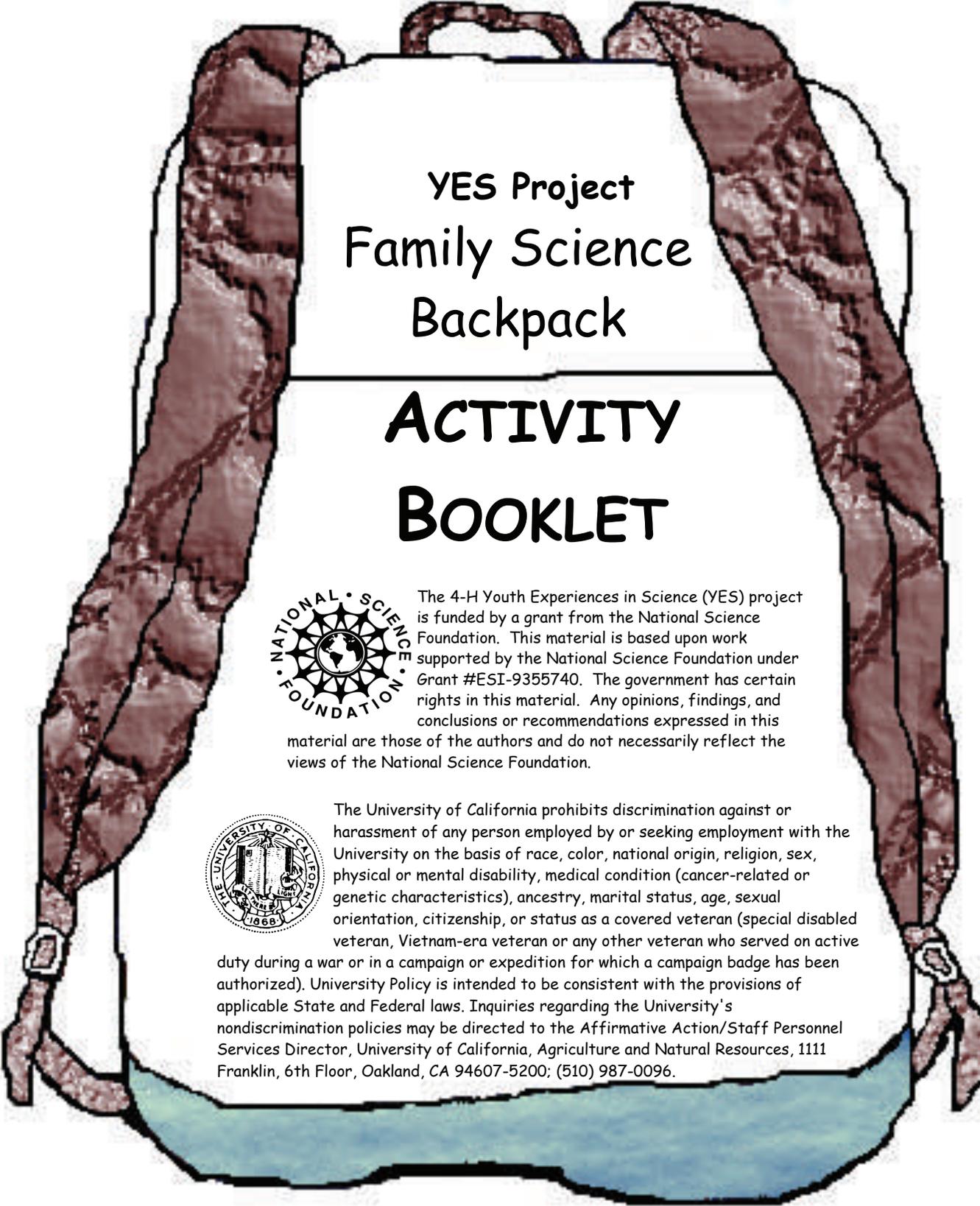
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YES Project Family Science Backpack

ACTIVITY BOOKLET



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