SLO Scientists
A Guide to Beginning a Club in Your Community

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Welcome to SLO Scientists!
University of California's
Nonformal Youth Science Program

The purpose of this manual is to provide you with the information necessary to begin and sustain a SLO Scientist Club in your community. This material may not answer all of your questions. Please contact the 4-H office if you have any further questions or concerns. We are here to help you!

4-H Youth Development Program
University of California Cooperative Extension

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Overview

SLO Scientists is a new program of 4-H, the University of California's Youth Development Program. Youth and adults team up to explore watersheds, earthquakes, paleontology, cycles, or the nature of a chemical reaction while learning and practicing the skills that scientists use in their investigations.

SLO Scientists join the Youth/Adult Science Clubs as a team. Each team consists of one child - in 3rd, 4th or 5th grade - and one adult. This adult may be a parent, grandparent, Big Brother or Sister, or any other significant adult in that child's life. These teams join with six to ten other adventurous teams from their community to work with hands-on models, observe carefully, learn to frame questions, and design experiments that can help to answer those questions.

Many teams look upon their SLO Scientist Clubs as an environment where they can spend quality time doing things together. SLO Scientists report that they spend more time now talking over many different things in their lives. Our research indicates that these clubs help foster positive interactions in the family.

Many SLO Scientists are so excited about their discoveries that they want to share their discoveries with others. Some have designed library displays about their club's activities. Several groups teamed up to build a giant watershed model for the local Environmental Education Camp. Others have taught community members about worm composting or planted trees for stream bank stabilization.

Volunteers are community members who treasure the rewards of working with youth in this unique format. Volunteers come from many different backgrounds - some are retired scientists, others are students, homemakers, accountants, waiters, or engineers. SERIES activities were modified for use in these clubs, and the volunteers are thoroughly trained in the investigative nature of the activities. The 4-H office provides all materials, training, and logistical assistance through their Science and Technology Committee.
Questions and Answers

What is SLO Scientists?

This program, part of the University of California’s Youth Development Program, was conceived and piloted in San Luis Obispo (SLO) County in 1995. These clubs, referred to as the SLO Scientists Clubs, incorporate a new model of a 4-H club structure that involves adults and youth in a one-on-one (one adult to one youth) basis. The SLO Scientist Clubs are designed to involve youth and adults together in fun, hands-on science activities as a way of helping youth develop positive attitudes about science, learn and practice the processes of scientific investigation, and improve critical thinking skills. Volunteers from the community are trained to lead these fun, science-based activities.

Who participates in SLO Scientists?

People just like you! The members of the SLO Scientists Clubs represent a variety of socioeconomic and ethnic backgrounds within your community. The diverse perspectives of the participants create the atmosphere of the club. All members of SLO Scientists do have one thing in common:

The desire to have fun with science!
Why begin a SLO Scientists Club?

- To get children and adults excited about science through hands-on and investigative activities!
- To expose children to a fun experience with science so that they will have a positive attitude toward science in school and later in life.
- To have the opportunity to participate in a program directly with your child.
- To sustain your own interest in science and share your enthusiasm with your child and community.
- To explore, question, examine and discover the world around you!

What do I need to start a SLO Scientists Club?

- A positive attitude about science!
- The desire to contribute some of your time and energy to your community
- A minimum 6 and maximum of 10 teams (youth/adult pairs) per Club
- A meeting location, dates and time
- A group commitment to meet every other week for one and a half hours in the evening.

You can do it!
Goals

What are the goals of the 4-H?

The goals of 4-H are to help young people:

- Develop leadership and be of service to others
- Develop initiative and assume responsibility
- Develop the ability to live and work cooperatively with others
- Acquire knowledge and skills, and explore careers
- Achieve satisfaction from work and accomplishments
- Choose from alternatives and plan satisfying lives
- Develop positive self images

What are the goals of the SLO Scientists Clubs?

- Teach the skills of scientific investigation from an enjoyable and fun perspective
- Provide a fun, safe environment for adults to learn from kids; kids to learn from adults; and everyone to learn from the world around them
- Promote the use of critical thinking skills and new initiate action on scientific and related issues in their homes and communities

What are the goals for the adults of the SLO Scientists Club?

- Promote science as a fun family activity
- Help your child learn how "to do science." Encourage your child to observe, question and examine
- Become a scientific "collaborator" rather than a teacher with your child
- Learn from your child
- Model thinking aloud - show your child the steps you took to reach a conclusion
- Cite Evidence - ask your child to give their reasons for giving a certain answer. You may be surprised by the considerations they used to make a judgment
- Encourage your child to use the tools of scientific investigation to conduct experiments and make new discoveries in the world around them
What is a typical SLO Scientists meeting like?

A typical meeting might go like this: the group meets on a Wednesday evening in the science room of an elementary school. The school janitor has been properly informed of the club's intentions and unlocks the door at the pre-arranged meeting time. The 4-H Volunteer Facilitators arrive with the materials. As the Club members arrive, they help the Volunteers set out the materials for the evening's activities. This group is using the "Chemicals are Us" curriculum and tonight they are experimenting with acids and bases. As the group takes their seats at the tables, the club officers make any necessary announcements. Shortly after, the science investigations begin! The 4-H Volunteer Facilitators get the whole thing started, then circulate among the groups watching and having the kids and adults explain what they are doing and what they see happening. The volunteers encourage a lively group discussion and further experimentation. Before leaving, the group - NOT the volunteers - clean the room and put the materials back in the boxes. A club member or the Volunteer then returns the materials boxes to the 4-H office.

What types of experiments do the clubs perform?

The 4-H Office has a wonderful selection of hands-on science activities to choose from. All of the materials you will need are in ready-to-use boxes at the office.

The possibilities are:
- Chemicals are Us
- Sciencing with Snails
- Recycle/Reuse
- Oaks Woodlands Wildlife
- From Ridges to Rivers: Watershed Explorations
- Imagineering
- Beyond Duck, Cover, and Hold

Note: The ultimate goal for each SLO Scientists Club is to become self sufficient. Groups are encouraged to introduce new curricula, community service projects, and field trips.
Where do the Volunteer Facilitators come from?

You need to call the 4-H office and tell them how many youth/adult teams you have. The office will recruit and train Volunteer Facilitators for your group. The 4-H Office recruits volunteers from the community. These are folks from your community who are interested in working with young people in fun, meaningful ways. They are trained by the 4-H Youth Development Program to lead hands-on, investigative science activities in ways that encourage active participation from all members. They learn skills that enable them to help the SLO Scientists to make the most of their hands-on, minds-on experiences!
Responsibilities:
You have decided to begin a SLO Scientists Club, now who does what?

You may begin a SLO Scientists Club at any time during the year. It is ideal to begin preparing for a new club at the end of August before the school year begins. Now that you have decided to lead a SLO Scientists Club, it is a good idea to ask another person to work with you. The two of you will function as the “Leading Team” for your club.

It is important to distinguish between the responsibilities of the Leading Team, the Volunteer Facilitators, and the 4-H office.

What is the difference between the Leading Team and the Volunteers?

The Leading Team consists of two or more motivated people with two distinct qualities. The first is a positive attitude about science. The second is the desire and commitment to organize a SLO Scientists Club in the community. Usually the Leading Team members are parents who will be involved with their children in the Club as members. These folks are the ones who help the group coordinate their logistics and get the ball rolling.

The Volunteer Facilitators are members of the community who have been recruited and trained by the 4-H office. They lead the experiments and get the discussions going during the meetings.

What are the responsibilities of the Leading Team?

- Notify the 4-H office of your intention to begin a SLO Scientist Club and work with the 4-H office to properly organize and maintain the program.
- Coordinate community outreach and recruitment of up to 10 youth/adult pairs for each Club.
- Establish the meeting location, dates and time.
- Submit the facility requests to the 4-H Office for official arrangements.
- Prepare for the first meeting.
What are the responsibilities of the Volunteer Facilitators?

- Pick up or arrange for the delivery of the materials necessary to conduct the experiments
- Arrive a little before the meeting. Help the Club members set out the materials
- Lead the group through the experiments, encouraging the scientific thinking process (Appendix A) and utilizing the Karplus Learning Cycle (Appendix B)
- Return or arrange for the return of the materials to the 4-H office.

Note: The volunteer is NOT responsible for clean up, calling people, or any club business.

What are the responsibilities of the 4-H office?

- Recruit and train volunteers
- Provide and organize materials for the experiments
- Make the official arrangements of the meeting location, dates and time with the schools
- Provide a resource for community outreach and recruitment
- Help problem solve and answer any questions

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The Leading Team: Getting Started

Step 1. The Pre-Meeting

Before the school year begins, recruit a co-leader. The two of you are the “Leading Team” of your SLO Scientists Club. Arrange a pre-meeting with your co-leader and use this checklist to organize the following:

☐ Notify the 4-H of your intention to begin a SLO Scientists Club.

☐ Establish the location, dates and time of the meeting (Refer to page  for procedure).

☐ Conduct community outreach and recruitment.

☐ Delegate who will phone the group to inform them of the first meeting.

☐ Contact 4-H to confirm the volunteers, materials and paperwork for the first meeting

☐ Prepare paperwork and introduction for the first meeting (Refer to Appendix  for a sample of the paperwork and introduction).

☐ Other things?
Step 2. Community Outreach and Recruitment

Community outreach and recruitment is your chance to introduce the SLO Scientists Club to your neighbors. The ultimate goal is to reflect the diversity of your community. Be creative - recruit in areas which are accessed by a variety of socio-economic and ethnic backgrounds.

Where:

- Schools (Refer to next section)
- Libraries
- Grocery stores
- Laundry mats
- Local papers
- Radio public service announcements
- TV public service announcements

How:

- Flyers
- Pamphlets
- Press Releases
- News Articles
- Word of Mouth

Refer to the Appendices for sample flyers, pamphlets, press releases and news articles. The 4-H Office has copies of many of these for you to use. We also have names and addresses for the newspapers, radio stations and TV stations in your area.

Remember the 4-H office is an excellent resource for community outreach and recruitment. You can use the office to make copies, obtain pamphlets and press releases, research old recruitment strategies (i.e. press releases and news articles), and talk with the knowledgeable staff.

We are here to help you!
The Youth/Adult Pairs

If there are not at least 6 teams signed up, try to recruit more! This is not to say that a group cannot proceed with less. However, in the past, groups with fewer than 6 pairs have struggled. Groups with 8 to 10 pairs have enjoyed substantial turnouts and dynamic participation.

Any significant adult willing to commit to the meetings may accompany the youth. For example, Grandparents, aunts, uncles, older siblings, neighbors, friends, baby-sitters, and Big Brothers/Sisters are very welcome!

The one-on-one relationship between the Youth/Adult pair is an essential part of the SLO Scientists philosophy. Many children lack consistent one-on-one time with an adult in their daily lives. For this reason, the club encourages one parent or significant adult to consistently accompany the youth. If a parent has more than one child interested in the program, they are welcome to bring a baby-sitter or family friend to provide the one-on-one relationship for the second child.

Parents with small children are asked to find alternative care for those children, so the adult may focus on the child they bring to the Club. Parents bringing younger siblings to the Club meetings often find themselves entertaining the younger child rather than focusing on working with their youth teammate. This defeats a major goal of the Club. Work on making this a special time with your youth teammate!
Step 3 Establishing the meeting location, dates and time:

Try to find a meeting area that is centrally located. For example, a school’s multi-purpose room or Science Lab, somebody’s house, community center or the UC Cooperative Extension conference room all work well.

Procedure to meet at a school

1. Contact the Principal or office staff of desired school at the end of August, about two weeks before school starts.

2. Identify yourself as a 4-H SLO Scientists leader.

3. Have a list of potential meeting dates and times. Check these with the office staff to make sure they are OK with the school.

4. Take the list of dates and times to the 4-H office.

     NOTE: The paperwork takes about three weeks to process. Make sure to allow time for the transaction before your first meeting.

5. The 4-H office will notify the Leading Team of the approved site, meeting dates and time.

6. Contact the school’s custodial staff to make sure they know when you will be coming and to ensure that someone will be there at that time. Be sure to ask about their lunch times!
Step 4 Recruiting in the Schools

The elementary schools in your community are an excellent source of outreach. However, there are guidelines that must be followed to recruit in the schools.

Before you may distribute flyers or pamphlets to the schools, a copy must be stamped with approval by the appropriate School District person. Refer to Appendix for the available flyer pre-approved for the Lucia Mar and SLO Coastal Unified School District. You might need to call the District to for the name of the person who must approve the flyer. A copy can be faxed to the school with a request for approval. They will fax the approved copy back to you.

Once the flyers are approved:

1. Notify the schools of your desire to distribute flyers. Identify yourself as a member of the SLO Scientists Club of the 4-H program.

2. Determine the number of 3rd, 4th and 5th grade classes in the school and how many children are in each classroom.

3. Bundle the flyers according to the above information and distribute to the school office. Each school needs to see a copy of the District approval for the flyer, so make a copy for each school.
First Meeting!

Here is the checklist for things you should bring to the first meeting:

- **Application forms** for each child. Bring a few extras in case.

- “Welcome to SLO Scientists” sheet that explains how to fill out the applications, where to sign, and how to make out the checks. Bring one for each team.

- “Goals for SLO Scientists” - one for each team

- **Job Descriptions**

- **Registrar’s Form**

- **Manila envelope** for forms and money

What Needs to Happen at the First Meeting

**Paper work**
“Roles” Speech
Job Assignments
The Activities!

Let's go through these one by one.

**Paperwork**
Each youth member needs to file a completed application with the 4-H Office. As people come in, you can hand out the paperwork and have them begin to fill it out. These forms require a lot of signatures. Refer to the “Welcome to SLO Scientists”. Try to get all of the signatures filled in before you start the rest of the meeting.
“Roles” Speech

You are now at your first meeting! This Club is probably different from any other you’ve ever been in before. We’ve discovered that it’s a good idea to clearly state what everyone’s role should be. We have ended up given speeches that go roughly like this:

Welcome, everyone to the SLO Scientists! We are so glad you’ve decided to join us tonight. Before we begin our introductions, let me go over a few things. It seems to make everyone more comfortable if we tell you a little bit about your roles in this Club. Let me start with the Volunteers.

The Volunteers have the responsibility of showing up with all the stuff that we use! They are going to get us started on our explorations and experiments, and they will help us get a good discussion going about our results and the things that we discover. Remember that they are giving their time to us, so let’s treat them well!

Then there are the big people. You are here tonight not as babysitters, not to just sit and watch, but you are here to be scientists. You are co-investigators with the young person you came with tonight. You don’t need to feel like you are the expert here. You aren’t here to lecture or tell your partner what’s happening. Your job tonight is to keep an open mind, sharpen your powers of observation, and discuss your observations with your partners. You are investigating together and you’ll have a great time if you approach the activities with the idea that this is going to be fun, exciting, and that you’ll all learn some new things tonight!

Now you younger people.

Your job is also to be a co-investigators with the bigger person you brought with you tonight. They don’t have all the answers or all the ideas. You have some wonderful ideas and thoughts that will help with your investigations! Don’t be afraid to try some things that may seem silly. A lot of scientific discoveries were made by people doing odd things.

You younger people also have another job – it seems that sometimes the bigger people sort of start to clump together and talk about other stuff. If this should happen at your table, it is your job to gently remind them that they need to get back to the task at hand!

At the end of the meeting, it is the Club members’ job to clean up the room. The Volunteers are not the maids! Your Volunteer will tell you where things go and how to clean up, but you members - bigger and younger people alike - need to make sure the room is spotless.

The last instruction - and this is the most important of all - is:

Have fun!
Job Assignments
There are some things that need to happen if the Club is to run smoothly. You can spread out the work by getting volunteers for the different jobs. Describe all of the jobs first, then ask for volunteers. Notice that most are youth jobs and a few are adult jobs. It is important that the youth get to do their jobs - this is part of the “Youth Development” aspect of the Club!

Make sure you write down who volunteered for what, since the Thank You Note people often forget what they volunteered to do!

And now you are ready for the Activities!
The Volunteers take over here and will have members introduce themselves in way that ties in with the night’s activities. So relax and have fun with your Club!
Appendices
Youth/Adult Science Club

"Science is the belief in the ignorance of the experts"
Richard Fyneman, Nobel Prize Physicist

Goals

1. Help you and your child learn how to "do science"

Science is an art - the art of reading the stories that the world has to tell. There is no book out there with all the answers to the cosmos. The knowledge that we have was created/discovered by people who worked hard to observe and make sense of their observations. We are committed to helping your child learn this art.

Reading any story begins with being a keen observer - the exciting thing about this is that one can use all the senses - sight, sound, touch, hearing, and taste (if safe). We encourage you to practice this with your child everywhere you go, in whatever you do.

As you know, children are great mimics and will do what you do. Model the patience needed to observe things for longer and longer periods of time. Be as thorough in your observations as possible. Talk about your observations together. Talk about similarities between what you observe now and what you have observed before about other things - make the connections. You can model this type of thinking for your child and also encourage them to do the same.

You may notice that in the SLO Scientists program we rarely seem all that interested in teaching scientific "facts." This is true. We are interested in helping you learn the processes of investigation that scientists use to explore and learn about the world. You may have come to this program looking for information and answers from "an expert", but we ask you to observe and to learn how to ask your questions of the world itself.

2. Foster effective learning dynamics between children and adults

Research shows that there are several effective ways to help children learn critical thinking and problem-solving skills.

Thinking Aloud: It is often useful to model your thinking process - to "think aloud." You can show your child the steps you take to reach a conclusion. An example: You see a small creature - some sort of bug or spider. Together you both examine the creature, talking over your observations: color, shape, size, hairiness, numbers of legs, behaviors you see it do, noticing where you found it. Your child asks what it is. You could answer "a spider," or you could say something like, "Hm. Good questions. Let's see how many legs it has." You both count. "Eight. How many legs did that bug we saw yesterday have? Six? OK, so it isn't like a bug. What has eight legs?" "I think it's a spider!" "That's a good idea. Let's look it up in a book at home and see if it matches any spiders in the book." Notice that you can either run through this process out loud yourself, or you can talk

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it through with your child. In the first case you are modeling scientific thought processes; in the second case you and your child are being scientific collaborators. This exchange takes the child through many of the steps that a scientist would use if confronted with a new creature that they did not know or that no one had seen before. You might look at the spider books at home and see which types of spiders it looks most like. It may be closely related to those. Or it may be entirely new. Remember that less than half the species of insects and spiders in the world have been “discovered” and named by scientists!

Citing Evidence: It is instructive to both you and your child to ask your child to give their reasons for giving a certain answer, whether or not you think it is the "right" answer. Scientists call this "citing evidence." You may be surprised by the considerations your child uses to make a judgment. Although they have not had the breadth and depth of experience that you may have, they are often keen observers and are not hindered, like we adults often are, by what they think they know. You can also cite the evidence that you consider for the answer that you think is correct. This helps you to become, again, a collaborator with your child rather than a “teacher” with all the right answers. You show your thought processes and the types of experiences, prior knowledge, and connections that you use to come to a conclusion.

Making New Discoveries: Believe it or not, there is a lot happening in your own back yard that you won’t be able to read about in a book … because no one knows about it yet. There may be bugs that no one has seen before, things about the bugs’ life histories that no one knows yet, peculiarities of your soil that are not like what you would read in the text books, the acidity of the rain in your area (maybe no one has measured it yet)! Go out and explore!

Figure out ways to study something. We bet there is no literature on the reaction of cinnamon and hot or cold water. But this may be one of the burning questions that your child has. Encourage these seemingly frivolous experiments - some of the greatest discoveries have come about from observing something unusual and unexpected in this “messing around” stage!

A lot of us think that science proceeds in dull, plodding, highly rigorous minute steps. While it is certainly true that scientific investigation can demand a lot of tediously meticulous work, it is equally true that the great leaps in understanding - Relativity, Newtonian physics, the understanding of hydrocarbon chains and rings in organic chemistry - come from the intuitive leaps, the sometimes almost seemingly frivolous experimentation, the dreams, the flashes of insight, the fostering of playful curiosity.

Think of your child’s knowledge about the world as a tree: you don’t know the shape of the final tree in advance, but the tree takes shape as a result of the many branches of knowledge that grow in response to the active interests and investigations of the child. The strength of this tree is that all of the branches are connected to the trunk of basic knowledge that grows as the child’s understanding of the world and how it works grows.

Enjoy your explorational
Welcome to the SLO Scientists!

Note: If a child is a returning 4-H member, they do not need to fill out the forms again. Payment is due only once a year. The 4-H year runs from September to September,

We need you to take a few moments and fill out the child's membership form. You need to fill out and sign both sides of the white sheet. Note that the back of the white sheet asks for two signatures of both the child and the parent or guardian, one for the release of liability for animals (even though we do not do animal projects in SLO Scientists) and one for the Code Of Conduct. Fill out both sides of the pink sheet and sign the front. The yellow sheet will automatically record as a carbon of the white. The blue sheet you may ignore.

Costs for the program are $6.00 per child for insurance for the year beginning October 1 through September 30. There is also a small materials fee of $2.50 to cover replacement of materials that are used during your science investigations. The total is $8.50. Scholarship money is available, just ask the 4-H Office. This is truly a deal!

Checks should be made out to the “4-H YDP”.

Please have your paperwork completed as soon as possible and return it to your club's registrar. Thanks!

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## Registration

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Press Releases

School Newsletter Sample - this needs to be approved by the Principal
(Add the day of the week and your name and number)

Have Fun With Science - Join the SLO Scientists Youth/Adult Science Club! To join, you need to come as a team: one child in 3rd, 4th, or 5th grade, and one adult. You will get to experiment with household chemicals, turn liquids to solids instantly, and make liquids change colors. It’s all hands-on, FUN, and sponsored by the University of California’s Youth Development Program! The group meets every two weeks on __________ evenings. For more information, please call ________________________
Scientific Thinking Processes

Underlying all the activities are the basic thought processes that Scientists use everyday. As a leader and CO-investigator, you'll be introducing and practicing these with your group.

**Observing:** Using all five senses to gain information.

**Communicating:** Recording your discoveries, sharing them with others, and listening to others who may have observed things we missed or have different ways of expressing their observations. Communication - whether oral, written, or graphic - increases everyone's awareness and gives a fuller picture of the object or phenomenon.

**Comparing:** Observing two or more things side-by-side to find similarities and differences. Some comparisons may be sensory, such as comparing how different things feel, sound, smell, taste, look, behave, or react. Measurement is another way of comparing things: you are comparing something to a set of standardized units. You may weigh something (compare it to and ounce or a pound); measure its length (compare its length to inches or centimeters); or measure its holding capacity (compare it to the scale on a measuring cup).

**Organizing:** Grouping or classifying the things you are studying into categories - for example: leaves vs. twigs; red vs. green vs. blue. Another type of organization is ordering or sequencing - for example: rank the rocks from the hardest to softest; twigs from the longest to shortest.

**Relating:** Trying out or checking your ideas in a systematic way. Once you have an idea about how something works (a hypothesis), you can experiment to test the hypothesis. For example, in one of the Sessions, you'll make a model of a watershed. By changing parts of it on eat a time, such as the steepness, rte of rainfall, and presence of rocks or trees, you'll find how these relate to the rate and patterns of erosion.

**Inferring:** Based upon your findings in the above processes, you can begin to recognize and predict general patterns and relationships, thus forming a more comprehensive theory.

**Applying:** Using your knowledge to solve problems. Knowledge can be used to further refine experiments. We also encourage every SLO Scientist Club to plan a community service project in which they can apply the science they are learning to a community need they have identified.
The Learning Cycle

Activities based on the Learning Cycle involve three distinct phases:

**Exploration:** Youth are given the materials and encouraged to explore, manipulate and observe. This is often a rather playful part of the program, and the “scientists” learn through their own actions with little guidance or expectation of specific accomplishments. As a leader, you are not looking for particular answers. Your role is to be a CO-investigator - you may explore also and even enrich their observations with your own.

**Concept Introduction:** In this phase, you encourage the group to discuss the observations and discoveries that they made during the Exploration phase. These findings should be made by members of the group. In your role as facilitator, you can help their group describe their discoveries: “the soil moved from one place to another” can be given labels such as “erosion” and “deposition.” This phase also provides an opportunity for your “scientists” to discuss the significance of their findings, develop hypotheses, and to begin to outline ways they can test those hypotheses.

**Concept Application:** In this phase, your “scientists” again have a chance to manipulate the materials. They may test the hypotheses they developed during the first two phases, refine a technique, or explore something in more depth. Ideally, theories and experiments should be developed solely by the youth investigators (Ponzio, 1994).