University of California Cooperative Extension 4-H • Sacramento START
With Support From: Intel Corporation • Bank of America • California 4-H Foundation

# Youth Experiences in Science
# Project Evaluation

April 1, 2002

# Youth Experiences in Science
# Project Evaluation

April 1, 2002

By Marianne Bird, M.S. and Rebecca Carver, Ph.D.

With Debra Aiello, Ediel Butts, Trisha Dixon, George Hom, Liz Jarrard,
Laura Kong, Sue Kong, On Shum, and Maria Vaughn

***A high priority in our communities is increasing academic performance of children, and after school programs with an academic focus are springing forth across the landscape. A central goal of these after school programs is to help students achieve in school by providing homework assistance and enrichment activities on a daily basis. The 2001 Youth Experiences in Science (YES) Project Evaluation examines how science education is happening in one such after school program—Sacramento START—and documents the project outcomes. Since September 1997, 2,384 first, second, and third grade children attending Sacramento START have participated in YES. The Project served 750 children at 13 Sacramento START sites in the 2000-01 academic year, and trained 47 teenagers to deliver the semester-long curriculum.***

## INTRODUCTION

The Youth Experiences in Science curriculum is designed to foster inquiry and engage children ages five to eight in the process of exploration. The purpose of the program is not to teach children science facts but to encourage questioning and seeking answers. Young children are introduced to the formal scientific process, by performing a variety of scientific tasks including observing, organizing, comparing, and communicating. The curriculum consists of seven units: Bubbles, Collections, Energy, Kitchen Science, Recycling, Snails, and Worms. Each unit contains five to six sessions, and each session has two or three activities. Embedded in the activities are opportunities to engage in inquiry and practice the age-appropriate scientific tasks mentioned above.

The 4-H Youth Experiences in Science Project (YES) brings the resources of the 4-H Youth Development Program and the Sacramento START after school program together to strengthen science education for young elementary school-aged children living in Sacramento's most economically challenged communities. Sacramento START is an after school enrichment and literacy program housed in 38 elementary schools throughout Sacramento County. START sites are located in the County's economically disadvantaged neighborhoods, and most students live in low-income families where education levels are minimal. Seventy-eight percent are ethnic and racial minorities, and 29% live in homes in which English is not their primary language. In 2000-01, the YES Project served 750 children at 13 sites. Population demographics are outlined in Table 1.

**TABLE 1: ETHNICITY OF YES PARTICIPANTS 2000-01**

| | Total | | African American | | Asian/ Pacific Islander | | American Indian | | Hispanic | | White | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Children | 750 | 100% | 240 | 32.0% | 184 | 24.5% | 1 | 0.1% | 195 | 26.0% | 130 | 17.4% |
| Teens | 47 | 100% | 11 | 23.4% | 13 | 27.7% | 2 | 4.2% | 13 | 27.7% | 8 | 17.0% |
| Sacramento County youth | | 100% | | 15.4% | | 16.0% | | 1.4% | | 17.5% | | 49.7% |

Teenagers are trained in the YES curriculum and work in teams to deliver the hands-on science experiences, volunteering their time to teach once a week for at least a semester (four months). Most teens are recruited from high schools, youth leadership programs, or have relatives who attend or work for the Sacramento START program. They work in teams under the guidance of an adult coach (usually a Sacramento START staff member) to plan and deliver their sessions. Teens and coaches attend a 10-hour YES training session where they are introduced to science and inquiry, learn about working with younger children, and explore the different YES units they will deliver. In addition, coaches receive training on how to successfully work with teenagers as program partners.

## METHODS

The evaluation team was made up of teen teachers, volunteer adult coaches and paid staff from START sites and the University of California Cooperative Extension. The group identified key stakeholders and reached agreement as to the highest priority goals for the program. Having agreed to focus on the impact YES has in the lives of children and teenagers, the team identified program objectives that relate to the experiences of young participants and teen teachers. The evaluation team constructed data collection instruments with care to insure that data from several sources would be considered for analysis. Data were collected using:

- A written survey for parents of children in the program (134 returned)
- A group interview/performance assessment of a sample group of participants (seven children)
- A group interview/performance assessment of a control group (five children)
- Formal observations of teens working with youth (at five START sites)
- A written survey of teen teachers (12 returned)
- A written survey of teen teachers' parents (12 returned)

- Focus group interviews of teen teachers (12 participants), of program staff (seven participants), and of teen teachers' parents (four participants).

Response rates, quality and validity of data varied by method. Concerns were expressed regarding the composition of performance assessment groups, as one example. Taking these issues into consideration, the evaluation team analyzed findings with respect to program impact on teen teachers, program impact on participants, and directions for program improvement.

The collection of data occurred at the very end of the school year. While this provided participants the opportunity to reflect on a complete program year in delivering YES, it also contributed to lower response rates for the surveys. Collecting information from several sources facilitated the triangulation of data. Though response rates were low in some areas, the evaluation team drew conclusions by analyzing data from multiple sources.

Teen teachers, volunteer coaches and paid staff describe their work as members of the evaluation team as both challenging and rewarding. Several of them have been able to articulate particular lessons learned and have already begun to modify their practice as YES program staff to reflect the findings and implications of this evaluation.

## IMPACT ON TEEN TEACHERS

**FINDING: Most teenagers enjoy their experience as teachers in the YES Project.**


Teen surveys, program observations, teen parent surveys and focus group discussions confirm that the vast majority of teenagers enjoy their involvement in the YES program. Some teens reported feeling scared or uneasy at first—an observation echoed by teens' parents—but confidence grew with time and practice. Teens reported that teaching science was fun, and though many were initially drawn to the program to complete a community service requirement for school, most stayed with the program because they enjoyed it.

At four of the five sites visited for observation, the teens appeared excited to be there. They were animated, smiled, greeted the children, and "joked and gently teased" each other. They appeared comfortable with their role and at ease with the children.

All parents surveyed reported that their teenager liked the program and specifically cited "enjoying the children," "working with peers," "fun," and "feeling good to help others," as reasons why. Over 80% of surveyed parents indicated that their teen would continue with the program next year.

**FINDING: Teens are effective teachers and learn a lot about working with younger children through the program.**

"You gain lots of experience with the kids especially if you want to work with them in the future," stated one teen. "You learn how to work with them, how to get their attention…I fell in love with my kids. I just really like them."

All responses in the teen survey and many comments in the teen focus group echo this sentiment: working with younger children is a very rewarding part of the program. Site observations and comments from teens and their coaches indicated that they possess many qualities of skilled teachers. They've learned how to manage groups of children and how lessons need to be thought through to assure success.

"I knew when I was starting to get boring—when it wasn't fun anymore—because it was like (the kids) would go from being quiet to being loud. Then I said to myself well maybe it's time to move on to the next thing. When I move on to the next thing, it goes quiet again. So basically, they told me when I was boring."

Observations revealed that teen teachers know how to get and keep attention and give directions. They are positive and encouraging, and they model reflective listening when working with the students. Half of the sites observed referred to previous lessons when setting up or discussing the day's lesson.

Teens have demonstrated the skills to promote inquiry, the foundation of science. "I think I started asking more questions," stated one teenager. "Like the first thing I learned was whenever kids ask a question, and you don't know the answer, and so (you ask them) 'What do you think?' My aunt owns this daycare center and I have to help the kids with their homework and stuff. So the kids will come up and ask, 'What does 6 plus 3 equal?' and I'm, like, 'Well, what do you think it equals?' I can't stop it…it's just like embedded in my head." Site observations confirm that the teens ask questions back to the children to encourage them to find answers themselves.

The children enjoy the teens, and this contributes to their effectiveness with the group. Children at the START sites are excited to see the teens, and coaches report a bonding that happens between teen teachers and students. Parents of the youngsters said that 85% of the children spoke of their YES teen teachers, and 90% of parents reported that their children liked their teachers.

**FINDING: The program develops public speaking skills in teenagers.**

Teens, their parents and coaches were asked how teens had grown though their experience in YES. While there were many answers to this question—becoming more organized, learning how to work with kids, being responsible, teamwork—the most frequently mentioned skill was confidence in speaking publicly. Ninety-two percent of teens reported feeling more confident in public speaking as a result of their YES experience.

"I'm not so shy speaking in front of classes and presenting speeches anymore," commented one teen. "I mean, I used to go last and stuff but now I would be the first to do it."

"Not only have I learned more about science while teaching the lessons, but I've also improved on my public speaking skills (which is a huge achievement for me, personally)."

More than 50% of parents reported that their teenager had gained public speaking skills through the program. One parent said that she is very proud her daughter has learned to "talk like a teacher." Another parent said this was true for her child as well: She came out of her shell, is a more confident speaker, and that her progress shows up in her writing, too.

However, some parents indicated that the program had no impact on their child's speaking ability: "She was a confident speaker before the program," one of them stated. It appears the program develops the greatest capacity in youth whose skill level may be lacking.

**FINDING: The YES Project provides new experiences for teenagers, which allows them to develop skills and explore potential career choices.**

Besides enhancing public speaking skills, teens and their parents reported the program provided other opportunities for growth. They listed assuming and following through on responsibilities, working together as a team, flexibility, and building confidence as skills developed through their role as a teen teacher and YES team member.

"You get to be in charge and not have an adult dictate what you need to do and how you need to do it," remarked one teenager. "Adults accept and recognize that you have a position of power and you have responsibility."

"I became more organized because I had to plan for the lessons and make sure we had everything."

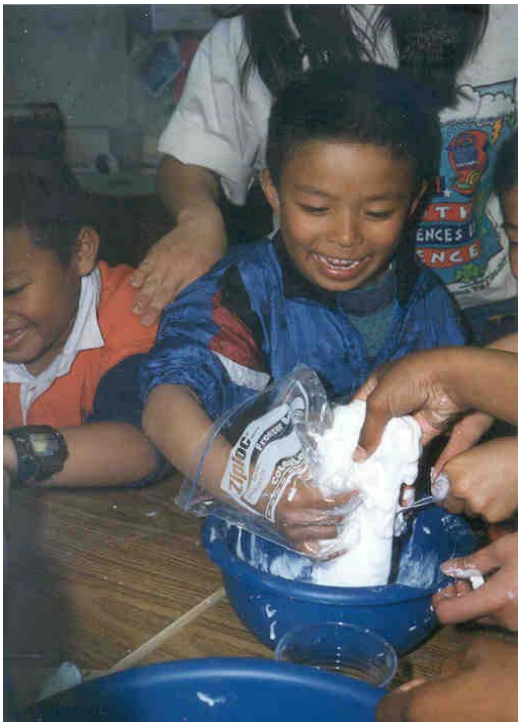
"I became more responsible…I remember to do stuff."

"I'm better at managing my time."


Observations of the teens over time verify these statements. At four of the five sites visited, the teens gave every appearance of being prepared in conducting their lessons: visual aids were done, they had all necessary materials gathered, and teens were familiar with the content of the lesson. Eighty percent of the teams worked together effectively, sharing teaching and organizational roles.

One-third of the parents surveyed felt involvement in YES had influenced their teen's career choices. Their thoughts: "He's considered teaching, and that was never an option before," "It has encouraged her to continue her plan of working with kids," and "It's sustained her interest in science." Program coaches also believe the program has opened career opportunities: "My teen teachers are looking forward to becoming Program Leaders (for Sacramento START)."

## IMPACT ON CHILDREN



**FINDING: Children enjoy the YES Project.**

Feedback from teens, coaches, parents, and children themselves all indicate that young program participants enjoy and look forward to the YES Project. Eighty-six percent of parents reported that their children wanted to continue in YES. Teens reiterate that finding: "Kids love it. They love exploring and observing and discussing things." "They have fun and enjoy the activities while learning." "They are very excited to see us and don't want to go home."

When there is a break in the program due to vacation or session changes, the children ask when YES is returning, according to coaches. The children ask teens at the end of the day when they're coming back and want to know what they'll be doing next week. The children are disappointed if they have to leave class early, before the YES lesson is finished.

**FINDING: Relationships with the teenagers are one of the great benefits of the program for the younger children.**

"The children just look forward to that day (of the program) because they know it's not going to be the leader teaching, it's going to be the teenagers…" stated a coach. "…(The teenagers) interrelate with them (the children) kind of better than we do so they love waiting for the teenagers…"

All the children asked said that they liked their teen teachers. "The kids really enjoy the attention…they feel important that these teens, that they look up to, want to spend time with them," another coach stated.

Site observations confirm the popularity of the teens with their young students. The children were enthusiastic, responsive to the teens, and happy to see them. At one site, the children were smiling and looking at the teen teachers to see if they are gaining approval by the speed of their clean-up efforts. All eyes were focused on the teens. At another site, the children all seemed to know the teens well.

**FINDING: Children are exposed to scientific facts and concepts, and are engaged in the process of inquiry.**

Measuring the scientific knowledge gained for young children in the program is not easy. Since the YES Project does not have an emphasis on teaching factual information but instead promotes inquiry, the Project's focus is on experience, not fact retention. Also, it is difficult to measure outcomes for young students who have limited reading and writing ability. But site observations and interviews with children and the teens who work with them reveal that the program engages children in hands-on experiences and promotes problem solving and thinking.

Most activities in the YES curriculum are inviting to young participants, and children respond enthusiastically. Fifty percent of parents surveyed reported that their child asked to do the science activities from YES at home. Coaches confirm that children return to the program saying that they've done activities from Bubbles, Snails and Recycling at home. It's the "doing" in the program that draw the interest of the children.

"You touch everything; you hear everything and everything is so new to them," commented a coach. "I had a class of second graders so they were afraid to touch the worms and they're afraid to touch the snails, but now they're not. Everything was hands-on and the kids just loved that the most…"

Teens asked questions that the children eagerly answer. At most sites, the children can't wait to be called upon; they just voice their answers. When the students discover things, they share with their teen teachers or simply exclaim aloud. Children were observed coming up with ideas for why things happen in the science activities. It was noted by one coach that, "This is a program that allows a child to freely express themselves. They don't have to be right and they are never wrong."

The children exhibit recall of past activities and retain information they have learned through the program. Teens said the children remember activities from previous units, even from past years, and ask to repeat some. Of the children interviewed who participated in YES, individuals answered questions based on the curriculum correctly. They remember best the most recent curriculum they've been taught and especially activities that involve the worms and snails. Coaches state that "The kids remembered the snail's body parts," "They have their five senses down pat," and "They remember what snails ate, and thought that's what worms eat, too."

## PROGRAM FINDINGS

**FINDING: Effective learning is happening through the YES Project.**

When the curriculum is implemented as intended, children are engaged in activities that stimulate curiosity and promote investigation. The sessions are designed in such a way that if they are followed as written, the process of inquiry happens and the program goals are met.

"The children asked the teens lots of questions about what they see and what they experience," noted one observer who witnessed a session from the Worms curriculum. "When the class played the Worm Bin Detective card game, they were full of questions. The class wanted to know how many legs the bugs had, who ate what and why. They delighted in recognizing the Roly-Poly and the ant."

In the focus group, teens reported that children in the program had good recall from week to week about the things they did and what they learned. Coaches reiterate this. "You can go back to a lesson plan, and they remember what they did. Like one time we had to go back because someone interrupted our YES program…(the kids) remembered all the snail's body parts and all that so they do remember."

There is little question from the data that the children are engaged in and enthusiastic about what they're experiencing through the project.

**FINDING: Overall, the program is having a positive effect on children, teenagers, and START sites. There is a great deal of buy-in from stakeholders—teenagers, START staff, and program administrators—for the program.**

Coaches and teen teachers are obviously committed to the program as evidenced by the generosity of their volunteerism. Coaches report feeling good about working cooperatively with other volunteers to share materials. Teens talk about bonding with the YES participants and the positive experience of learning how to teach children. One teenager comments that if he had been able to participate in the YES program, it would have kept him out of trouble, and now, he is committed to providing that opportunity for other kids.

Teenagers give a great deal of time to the program. "I added up the hours they give," said one coach. "They did 30 weeks with lesson plans—it took them about an hour and a half to two hours every week to develop the lesson plans for the week. Then they taught the two days worth of classes and were always there…they knew that because there were only two of them that those kids were counting on them, and they didn't miss. They're so dedicated."

Buy-in from START program staff is evident in their enthusiastic reports of children looking forward to the day when the teenagers come. Some staff are surprised at how much the kids enjoy science. They claim that the kids demonstrate what they have learned by eagerly sharing information from the lesson with others. Staff also comment on how impressed they are by the teens and how the teens are becoming good teachers—observing cues of children's interest and adapting practice, putting together lesson plans and performing functions of a professional teacher. Staff at the START sites report that kids appreciate the opportunity to participate in the program and the program supports staff by lessening their burden while providing a quality educational experience for the youth.

Parents of YES participants and parents of teen teachers support the program because of the changes they have witnessed in their children's lives, which they attribute to their children's involvement in the program. One parent explains that the program "encourages creativity in children. It gives them the ability to think… and process information." Another explains that her family recently immigrated to the United States and her teenager's involvement in the program as a teen teacher has provided valuable opportunities for her child to develop language skills and become acculturated. Parents of teens say that the training their children receive is valuable and results in the teens feeling "refreshed" and "rejuvenated in their capacity to provide service to others." Parents of teens also report that they have observed their children practicing responsibility and developing pride through involvement in the YES program. In the busy lives of families with teenagers, parents and teens are carving out time to get involved in the YES program because of the benefits they perceive for the teenagers as well as the youth participants.

When asked about their commitment to the program, the evaluation team discussed how teens and children learn from each other, teens learning responsibility, young children being encouraged to think, feel, see, and listen. They state that the program injects the importance of science in kids' lives and assists children in learning to process information. For teens, the program is said to open doors to opportunities for participation in 4-H, career exploration, and further civic participation in their communities. Teens develop public speaking skills, explain teens and staff alike, and the program provides opportunities for young people to be in mentoring relationships with adults. Teens are seen as resources, engaged in service-learning, and feel empowered as a result of their experiences.

There is no better indication of how YES at the START sites is supported by staff, volunteer coaches, and volunteer teen teachers than the commitment that was made to this evaluation. Tens of hours of difficult thinking and doing went into conducting this complex evaluation designed by a team that was committed to learning about how well the program was doing and how they could improve program implementation to better the results. Members of the evaluation team took initiative to collect additional data when they considered the sample size too small; they worked through analytical tasks that were personally challenging, and logistical problems that added to the burden of data collection. And when it was over, they spoke positively of the experience, sharing ideas about how they would take what they learned and apply it to their continued involvement in the program.

**FINDING: There are some inconsistencies in how the program is implemented across sites that point to recommendations for program improvement.**

There is variation across sites as to how well the program is implemented. While four of the five site visits resulted in positive commentary by observers, at the fifth site the teen teachers appeared "unprepared" and "going through the motions." Attributes of successful programs are not constantly available at all sites. Several factors contribute to program success and are noticeable when missing. These include:

1) Teens having experience as YES teachers
2) Coaches skilled in working with teenagers
3) Appropriate and consistent space for teaching and learning
4) Desirable time for program implementation during the START day
5) Support for teen teachers – transportation, recognition, mentoring, fun rewards

In the best cases, consistent participation of teens and coaches is coupled with support at a START site for the implementation of the program. When these factors are not present, teens are more likely to drop out of the program, staff are less likely to be impressed by the teens' performance or the curriculum, the curriculum is less likely to be implemented well. More precisely, lesson plans are not as well thought out or executed and there appears to be more redundancy and less depth of exploration for participants.

Problems may be addressed by coaches providing transportation for teens; staff inviting teens to participate in field trips; teenagers recruiting their peers and receiving movie passes and other small tokens of appreciation for the hours of service they donate to the program; a consistent and appropriate space and time for the YES program being established at every START site; and experienced teens and coaches working at new sites with less experienced volunteers.

A second finding regarding inconsistencies across sites pertains to the extent to which parents of young children are familiar with the YES program. When asked what they knew about the program, only one-third provided answers. Of those who acknowledged an awareness of the program, some described it as a science program while others went into more detail about specific topics covered in the curriculum. Although it is unclear to what extent parent knowledge about the program affects participant benefits, the evaluation team has decided to take steps to advertise the program to parents and invite parents to participate in more aspects of the program. Focus groups and surveys from the parents of the teen teachers indicate that they, too, would like to receive more feedback about their children's participation in the program.

# IMPLICATIONS

The following recommendations emerge from this program evaluation:

**FOR PROGRAM ADMINISTRATION:**

- Seek avenues for how high school volunteers might receive school credit for their participation as YES teen teachers. The learning that happens through the YES Project is authentic; that is, students are developing skills through real-life, meaningful experiences. School credit opportunities (ROP, service learning credit) may exist or could be created as a means of acknowledging student learning through YES.

**FOR START SITE STAFF:**

- Establish a set time and suitable location for YES activities to occur. The YES program frequently happens at the end of the START day. Scheduling it during the Literacy component of the day (which is typically earlier) would allow teens to teach uninterrupted by parents arriving to pick up their children.
- Explore transportation solutions for the teenagers who sometimes have a difficult time getting to and from Sacramento START sites.

**FOR ADMINISTRATORS, SITE STAFF AND TEENS:**

- Find ways to communicate information about the YES program to parents of both young participants and teenagers. There is little knowledge among parents about the program, its benefits, and its connection to the University of California Cooperative Extension 4-H Program. Parent education could be accomplished in different ways including letters to parents, family activity nights, or children keeping journals that go home at the end of the program.

**FOR FUNDERS:**

- Continue support of the Youth Experiences in Science Project. The program demonstrates benefits to the community on several fronts: building skills in teenagers, connecting teens to their communities, enhancing program quality in after school settings, and providing engaging, enjoyable science experiences for children.

UNIVERSITY OF CALIFORNIA | DIVISION OF AGRICULTURE & NATURAL RESOURCES | COOPERATIVE EXTENSION | COUNTY OF SACRAMENTO

The University of California prohibits discrimination against or harassment of any person on the basis of race, color, national origin, religion, sex, physical or mental disability, medical condition (cancer-related or genetic characteristics), ancestry, marital status, age, sexual orientation, citizenship, or status as a covered veteran (special disabled veteran, Vietnam-era veteran, or any other veteran who served on active duty during a war or in a campaign or expedition for which a campaign badge has been authorized). University Policy is intended to be consistent with the provisions of applicable State and Federal laws.

Inquires regarding the University's non-discrimination policies may be addressed to the Affirmative Action/Staff Personnel Services Director, University of California, Agriculture and Natural Resources, 300 Lakeside Drive, 6th Floor, Oakland, CA 94612-3550, (510) 987-0396.

Sacramento County Board of Supervisors -- Roger Dickinson, 1st District; Illa Collin, 2nd District; Muriel P. Johnson, 3rd District; Roger Niello, 4th District; and Don Nottoli, 5th District. Also Terry Schutten, County Executive; John O'Farrell, Administrator, Community Development & Neighborhood Assistance Agency; and Gloria J. Barrett, County Director, Cooperative Extension.