Teens as Teachers Enhance Environmental Education and Personal Skills through Service Learning

Marianne Bird and Aarti Subramaniam

This article describes the outcomes of 4-H On the Wild Side, a collaborative project that unites 4-H with schools and afterschool programs to enhance environmental education and expose children to the natural world. Teens—in partnership with adult volunteers—plan and deliver overnight camping experiences to children from low-income communities. Regular evaluations of the program, conducted annually from 2000-2009, investigated whether students learned and had a positive experience. They also examined whether teenagers benefitted from their service learning experience. Consistent outcomes for the program include significant knowledge gain for participants, growth in leadership skills for teen presenters, and a sense of community contribution. Findings reinforce the fact that research based concepts such as experiential learning, teens as teachers and youth adult partnerships together create a strong program that shows positive outcomes for youth from marginalized communities.

Many children today—especially those from urban, economically disadvantaged communities—do not have the opportunity to understand nature through first-hand experience. Yet these children are the stewards of our future and the ecological health of our planet. It is crucial that all children have access to quality environmental education programs that allow them to develop a knowledge and positive attitude toward the environment. What does such a high quality environmental education program look like? This article describes the findings from annual evaluations of 4-H On the Wild Side (OTWS), a weekend outdoor program which engages teens as teachers for elementary school children.

4-H On the Wild Side—The research base

The purpose of 4-H On the Wild Side is two-fold—to expand outdoor learning and wilderness opportunities for elementary youth who would otherwise not likely have access to the natural environment, and to provide meaningful service learning opportunities for teenagers who plan and present the program.

On the Wild Side emphasizes experiential and inquiry based learning in areas of environmental science, cross age teaching and youth adult partnerships. The authors review each of these concepts in terms of their research base, their relevance to marginal populations of young people, and how they are practiced in the program.

Experiential learning is defined as a process whereby knowledge is created through the transformation of experience (Kolb, 1984). Experiential learning occurs through a direct encounter with the phenomenon being studied rather than just thinking about the phenomena. Components of such learning include concrete experience, observation, reflection, generalization of abstract concepts, and application (Kolb,1984). Environmental education concepts lend themselves especially well to experiential learning. In OTWS, children have an opportunity to see the Milky Way, explore the lake, listen to frogs at night – and all these provide an essential backdrop to both the cognitive and affective components of learning, namely increased knowledge about, as well as positive value towards, nature. OTWS activities also incorporate inquiry based methodology, another constructivist learning approach where the learner

Marianne Bird
University of California Cooperative Extension,
Sacramento County
mbird@ucdavis.edu

Aarti Subramaniam
University of California, Davis
asubramaniam@ucdavis.edu

is not handed a correct answer but, through an active process, discovers the answer themselves. There is evidence that African American youth and other youth from marginalized communities learn better with inquiry based approaches (Hmelo-Silver, Duncan, & Chinn, 2007).

Cross age teaching, where teenagers instruct younger children, has received merit as a promising strategy for engaging elementary age students. There is evidence that teens can have a positive impact over the knowledge, behavior and attitudes of younger children (Meyer, Nicholson, Danish, Fries & Polk, 2000). Teens are natural role models for younger children who are eager to emulate them (Bandura, 1977). In addition, engaging teens in leadership roles benefits teens as well. Some reported benefits include learning to be more organized, responsible, and involved in positive change in their community (Hoover & Weisenbach, 1999). Teens that volunteer for On the Wild Side are a diverse group, and this also helps build connection with elementary students who are from similar social and ethnic communities.

Youth adult partnerships are relationships between young people and adults where there is mutuality in teaching, learning and action (Zeldin, McDaniel, Topitzes & Lorens, 2001). Young people's voice, influence and decision-making are on par with adults'. In OTWS teens are trained in experiential and inquiry methods and then have full ownership over the planning and decision-making to develop their lessons and activities, supported by adult guidance. Adult staff in the program intentionally practice strategies that characterize effective youth adult partnerships – creating non-hierarchical structures for equal participation of youth and adults, respectful communication and value for young people's contribution to the process, and together building a project to serve an authentic need in the community (Camino, 2000).

4-H On the Wild Side – In practice

Since 2000, teens and adult volunteers have worked in partnership to plan and staff two annual On the Wild Side weekend camping experiences in late May or early June. About 60 4th, 5th, and 6th grade children from the Sacramento area attend each session, coming with their classes or afterschool programs. Participants rotate through the teen-led activities to learn about different topics like ecosystems, migration, habitat or water properties. Activities may include games, simulations, observations, and exploration. Participants also have the opportunity to paddle a canoe, sing around a campfire, and fall asleep under the stars.

Teen volunteers engage in authentic leadership roles as they plan and implement their program. They select activities from tested environmental curricula and work in teams to plan their lesson, meeting monthly to design the weekend programs. Teaching is new for most of the teens, and prior to camp they participate in a weekend retreat where they have the opportunity to practice their lessons and learn about inquiry-based science. An adult "coach" partners with each team, but teenagers lead the sessions.

Participants arrive by bus Saturday morning. They sleep outside on decks, and teenagers are assigned to each living group (denoted by school site and gender). On Saturday afternoon and Sunday morning participants rotate through six teen-led learning sessions. The evening includes a campfire and evening program, and the participants leave Sunday afternoon.

Participants come from school and afterschool sites, most from the city of Sacramento. A few weeks prior to the camp, program administrators visit the sites to deliver an informational meeting for students, staff and parents attending camp. Participants and their parents see photos of the facility, learn what to expect, and have an opportunity to ask questions. Adults—usually teachers and afterschool program staff—attend camp with their students. Teens and adult volunteers who serve as camp staff are often new to 4-H and have heard about the project in seeking service opportunities.

Since 2000, 4-H OTWS has been evaluated annually to see if it met its objectives, namely, i) participants would show a significant increase in knowledge of environmental concepts, ii) participants would show a positive attitude and enthusiasm for the natural world, iii) teens would show significant change in life skills, leadership and/or sense of contribution to the community, and iv) all participants would enjoy the experience.

In this article, we provide a summary from ten years of annual evaluation of the impact of 4-H OTWS program for the elementary students and teenagers.

METHODS

The sample, data gathered and analysis are described below. The evaluation utilized several methods to inform program practice and measure impact.

Sample

Participants who attended On the Wild Side, from 2000-2009 were included as the sample for evaluation. Teen teachers for three of the years between 2007-2009 (n=44) were assessed as well. Table 1 below provides total campers and teen teacher demographics who attended the program from 2000-2009.

Data

The following data were collected for the annual evaluations.

Pre- and post-test surveys for campers

Once teen staff selected the lessons they would teach, a short multiple choice/short answer test was designed each year to measure what the elementary school students knew about the topics to be presented. Teen teachers did not see this test; it was constructed based on the lesson plan objectives. The pre-test was given the week prior to camp, the post-test at the close of the program, and the matched pairs compared with paired samples t-tests in SPSS (SPSS, Inc., 1999).

Student journals

Youth kept a journal used for reflection in the teen-led activities and throughout the weekend.

Participant Survey

Elementary school students and adult chaperones who came with them filled out an evaluation of their experience where they rated their experience, shared highlights and suggestions for improvement, and what they had learned.

Survey for teens

From 2007-2009, 44 teen staff members took an anonymous survey at the conclusion of the program to rate on a five-point Likert scale their relationships with adults, their environmental awareness, and their sense of contribution. A retrospective post-test also asked them to assess their leadership skills (making presentations, sharing opinions with peers and adults, organizational skills, working with younger youth) before and after their experience. Open

TABLE 1
Profile of On the Wild Side Participants 2000-2009

	*Elementary Students (n=1,181)**		*Teen Teachers (n=191)**		*Adult Staff and Chaperones (n=328)**	
Ethnicity						
African American	446	38%	15	8%	58	18%
Asian/Pacific Islander	107	9%	52	27%	39	12%
American Indian	26	2%	0	0%	9	3%
Caucasian	291	25%	112	59%	172	52%
Hispanic	306	26%	12	6%	47	14%
Other	5	< 1%	0	0%	3	1%
Gender						
Female	708	60%	141	74%	226	69%
Male	473	40%	50	26%	102	31%

* Totals include duplicates since participants, staff and chaperones may return from year to year.

ended questions on the survey provide qualitative data about the teens' experience.

Focus groups

In 2003 and 2005, evaluators conducted focus groups. A total of 17 teens and 10 adult staff participated in (separate) focus groups to gain a sense of how the youth adult partnership worked, their feelings about the project, and their reflections on their personal growth, if any.

Observations

In 2008 and 2009, the evaluator conducted systematic observations of aspects of the camp experience noting camper, teen and staff behaviors, issues, and practices.

Analysis

For measuring short-term changes in participant knowledge, paired sample t-tests were conducted to test for significant change each year between pre-test and post-test scores. In addition, effect size measures, namely Cohen's *d*, were also calculated. Qualitative data from the journal entries were coded to extract quotes that specifically mentioned learning.

We gauged camper attitudes about the experience through t-tests in retrospective post-pre surveys. In addition, qualitative information from the journals were also coded for engagement.

To assess impact for teens, we analyzed data from retrospective post-pre surveys and tested for significant differences using paired t-tests. We coded qualitative information from the focus group interviews to further assess impact for teens.

RESULTS

The annual evaluations identified the following outcomes for elementary school participants and the teens who teach the program.

Impacts for Elementary Students

The annual evaluations noted the following impact for the camp participants (4th to 6th grade).

Participants gain knowledge about the environment

Each year there was a significant difference in the participant's pre- and post-test scores (Table 2). Effect size measures (Cohen's *d*) show that in five out of the 10 years, there was a large effect (> .80); for three of the years there was a moderate effect size (around .5). Only one year showed a small effect (around .2). There were no significant differences in learning by grade level, gender, or whether participants had been to camp before.

Each year, the students' journals reflected learning, especially through direct experience. The following quotes from journaling activities represent the type of reflective observations that elementary students made. They include both affective and cognitive elements

TABLE 2
Mean Pre-test, Post-test, *p*-values and Effect Size from 2000-2009

Year	N	No. of items in test	Pre-test mean	Post-test mean	Significance *p*-value	Effect Size (Cohen's *d*)
1999-2000	74	10	4.1	6.0	.001	.84
2000-2001	58	10	5.3	6.3	.001	.23
2001-2002	117	10	4.8	6.0	.001	.32
2002-2003	113	10	6.6	8.3	.001	.81
2003-2004	99	10	5.7	7.3	.001	.94
2004-2005	113	11	6.0	7.9	.001	.41
2005-2006	87	11	5.9	7.8	.001	1.13
2006-2007	98	11	6.1	7.9	.001	.86
2007-2008	114	11	7.9	9.1	.001	0.53
2008-2009	127	11	5.0	6.3	.001	.66

stemming from direct experience.

"I learned about the prey and predator and that a bird is both—they eat worms and we eat them."

"I learned that mosquitoes were born in water."

"I learned about the tap root and how it helps stabilize the tree. I like that leaves make food for the tree."

"You can find a lot of snails in the water. You can find dead skin, snails, frogs, and worms and even frys, which is baby fish that just was born."

"A madrone tree is smooth and cold."

"When you cut down trees, you are cutting down an animal's shelter."

Such discoveries appear to be born of first-hand observations as participants explore the environment through structured and unstructured activities.

Participants engage with the natural world

For many students, the program creates opportunities to explore and encounter nature in ways they have not before. For each year, an average of 60% of children reported that this was their first outdoor living experience. The end of camp survey and student journals reveal a litany of first-time experiences for children: Seeing bats, sleeping outside, looking for bugs, paddling a canoe, seeing shooting stars or the Milky Way, swimming in a lake, finding lizards, feeling the campfire, among others.

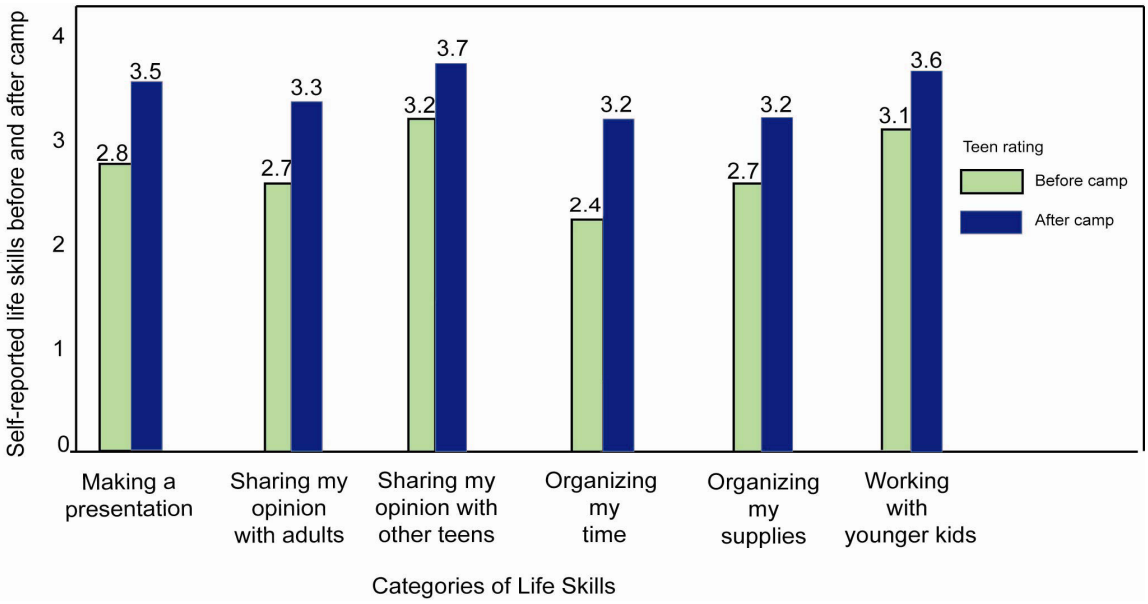
"My favorite thing about Wild Side (camp) was the sleeping because it was beautiful when I looked up at the sky. I saw a million stars and I saw a shooting star. And then in the morning it was nice to hear the birds sing their songs, see the clear blue sky, and feel the fresh, cold air blowing on my face."

Program planners recognized the importance of a positive experience for participants (both youth and adult), many of whom had never spent the night outside or lived in such a primitive setting. Pre-conceived ideas about wildlife and the woods, fear of tipping the canoe, and unfamiliar sounds and surroundings—all these activities and the environment sometimes pushed participants out of their comfort zone. However, feelings of accomplishment follow mastered challenges, fostering a sense of "I can do it."

"We had so much fun at canoeing. I think we were the best at backing up. I was with Scott and this boy named Jordan. We had the funnest time. At first we were a little scared. We all were. But I liked it in the end."

The newness of the experience can raise anxiety

GRAPH 1
Showing Teens Self-reported Life Skills Before and After Camp



for some participants, and not all embraced the rustic environment. However, a majority (an average of 96% for all years) of participants rated their experience as excellent or good. Students repeatedly stated on surveys that the program could be improved by making it longer.

Impacts for Teen Leaders

Evaluators identified several outcomes for teen leaders participating in 4-H On the Wild Side, specifically growth in leadership skills and a sense of contribution to community, among others.

Teens grow in leadership skills

Data from three years of the program indicates that teens self-assessed growth in the following areas: making a presentation, sharing their opinions with adults, sharing their opinions with teens, organizing their time, organizing supplies and working with others. All the categories showed a significant increase at $p < .01$ level.

When teens reflected on how they changed through the experience, four themes arose: personal growth, changes in their perception, a sense of efficacy, and skill development. Over 40% of teens listed gaining tangible skills including working with children and speaking in front of others.

> *"I've become a more responsible, flexible and compassionate leader. Plus, I've learned more about nature through teaching than I could have ever learned in a classroom."*

Journal entries and observations verified that each time they taught their lesson, the session improved in content and efficiency, and their confidence as presenters grew.

> *"I have watched the teens that have stuck with it year after year. I've watched them grow in their leadership, in their confidence, and in their communication skills. You know, it's amazing to me, when I watch them when they're a freshman, and then if they stay with the program and they're a senior, how much more confident they are in their skills, and their teaching, and… everything, their communication, their tone, the projection of their voice." – Co-director*

Teens and their coaches voiced highly positive reflections about their shared partnership. A majority (above 90%) of teens agreed or strongly agreed with the statement, "I think the adults involved in On the Wild Side respect me and support me."

> *"When I was planning camp…all the adults that I worked with were willing and open. I gave some idea and took some of theirs. They made me feel welcomed."*

> *"(The adults) were awesome. They helped us in what they could and gave us ideas. They cheered us on and they listen to us, respected us, and we had fun."*

> *"I learned that just doing a little goes a long way: listening to the teens…and letting them really take charge of their activity—even though I think it should be done a different way…the response I got was very rewarding."*

Teens feel that they contribute to their community through the project

The project requires a fairly extensive time commitment from its teen and adult staff: four evening meetings, a six-hour training session, a weekend retreat and evening evaluation beyond the weekend-long camp. As a service learning experience, a large majority (99%) of teens felt as though they made an important contribution in their community through the project. The project appeals to youth who have an interest in environmental issues or in working with children.

> *"I feel like a more important person for having given the kids that opportunity and making everyone's day. I feel great after every weekend, knowing I've helped make memories…"*

> *"I like the focus on biology. I also like that it's completely for the kids and we're all volunteers. That it's completely non-profit and the whole focus of the camp is to teach the kids, not just*

about science, but about appreciating nature and having a sense of environmental responsibility."

Other youth development outcomes

When asked what the most meaningful part of the program was, teens shared many things: learning to teach and working with children, being in an environment that augmented the lessons, feeling good about teaching kids new things. But the most frequently mentioned item was bonding and forming new friendships, both with campers and other staff members. The relationship component of camp ranks high on what teens value about the experience.

> *"What I like most is the feeling of instant community. Although many people are regulars (on the staff), newcomers feel just as a part of everything as everyone else."*

> *"Every year I look forward to being able to communicate and relate to them (campers) on a certain level. It's amazing what kinds of friendships and bonds that can happen in just one weekend."*

DISCUSSION

In this article we presented findings from ten years of annual evaluation. Our findings indicate that 4-H On the Wild Side provides an experience where participants learned environmental concepts, felt more engaged with the natural world, where teen leaders gained life and leadership skills, and all participants (elementary students, teens and adults) report a positive experience overall. This section describes some of the theoretical and practical implications of our findings.

Our findings reinforce that experiential learning, cross age teaching and youth adult partnerships—the research based concepts behind 4-H OTWS—can create positive outcomes for young people at many levels. Both quantitative tests and qualitative journals for elementary students indicate that learning took place at a deeper level than in most traditional learning situations. Not only was the learning in environmental content substantive (based on the medium to large effect size), there is evidence of profound, affective and transformative qualities of learning in the journals of elementary students. This speaks to the true impact of experiential learning – where the learner is moved not just by facts, but by physical and sensory experiences. Learning happens as the individual discovers information through his or her own inquiry and experience, thus understanding concepts at a deeper level and "owning" what they construct. One might argue that the richest part of On the Wild Side is simply creating a safe, fun environment that encourages exploration. That type of setting should exist not only for young students, but the teens who are also exploring and learning aspects of leadership, community involvement, and relationships. Further study could explore deeper how OTWS creates this supportive space for learning for campers, teen, and adult staff and chaperones as well.

We believe the role of teens as teachers in the program enhances the level of campers' positive engagement in their learning and involvement at 4-H OTWS. The OTWS evaluations did not gather specific data from campers about their perceptions on the effectiveness of teen teachers. If the program was planned and delivered solely by adults, how would the outcomes for students be different? It is possible that teens model leadership and stewardship and provide younger campers with avenues for thinking about themselves in those roles. Or could it be that teenagers create an environment where elementary students feel emotionally as well as physically safe, leading to greater interaction and the willingness for learners to take risks? A study of resident camps revealed the important role young staff have in making campers feel safe, supported and engaged (American Camp Association, 2006; Bird, et al., 2007). Further study could unearth whether and how teens are more effective as teachers than adults even in short term programs with specific learning goals such as OTWS.

Data from focus groups and the teen survey speak to the power of the teen experience. The commitment is extensive; it is not a one-time, short-term community service opportunity. Their investment—not only time but also ideas and relationships—may create ownership and meaning leading to the high degree of satisfaction they feel about the program and the difference they make in the community. Teens experience personal growth through OTWS as indicated through the teen survey. The evaluations indicate that OTWS is an exemplary

service learning experience as it incorporates both content based learning (environmental knowledge), life skill learning (leadership, communication etc.) and authentic contribution, all in the supportive context, of youth-adult partnerships where young people's ideas are heard and they are able to own their projects.

Our findings reinforce promising practices in the area of youth-adult partnerships (Zeldin, Camino & Mook, 2005). The overwhelming majority of teen and adult staff reported positive working relationships. Several elements seem to contribute to this: i) teens and adults shared a common goal: building and implementing a successful program, ii) the focus for adults was not on developing teens, but on working with teens to address a community issue, iii) youth and adult staff built agreements about how they will work together, iv) the length of the project brought youth/adult teams together over time and allowed individuals to get to know one another and develop friendships, and v) the project integrated youth at all decision-making levels, from fundraising and publicity to kitchen help and clean-up. The camp environment—sharing meals, space, and the natural setting—lends itself to community-building.

CONCLUSION

The case for experiential or project based learning is well documented, and nowhere does there seem to be a better match for providing this type of experience than in afterschool settings. These programs, now common throughout the country, seek to engage young people in constructive activities designed to complement classroom lessons and promote positive youth development outcomes. Like 4-H On the Wild Side, they are informal educational opportunities, unconstrained by school requirements. Learning in these settings can—and some would argue should—be qualitatively different than the formal classroom. This poses the question as to how to make such "in the field" experiences available to students who attend afterschool programs.

We believe that one of the reasons for OTWS success in improving student learning stems from the audience it serves. On the Wild Side draws from low-income and ethnically diverse communities, populations that often lack the breadth of experience that create a schema to understand and apply information about the natural environment. Learners, many of whom have limited experience in the natural world, have initially less knowledge about concepts germane to that setting, but upon interacting with it, are excited about—and ripe for—learning. This has special relevance as, as a nation, we struggle to produce both future scientists and a citizenry capable of making informed decisions on science-based issues.

REFERENCES

American Camp Association (2006). *Innovations: Improving youth experiences in summer programs*. Martinsville, IN: American Camping Association, Inc. Retrieved from http://www.acacamps.org/research/enhance/inspirations

Bandura, A. (1977). *Social learning theory*. New York: General Learning Press.

Bird, M., Borba, J., Brosnahan, A., George, J., Schmitt-McQuitty, L., & Subramaniam, A. (2007). *Beyond evaluation: Findings from the California camp study.* University of California. Retrieved from http://www.ca4h.org/files/4427.pdf

Camino, L. (2000). Youth-adult partnerships: Entering new territory in community work and research. *Applied Developmental Science, 4*, 11-20.

Hoover, A.B., & Weisenbach, A. (1999). Youth leading now: Securing a place at the table. *New Designs for Youth Development, 15*(3), 29-36.

Kolb, D. A. (1984). *Experiential learning: Experience as the source of learning and development.* New Jersey: Prentice-Hall.

Hmelo-Silver, C.E., Duncan, R.G., & Chinn, C.A. (2007). Scaffolding and achievement in problem-based and inquiry learning: A response to Kirchner, Sweller, and Clark (2006). *Educational Psychologist*, *42*(2), 99-107.

Lynch, S., Kuipers, J., Pyke, C., & Szesze, M. (2005). Examining the effects of a highly rated science curriculum unit on diverse students: Results from a planning grant. *Journal of Research in Science Teaching*, *42*, 921-946.

Meyer, A., Nicholson, R., Danish, S., Fries, E., & Polk, V. (2000). A model to measure program integrity of peer-led health promotion programs in rural middle schools: Assessing the implementation of the sixth grade goals for health program. *Journal of Educational and Psychological Consultation, 11*(2), 223-252.

SPSS Inc. (1999). *SPSS Base 10.0 for Windows User's Guide*. SPSS Inc., Chicago, IL.

Zeldin, S., McDaniel, A.K., Topitzes, D., & Lorens, M.B. (2001). Bringing young people to the table: Effects on adults and youth organizations. *CYD Journal, 2*(2), 21-27.

Zeldin, S., Camino, L., & Mook, C. (2005). The adoption of innovation in youth organizations: Creating the conditions for youth-adult partnerships. *Journal of Community Psychology*, *33*(1), 121-135.