Are We Making a Difference?

Lessons Learned From VINE Program Evaluations

Karen S. Hollweg

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Foreward

How do we know if our environmental education programs are good, whether they are meeting our goals and objectives, whether they are serving the needs of our audiences? There are, certainly, indicators we use everyday to gauge our successes: staff self-evaluations and reflection, the thank you letters from students and teachers, the number of people who participate in our programs or the number of groups that return year after year. Although these certainly can give us an idea that we are doing something right, they do not provide sufficient "proof" that the goals and objectives are being met, nor perspective on <u>how</u> we can improve our programs.

Systematic evaluation can play an important role in the development and implementation of quality programs. Through the use of formative and summative evaluations we can begin to understand how our programs work, and if they are meeting our expectations. Evaluation gives us the tools necessary to examine our assumptions about what works. Carefully crafted evaluations allow us to improve our programs continuously. To be effective, the evaluation methods used must be rigorous, but they must also be fluid enough to capture the nuances that make a particular program unique. In designing an evaluation scheme we must recognize the wisdom in the admonition "Not everything that counts can be counted and not everything that can be counted counts."

Developing a strong evaluation component is too often a missed opportunity for program improvement. Unfortunately, it is seen as an expensive extravagance by some, or something done only to please funders by others. Fortunately, for the field of environmental education, the VINE Program has shown the foresight to build and document an evaluation strategy that is integral to the program's development, implementation, and eventual success. Hopefully, this publication, *Are We Making a Difference?: Lessons Learned from* VINE *Program Evaluations*, will provide sufficient insight into the value and practice of evaluation to inspire others.

Bora Simmons, President
North American Association for Environmental Education

Preface

We live in an era of accountability. Funders, both private and public, insist on evidence that shows what we've accomplished with their money. Not only must we provide them with such evidence, we should **want** to ask and find answers to questions about what our education programs accomplish as a means of informing our efforts and improving our practice.

My colleagues and I have learned much over the last 10 years as we have attempted to evaluate **V**olunteer-led **I**nvestigations of **N**eighborhood **E**cology, VINE Programs. At first, we used "homemade" instruments and volunteers, and later, when we had funds, we worked with professional evaluators. The **purpose** of this document is **to describe the evaluations we've conducted, and to relate what we have learned** about the evaluation process and the programs themselves.

We hope that as you and others read this, it will lead you to (1) know and understand our program and its impact, (2) gain from our experiences, and thereby (3) contribute to a larger professional discussion regarding ways to appropriately question and assess what we are doing and achieving.

The purpose and objectives of VINE Programs are set forth in the program manual:*

To provide children (8 to 11 year-olds) growing up in central cities with enjoyable neighborhood experiences that will heighten their awareness, expand their knowledge, and develop their respect for the plants and animals living in their urban world.

The children participating in this program will:

- explore their local natural environment, the plants and animals that live there and the ecological interactions of those plants and animals.
- interact with adults who demonstrate interest in and share enthusiasm for investigating nature out-of-doors.
- develop the skills necessary to observe, use scientific tools, record, compare, quantify and analyze data, and apply critical thinking to reach conclusions. (The children are encouraged to apply these skills in other settings too.)

We emphasize hands-on experiences, **not** facts and information. (p. 20)

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*Volunteers Teaching Children: A Guide for Establishing VINE Ecology Education Programs, Karen S. Hollweg, Washington, D.C.: North American Association for Environmental Education (937) 676-2514, 1995.

Needs assessments and formative evaluations are not the focus of this publication. From the beginning, VINE participants' input—both verbal (via phone calls, informal conversations and meetings) and written (via surveys and various kinds of feedback forms)—has been used to shape the VINE Program. For those interested, our needs assessment, formative instruments and techniques, and descriptions of their use are included in *Volunteers Teaching Children: A Guide for Establishing* VINE *Ecology Education Programs.*

The focus here is on **summative evaluation*** — questions regarding the impact of our program and whether we are accomplishing what we intend.

Please note that this publication is written by a project director, **not** an evaluator. The intent is **not** to authoritatively teach the "right" or "best" way to evaluate a project. Instead, it is to show the evaluations we have done, "warts and all", and to share with other interested professionals what we have learned...and not learned. One statement that has motivated us to pursue this work was printed in *Informal Science Learning:***

....much remains to be done. The field [of evaluating informal science learning] would move much faster if program developers, evaluators, and funders had more opportunity for oral and written communication. (p. 162)

We hope our efforts will contribute in some small measure to such communications and would welcome opportunities to learn about your experiences and receive your critique and suggestions concerning our efforts.

On the following pages, each of our central evaluation questions is presented as a major heading. Following a brief introduction to the question, we describe the following:

- Data Collection and Analysis
- Cost
- What We Learned
- Unexpected Findings
- What We Could Have Done Better

For each question we have indicated the source of the data. In some cases, we have used existing program data; but most questions are

*To learn about formative and summative evaluation and gain background in basic principles of project evaluation, we suggest *User-Friendly Handbook for Project Evaluation: Science, Mathematics, Engineering and Technology Education*, Floraline Stevens, Frances Lawrenz, Laure Sharp, Arlington, VA: National Science Foundation (703) 306-1234, 1993.

**Informal Science Learning: *What the Research Says about Television, Science Museums, and Community-based Projects.*, Valerie Crane, et. al., Dedham, MA: Research Communications Ltd. (617) 461-1818, 1994.

answered using information from five studies. In the appendices, we have described each of these studies and provided a one-page overview summarizing their findings. For those interested in more detail, we have also included the final reports for the four studies conducted by professional evaluators.

In addition to the "What We Learned" and "What We Could Have Done Better" sections under each question, we have included on pages 85-86 some reflections and overall lessons we've learned about evaluation and working with professional evaluators. And because for us every study has ended with more questions, we have summarized some of the questions we would still like to address on pages 87-88.

This book would not have been possible without the cooperation and support of many people. The educators who coordinate VINE Programs in cities across the country have generously shared their local program data and openly involved their programs in numerous evaluations. Jan White, Gail Shands, Anita Lagerberg, Karen Mauck, Helga Burre, Joe Harber, Bob Sullivan, Jim Tindall and Walter Augustine have devoted many hours to program evaluation and have thoughtfully applied what we've learned to improve their local programs. They have also encouraged numerous program participants of all ages to take the time and do their best to contribute to the studies cited here; and they have been honest and insightful in discussing their ideas. Mark St. John, Jill Burruss, Jean Judson, Irene Goodman, Colleen Manning, and Jean Young have patiently taught us much. Ted Mills, Leonard Nelson, Bora Simmons, Kass Hogan, Alan Berkowitz and Bill Hammerman have reviewed drafts and made constructive suggestions. Kristin Jenkins and John McComb have helped me complete this publication with their superb technical skills and unflagging encouragement. Other colleagues have stimulated questions and ideas through their writings, conference presentations and informal discussions. To all, I extend my most sincere appreciation and my hope that together we may continue to pursue ever more productive evaluations.

Who are we reaching?

Our original intent was to create a program for children of middle and lower socio-economic levels growing up in Denver and other central cities. Our needs assessment showed that this was the population with the least access to outdoor, hands-on learning experiences concerning the natural world, and both formal and informal educators identified them as the youngsters with the greatest need for such experiences.

Data Collection and Analysis

To assess whether we are in fact reaching our intended audience, we have collected data that describe the participants in socio-economic terms. To make this task as easy as possible, we have provided local VINE Program coordinators with the form shown in Table 1 and have asked them to use the most readily available **existing data** to complete the "poverty level" sections.

At schools, the easiest and least obtrusive way of collecting economic data has been to record the number of students in each participating classroom who are on the **totally free school lunch** program. By federal guidelines, access to this program is limited to those **living at or below poverty level**. Generally school secretaries and principals have been willing to provide us with these data once they understand that their children and school will not be singled out. We combine the data for all program delivery sites in a city and publish them as one number for the city to describe the children we are reaching and acquire funding to sustain the program.

Obviously, for our non-school sites, free school lunch data are not relevant. In fact, Boys and Girls Clubs make it a point NOT to collect or use data regarding economic status in signing up or working with youngsters. For non-school sites, we have asked the staff we work with to **estimate** the number of program participants who are from "low income" families. Their estimates are generally based on their knowledge of the number of children living in housing projects or other government-subsidized housing units.

Numbers describing the **ethnicity** of our participants have generally also been readily accessible from the staff members at each of our school or non-school program sites. Where this is not the case, program leaders have made visual estimates of the number of participants in each ethnic group when they are at the sites observing or overseeing program delivery.

Table 1. Program Data Form

for City: _____

Dates: _____

Program Delivery Sites	Example School		
# of Children Involved			
3rd Graders			
4th Graders	64		
5th Graders			
Mixed Ages			
Other			
TOTAL			
# From Families at or below poverty level(+)	25		
Ethnicity:			
# Anglo	21		
# Hispanic	32		
# Black	10		
# Asian	0		
# Amer. Ind.	1		
# Other	0		
# Volunteers & List of Volunteer Sources	5 West High Biology Students		
Activities Used: Titles and Dates	Plant Heist 3/20		
	Litter Critters 3/27		
	Worm Worlds 4/10		
	Neighborhood Birds 4/17		

(+) Poverty Level determined by number of students qualifying for totally free school lunch

As the number of teenage volunteers has increased we've also started collecting similar information about them—with one exception. Our project coordinators have found it to be much more difficult to get economic data from high schools than from elementary schools. In addition, some high school teenagers no longer live with their families. Consequently we do not attempt to profile teens by their families' economic status.

By displaying the 1990-1991 VINE Program Participants' data for each city in Table 2, we could readily see which cities were reaching an audience representative of the total school district's population. By comparing the figures in the last two columns at the right, it is obvious that some cities like Arlington, Boston, and Prescott, reached hundreds of disadvantaged children—and that their participants include a higher percentage of minority and/or disadvantaged youngsters than the number of such children in the population as a whole. In both Arlington and Birmingham, by delivering the program at sites frequented by disadvantaged children during non-school time, a high proportion of minority, disadvantaged children were reached. Since there is no data for Birmingham's school district, one cannot tell how the program population compares with the district's—an omission that we could and should have avoided.

The 1994-95 VINE Program Participants' data in Table 3 show that with increased emphasis on community-service learning and the growth of cross-age programs, more VINE Programs were using teen volunteers. The "% Minority" columns for teens and for children highlight the fact that in cities like Boston, Denver, and Baltimore, which use teen volunteers from nearby high schools, elementary school students of color interact with older positive role models who are often of the same ethnicity. Anecdotal data, from both the Inverness and Goodman Studies (detailed later in this publication), indicate that these teen leaders are warmly welcomed by both the youngsters and their teachers/supervising staff.

Readers familiar with software such as Excel, Lotus, or QuatroPro know that once data has been collected and entered, it can easily be displayed to highlight virtually any variable. Figure 1 shows a graph for Seattle's program that visually emphasizes the demographics of program participants and the program's growth.

Table 2. 1990-91 VINE Program Participants

City	Sources of Volunteers	# Volunteers	# Children	# Activities	Total Hours Contact w/Kids	% Poverty, % Minorities	School District's % Poverty, % Minority
Denver, CO	Audubon, PTA	188	1,050	3-8	5,795 hrs.	42%, 45%	33%, 65%
Arlington, TX	PTA, Boys Club camp staff	38	474	6-8	3,275 hrs.	39%, 36%	16%, 25%
Birmingham, AL	University students, personal contacts	14	102	3	305 hrs.	41+%, 63+%*	**
Boston, MA	Mostly high school and university students	***120	280	5-9 (some 3)	1,623 hrs.	65%, 82%	49%, 78%
Broward County, FL	High school students, PTA/Parents, Audubon	***195	1,428	5	6,455 hrs.	23%, 33%	26%, 41%
Louisville, KY	High school students	***191	2,576	3 (some 6)	7,783 hrs.	36%, 25%	35%, 32%
Prescott, AZ	Audubon, PTA, community volunteers	81	396	6	2,376 hrs.	32%, 9%	11%, 10%
Seattle, WA	Audubon, PTA, university students	88	769	9 (some 3)	4,555 hrs.	35%, 52%	31%, 55%

* The actual percentages were somewhat higher, since conservative estimates were used.

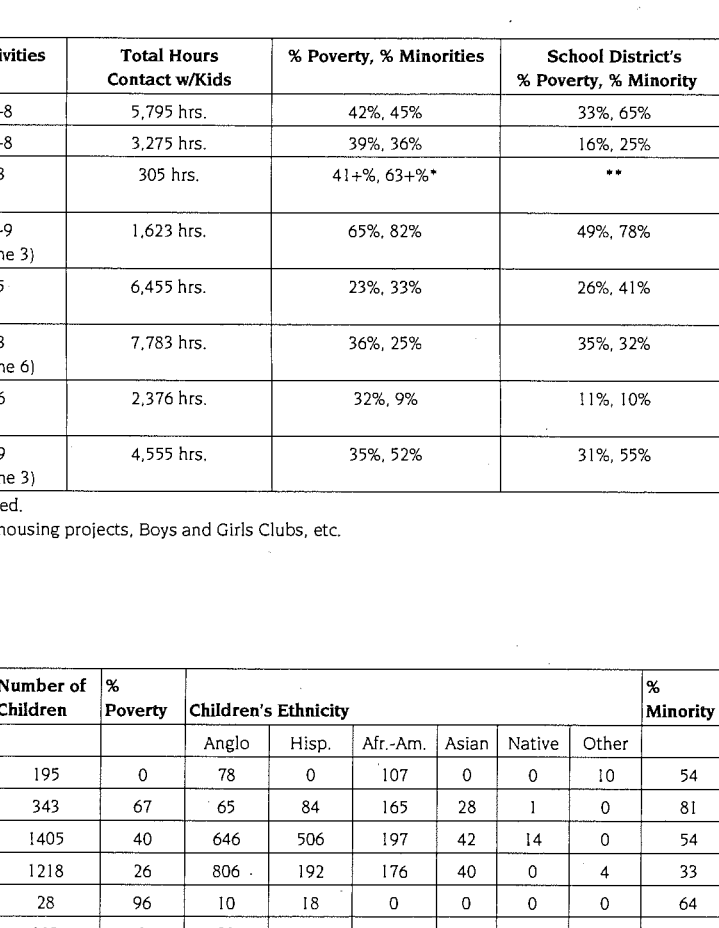
** Reached disadvantaged children via after-school program at city recreation centers, housing projects, Boys and Girls Clubs, etc.

*** Used high school volunteers; sometimes 2 volunteers per 6 children.

Table 3. 1994-95 VINE Program Participants

City	Volunteer Numbers			Ethnicity of Teen Volunteers						Number of Children	% Poverty	Children's Ethnicity						% Minority
	Total	Adults	Teens	Anglo	Hisp.	Af.-Am.	Asian	Other	% Minority			Anglo	Hisp.	Afr.-Am.	Asian	Native	Other	
N. Little Rock, AR	6	0	6	4	0	2	0	0	33	195	0	78	0	107	0	0	10	54
Boston, MA	74	0	74	10	21	37	0	6	86	343	67	65	84	165	28	1	0	81
Denver, CO	247	122	125	36	80	9	0	0	71	1405	40	646	506	197	42	14	0	54
Ft. Lauderdale, FL	151	52	99	78	14	6	1	0	21	1218	26	806	192	176	40	0	4	33
Woodstock, IL	5	0	5	0	0	0	0	0	0	28	96	10	18	0	0	0	0	64
Attleboro, MA	16	0	16	15	0	0	0	1	6	102	8	90	4	5	3	0	0	12
Baltimore, MD	235	10	225	34	1	198	1	1	88	843	36	117	5	719	1	1	0	86
Seattle, WA	214	214	0	0	0	0	0	0	0	1523	26	670	104	317	286	46	100	49

Figure 1. Graph of Seattle Audubon's Program 1988-93



Cost

The least expensive method of collecting demographic data is also the easiest method. VINE program coordinators in each city integrate data collection into their regular meetings with staff at sites hosting the program. For some coordinators that means filling out the form shown in Table 1 with teachers and/or office staff at the beginning-of-the-year program planning meeting. For others, the form is filled out and/or collected at an end-of-the-year meeting. Some programs have collected these data on application forms used to enlist new sites into the program, but others serve populations that are so transient that such data do not accurately describe the children who actually participate in the program months later. If the VINE Program student population is transient, post-program data are more desirable. Most educational institutions and organizations have spreadsheet software, or have access to it. Consequently, other than the time needed to collect and compile the data, there are no extraordinary costs associated with this technique.

What We Learned

We are indeed reaching large numbers of disadvantaged urban children from diverse ethnic backgrounds. These data are not surprising to local VINE program coordinators because they regularly interact with the people participating in the programs.

The people most impressed with these data have been environmental educators and funders who have not had extensive experience working in cities. Tables and graphs, with few words, clearly make the point that we are definitely reaching a historically underserved population.

At the local level, the value of these data is the fact that they enable each program coordinator to annually reflect on the totals with their target population in mind, identify under- and over-represented segments, and make program adjustments. Such analysis may lead the coordinator to pursue new recruitment techniques. For example, in Broward County (FL), the program is known and sought out by some of the more affluent schools with mostly Anglo students. The local program coordinator has learned that to maintain a program that reaches a diverse audience, she must make a concerted effort to recruit elementary schools serving students of color as well as volunteers to lead their outdoor investigations.

What We Could Have Done Better

Local program coordinators who regularly collect demographic data have institutionalized a system for doing it every year. Most have seen the value data have in promoting and funding their programs and make data collection a routine matter. But we have not been successful in converting all coordinators to this view. Consequently, we do not have a complete data set—i.e. demographic data for participants in all VINE Programs. As a voluntary association of program coordinators, the VINE Network cannot proclaim laws and enforce compliance. Soon, however, the Network may link access to benefits (such as the Network's annual purchase of hand lenses at a greatly reduced price) to submission of program data for the previous year. We hope this will provide added incentive and lead to the "conversion" of more coordinators.

Are we providing participants with new and different experiences?

From the beginning, VINE Programs have aimed to provide children, especially those growing up in our central cities, with outdoor neighborhood experiences with their environment that would not otherwise have been available. Therefore, it was very important to us to find out whether we were, in fact, meeting this goal.

Data Collection and Analysis

The first time we collected data to find out whether we were providing new and different experiences to program participants was in 1986-87 in Denver. At that time, Denver Audubon's local program coordinator and two University of Colorado graduate students designed two different survey instruments: questionnaires for adults, and open-ended questions for small groups of children to answer verbally. In both the written surveys and the interviews, items shown below followed questions which asked respondents about the extent of their participation and general perceptions of the program. Figure 2 shows an item from the written questionnaire and responses from 28 parents, school teachers, and staff members at non-school community sites hosting the program (such as Boys and Girls Clubs).

For a desciption of the 1986-87 University of Colorado-Denver Study and its findings, see Appendix A.

Figure 2. Adult Survey Responses: "New Experiences for Children"

Listed below are some learning opportunities that may have been introduced to your child/children during Audubon activities. Check the one(s) you consider to be new experience(s).

68% _____ Use magnifying lenses.
64% _____ Participate in a small group learning activity outdoors.
75% _____ Share discoveries with others about neighborhood plants and animals.
64% _____ Learn from other adults interested in nature.
71% _____ Find answers to questions about nature by looking and experimenting.
82% _____ Do outdoor investigations of nature using scientific aids.
57% _____ Do activities to learn about the environment.
4% _____ Other. Please specify..."Use of sweep nets to catch bugs."
4% _____ None of the above..."Child took course in field biology at a community college."

Verbal responses from 66 children, interviewed in small groups, were grouped into categories and are shown in Figure 3.

Figure 3. Children's Interview Responses: Program Activities Not Normally Done

What do you do with Audubon that you normally don't do?

22%	Learning experience is outdoors
30%	Use scientific aids:
	12% Magnifying lens
	18% Sweepnets
36%	Find, study, identify or learn about bugs, leaves, ants, plants, spiders
5%	Make sunprints
6%	Other

In 1995-96, the program staff in Baltimore built on the Denver findings shown above and created a set of four questions. The questions and the responses of children surveyed prior to and following participation in five outdoor investigations are shown in Table 4.

Table 4. Experiences of Baltimore Children Pre- and Post-Program

	Pre-Participation (441 responses)		**Post-Participation** (255 responses)		**Increases in "Yes" responses**
	YES	**NO**	**YES**	**NO**	
Have you gone outside during school time to do science activities?	54%	46%	89%	11%	+35%
Have you hunted for insects around your school?	38%	62%	75%	25%	+37%
Have you used a magnifying lens?	77%	23%	91%	8%	+14%
Have you had a teenager or grown-up show you things about nature?	64%	36%	91%	8%	+27%

In 1992, we contracted with University of Denver evaluators to do a two-year study with large samples of students and teachers in Seattle (WA), Denver (CO), and Broward County (FL). The evaluators used, in part, National Assessment of Educational Progress (NAEP) questions, which allowed us to compare our results with those of the U.S. Department of Education's large national sample. The evaluators found their sample of VINE and control schools and teachers in the three cities to be similar to the national samples in terms of numerous variables ranging from days in school year, hours per subject, class size and classroom resources, to teachers' ethnicity, years of experience, and college degrees.

A description of the 1992-94 University of Denver Study and a copy of the final report may be found in Appendix C.

In both the 1992-93 and 1993-94 academic years, there were classes participating in the study which had more than 50% of the students participating in the free school lunch program. These are comparable to NAEP's "Disadvantaged Urban" schools and are so designated on the data tables.

VINE and control students were surveyed before and after program participation. Responses to the question "Have you ever done experiments or projects at home or in school with plants or animals?" (in Table 5) show significant differences between VINE students, control students in comparable schools, and NAEP samples.

Table 5. Experiments or Projects with Plants or Animals

	Have you ever done experiments/projects at home/school with plants or animals?		
	"YES" Responses		**Significant Differences**
	Pre	**Post**	**P<.01**
VINE 1992-93 N=636	64%	85%	Significant Increase
VINE 1992-93 Disadvantaged Urban N=83	58%	81%	Significant Increase
Control 1992-93 N=410	74%	68%	No Difference
VINE 1993-94 N=758	74%	82%	Significant Increase
VINE 1993-94 Disadvantaged Urban N=97	63%	79%	Significant Increase
NAEP 1990 N=3631	58%		Significantly Lower than VINE Students
NAEP 1990 Disadvantaged Urban N=418	55%		

When presented with the series of items shown in Figure 4, students in VINE and control classes overall reported no significant differences in how often they engaged in the various school science activities listed after the numbers four through eight. But there was a significant difference in responses to number nine following VINE participation. VINE students reported doing "outdoor science activities" (item #9) more frequently at the p<.01 significance level. The pre- and post-responses for two different years are shown in Table 6. In both years, the "disadvantaged urban" students showed lower frequencies in their pre-VINE responses, but responses similar to all VINE students post-VINE. Control groups showed no difference in pre- and post-responses.

Figure 4. Frequency of Various School Science Activities

Questions 4-9: When you study science in school, how often do you do each of the following? (Check the box with the best answer)

	Almost every day	Several times a week	About once a week	Less than once a week	Never
4. Read a science textbook	☐	☐	☐	☐	☐
5. Discuss a science news event	☐	☐	☐	☐	☐
6. Work with other students on a science problem	☐	☐	☐	☐	☐
7. Give an oral or written science report	☐	☐	☐	☐	☐
8. Do science experiments	☐	☐	☐	☐	☐
9. Do outdoor science activities	☐	☐	☐	☐	☐

Table 6. Responses to #9: "How often do you do outdoor science activities?"

	Almost every day (1)	Several times a week (2)	About once a week (3)	Less than once a week (4)	Never (5)	AVG.	Signif. Diff. P<.01
VINE Pre 1992-93 N=636	9%	9%	13%	29%	39%	Less than once a week (3.8)	More Frequent
VINE Post 1992-93 N=636	4%	10%	22%	47%	16%	Less than once a week (3.6)	
VINE Pre 1992-93 Disadvantaged Urban N=83	0%	13%	7%	34%	45%	Less than once a week (4.1)	More Frequent
VINE Post 1992-93 Disadvantaged Urban N=83	16%	1%	18%	37%	28%	Less than once a week (3.6)	
Control Pre 1992-93 N=410	5%	6%	15%	30%	44%	Less than once a week (4.0)	No Difference
Control Post 1992-93 N=410	5%	4%	10%	48%	33%	Less than once a week (4.0)	
VINE Pre 1993-94 N=758	7%	7%	14%	10%	62%	Less than once a week (4.1)	More Frequent
VINE Post 1993-94 N=758	4%	8%	28%	40%	19%	Less than once a week (3.6)	
VINE Pre 1993-94 Disadvantaged Urban N=97	4%	3%	9%	8%	76%	Less than once a week (4.4)	More Frequent
VINE Post 1993-94 Disadvantaged Urban N=97	5%	9%	22%	41%	23%	Less than once a week (3.7)	

What We Learned

The experiences provided by VINE Programs are new and different experiences for substantial numbers of participants. The exact numbers vary from one group to the next, but all three studies that have probed this question (pp. 15-18) indicate that the following are new experiences for at least 10 to 35% of participating children:

- Using "scientific" tools, like magnifying lenses and sweep nets,
- Finding, studying, learning about insects, leaves, spiders, plants, ants, etc. around my school/neighborhood,
- Learning about nature and/or sharing discoveries with an interested teenager or grown-up, and
- Doing experiments or projects with plants or animals.

By comparing VINE participants to similar control groups within the same school district and to nation-wide populations sampled through NAEP, we know that VINE Programs significantly increase how often urban children do outdoor science activities. The increases are even greater for disadvantaged urban students.

Parents and adult leaders responsible for the children tell us that these experiences would not have been available without VINE. In fact, 71% of a sample of 46 school teachers with classes participating in VINE report that VINE activities are different from their regular program, and 77% say that they could not provide the small group instruction and individual attention to their students without VINE. (Appendix C-5, pp 41 & 63)

Unexpected Findings

Children participating in VINE Programs find various aspects new and different. By asking children an open-ended question and only capturing their first answer, as was done in 1986-87 (see Figure 3), we missed the richness of the responses that parents/adults and children provided when we used checklists (as in Figure 2) and multiple questions (as in Table 4).

Initially we had assumed that VINE Programs would be somewhat more valued by groups with high proportions of economically disadvantaged youngsters. Our 1992-94 data verified our assumptions by showing greater gains for students in "disadvantaged urban" schools. To achieve these gains, program coordinators have to invest more time and effort in making logistical arrangements and placing volunteers at these sites. Evidence of the success of VINE Programs in achieving the stated purposes helps to motivate this added effort.

How satisfied with the program are participants, their parents, teachers and volunteer leaders?

As a totally voluntary program, VINE depends on the interest and enthusiasm of all participants. If kids, volunteers, and adults sponsoring the program don't all see it as worthwhile and engaging, the program dies.

The children are key. Their response is most vividly gauged by direct observation. Smiles, laughter, exclamations, active involvement, and intense focus are all visible when one watches a VINE session. Those characteristics can be captured in photographs, videos, and thank you notes that the children write to "their" volunteers. But, can we also provide an objective, quantitative measure of program satisfaction?

Data Collection and Analysis

In 1986-87, the University of Colorado evaluators wanted to hear (as impartial outsiders) what students had to say about Denver Audubon's VINE program. They collected verbal responses to four questions in small group interviews with 66 children. Under each question shown in Figure 5, general categories describing student responses are preceeded by the percentage of responses falling in that category.

See Appendix A for a description and Summary of Findings from the 1986-87 University of Colorado-Denver Study.

Figure 5. Four Items Gauging Children's Satisfaction with Denver's VINE program

If you were to tell a friend who does not know about the Audubon program, what would you tell this friend so they will know what it is like?

23%	Find different leaves, insects
11%	Educational or study experience of activity (Formal response)
19%	Learn about nature (Informal response)
8%	Use scientific aids in activity
31%	Fun experience
9%	Other

What did you like best about the Audubon program.

35%	Finding, studying bugs
17%	Studying leaves/Making sunprints
11%	Isopod races
5%	Enjoyed learning from volunteers
20%	Learning about nature outdoors
8%	Use of scientific aids
5%	Other

What is the best reason you would give your teacher to convince him/her to go to an activity again?

34%	Fun
5%	Interesting
11%	Educational
26%	Learn about nature outdoors
18%	Supplements classroom learning experience
3%	Liked learning from volunteers
3%	Other

What did you like least about the Audubon program.

33%	Nothing I can think of
23%	Handling insects
23%	Unpleasant field conditions (stickers, mud, cold/wet/hot weather, cold temperatures resulting in inability to find bugs, etc.)
8%	Bug activities
6%	Leaves/plant activities
6%	Not doing the activities in the program often enough
2%	Other

In 1992-94, the DU evaluators assessed interest in or satisfaction with the program by asking both teachers and students in three cities whether they "want to do more outdoor activities like these." They also asked teachers whether they thought their students would like to do "more activities like these." While some differences exist, the responses, shown in Table 7, are overwhelmingly positive.

See Appendix C for the description, summary of results and final report of the 1992-94 University of Denver Study.

Table 7. "Want More Outdoor Activities Like These?" Students' and Teachers' Responses

	Students' Responses (n=821) 92-93			Students' Responses (n=944) 93-94			Teachers' Responses (n=64) 92-93			Teachers' Responses (n=33) 93-94		
	Yes	Some-what	No	Yes	Some-what	No	Yes	Some-what	No	Yes	Some-what	No
Teacher wants more							91%	9%	0%	93%	7%	0%
Student wants more	84%	12%	4%	83%	12%	5%	96%	0%	0%	100%	0%	0%

In addition to measuring children's satisfaction, the 1986-87 survey attempted to collect information from parents, by sending mail-in questionnaires home with the children. Only 14 parents responded. But ten of those (71%) said they had heard about the program and would encourage their child to do more. (See Figure 6.)

Figure 6. Items Gauging Parents' Knowledge and Support of Denver's Program

What, if anything, has your child told you about the Audubon activities.

14%	The activities were fun, educational, and/or interesting.
57%	The activity involved bugs, leaves, ants, etc.
21%	My child told me nothing about the activity.
7%	No response.

If your child were able to do more Audubon activities, would you encourage her/him. If so, why? If not, why not?

57%	Yes	
	Why.	Supports learning for environmental and natural science awareness.
14%	Other	
	Why.	-She enjoys it and it is a helpful learning experience. -Main objective is to have child learn as much as possible. Child can learn more by working on a project she considers "fun."
7%	No	
	Why not.	Child is not really interested in nature.
21%	No Response	

In addition, 91% of the 34 adult volunteers sampled in 1986-87 said they were "satisfied" or "very satisfied" with the program. That same year, Denver's retention rate for volunteers was 70%.

By 1994, most VINE Programs used teenage volunteers, and the Goodman Study assessed the satisfaction of 259 teens in 5 cities using the questions shown in Figure 7.

Appendix D contains details about and reports from the 1995 Goodman Research Group's Study.

Figure 7. Items Assessing Teen Volunteers' Satisfaction with the VINE Program

How much did you like the VINE program? (*Circle one*)
Really liked Liked Sort of liked Didn't like

- 86% of volunteers "really liked" or "liked" the VINE program.

What did you like *best* about the program?
(*Check the <u>one</u> that you liked best*)

40%	☐teaching the children science
26%	☐being a role model for the children
15%	☐the children's excitement about it
5%	☐getting to do the activities
3%	☐working with other people my age
8%	☐being outside
3%	☐other; what?_____

What did you like *least* about the program?
(*Check the <u>one</u> that you liked least*)

27%	☐there wasn't enough time to do the activities
16%	☐going outside when it was very cold or hot
27%	☐having to work with difficult children
19%	☐the program didn't last long enough
11%	☐other; what?_____

How much did you like working with younger children during this program?
(*Circle one*)
Really liked Liked Sort of liked Didn't like

- 85% of volunteers "really liked" or "liked" working with younger children

How likely would you be to volunteer for this program next year? (*Circle one*)

Very likely Likely Somewhat likely Not at all likely

- 80% of volunteers responded that they would "very likely" or "likely" volunteer again.

What We Learned

The overwhelming majority of children, teachers, parents, and volunteers liked the program and wanted to continue to be involved or to be more involved. It is helpful to be able to cite numbers regarding program satisfaction which have been collected by an outside evaluator. We frequently use those hard data from large numbers of participants in conjunction with individual pieces of authentic or anecdotal evidence. For example, we may caption a photo or a child's thank you note with a statement about the percent of participants who liked the program or wanted to participate more.

When outside evaluators have probed respondents using open-ended questions or checklists we have learned things that have helped us improve our programs. For example, in 1986-87, we found that 50% of the parents surveyed didn't know enough about the program to describe it; so, we created a brochure with both pictures and text for the kids to take home. And in 1994-95, the responses which teen volunteers gave to the question regarding what they liked **least** focused program coordinators on the need to address the issues of "difficult" children and the pacing of activities as they trained and coached the teenagers.

Unexpected Findings

While we weren't surprised by the very positive survey responses, we were surprised by the **range** of responses from one site to another. For example, in three different cities, responses of teens indicating that they *really liked* working with children ranged from 73% to 50% to 33%. These results signal substantial differences and lessons to be learned. By enabling the people in charge at these different sites to compare strategies and, when possible, visit each other to learn new ways of working with teens, the practices teens liked most can be made known to all sites. Because of this experience, and the range of responses we've found in sites with more and less economically disadvantaged children, we advocate comparing results from site to site **before** combining data from all sites.

How has the program been adapted? Does it "work" in each of its configurations?

The VINE Program began as the "Urban Education Project" of Denver Audubon Society. In 1988, the National Science Foundation (NSF) awarded a dissemination grant to Denver Audubon to enable the project staff to see if the program could serve as a model for other cities and to determine the most constructive dissemination strategies.

Throughout the three-year grant, the project director and program coordinators in each city documented the dissemination process and collected formative evaluation data. Their experiences in designing and establishing local programs based on the Denver model are set forth in *Volunteers Teaching Children: A Guide for Establishing* VINE *Ecology Education Programs.*

To assess the results of this dissemination effort, in the final year and a half of the grant we hired Mark St. John, an outside evaluator with extensive experience evaluating informal science education programs. He and his Inverness Research Associates staff addressed our evaluation questions as knowledgeable professionals, well respected in the field. What they reported was viewed as an expert opinion, much as the way the opinion of a "connoisseur" is viewed regarding the meals served by a new restaurant.

See Appendix B for a description of the 1990-91 Inverness Research Associates' Study, their Summary of Findings and Mini-Study Guidelines.

Data Collection and Analysis

As contracted, the 1990-91 Inverness study included three major components: Case Studies, local "mini-studies", and a cross-site Summary of Findings.

The **Case Studies** began with visits to six dissemination sites by Mark St. John and other Inverness staff members. These took place from the spring of 1990 through the spring of 1991. Each visit lasted one to two days and included meetings and interviews with key volunteers and coordinators responsible for the programs, with teachers, students, principals and other school district officials, and with staff members of museums and other community facilities participating in the program. In addition, the evaluators observed and talked with children and volunteers "in action" as they participated in program activities at each site.

Following each site visit, the evaluators wrote a Case Study, which described in detail the history, context, operations and impacts of the program they encountered. A draft was reviewed by the director of the dissemination grant and by the local program coordinator, and their input was used to make corrections and revisions.

To supplement the Case Studies, we allocated up to $1,000 per city for **"mini-studies"**. The idea was to enable the newly established programs to evaluate and find out about aspects of their programs that were of special interest or concern to them. By hiring a local graduate student, or a professional experienced in observing, interviewing and writing about education programs, the new program's coordinator and steering committee could launch their own small-scale evaluation. Mark proposed topics, methods, and products for five different mini-studies. Each city's program leaders chose the one(s) they wanted to do. Then, a simple contract outlining the scope of work, timeline, and deliverables was negotiated by the local program coordinator and local evaluator and was approved by the dissemination grant director.

The dissemination sites enthusiastically embraced this idea, and a total of 9 mini-studies were done. Each city took a slightly different approach to the mini-studies. Louisville used all their money to do one in-depth study of their teenage volunteers. Seattle did three separate studies that were smaller, but substantive. The educators with experience in informal settings hired to work on mini-studies had the background to fully appreciate many aspects of the program and the skills to do credible studies. The newspaper reporter hired in Prescott to assess ways the program benefited participants brought observation and writing skills to the task, as well as a fresh perspective. No matter who conducted the mini-study, the driving force behind these studies was the fact that each site was empowered to pursue questions of interest to them.

Appendix B-7 contains a complete set of the Mini-Study Guidelines that were given to each dissemination site, and Appendix B-2 lists titles for the 9 completed studies.

Once all the case studies and mini-studies were completed, the evaluators wrote a **"Summary of Findings"**. It describes the range of configurations developed at the dissemination sites and also describes and analyzes the common issues and dilemmas shared by the sites as they started and built their programs.

The "Summary of Findings" draws on quotes and observations collected during the site visits, and is, by its very nature, subjective. In it, the respected experts (or "connoisseurs") we hired give their opinions. They express concern regarding the "fragility" (i.e., lack of financial sustainability and institutional support) for programs at some sites. But most of their text describes the positive characteristics these programs have in common. A complete copy is printed in Appendix B-5. We put together one page of quotes from that document to highlight some of the main points.

Quotes from A *Study of the Dissemination of Denver Audubon's Urban Education Project*: A *Summary of Findings*
Inverness Research Associates, June 1991.

The projects studied:

- offer children a rare opportunity...to explore, investigate, and learn about the natural world right in their own neighborhoods. (p. 10) ...learning "how to see" can be a novel and powerful experience. Children & guides often have the experience of "Wow! I never saw that before!" (p. 11)
- are curriculum-led. The Outdoor Biology Instructional Strategies (OBIS activities) provide a solid curricular foundation for all sites...and also provide a kind of "quality control" for the projects. (p. 8)
- give many children chances to experience a sense of success with science activities for the first time (p. 9) and to see science as personal, value-laden, connected with real issues in the environment, and fun as well. (p. 12)
- provide an intense hands-on science experience which the schools themselves are unable to provide. The program simultaneously provides lessons in environmental education that are not abstract, but rather are grounded in the schools' own yards. (p. 13)
- require a small adult-student ratio, usually 1 volunteer to every 5 or 6 students. There is a strong egalitarian flavor to the small groups. All class, color, and sex distinctions are erased in the excitement of finding a colony of ants under an old rotting board. (p. 9)
- provide a vehicle for parents, scientists, naturalists, other interested lay adults and high schoolers to participate directly in the school's life and to work with young children,...to provide young (often minority) children with older positive role models,...and strengthen the link between schools and the rest of the community. (p. 13)
- serve as a useful and very visible model for teachers and administrators... illustrating well many characteristics of the nation's educational 'reform agenda' (e.g., cooperative learning, peer teaching, inquiry learning, use of the local environment, etc.) (p. 13)
- lie between and bridge, established institutions. They serve as nodes in a network that connect schools with community groups, museums, conservation groups, parents, senior citizens, and universities. (p. 1) ...As schools continue to suffer budgetary reductions, they will have to look for outside resources to offer such activities to students and to meet the demands of the national reform efforts in science education. (p. 21)

What We Learned

Since this was the first time we'd contracted with a professional for an outside evaluation, I had a naive view that once the contract was agreed to, the evaluators would take over and do the work. What I and

the local program coordinators learned is that program staff **must** allocate time to work with the evaluators. As director of the dissemination grant and the original staff member in charge of Denver Audubon Society's Urban Education Project, I found that I needed to provide the evaluators with detailed information on Denver's "model" program both in the form of written documents and through phone and in-person discussions. They wanted background on program objectives, organizational structure, achievements, and problem areas. These interactions were essential in conveying the nature and intent of the program to the evaluators. Once ready to begin site visits, we discussed each city's program, best times for seeing children and volunteers in action, and key people worth interviewing. After that, the evaluators worked directly with the local program coordinators to plan the details of their trips. While this put some extra responsibilities in the hands of the coordinators during their busiest seasons, they rose to the occasion, because they perceived the evaluative process to be a worthwhile one. And finally, once a draft of each case study was completed, both the local program coordinator(s) and I reviewed it for accuracy.

What the evaluation report taught us programmatically was that the evaluators saw the VINE Program model as "robust and flexible enough to be adapted to a variety of settings" and as providing exciting, reform-minded, inquiry experiences to participating children. While the majority of their comments were positive, they expressed concern regarding the sustainability of the program at some sites. They attached importance to an ongoing network. Besides linking programs and enabling coordinators to learn from one another, the evaluators saw a network as an effective way to "extend the model throughout the nation." In the next five years as the VINE Network developed, we reaffirmed their views.

Unexpected Findings

Since the Inverness Study was different from anything we'd done previously, we encountered some surprises. Addressing them, we felt, strengthened the project and increased what we got out of the evaluation.

We contracted for four site visits (two in the spring of 1990 and two in the fall of 1990) and for phone interviews with the dissemination sites not visited. However, when preliminary reports of the spring site visits were presented at the summer meeting of all local program coordinators, we ran into trouble due to the popularity of the evaluation process. Coordinators at the two sites that had been visited found: (1) the evaluators' interviews valuable in getting key players to articulate the program's worth and thereby build commitment, and (2) the case study useful in promoting the program and garnering additional support. In addition, all the coordinators got a chance to meet Mark St. John and could immediately see that a visit by the Inverness researchers would increase the status and visibility of their program and get those involved

to spend time thinking critically about the program. By popular demand, we were compelled to add two more site visits and revise the grant budget and time allocations to accommodate them.

At that same summer meeting, we introduced the idea of mini-studies. This too was warmly welcomed—and also required revisions in budget and time allocations. Fortunately, we were able to accommodate these changes. The most significant benefit was that the evaluation process was perceived by program leaders as an integral, authentic part of the development of their programs and, therefore, helped mold the programs' futures in a relatively unobtrusive way.

Another benefit that we had not expected arose the following year as the Irvine Natural Science Center was raising funds to start a VINE Program in Baltimore. They had included several documents describing existing VINE Programs in their fundraising proposal, including the sheet of quotes printed on page 27. The potential donor asked for, and received, a copy of Inverness' entire Summary of Findings. The Findings convinced them that the program could be successfully adapted for delivery in Baltimore, as Irvine's staff had proposed, and they awarded the grant!

What We Could Have Done Better

As noted earlier, the Inverness Study was subjective in nature and was reported in a 21-page narrative. While this document has proven useful for some audiences, others have asked for a more concise display of findings. In retrospect, we wished that we would have designated one of the study's products to be a cross-site matrix. Ideally, the matrix or chart would have listed dissemination sites across the top and would have displayed common characteristics, themes and/or issues raised in the course of the study down the side. Marks in the cells of the chart would show which characteristics or issues were found at each site. At a glance, one could see the elements found at most dissemination sites (i.e., elements imbedded in the basic program and likely for most future sites) versus elements that were unique at one or two sites and indicative of special program adaptations or local situations.

What Does the Program Cost?

Expenses for local VINE Programs vary depending on decisions made by the sponsoring organizations. Experience has taught us that in terms of finances, there are two general program types. One type includes 501(c)(3) non-profits that have decided to start a full-scale VINE Program as an outreach initiative to serve previously underserved audiences. For this type of new outreach program, annual expenses range from $30,000 to $50,000.* Approximately 70% to 90% of that total encompasses pay for the person(s) hired to coordinate the program. Materials and supplies and transportation/mileage make up most of the remaining direct program costs. A second type includes non-profits or government agencies (such as Boys and Girls Clubs, 4-H Extension Services or Parks and Recreation Departments) that have adapted VINE to fill a program need and serve an existing audience with existing staff. In this case, expenses are minimal. Since salaries for the agency's program staff are already part of a comprehensive budget, the only new costs are $1,000 to $4,000 for materials and supplies. While we knew that these two categories existed, we wanted to be able to directly answer several questions regarding costs:

- What do VINE Programs cost per student?...per contact hour?
- Are the costs of programs with different configurations significantly different?
- How do the costs of VINE Programs compare with other programs having similar audiences and objectives?

In the following pages, we provide detailed examples for programs of different sizes, different ages, and different configurations, and we compare the costs for those examples with one another and with other types of outdoor ecology and environmental education programs.

Data Collection and Analysis

Clearly, programs with substantial budgets have financial statements which detail their expenditures. The staff members in charge of local VINE programs have been very generous in sharing this information. In fact, each year at their annual meeting, local program coordinators exchange such information so they can learn from one another. What we have done here is merely display and analyze that existing program data, with their permission.

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*Sample job descriptions for program coordinators/directors and sample budgets for programs of two different sizes appear on pages A3-A8 of *Volunteers Teaching Children: A Guide for Establishing* VINE *Ecology Programs.*

Table 8 shows 1994-1995 costs for five different programs. As the headings show, the first is for a program in North Little Rock, AR, at the Boys and Girls Club, where the Education Director leads the program as one of several responsibilities. (He estimates 5 to 10% of his time is spent on this program.) The salary for his on-going staff position is part of the Club's general operating budget. It is not attributed to the program cost because the position would exist and would be funded even if they had not chosen to include a VINE Program in their Club's educational offerings. On the other hand, new staff were hired specifically to establish and run the projects at the other 4 sites shown. Consequently, staff costs are shown as part of their program budgets.

The notes on pages 34-35 highlight and describe the major variabl displayed in Table 8.

Table 8. 1994-95 Costs for 5 Local VINE Programs

Name of Local Program	Nature Studies	BONUS Project	FUN Project	Natural Connections	Urban Educ. Project
	estab. 1992-93 N. Little Rock	estab. 1988-89 Ft. Lauderdale	estab. 1988-89 Seattle	estab. 1993 Baltimore	estab.1984-85 Denver
PROGRAM BUDGET					
Staff pay ①	◆	18,958	25,360	33,857	38,162
salaries & taxes contract or stipend		18,958 .7FTE, 8 mo.	23,000 2x.5FTE, 10 mo. $2,360	32,857◊ 1FTE, 12 mo. $1,000	38,162◊ 2x.5FTE, 10 mo.
Transport & mileage ②		1,305	847	1,119	1,389
Matls. & supplies ③ (includes printing)	1,200	2,458	1,105	2,753	4,243
Staff education & professional. mtgs.	◆	1,181	550	568	
Office & phone ④	◆	1,383 and ✶	◆	◆	5,391
Misc.		2,619▲		71	2,968▲
TOTAL	$1,200	$27,904	$27,862	$38,368	$52,153
PROGRAM SIZE					
# children served	195	1,218	1,523	850	1,405
# sessions/child	10	5	8	5-6	4-8
# volunteers ⑤	4	151	219	235	247
teens college & adult	4	99 52	219	225 10	125 122
Hrs. training/vol.	4	6-7	8	5	9-13
for teens for college & adult	4	7 6	8	5	13 9
Total # participants, all ages	205	1,369	1,742	1,085	1,652
Total contact hrs.	1,966	7,095	13,104	6,220	9,109
with children with teens with adult vols.	1,950 16	6,090 693 312	12,184 920	5,100 1,120	6,922 1,647 540
PROGRAM COST					
Cost/participant ⑥	$5.85	$20.38	$15.99	$35.36*	$31.57*
Cost/contact hour	$.61	$3.93	$2.13	$6.17*	$5.70*

◆ included in organization's operating budget.
◊ includes benefits.
✶ in-kind donation to project.
▲ includes fundraising expenses.
* see explanation and adjustments to these costs in ⑥ below

Notes about referenced items in Table 8:

① Salary levels of VINE program coordinators vary from one geographical area to another and from one institution to another. In addition, the number of staff and their work calendars vary. Baltimore with both school year and summertime programs, has a full-time, year-round Coordinator, plus an intern who is paid a small stipend. The 3 other programs with staff salaries shown are exclusively or largely delivered through schools. Their staff members work on a part-time basis during the school year. Sample Coordinator/Director job descriptions are printed in *Volunteers Teaching Children: A Guide for Establishing* VINE *Ecology Education Programs*, pages A3-A6. The major difference in responsibilities of the salaried employees listed here is that the staffs of the Ft. Lauderdale and Denver programs are responsible for raising the funds to sustain their own programs. In Seattle and Baltimore the program coordinators share fund-raising responsibility with "development" or fund-raising staff members.

② This category includes two types of expenses: bus transportation and staff mileage. The Ft. Lauderdale and Denver budgets include expenses for busing high-schoolers to elementary schools for program delivery. By selecting neighboring high schools and elementary schools, Baltimore has been able to keep this expense very minimal. Seattle's program uses adult volunteers who take responsibility for getting themselves to the elementary schools, so has no bus costs. In all 4 of these cities, staff members travel considerable distances to volunteer training and program delivery sites. They are reimbursed for mileage, and that expense is also included here.

③ The biggest variables here are the expense of assembling additional kits of activity materials and the cost of restocking consumables. Depending on the number of times each kit is used in a year, it can be reused for 5 to 8 years before it needs to be replaced. And as programs grow or add new investigations to their repertoire, additional kits need to be assembled. The cost of consumables depends most directly on the number of children served. These figures represent a full range of typical expenses for consumables and new kits.

④ The Boys and Girls Club, Audubon Society and Nature Center that sponsor the programs in North Little Rock, Seattle, and Baltimore are by far the largest organizations represented here, with annual budgets exceeding $400,000. These larger organizations include office occupancy and phone expenses as line items in their general operating budgets; so these costs are not shown here. On the other hand, the smaller organizations in Denver and Ft. Lauderdale (both local Audubon Societies) include office and phone within the program budget because the phone and office space specifically serve the project. The Florida program operates out of a home office and a warehouse storage space.

⑤ The distinction between programs using large numbers of high school teens versus those using adults or college-aged volunteers is an

important one when it comes to program costs. In ② above, we have already noted a difference in transportation expenses. The other major difference is in the amount of staff time invested in recruiting, scheduling, training and supervising the teen volunteers. Logistical arrangements must be made with the sponsoring faculty member at each high school; and program coordinators go to each high school to train the teens. As described in *Volunteers Teaching Children* pages 43-45, teens typically participate in a training session prior to leading each outdoor investigation. On the other hand, adult volunteers can be expected to come to scheduled training workshops two or three times during the year and to use printed materials to prepare themselves immediately before guiding each outdoor investigation. While considerable staff time is spent organizing the large centralized adult workshops, there is an efficiency of scale that is lost in conducting multiple training workshops at each high school. For these reasons, programs that involve teen volunteers require more staff time and are more expensive.* (See pages 33-46 in *Volunteers Teaching Children* for more details on the differences in training adult and teen volunteers. Also, pages 79-84 in this document specifically address teens.)

⑥ While the Baltimore program appears most expensive, it is also the youngest. Since 1994-95 was the second full year for their program, the program coordinator was still spending many hours on program expansion (e.g. recruiting new volunteer sources, lining up new delivery sites, supervising the preparation of additional materials kits). Each year, as relationships are established with program partners throughout the city, the program coordinator spends less time on program expansion and the cost/participant goes down. The 1994-95 cost for Baltimore's program is 20% lower than the previous year, and additional efficiencies in 1995-96 resulted in another 20% reduction in costs. Thus, the 1995-96 costs are $28.29/participant and $4.94/contact hour.

Denver's program also costs less than it appears to in the chart. In 1994-95 approximately 5 to 10% of the staff's time was spent on program planning and development related to two new aspects of their project which were implemented in 1995-96. When 7.5% of staff time is subtracted, the total project budget for the VINE program itself is $48,242 ($52,153 - $3,911). Therefore, a more accurate figure is $29/participant and $5.63/contact hour. Because Denver's program accounts for office, phone, fund-raising, and overhead in its program budget, these cost figures show actual or real program costs—whereas the costs shown for other programs in the table are subsidized to a greater or lesser degree by the parent organization.

*A 1994 evaluation of the Youth ALIVE! program sponsored by the DeWitt Wallace-Reader's Digest Fund and the Association of Science-Technology Centers showed that their museum-based teen programs for under-served audiences cost $6 to $15 per contact hour per youth. So, while VINE programs that involve teens are more expensive than those with adult volunteers, they are comparable to the costs of similar teen programs.

What We Learned

Costs are significantly different for VINE programs with different configurations. The cost to employ staff and run a VINE program as an outreach effort from a non-profit organization ranges from $16 to $29/participant or from $2.13 to $5/contact hour. Programs with adult volunteers represent the lower costs; programs with teenage volunteers incur costs that are 25% to 35% higher due to the additional staff time invested in planning and training. On the other hand, the cost of using existing education staff to run a VINE program as an aspect of a youth-serving institution/agency's program is under $6/participant and approximately $.60/contact hour in additional costs to the organization.

To get a sense about whether these costs are "reasonable", we can compare them with other similar programs. Many upper elementary students across the country are provided with outdoor learning experiences at special facilities, sometimes called "outdoor lab schools." At these facilities, classes engage in a variety of outdoor investigations and observations for three to five days. As a result, students gain a greater awareness and understanding of the natural world and their place in it, and develop skills and concepts that are important for addressing environmental issues.

How *do* VINE *Program costs compare with outdoor lab school costs*?

Costs for facilities in Colorado and Illinois are shown in Table 9. Because participants at these facilities incur transportation costs (for the bus ride to get there) and overnight expenses (food and lodging), we have separated instructional costs from the other categories of expenses.

Table 9. 1995-96 Costs for 2 Outdoor Lab Schools

	Taft Field Campus estab. 1952, north central IL	Windy Peak School estab. 1976, west of Denver, CO
PROGRAM COST/person		
Transportation to site	paid by school	$5/child
Food, lodging, taxes, medical ins., maintenance	$40.79 for Mon.-Wed. (2½ days)	$48.50 for Mon.-Fri. (5 days)
Capitol costs	▲	▲
Instruction ✶	$27.21	$71.50
DIRECT, FORMAL INSTRUCTION		
Format large group/whole class small group, group size	 100 %, 10-15/group	 15% 85%, 10-15/group
Small group leaders	university grad students	high school volunteers
Hours provided by staff and vols.	8 hrs.✦	31.9hrs.
PROGRAM COST		
Instruction cost/participant	$27.21	$71.50
Instruction cost/contact hour	$3.40	$2.24
Total cost/participant	$68.00 does not include transportation and capital costs	$125.00 does not include capital costs

▲ paid by income from other programs or from institution's general funds.
✶ includes program administration and oversight, staff, instructors, materials and supplies, training of small group leaders, phone, scheduling and planning. Does NOT include classroom teacher's salary or the times s/he is in charge of the group.
✦ another 8 hours of instruction is provided by the classroom teacher.

There are some obvious differences between outdoor lab schools and VINE Programs. At outdoor lab schools, the overnight expenses add substantially to the cost. The overnight element of the total experience for the youngster is, however, admittedly important and produces many memorable outcomes. The outdoor lab schools are on large, natural acreage. The VINE Programs engage kids in smaller groups (six children/volunteer) with more individual attention. Parents, PTA's, and schools pay for children to participate in residential outdoor experiences, like those at Taft and Windy Peak. On the other hand, VINE Programs are led and funded by non-profit organizations. In essence, the community's individuals, corporations, and foundations (as opposed to students' families and schools) pay for VINE Programs. But for both outdoor lab schools and VINE Programs the emphasis of the direct instructional program and the educational objectives are similar.

The data, summarized in Table 10, show that school-based VINE Programs can be delivered at a cost per hour of instruction that is comparable to outdoor lab schools. While the 8 hours of small-group hands-on learning experiences provided at the Taft Field Campus is comparable in length to VINE Programs, a week-long lab school program like Windy Peak's provides many more hours of instruction. But in terms of cost, Windy Peak has a cost per contact hour similar to the most economical VINE program shown here.

Table 10. Comparison of School-based VINE Programs and Outdoor Lab Schools

	School-based VINE Programs	Outdoor Lab Schools
Direct Instruction	5 to 8 hours	8 to 32 hours
Cost/Contact Hour	$2.13-$5.00	$2.24-$3.40
Total Cost/Participant	$16-$29	$68-125 + capital costs

In terms of overall cost, VINE Programs offer a low cost alternative to outdoor lab schools. Because there are no overnight costs and no facilities to maintain, the total cost/participant for an outdoor learning experience of comparable length is approximately half. Of course, it is even less than that if the considerable capital costs are taken into account. The university and school district that own and run these facilities have made sizable investments in them. Each property has a value exceeding a million dollars. In fact, a recent valuation of the Windy Peak property came to $3.5 million.

For schools that have no access to an outdoor lab school, a VINE Program is a cost-effective approach to providing students with opportunities to directly interact with and explore ecological concepts, develop investigative and critical-thinking skills, and pursue outdoor learning with small groups. For schools that already have outdoor lab school access, VINE Programs offer complementary experiences to build skills and investigate ecological concepts in a different outdoor setting. Anecdotal evidence from Denver teachers and community educators has indicated that students who had participated in VINE and then went to an outdoor lab school demonstrated a greater understanding of the natural world, showed more advanced observational skills, and applied what they had learned through VINE in the more natural setting.

What We Could Have Done Better

While the data and analysis in this section provide substantive information about the costs of VINE Programs as well as a comparison with outdoor lab school costs, they leave us with many as yet unanswered questions. The five local VINE Programs for which costs are shown in Table 8 each attributed program costs and overhead costs somewhat differently. Consequently, the cost/participant and cost/contact hour presented at the bottom of the table are not really comparable figures. Would those costs show the same patterns if the in-kind support contributed by each of the parent organizations was included?

To further illuminate the comparison between VINE and outdoor lab school programs, we would like to have detailed comparisons of each program's objectives and student outcomes. For student populations that have access to both types of programs, we would like to know whether some objectives are more efficiently delivered via VINE and some objectives are more appropriately delivered via outdoor lab schools. Are there ways the programs could and should build on one another? We have not yet found ways to pursue these questions.

Is the program being implemented as intended?

VINE Programs are, by their very nature, different from one city to another. Each program is designed to draw on local resources to meet identified needs. (See *Volunteers Teaching Children: A Guide for Establishing* VINE *Ecology Education Programs*, especially pp. 5-8 and P1-P14.) In Seattle, during the fall and spring, adult volunteers take 3rd through 5th graders onto the school grounds to investigate the predatory behaviors of spiders and to discover the habitats that harbor the most earthworms. In the winter months, Ft. Lauderdale high school volunteers guide 4th graders in using sweep nets to find out how many different kinds of critters live in the grass and in figuring out how many different kinds of plants grow in the schoolyard. Summer interns in Little Rock lead Boys and Girls Club youngsters in daily outdoor explorations to learn from ants, pillbugs and other things on the Clubs' grounds and neighboring parks.

To be able to evaluate these VINE Programs and compare outcomes from site to site, we need to be able to define the key elements that they have in common and that make them comparable—i.e., we need to show that we are comparing "apples" with "apples". As described in previous sections, we have information for each program that describes their participants and lists the activities they do. We also know the program sponsors' cooperative working relationships with other organizations and institutions that enable the programs to succeed locally. What we still needed to know is whether it "looks like...feels like...tastes like" a VINE Program when it's in full swing.

We found an instrument for this purpose which had been developed by education researchers at the University of Texas at Austin in the early 1980's. It was called a "Component Checklist" and was used to describe "Innovation Configurations".* These checklists listed the major features of a program in operational terms, thus describing how the program looks in actual practice. Using their Configuration Checklists as models, we drafted a *Checklist of Project Components*** to describe what an observer could see when a VINE Program is being implemented.

*A full description of "Innovation Configurations"and "Component Checklists", as well as several examples and suggestions for their use, appear in Taking Charge of Change Shirley M. Hord, William L. Rutherford, Leslie Huling-Austin, and Gene E. Hall, Alexandria, VA: Association for Supervision and Curriculum Development, 1987, pp. 12-27.

**See the VINE Checklist of Project Components in *Volunteers Teaching Children: A Guide for Establishing* VINE *Ecology Education Programs*, pp. A52-A53.

We have found it useful as a formative evaluation tool. Program coordinators can use it to guide their observations at a site and to record what they observe. Besides showing exemplary practices, the completed checklist helps pin-point areas in need of attention. In addition, coordinators have used it as a tool for stimulating site visits and observations by board and/or steering committee members and, subsequently, initiating discussions and decisions on program improvements.

Data Collection and Analysis

In the University of Denver 1992-94 Study, the evaluators adapted the VINE *Checklist of Project Components* and added "Directions" for its use. (See Figure 8.) At Seattle, Denver, and Ft. Lauderdale schools participating in the study, teachers and paid observers each completed checklists during two different VINE Program sessions to determine whether the program was being implemented as intended. The outside observers had professional backgrounds in formal and/or informal science education, and were either graduate students or worked in informal education institutions so that they had the flexibility to observe during the school day. A total of 245 checklists were completed over two years. Teachers and paid observers agreed on all areas except that teachers saw themselves as being more involved than did the outside observers.

Appendix C contains a description of the University of Denver 1992-94 Study and a complete copy of the final report.

Figure 8. Observation Checklist

Directions to Observers:

This instrument is designed to help us assess whether or not the program is being provided as intended. In order to gain a sense of what is actually delivered In this program, you are asked to:

1. familiarize yourself with this form and the day's activity, paying special attention to the "Challenge";
2. arrive prior to the beginning of the activity so you can see the opening minutes;
3. circulate among the groups and students after the initial directions have been given; and
4. remain outside and observe the volunteers as they complete responsibilities associated with this activity.
5. While observing, please check off those statements on the form that pertain to the three time periods listed:
   a. as the activity begins
   b. during the activity and at closure
   c. after the conclusion of the activity

In cases where there are multiple responses, choose the one most typical for that question. If there is only one response, please check the line if it is present and leave it blank if it is not present. If there are comments that you would like to add to give us a better feel for what is actually going on during the activity, please feel free to write them on the back of the second sheet

Thank you for your assistance!

Site: _____
Date: _____ Time: _____ Class: _____
Observer's name: _____
Title of Investigation Observed: _____

<u>As the activity begins:</u>

___ Children are excited to see 'their' volunteer/leader and anxious to go outside		
___ Children are organized in groups of 6. (Some groups may have 1 or 2 more or less.)	___ Children are organized in groups of 4 to 8.	___ Children are organized in groups smaller than 4 and/or larger than 8. ◆
___ Volunteer/leaders have their children come together in a circle.	___ Volunteer/leaders have their children loosely collected.	___ Volunteer/leaders do not collect their children in a group.
___ Volunteer/leaders issue the "challenge" to their children.	___ Volunteer/leaders do not issue the "challenge".	
___ Volunteer/leaders clearly explain to their group what to do and show how to use the materials/tools.	___ Volunteer/leaders explain more or less what to do.	___ Volunteer/leaders give confusing directions about what to do.
___ Volunteer/leaders show the group the boundaries of their study areas.	___ Volunteer/leaders do not point out the group's study area.	

As the activity proceeds:

___ Children are outdoors in pairs and/or small groups.
___ Children are in large groups (10 or more per group).
___ Children are together as a class.

___ Children are outdoors on the project site.
___ Children are outdoors in an area adjacent to the project site.
___ Children are outdoors in an area within walking distance or away from school grounds.

___ Each volunteer interacts with children individually, in pairs, and as a group--listening, questioning, directing, and encouraging.
___ Each volunteer talks to the group most of the time.
___ Each volunteer/leader provides little guidance to his/her group.

___ Tools and simple scientific equipment are being used by pairs and individual students.
___ Tools and simple scientific -equipment are being used by only some children.
___ Tools and simple scientific equipment are used primarily by the volunteer.
___ Tools and scientific equipment are not being used.

___ Children seem to be very involved in the activity.
___ Children seem to be somewhat involved in all or parts of the activity.
___ Children seem to be involved in something unrelated to the activity.
___ Children seem to be bored and/or passive.

___ Children are interacting with each other, their volunteer, the plants and/or animals and/or habitat being investigated in the activity.
___ Children are interacting with other people and things unrelated to the activity.
___ Children are not interacting with anyone or anything.

___ The teacher/staff is circulating, observing, and ready to take care of discipline or first aid problems.
___ The teacher/staff is intervening occasionally, as needed for discipline, etc.
___ The teacher/staff is participating with one group only.
___ The teacher/staff is doing something seemingly unrelated to the activity or is not visibly present.

At the end of the activity:

___ Each group of kids and volunteers clean and reassemble their equipment.
___ Some groups of kids and volunteers clean and reassemble their equipment.
___ Groups of kids disband with no responsibility for equipment. ◆

___ The staff/volunteer cleans or reassembles equipment.
___ No one cleans or reassembles the group's equipment.

___ Each group discusses and compares their findings from this activity.
___ Some groups discuss and compare their findings from this activity.
___ Each group makes no comparisons and has no discussion. ◆

___ Each group talks about their next session.
___ Each group makes no reference to future sessions.

___ The volunteer team discusses successes and problems with reference to future activities.
___ The volunteer team departs without further reference to the program and/or what comes next for this group.

◆ See shaded boxes in Table 11.

The observations, summarized in Table 11, "strongly supported that the program is being delivered as intended." (Appendix C-5, p. 11) As the shaded areas of Table 11 show, the data revealed three areas where improvements were needed. At about one-third of the sites, students were in groups smaller or larger than the recommended group of 6; did not take responsibility for cleaning up the materials they had used; and

did not compare and discuss their findings with others. (It is interesting to note that the city with all adult volunteers had groups of 6 more frequently and engaged more students in discussions of their findings; but that cities with teen volunteers more often involved the students in cleaning up the material they had used.)

Table 11. Delivery of VINE Program at Schools in Three Cities

Observations (reported by percent)

	92-93*	93-94**
Eager to see leader	100	100
Groups		
of 6	58	67
of 4-8	38	23
smaller or larger	4	10
Gathered		
in circle	81	84
loosely	18	14
not gathered	1	2
Challenge		
issued	88	91
not issued	12	10
Directions		
clear	75	80
sort of clear	22	20
confusing	3	0
Boundaries		
shown	86	87
not shown	14	13
Groups		
Pairs or small groups	98	97
large groups	2	3
whole class	0	0
Outdoors		
on site	96	97
adjacent to site	4	2
away from school	0	1
Volunteer interaction		
with children	89	88
volunteer talks	11	11
little guidance	0	1
Equipment		
used by students	92	95
used by some students	8	2
used by volunteer	0	2
not used	0	0
Student involvement		
very involved	91	84
somewhat involved	9	16
not involved	0	0
bored	0	0
Student interaction		
with	97	99
not with activity	3	2
not interacting	0	0
Teacher		
involved	75	79
occasionally involved	15	14
with only one group	5	2
not involved	5	6
Cleaning up materials		
by all students and volunteers	59	64
by some students and volunteers	36	31
none	5	4
Volunteer cleans		
yes	99	100
no	1	0
Group discussion		
each group	68	66
some groups	28	32
none	4	2
Talk about next session		
each group	42	45
none	58	55
Follow up discussion by class		
yes	77	73
no	21	26
go back to regular activities	2	1
Follow up discussion by volunteers		
yes	46	88
no	54	12

* 92-93
All observers=110, Teacher observers=58, Outside observers=52
** 93-94
All observers=135, Teacher observers=79, Outside observers=55

Cost

For the 1992-94 University of Denver Study, we paid each outside observer $15 per observation and reimbursed him/her for actual miles driven to reach the sites.

What We Learned

By using this instrument with both teachers and paid observers, we were able to document the similarity of VINE Programs in the three cities being studied. We learned that these VINE Programs were indeed being delivered as intended. In addition, we learned something about the instrument itself and something about VINE Programs.

Teachers and outside observers with informal and/or formal science education backgrounds seem to be able to use the Checklist with equal ease. In fact, adult volunteers actively involved in shaping VINE Programs also seem to be readily able to use this instrument. In both Denver and Baltimore, program coordinators have gotten steering committee and board numbers to make observations. Besides helping with the program evaluation, these uses have engendered a better understanding of the program among those who are shaping its future.

In the four cities that have used this checklist, we have regularly found relatively low marks on the item asking if "each group discusses and compares their findings" at the end of the activity. With adult volunteers such discussions may be lacking at 30% of the sites; with teen volunteers the number is somewhat higher. Clearly this is the most difficult program component for volunteers despite the fact that the program leaders model good discussion techniques in their training sessions and coach volunteers in building these skills. On reflection, however, this finding is not surprising. After all, isn't it one of the most difficult skills for classroom teachers, too?

Unexpected Findings

We were surprised to find so many sites where observers reported the sizes of small groups were smaller than 5 or larger than 7 children. (Repeatedly over the years, VINE program coordinators and volunteers have reported that 6 is the ideal size for VINE small groups.) Some variation in group sizes is inevitable because of absenteeism and other unanticipated events. But program coordinators work hard to maintain small groups and, as the data in Table 11 show, were able to field groups of 6 at two-thirds of the sites in 1993-94.

What We Could Have Done Better

Unfortunately, the observation form used did not contain a space for the title of the investigation being done by the youngsters. Consequently, the evaluators lacked information on which activities were observed in one city. After the fact, we corrected this error.

What is the program's impact on participating students?

By 1992, we knew much about the VINE Program. In the Inverness Study, we had the word of respected outside evaluators that the VINE model could be successfully adapted to a variety of settings and thereby provide children with positive learning experiences that otherwise they would not have. We were eager to facilitate the start-up of additional VINE Programs, but needed funding to do that. Potential funders, in turn, wanted to know the program's "impact". So, our next study attempted to measure the program's impact on both participating children (described in this section) and on their teachers (see pages 63-67).

At the time, every state had representatives of the National Diffusion Network (NDN) who informed people about programs that passed the scrutiny of the U.S. Department of Education's "Program Effectiveness Panel", and federal funds were awarded to support the dissemination efforts of those programs. We initiated the 1992-94 study with University of Denver evaluators to gather the information we needed to apply for NDN funding and/or dissemination funding from other sources. To qualify we needed to do a multi-year study (to show that measurable "gains", changes, or trends could be repeated and thereby reduce the possibility that the results were due to or significantly influenced by chance), involve large numbers of participants and controls, and show how our audience compared to a national sample.

The question of student impact was primarily addressed by a 1992-94 study involving students and teachers in Seattle, Denver, and Ft. Lauderdale. Appendix C contains details about this 2-year study and a copy of the final report prepared by the University of Denver evaluators.

It was a great leap—and we hoped it would be a great leap *forward*. Since each student participated in five to eight one-hour volunteer-led investigations during the school year, our challenge was to identify and measure affective and cognitive gains due to that limited exposure.

Data Collection and Analysis

Do VINE *participants like science more?*

Since students clearly liked VINE (see pages 21-22), and both children and teachers thought of their VINE experience as doing science, we thought that VINE might increase the number of children who liked science. We used the item in Figure 9 from the 1990 National Assessment of Educational Progress (NAEP) fourth grade questionnaire on the Student Questionnaire that we distributed both pre-and post-VINE.

Figure 9. NAEP Item Used on Student-Questionnaire

Do you like science?	☐ Yes ☐ No

The results, summarized in Table 12, show that a higher percentage of students participating in the VINE Program reported liking science than those who were part of the 1990 NAEP sample, but there were no significant increases in the numbers reporting that they liked science post-VINE. The evaluators wrote: "Because the number of students who reported that they liked science was so high on the pre-test measure, there was very little chance of an increase in positive responses." (Appendix C-5, p. 43)

Table 12. Student Responses to: Do you Like Science?

		YES	NO
1992-93*			
	VINE Pre (N=636)	91%	8%
	VINE Post (N=363)	90%	10%
	VINE Disadvantaged Urban Pre (N=83)	86%	12%
	VINE Disadvantaged Urban Post (N=83)	88%	12%
	Control Pre (N=410)	89%	11%
	Control Post (N=410)	90%	10%
1993-94*			
	VINE Pre (N=758)	91%	9%
	VINE Post (N=758)	91%	9%
	VINE Disadvantaged Urban Pre (N=97)	88%	12%
	VINE Disadvantaged Urban Post (N=97)	92%	7%
NAEP (1990)**			
	All (N=5008)	80%	
	Disadvantaged Urban (N=593)	78%	

* There was no significant increase in number of students reporting that they liked science, however VINE participants reported liking science more frequently than did those participating in the NAEP study.

** The 1990 science report card: NAEP's assessment of fourth, eight, and twelfth graders, L.R. Jones, I. Mullis, S.A. Raizen, I.R. Wiess, E.A. Weston, Washington, D.C.: Prepared by EDUCATIONAL TESTING SERVICE under contract with the National Center for Education Statistics, Department of Education, 1992.

Does VINE *increase students' interest in science?*

In the 1986-87 University of Colorado Graduate Students' Study, we admittedly had small sample sizes. But the results of those surveys made us question the 1992-93 responses that showed no significant increase in the number of students who "liked" science. So, we returned

to the 1986-87 survey in which we had asked parents, teachers, and educators at non-school sites what changes they had noticed in participating youngsters. While these adults felt that they could not comment on some of the choices, a couple of their responses stood out.

See Appendix A for a description of the study and a summary of the findings from the 1986-87 University of Colorado-Denver Study.

Table 13. 1986-87 Responses of Parents, Teachers, and Informal Educators, n=28

Since participating in Denver Audubon activities, have you noticed changes in your child/children in any of the ways listed. Check as many changes as you have noticed. Indicate NO where no change has been observed, and N/A where you cannot comment on the change.

YES	NO	N/A	
64%	11%	25%	Greater interest in science.
54%	18%	36%	Increased observation of nature outdoors.
36%	18%	46%	More reporting about what may have been seen in nature daily.
61%	7%	32%	Increased curiosity and questions about science/nature.
29%	14%	57%	Increased discussion about science/nature in the classroom.
18%	21%	54%	Increased requests for books about science/nature.
29%	21%	50%	Greater amount of time spent outdoors within your home area looking for bugs, examining leaves, and other activities.
4%			None of the activities listed above..."Parent could not comment on change because the child has always had an interest in nature and science."
21%			Other. Please specify..."Increased activity with plants and seeds."

As the data in Table 13 show, a clear majority of adults had perceived an increase in children's interest in science. So, we thought it might be worthwhile to try to differentiate between "liking" science, "interest" in science, and understanding of "what science is". In addition, with our two year study, we had our first chance in 1993-94 to try to collect follow-up data from children one year after their participation in VINE. We perceived this to be an important opportunity.

Because word usage would be so critical, and our student cohort contained bilingual students, we felt it was essential to pre-test the survey instrument. Fortunately the program coordinator in Denver was able to make arrangements with a couple of teachers so that evaluators could not only have 5th graders try out their draft questionnaire, but could immediately thereafter talk with the 5th graders and learn what certain questions meant to them and get suggestions of alternative words to use.

The result was a two-page questionnaire completed by 5th graders in three cities in the 1993-94 school year. (See Figure 10.) All students completed the first page. The second page asked for additional responses from those who had participated in a VINE Program as fourth graders.

Figure 10. Fifth Grade Student Follow-up Questionnaire

Name:____________________
In the 4th grade last year I was in ____________________school
and my teacher's name was ____________________

****

Code:____________________ Date:__________

5th grade Student Follow-Up Questionnaire

Directions:
Please fill in the boxes and blanks that best answer these questions.

1. What do you think of when you hear or read the word "science"?

2. Are you interested in science?

☐ Yes ☐ No

If yes, what are you most interested in?

What have you done in school that got you interested in science?

What have you done out of school that got you interested in science?

3. Were you a part of the Audubon activities last year as a 4th grader? (You used magnifying glasses, went outside, and worked in small groups of students.)

☐ Yes ☐ No **If No, please stop here.**

IF YES, PLEASE CONTINUE ON BACK.

4. Do you consider the Audubon activities to be "science" activities?

☐ Yes ☐ No

Why/Why not?____________________

5. Did you learn something new from these activities?

☐ Yes ☐ No

If yes, what?____________________

6. What do you remember doing during the outdoor activities with Audubon volunteers?____________________

7. Are you doing outdoor science activities this year, like the Audubon ones from last year?

☐ Yes ☐ No

If yes, Where?__________With Whom?__________

What are you doing?____________________

8. Has doing the Audubon activities increased your interest in science?

☐ Yes ☐ No

Why/Why not?____________________

Evaluators summarized answers to the open-ended questions into eight to ten general response categories. As the data in Tables 14-16 show, the evaluators found significant differences in the two groups regarding: their positive feelings about science, their interest in science (in general), and in life sciences (e.g., plants and insects), and what they had done both in and out of school which got them interested in science.* The evaluators concluded: "Their responses appear to indicate that the VINE program has a continuing positive impact on students."(Appendix C-5, p. 35)

*In 1992-93 as fourth graders, the students reported significant increase (p<.05) in how often they "participated in <u>outdoor</u> science activities <u>not as a part of school</u>" following their participation in VINE. There was no significant difference in control students. (In 1993-94, VINE participants did not report such an increase).

Table 14. Fifth Graders' Definitions of Science

	Previous Participants in VINE N=621	Nonparticipants N=535
Activities or experiments	30%	31%
Specific subjects (Astronomy, Rockets, Animals)	23%	21%
Positive feelings (I like science; Science is fun)*	22%	14%
Learning and being challenged	8%	8%
Related to school (Science is what we study in school; Science is taking tests)	4%	5%
Things that happen in the world (Becoming a biologist; Studying global warming)	3%	5%
Negative feelings (Science is boring; Science is yucky)	3%	5%
Other	7%	11%

*Significantly more positive feelings toward science were expressed by previous VINE participants (p<.01).

Table 15. Fifth Graders' Interest in Science

	Previous Participants in VINE N= 621	Nonparticipants N=535
Are you interested in science? *		
Yes †	85%	74%
No	15%	27%
If you are interested in science, what are you most interested in? *†	84% responded	73% responded
Doing activities or experiments	25%	22%
Life sciences (ex. plants) ††	23%	16%
Physical sciences (ex. rockets)	17%	15%
Earth sciences (ex. rocks)	5%	5%
General science	5%	2%
Chemistry	3%	5%
Learning new things	3%	3%
Other subjects	0%	1%
Other	4%	4%
If you are interested in science, what have you done in school? *†	88% responded	74% responded
Activities or experiments ††	48%	38%
Learning about science in general †††	9%	6%
Nothing •	8%	11%
Learning about life sciences	6%	5%
Learning about physical sciences	5%	4%
Teacher influence (ex. My teacher does fun things)	4%	2%
Learning about earth sciences	2%	2%
Learning about chemistry	1%	1%

Successful experiences (ex. I get good grades in science)	1%	0%
Other	7%	5%
If you are interested in science, what have on done out of school? *†	89% responded	72% responded
Home activities or experiments ††	40%	31%
Nothing	16%	13%
Outdoor experiences (ex. hiking, gardening)	6%	4%
Reading or TV (ex. Read animal books)	6%	5%
Go to exhibits (ex. museums)	5%	5%
Organized camps or classes (ex. Museum classes)	3%	2%
Adult influences (ex. Do things with my mom)	3%	1%
Other	10%	11%

* Percentage of total number of Previous VINE Participants or Nonparticipants was reported
† Significantly more of the Previous VINE Participants reported having areas of interest in science ($p < .01$), and having done things in school ($p < .01$) and out of school that got them interested in science ($p < .05$)
†† Significantly more of the Previous VINE Participants answered in this way ($p < .01$)
††† Significantly more of the Previous VINE Participants answered in this way ($p < .05$)
• Significantly more of the Nonparticipants answered in this way ($p < .05$)

The second page of the questionnaire gave us additional insights into students' thoughts and opinions regarding their fourth-grade VINE experiences. Responses are displayed in Table 16. Item #7 responses provide further evidence that most of these students would not have the opportunity to investigate living things outdoors without the presence of the VINE Program. And the open responses to #8 indicate that students' positive feelings about VINE experiences and their interest in and feeling successful with science are indeed linked.

Table 16. Fifth Grade Questionnaire, Page Two Responses

	Previous VINE Students N=621
#4. Do you consider Audubon activities to be science	
Yes	88%
No	12%
Why/Why not?	
Because we study things in the	42%
Because we learn science	16%
Positive feelings (Because I	15%
Because we do activities and experiments	10%
Because we will use it in the future	6%
Because we do it in school	1%
Negative feelings (I hate science)	1%
Other	10%
#5. Did you learn something new?	
Yes	70%
No	30%
What did you learn?	
About animals or insects	33%
About plants	17%
How to do activities or experiments	13%
How to make birds nests or feeders	6%
About environment impact (ex. pollution)	4%
About water or soil	3%
How to use scientific tools (ex. magnifying	2%
Other	11%
#6. What do you remember?	
Activities with insects	42%
Activities with plants	24%
Activities with birds	10%
Activities with water or soil	4%
Using scientific tools	3%
Being outside	2%
Nothing	1%
Other	5%

	Previous VINE Students N=621
#7. Are you doing outdoor activities this year?	
Yes	25%
No	75%
If yes, where are you doing them? (N=148))	
At school	65%
At camp	11%
At home	9%
Other	15%
If yes, with whom? (N=145)	
Teachers or school	83%
Parents or relatives	8%
Self	6%
Friends	3%
If yes, what are you doing? (N=136)	
Learning about nature	46%
Going camping or hiking	9%
Planting flowers or gardening	4%
Other (miscellaneous personal)	55%
#8. Has Audubon increased your interest in science?	
Yes	67%
No	32%
Why /Why not?	
Positive feeling (ex. I like science)	39%
Connection to school (I get better grades)	24%
Negative feelings (Science is boring)	13%
I already knew what we learned in Audubon	5%
I was already interested in science	4%
Being outdoors	3%
Doing activities and experiments	3%
Other	9%

In their analysis of these data, the evaluators wrote:

> The information gathered from 5th grade students appears to support the continuing impact of the VINE program. Previous participants report positive feelings and attitudes toward science. They also reported that they learned something new from the program, and have an increased interest in science. (Appendix C-5, p.39)

Do students learn new things through VINE *activities?*

In addition to the affective impact described above, we wanted very much to know whether our programs resulted in students learning content and gaining greater understanding of ecological concepts. But we learned that evaluating this whole area was fraught with problems. Our evaluators concluded that due to the "variability inherent in using intact groups in multiple sites", and our limited resources, measurement of students' cognitive gains was not possible. Their full explanation follows:

> Because different teachers and schools bring varying backgrounds, interests, and philosophies into the project, determining the effect of the VINE project on

actual student content learning is nearly impossible to tease out of the entire learning experience. Some teachers used the VINE program as a supplement and continued the discussions and lessons in class; other teachers viewed VINE as their science class and spent no additional time on continuation aspects. At some schools, the VINE projects were part of a strong emphasis on science and hands-on learning; at other schools these activities were seen as special separate activities, not connected to the regular school program. Some children engaged in supplemental science learning, both in and out of the formal school classroom, and other children only got as much as was presented by the lay naturalist. This type of variability confounds any attempt to directly attribute science learning to these projects without significant amounts of on-site observation and frequent follow-ups. Since that was not possible in terms of time, resources, or accessibility, actual measurement of science content was deemed inconclusive and thus not appropriate. Also since conventional pre and post testing of students generally takes significant class time and teacher/volunteer coordination, it was not viewed as desirable by site coordinators. (Appendix C-5, p. 2)

Consequently, we tried to get at questions regarding "learning" in two ways: by asking students and their teachers, and through student drawings.

In the 1992-94 University of Denver Study an Outdoor Activity Survey was administered near the end of each school year. In one item on each survey (see Figure 11), students and teachers were asked whether something new had been learned.

Figure 11. Items from Outdoor Activity Surveys

On the student survey:

I learned something that I didn't know before I did the outdoor activities.	**YES** ☐	**SOMEWHAT** ☐	**NO** ☐

On the teacher survey:

They learned something that they didn't know before they did the outdoor activities.	☐	☐	☐

How do you know this?

_____

_____

Responses, which were very positive in each of the three cities, are summarized in Table 17.

Table 17. Survey Responses: Students Learn Something New†

	YES	Somewhat	NO
VINE Students 1992-93 N=821†	74%	20%	6%
VINE Students 1993-94 N=944	72%	18%	10%
Teachers 1992-93 N=64	89%	11%	0%
Teachers 1993-94 N=33	93%	7%	0%

†These responses were corroborated a year later by the 621 5th graders who responded 70% "yes" to item #5 on the 1993-94 Student Follow-Up Questionnaire, Table 16.

Indicators provided by teachers in response to "How do you know this?" are dominated by phrases like:

they wrote about it
class discussion
post group sharing
used new terms; asked questions
they run up and tell you!
observations
by the way they talk about activities afterward
launched quite a few topics for study
students showed growth

To try to gain some insights into *what* it was that the students had learned, we decided to try asking the students to draw and label what they had seen living in their schoolyard, locating the things in the places where they had seen them.* The teachers and program coordinators liked this idea because it was an easy, straightforward task and was something that the children enjoyed doing. In addition, they felt it would give a striking visual which showed all the new discoveries the children had made during their outdoor investigations.

In both the 1992-93 and 1993-94 academic years, teachers used the directions in Figure 12 to guide the students in creating pre- and post-VINE drawings. Several sets of 1993-94 drawings are printed on pages 56-58.

At the end of the 1992-93 school year, the three city program coordinators each reviewed a sample of the drawings from their students. They saw changes from pre- to post-drawings which they categorized as: increased number of different organisms, things drawn more to scale, more detail, things drawn in their place/context. While we saw major differences in the pre- and post-drawings for some children, we couldn't devise any system that enabled us to deal with all the drawings in a systematic way. We were at a loss as to how to proceed, but were not ready to abandon the use of drawings.

*This idea had been triggered by the papers presented by in *The Assessment of Hands-On Elementary Science Programs*, George Hein, Ed., Grand Forks, ND: North Dakota Study on Group Evaluation, 1990.

Figure 12. Directions for Pre- and Post-VINE Drawings

"Draw the School yard's Creatures and Plants" Directions:

To the Teacher or Activity leader
(Done at tables, desks, on floor ... wherever they are used to drawing)

1. Hand out a sheet of this prepared paper to each student. They are to orient the paper horizontally. (See example.) Please ask that they print their first and last names. This information will be removed following coding and thus the students will remain anonymous.
2. Please have them use pencils.
3. Amount of time: Please use 20 minutes for this activity; let them know how long they have and remind them a few minutes before closure.
4. Call the group to attention.
5. Read them the following directions:

****

Students. Holding your paper the long way, please, in the upper right hand corner, print your name, first and last, on the sheet.

Pre-code _____ _____
your name (printed)

We are interested in knowing what you have seen in your school yard. Please draw all the types of living things (creatures and plants) that you have seen in the school yard and where you have seen them. For example, if you saw something in a bush, also draw the bush. Draw each one as well as you can. Please put the name or label of each below or next to each creature or plant that you draw.

Some examples: If you have seen three different kinds of birds that are found in the school yard, draw (and label if you can) all three. If there are six of the same kind of bird, draw only one as an example.

You have 20 minutes to complete this. Your papers will be collected at the end of this time. This is not a test and will not be graded. Everyone has different drawing abilities so all we ask is that you do your best. What we need is a complete record of all the living things you have seen in your school yard and, in general, where you saw them.

Thank you for helping us with this!

The city program coordinators decided to collect pre- and post-drawings in 1993-94, and the evaluators agreed to learn more about assessing or scoring drawings. The result was the following system for analyzing the drawings, as described in the final evaluation report:

A random sample of pre- and post-drawings of the Draw the Schoolyard pictures were analyzed using three criteria:

1. **Application** was considered to mean application of the information presented in a VINE activity. For example, if a student placed a bird's nest

in a bush or tree in a post-VINE drawing, and had not done so in a previous VINE drawing, it was considered a change in application.

2. **Organization or context** was defined as the logical coherence of the picture. Some students organized their pictures by drawing a literal representation of the schoolyard. If they used this context, then change was considered to be shown by adding more to that context. Some students used a diagram or listing of objects from the schoolyard. If they used this organization for the picture, change might have been shown by the number of items drawn.

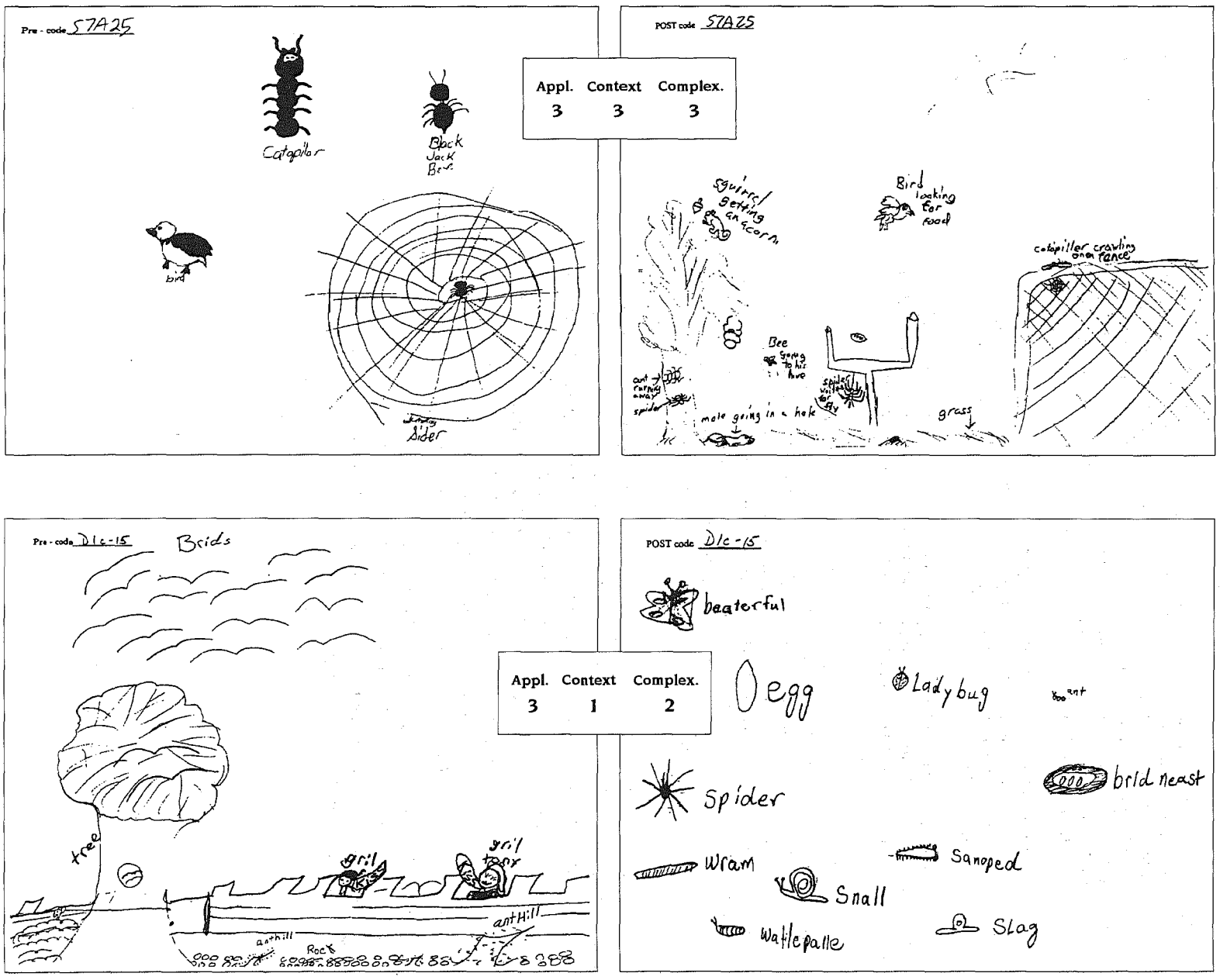
3. **Complexity** was considered to be the amount and type of detail included in the drawing. An example of change might be a student who randomly placed legs on a drawing of a spider before VINE, and placed the legs correctly after VINE.

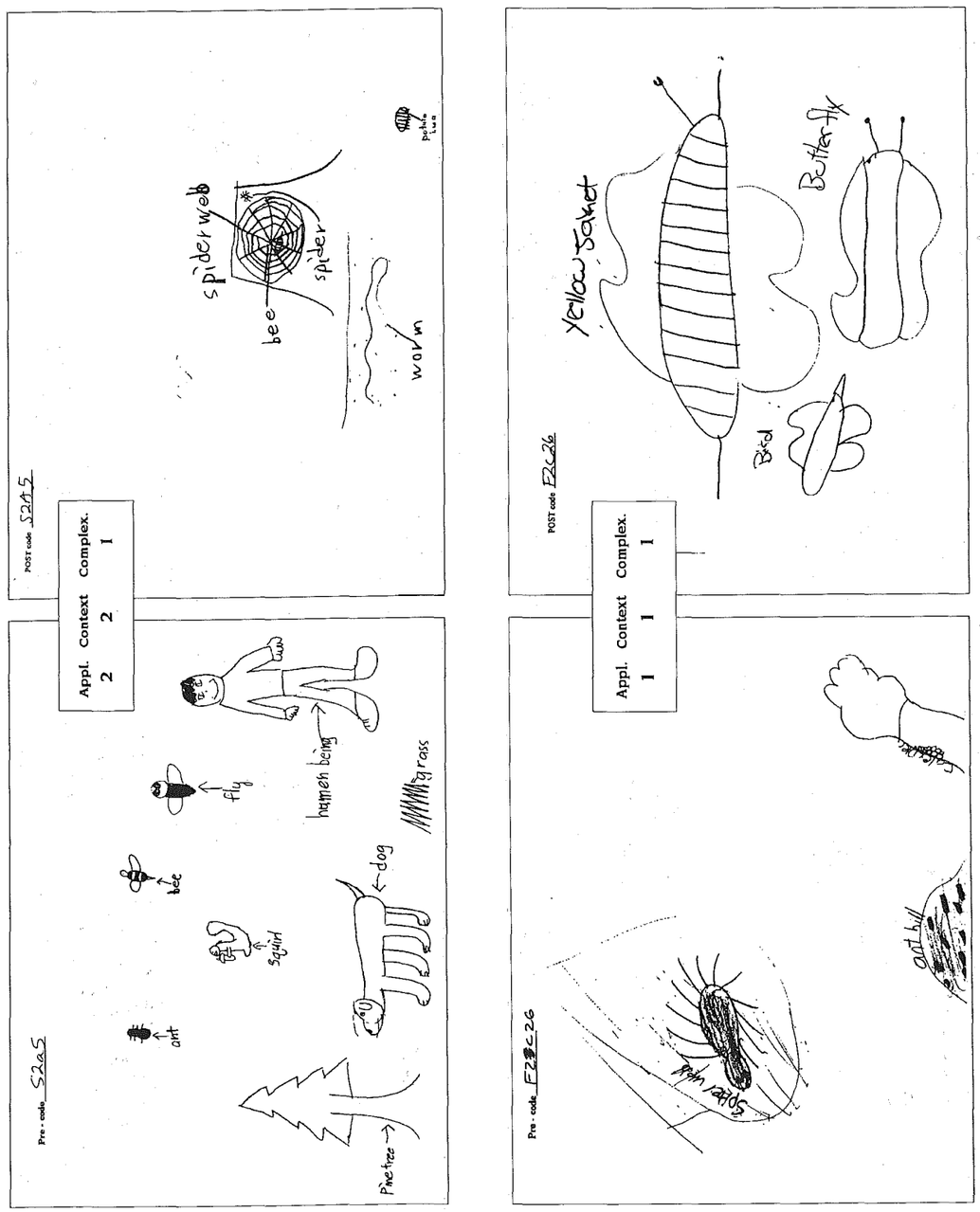
The problems associated with using the three criteria are that changes demonstrated by students may be due to maturation or learning, not related to VINE, and conversely that students may not have shown change because of their stage of development.

The evaluation of pictures was conducted by using the following procedures. A team of evaluators worked together on a set of pictures to determine the criteria and what would constitute "Noticeable change", "Some change", and "No change". A pre and post drawing done by the same student were placed side by side and examined. After the three criteria were developed and standards set for demonstrated change, a single evaluator examined the randomly chosen sets of pictures (N=105). This procedure controlled the subjective nature of the evaluation as much as possible. (Appendix C-5, pp. 16-17)

By looking at the drawings on pages 56-58, the reader can see how this scoring procedure was used. For example, most sets of pre- and post-drawings show "application" of information regarding spiders, birds, ants, roly poly/potato bugs, worms and the variety of insects investigated during VINE and received scores of 3 for "noticeable change" or 2 for "some change." When these organisms are shown in the places where they are likely to occur, as those on page 57 , they were scored 3 on "context." On the other hand, organisms just "listed" or shown out of context, as in the drawings coded D1C-15 (p.56) and F2C26 (p.58), were scored 1, indicating no change/no context. Similarly drawings that show more detail in the post-drawing, like those on page 56, are scored 3 for "noticeable change" under "complexity."

Figure 12-a. Sets of Pre- and Post-VINE Schoolyard Drawings with Scores Indicating Amount of Change





While results from each city were somewhat different, they all showed similar patterns. Scores, determined as described above, showed that the most change was in "Application". (See Table 18.) Seventy-five percent of the student drawings examined showed some or noticeable change. Fewer student drawings scored some or noticeable change in "context" (47%), and in "complexity" (40%).

Table 18. Pre- and Post-VINE Drawings Showing Change

Scoring Criteria	Percent (%) Showing Change
Application	75%
Organization or Context	47%
Complexity	40%

What We Learned

Over the two years of the University of Denver Study we learned a tremendous amount—both procedurally about evaluation studies and programmatically about VINE's impact. And in several instances, we learned that these two facets are inextricably linked.

We're very pleased that we persevered in surveying 5th graders. First of all, it provided us with some substantive impact data. As mentioned earlier, we had a special interest in taking advantage of our opportunity to follow 1992-93 participants and learn about any impact that remained for them a year later. The reason: Interest in science is related to achievement*, and NAEP data over the years has consistently shown significant drops between 4th and 8th grades in student interest in science and in "liking" science**. We thought that if we could show that trend did not hold true for VINE participants (as we did), we would be making an important contribution.

We could not have succeeded in collecting the 5th grade data, however, without the extra effort and willingness of many people to "rise to the occasion". The evaluators agreed to pilot test and revise their draft questionnaire, the Denver program coordinator worked with classroom teachers to enable us to gain access to some fifth graders for the pilot test, and we all rolled up our sleeves to copy, distribute, collect, code and process over 1,000 additional questionnaires. As a result we all

*Human Characteristics and School Learning, B.S. Bloom, New York: McGraw-Hill, 1976.

**"The 1990 Science Report Card: NAEP's Assessment of Fourth, Eighth, and Twelfth Graders, L.R. Jones, I. Mullis, S.A. Raizen, I.R. Weiss, E.A. Weston, Washington, D.C.: Prepared by EDUCATIONAL TESTING SERVICES under contract with the National Center for Educational Statistics, U.S. Department of Education, 1992.
"Changes in Perceptions of Science for Third, Seventh, and Eleventh Grade Students," Robert E. Yager and Stuart O. Yager, Journal of Research in Science Teaching, Vol. 22, No. 4, 1985, pp 347-358.

learned about the evaluation process and about the program's impact on kids.

We also learned, by students' self-reports and from teachers, that VINE participants "learn something new" from their experiences. Their drawings show that, for many, their perception of what's living in their schoolyard changes. But we were not satisfied with our inability to more fully document *what* they learned. (Please see "What We Could Have Done Better" on page 61 for more about this).

Because we had never done an evaluation of this magnitude before, we had many surprises.

1. **Schedule**—In the summer of 1992, we selected an evaluator; identified VINE Program coordinators in three cities who wanted to take part in the study; designed the study; completed applications and got permission to proceed from administrative offices and boards in the three urban school districts; and identified the VINE schools and matched control schools (getting **voluntary** agreement regarding participation from the principals and teachers in each of the schools—standard procedure in districts with site-based management). As school started, we scrambled to get "pre-" instruments designed, printed, distributed, completed, and collected **before** 1992-93 VINE Programs began. While we had known that we were working on a tight timeline, we had been ignorant of the layers of approval required within each school district and school. We should have scheduled and budgeted for three years of time to complete the two-year study.

2. **View of the Challenge**—While we consulted repeatedly with U.S. Department of Education NDN staff members and the evaluators they recommended as well as the evaluators we finally selected, those meetings failed to impress on us both the magnitude and complexity of the challenge. Had we come to grips with those realities in advance, rather than at the start of the first of two school years during which we needed to collect data, we might have constructed a more realistic plan for proceeding. Instead, we set about collecting pre-program data in September, so that we wouldn't miss our window of opportunity. Because of this impetuous start up, teachers, principals, students, and program coordinators were all hit with a heavy load right off the bat. We were fortunate and thankful to be working with so many cooperative people. However, because of this experience, all of us became more and more sensitive to the obtrusive nature of our study.

3. **Large Sample Sizes**—The scale of this study actually "hit home" at our central project office (and Kinko's and U.P.S.) the week that we had to get the first load of "pre-" instruments out to all three cities. Sending pre-counted and bundled packages of different instruments for over 1,200 students and over 100 teachers and principals along with directions for their distribution and use to three different cities is a huge task. As collection, coding and return of these items proceeded, the scale of what we were doing became clear to everyone involved!

4. **Time Commitment**—By 1992 we were aware of the fact that program staff must work with outside evaluators in many different ways for a summative study to go smoothly. But the scale, timeline, and lack of focused pre-planning for this study made it far more time-consuming than we had anticipated.

What We Could Have Done Better

Had we known in 1992 what we now know, we would have selected evaluators sooner and spent more time with them earlier in the year designing an evaluation plan. Ideally, that would not only have given us time to focus our efforts on a more limited number of questions or impacts, but also would have enabled us to determine the least intrusive and most credible way to measure those impacts. We could have tested instruments and prepared for the start of the school year in a more realistic way.

Two documents would have helped us tremendously in that planning phase, but, unfortunately, they did not exist then. George Hein and Sabra Price's book *Active Assessment for Active Science: A Guide for Elementary School Teachers* (Portsmouth, NH: Heinemann, 1994), especially the chapters on "Interpreting Children's Work" and "Scoring", would have filled a genuine need as we attempted to learn from students' drawings. Had we been able to read and heed their advice of "checking your interpretations and hunches by talking with students", we may have included interviews with at least a sample of children in our design.

The second thing that would have been a great help to us is a series of three papers reporting a study conducted by researchers at the University of Leeds, UK. The paper series is entitled "Children's Ideas About Ecology," and in the study the researchers interviewed 200 students, ages 5-16, regarding cycling of matter and the interdependency of organisms in ecosystems.* They probed to learn about youngsters' understandings as well as their misconceptions regarding these ecological concepts. Had we known about their work in 1992, we may

*"*Children's Ideas about Ecology* (1): *theoretical background, design and methodology*", J. Leach, R. Driver, P. Scott, C. Wood-Robinson, International Journal of Science Education, 17 (6), 1995, pp. 721-732.
"*Children's Ideas about Ecology* (2): *ideas found in children aged 5-16 about the cycling of matter*", Leach, Driver, Scott, Wood-Robinson, International Journal of Science Education, 18 (1), 1996, pp. 19-34.
"*Children's Ideas about Ecology* (3): *ideas found in children aged 5-16 about the interdependency of organisms*", Leach, Driver, Scott, Wood-Robinson, International Journal of Science Education, 18 (2), 1996, pp. 129-141.

have been able to use it to determine appropriate interview techniques for probing VINE students' understandings.

In retrospect, it seems as though we could have learned a lot about the changes in students' understanding of ecological concepts through an embedded assessment. Ideally, we would have had a year to develop and pilot test an assessment strategy which included:

- pre-and post-drawings using Hein and Price's guidelines for interpreting and scoring them, and
- pre- and post-interviews with a sample of students to hear and more fully understand what their drawings show, comparing gains among VINE participants and control students on concepts such as diversity of organisms in their everyday surroundings, and how environmental factors vary from one habitat to the next.

Such instruments, when developed, could not only provide us with findings regarding the value of VINE Programs for conceptual learning, but could also be adapted to provide teachers of classes participating in VINE with ideas for teaching strategies that build on VINE experiences and further enhance classroom learning. Then the real payoff would manifest itself as authentic student products are used to assess conceptual understanding and to facilitate concept development.

Finally, we could have developed a checklist for use by teachers in observing and recording skills developed by their students. It is clear from teachers' responses regarding how they knew their students had learned new things (see p. 53) that they were observing their students and had much information regarding their students' growth. By enlisting them (for a stipend), we could have engaged them in developing an easy-to-use device for recording the skills their students were developing, such as the use of simple scientific tools (magnifying lenses, nets, etc.), ability to work with others, skills of observing, recording information, etc. Such an instrument, as well as the data it would enable us to collect, both through teachers and outside observers, would have strengthened the evaluation study—and would have enabled us to learn more about the impact of VINE Programs.

Who are the VINE teachers? Does the VINE Program influence them?

Children are the primary recipients of the VINE Program. But, when the program is delivered through elementary schools, it is the classroom teachers who are the ones directly responsible for involving their classes. For this reason, we wanted to learn more about these teachers.

We had hoped to find out how the VINE Program affected their curriculum and teaching. But the University of Denver evaluators pointed out that it was not possible to determine the impact of VINE on "teaching style and substance" with our limited resources. They wrote:

> Since there was no way to observe each participating teacher in the classroom prior to the activities, we could not ascertain how much emphasis on science and inquiry was actually present in the classroom before the VINE activities started. Even asking that as a question presented some problems as teachers know what is expected in this time of educational reform and that data is always suspect unless it is supported by evidence of action. Triangulation of data (observation supporting an instrument response) is the only way to look at that in a meaningful fashion. This is also true in a post hoc situation; we have to observe the classroom after the conclusion of these activities, and over a longer period of time, to ascertain the impact on teaching. With this other data, pre and post levels would have been useful for comparison purposes. Since that data was not available or collectable, this type of evaluation was discarded. (Appendix C-5, p. 3)

We decided to focus on two aspects:

- profiling VINE teachers as a group to learn about their professional background and practices and to compare them with a large national sample, and
- finding out whether they feel VINE is influencing their teaching.

Data Collection and Analysis

In the 1992-94 University of Denver Study, we collected data from teachers over two years using three different survey instruments. As with the student aspects of this study (pp. 45-62), we included large numbers of both control teachers and teachers who involved their classes in VINE. We also compared our sample to a large national sample.

How did VINE *teachers and control teachers compare to a large national sample?*

To answer this question, the University of Denver evaluators used items from National Assessment for Educational Progress (NAEP) instruments to construct both a Teacher Questionnaire and an Administrator Survey. (The Administrator Survey focused primarily on the school's characteristics and the context in which the teachers taught.) By comparing all factors, from class size and time schedules to human resources and classroom materials, the evaluators determined that the 23 schools in the study were indeed similar to other schools throughout the United States, according to the 1990 NAEP data. As the data in Table 19 show, the teachers in the study were also similar to the national norms.

Table 19. Comparison of Teachers in the Study and in NAEP

Teachers		VINE study		NAEP*	
Females		60%		73%	
Males		41%		27%	
Ethnicity					
	White	79%		75%	
	Black	11%		16%	
	Hispanic	6%		6%	
	Asian	4%		2%	
Years teaching experience		14		15	
Educational level		BA	68%	BA	64%
		MA/EDS	37%	MA/EDS	36%

* National Center for Education Statistics. Schools and Staffing in the United States: A Statistical Profile, 1990-91 (SASS). Washington, D.C.: U.S. Department of Education, Office of Educational Research and Improvement.

To get a general understanding of the practices of VINE teachers, the survey asked about time spent and teaching techniques used in different subject areas. According to the evaluators, the teachers' responses showed that they:

...rely heavily on traditional teaching techniques such as lecture, question and answer, drill and practice, and other teacher-directed activities. Different techniques are used depending on the subject. Texts or films were mentioned the most frequently in teaching social studies, and hands-on activities like manipulatives were mentioned the most often in teaching math. (Appendix C-5, p. 64)

VINE teachers (N=46) spent an average of three hours per week teaching science, with a range from one to six hours. (Appendix C-5, p. 65) The data in Table 20 show the techniques they reported using.

Table 20. Techniques Used in Teaching Science

	Always	Frequently	Occasionally	Rarely	Never	Average
Small Group Work	12%	51%	35%	2%	0%	Frequently (2.3)
Individual Work	7%	58%	28%	7%	0%	Frequently (2.3)
Lecture	2%	59%	27%	9%	2%	Occasionally (2.5)
Inquiry/Hands-On	0%	44%	47%	9%	0%	Occasionally (2.7)
Text	12%	41%	21%	19%	7%	Occasionally (2.7)
Outdoor Activities	0%	9%	55%	30%	7%	Occasionally (3.3)
Lab Experiments	0%	21%	35%	33%	12%	Occasionally (3.3)
Field Trips	0%	7%	57%	23%	14%	Occasionally (3.4)
Computer Activities	0%	7%	35%	33%	26%	Rarely (3.8)

The evaluators noted that the teachers new to the VINE Program in 1993-94 (a total of 9) reported spending less time teaching science (2 hours/week).

What were the VINE *teachers' attitudes and perspectives on science and teaching science?*

The evaluators adapted Robert E. Yager's "Perspectives on Teaching Science" to learn about the views of both VINE and control teachers. The evaluators reported that, "since the teachers had an average of 14 years of experience, a pre-post measure over a one year period would not be likely to show much change. Also, since many of the perspectives and attitudes towards science were very positive, it would be difficult to show a significant change." In fact, there were no significant pre-post changes, and the VINE and control teachers responded similarly.

The responses, shown below, do give us a more complete profile of the VINE teachers. (Appendix C-5, pp. 60-62)

- 95% are responsible for teaching science
  - 57% are totally responsible
  - 38% are jointly responsible with another person
- 59% have *not* received specific training in science teaching or content.

As the data in Table 21 show, science is *not* their favorite subject to teach; however, they generally enjoy science and would like to work with others to improve their science programs.

Table 21. VINE Teacher Perspectives and Attitudes, N=47

Agreement that...	Agree	Undecided	Disagree
...I personally enjoy science	91%	2%	7%
...I enjoy discussing science topics with other teachers	77%	20%	4%
...I would like to work with a science consultant to improve my science program	74%	26%	0%
...I would like to work with other teachers to improve my science program	78%	13%	9%
...I prefer teaching science over any other subject area	24%	26%	50%
...I would like to participate in workshops/ in-services on science	74%	17%	9%
...I would be interested in being part of an experimental science project	52%	28%	20%

What were the teachers' perspectives regarding impact of VINE *on their teaching?*

While teachers allocate time for VINE activities from a combination of several subject areas, 100% "consider it to be science" because, in their words, students are: "outdoors studying things in the environment" 41%; "doing activities and hands-on experiments" 33%; "learning and doing science" 13%; other 11%. (Appendix C-5, p. 63)

VINE investigations are clearly different from what they normally do in class, since 71% of teachers responded "no" to the following question:

Figure 13. Comparison of VINE with Regular "Science" Instruction

Are these activities similar to ones you do in regular "science" instruction?
☐ Yes ☐ No
If yes, examples _____

Examples given by the 14 teachers responding "yes" included "hands-on activities, outdoor activities, and small group activities."

And finally, in response to the next question: 77% said "yes" and 23% said "no".

Figure 14. VINE Influence on Teaching

Has the Audubon project influenced your teaching and/or curriculum?
☐ Yes ☐ No
How?_____

Open responses that were given by the teachers indicated that VINE influenced their teaching and/or curriculum by exciting, encouraging, and involving students in science (33%), by providing a model for the use of hands-on activities (15%), and by giving them new ideas and information (12%). (Appendix C-5, p. 41)

What We Learned

The University of Denver Study provided us with a profile of VINE teachers and showed that they are similar to the much larger sample of teachers that participated in the 1990 NAEP. By their own report, the majority of VINE teachers rely on traditional, teacher-directed teaching techniques most of the time, using lectures, films, texts, math manipulatives, and both small group and individual work with their classes.

They are responsible for teaching science, but 59% have not received specific training to enable them to fill that responsibility. While science is not their favorite subject to teach, teachers identify VINE as science, and 91% (1992-93) to 93% (1993-94) want to do more outdoor investigations. (Appendix C-5, p. 69) 71% of teachers reported that VINE activities are different from their regular science instruction, and 77% say that the program has influenced their science teaching.

Their explanations as to how that influence occurred were presaged by Mark St. John and his Inverness Research Associates in their 1990-91 study. In 1992-94, the teachers pointed out the degree to which their students were excited and involved in the activities and the way the program modeled the use of hands-on activities for them. The Inverness "Summary of Findings" reported that there "was a remarkable consistency across projects in the degree to which the children were, in fact, engaging in hands-on exploratory learning. We saw excitement and eagerness..." (Appendix B-5, p. 10) And in three of their six case studies, the Inverness evaluators directly quote school principals and a Director of Curriculum who saw the program as a model or "a microcosm of the direction we want to go in our science program." In the Summary of Findings, the evaluators wrote that they saw the programs "serving a useful and very visible model for teachers and administrators." (Appendix B-5, p. 13) Further, they wrote that the activities "are highly successful in giving students the kinds of positive, hands-on learning experiences envisioned in national educational reforms." (Appendix B-5, p. 15)

Unexpected Findings

While we knew from the professional literature that teacher preparation in elementary science was lacking nationwide, we were very surprised that 59% of these experienced teachers had *not* received specific training in science teaching or content. In addition we were impressed by the fact that 74 to 78% of them said they would like to participate in workshops and/or work with others to improve their science programs. Given the interest these teachers expressed both in VINE and in professional development, we felt there was a natural "next step" that we needed to pursue. In 1994, we submitted and received funding for a professional development proposal to develop a VINE Follow-Through program. (See pp.68-78.)

Do VINE Follow-Through teachers change their classroom practice?

As a direct result of the things we learned about VINE teachers in the University of Denver Study (pp. 63-67), we initiated the VINE Follow-Through Project. The National Science Foundation (NSF) funded this 1994-1997 three-city project which included summer institutes and team work-sessions, and periodic school year team meetings. Teachers, whose classes were involved in VINE Programs, participated in the professional development teams. Each team included five (or more) teachers, school district curriculum specialists, university faculty, local VINE program coordinators and a facilitator/coordinator. The goal for the collaborative teams was to develop strategies for building on VINE investigations in ways that enabled students to do more science and construct meaning from their experiences. Each team designed "lead-in" and "follow-through" activities that would build the VINE outdoor investigations into the ongoing curriculum and, at the same time, accomplish school district objectives and meet state mandates.*

The overall goal of the VINE Follow-Through Project with regard to teachers' classroom practice was to enable the teachers to build on VINE investigations by engaging their students in more constructivist strategies and in doing more science. As in the earlier DU Study, we were confronted with the dilemma of how to document classroom practice without utilizing expensive classroom observations.

M. Jean Young, one of the external evaluators contracted for the VINE Follow-Through project, had previously used pre-coded teacher logs first developed by Porter, et. al.** Jean and others, adapted the teacher logs for evaluating the U.S. Department of Energy's (DOE) Teacher Research Participation Programs (Young and Scheirer, 1995) and Teacher

*VINE Follow-Through professional development materials fully describing this team approach to building hands-on experiences into the on-going classroom curriculum will be available in 1997 from the North American Association for Environmental Education Publications and Membership Office, P.O. Box 400, Troy, OH 45373,

**_Reform up close: A classroom analysis_, A.C. Porter, M.W. Kirst, E.J. Osthoff, J.L. Smithson, & S.A. Schneider, Madison, WI: Wisconsin Center for Education Research, School of Education, University of Wisconsin-Madison, July, 1993.

Development Programs (Young and Roberts, 1996).* Subsequently, others further adapted and used the pre-coded logs in national studies including a Multi-Agency Dissemination/Evaluation Working Group (DEWG) study under the leadership of the National Science Foundation.

In their study, Porter et. al. validated teacher log data against classroom observations. There are, however, three important differences between the logs and classroom observations. First, teacher logs are considerably cheaper than observations for collecting classroom practice data. Second, teacher logs can provide data over a longer period of time. Classroom observations are typically "snapshots" for the one or two times an evaluator visits the classroom. Teacher logs are completed by teachers for several days, or even months, thereby providing a picture of classroom practice over a period of time. And finally, observations can provide a more complete picture of the classroom because they usually incorporate more varied kinds of observations. The bottom line is that teacher logs are an inexpensive alternative to costly classroom observations.

Data Collection and Analysis

For the 1995-96 VINE Follow-Through Study, M. Jean Young used the teacher logs that had been adapted for the DOE and DEWG studies. Her instruments included:

- a background information sheet
- a 2-page daily log (See pp. 70-71.), and
- a post-log reflection sheet.

See Appendix E for a description of M. Jean Young's Study and a copy of her final report.

These documents were mailed to teachers in a packet that included a cover letter and a complete sheet of instructions.

*A *pilot impact assessment of the United Stated Department of Energy's Teacher Research Participation Programs*, M.J. Young & M.A. Scheirer, Andover, MA: The National Center for Improving Science Education, June 1995.

A *pilot impact assessment of the United States Department of Energy's Teacher Development Programs*, M.J. Young, E. Roberts, Andover, MA: The National Center for Improving Science Education, June 1996.

Daily Logs Number of students _____ Date _____

1. List the 2-3 intended outcomes, or state the general purpose of the lesson.

2. Approximately how many minutes (throughout the day) were spent on activities directly related to the lesson? _____ Minutes

3. What is the overall context of the lesson, e.g. is it part of a unit or long-term project, and if so, is the lesson at the beginning of the unit or project, near the middle?

4. Indicate the name of each content topic or activity (see instructions) covered in this lesson in the spaces; circle each emphasis that applies. (If more than three topics were covered, indicate the three that were most important.)

(Circle all that apply for each topic.)

Topic 1 _____

Topic 2 _____

Topic 3 _____

Emphasis	Topic 1	Topic 2	Topic 3
Learn facts or definitions	1	2	3
Understand science concepts or principles	1	2	3
Learn real-world applications of science	1	2	3
Follow a written procedure to do an investigation	1	2	3
Design experiments to answer question(s)	1	2	3
Collect data (e.g., observe, measure)	1	2	3
Interpret data (e.g., compare, estimate, recognize patterns)	1	2	3
Engage in thinking skills (e.g., predict, infer, evaluate)	1	2	3
Develop skills in working collaboratively	1	2	3
Develop communication skills (e.g., writing, giving presentations)	1	2	3
Work on a long-term project that incorporates many of the above	1	2	3

5. Describe below how you introduced the lesson, then circle all that apply to the overall emphasis of the introduction .

Description:

Introduction emphasis: (*Circle all that apply.*)

Provide overview	1
Explain activity	2
Relate this lesson/activity to previous lessons/activities	3
Provide rationale for doing the activity	4
Assess prior knowledge	5
Other (please specify) _____	

6. What modes of instruction were used during this lesson? (*Circle all that apply.*)

Lecture	1
Teacher demonstration	2
Recitation/drill/practice	3
Correct or review homework	4
Whole class discussion	5
Students working in pairs/teams/small groups	6
Students working independently	7
Students engage in out-of-class activities (including fieldwork)	8
Other (please specify) _____	

7. What activities did students engage in during this lesson? (*Circle all that apply.*)

Listen and take notes	1
Complete worksheets or do practice problems in class	2
Write in journals or logs	3
Take a test/quiz/exam	4
Read a textbook in class	5
Laboratory or hands-on activity	6
Work on computer	7
Other (please specify) _____	

8. What assessment strategy(ies) did you use during this lesson, if any? (*Circle all that apply.*)

Multiple-choice/short answer test or quiz	1
Essay/type test or quiz	2
Discussion or recitation responses (participation)	3
Observation of group work	4
Oral reports or presentation of students' work	5
Journal or log entries	6
Homework assignments	7
Observing students' skills in lab work or hands-on activities	8
Other (please specify) _____	

9. What materials did you use during this lesson? (*Circle all that apply.*)

Assigned textbook for the class	1
Other textbook	2
Workbook or worksheets	3
Laboratory equipment (implements, instruments)	4
Manipulatives (hands-on equipment)	5
Audio-visual (films, film strips, videos)	6
Computers	7
Test manual or commercially made test sheets	8
Other (please specify)_____	

Teachers participating in the VINE Follow-Through Project ("treatment" teachers) and teachers from the same or similar schools (schools in the same school district with similar student populations) involved in VINE but not involved in the Follow-Through Project ("control" teachers) were each asked to complete 20 logs over the course of the year: 10 in the fall and 10 in the spring. All teachers were asked to complete the logs every time they engaged their students in VINE-related activities. Some control teachers in Kentucky who were not engaged in VINE or VINE Follow-Through activities were asked to complete logs during the same period of time as the treatment teachers when they engaged their students in science activities, especially field-related or out-of-class activities. A total of nine control teachers and a total of 15 treatment teachers participated.

The pre-coded log items collect data about six different elements of the lesson: Lesson emphasis, introduction emphasis, modes of instruction, student activities, assessment strategies, and materials used. Each element includes several items. Teachers were also asked to provide information about intended outcomes, context of the lesson, how many minutes were spent on the lesson, and how they introduced the lesson. The pre-coded data were analyzed using an Excel spreadsheet. Treatment and control teachers were compared on individual items and on overall practice. The additional qualitative data were used to further determine classroom practice and provide contextual information that helped with log interpretation.

The Total Compiled Data table for "Modes of Instruction", Table 22, shows the analysis of pre-coded data in detail so that you can appreciate the complexity and understand how the results are found. On item #6 in the log (See p. 71), teachers were asked to report instructional categories they used. Those categories are displayed across the top of the table, and teachers' responses are tallied in the appropriate column. Treatment (TRT) teachers' responses are separated from those of control (CON) teachers. The fall semester logs, compiled in February, are labeled 2/96; spring logs, compiled in May, are labeled 5/96.

At the bottom of each column, a **T**, **B**, or **P** designate traditional (**T**), both (**B**), or progressive (**P**) strategies. "Progressive" means that the strategy has been advocated in the *National Science Education Standards* and the American Association for the Advancement of Science *Benchmarks for Science Literacy*. These are strategies focused on in the VINE Follow-Through Project by promoting constructivist strategies and engaging students in the process of doing science. "Traditional" strategies are characterized by lecture-recitation-seatwork-textbook types of strategies that have been shown to be less effective if *overused*. "Both" are strategies that may be more "progressive" or more "traditional" depending on the context.

Table 22. Total Compiled Data from Teachers' Daily Logs for "Modes of Instruction."

COMPILED 2/96 AND 5/96 DATA: Treatment (TRT) and Control (CON) Teacher Comparisons										
Modes of Instruction Codes (See item #6 on Daily Log, page XXX):										
	Lecture	Teacher Demo	Recit.	Hmwrk	Discuss.	Teams	Indept.	Out-class	TOTALS	
TRT 2/96	33	63	5	2	101	104	49	60	417	
TRT 5/96	35	51	3	3	101	97	46	69	405	
Total TRT	68	114	8	5	202	201	95	129	822	
CON 2/96	39	51	13	5	52	54	45	22	281	
CON 5/96	25	36	0	0	35	42	25	19	182	
Total CON	64	87	13	5	87	96	70	41	463	
	T	**B**	**T**	**B**	**B**	**P**	**B**	**P**		
PERCENT (Note totals may not always equal 100 because of rounding off.)										
Total TRT	8	14	1	1	25	24	12	16	101	
Total CON	14	19	3	1	19	21	15	9	101	
diff	-6	-5	-2	0	6	3	-3	7		
diff 2/96	-6	-3	-4	-2	5	6	-4	4		
diff 5/96	-5	-7	1	1	6	1	-3	7		
% diff	-75%	-36%	-200%	0%	24%	13%	-25%	44%		
% 2/96	-43%	-17%	-80%	-100%	26%	32%	-25%	75%		
% 5/96	-56%	-54%	100%	100%	24%	4%	-27%	41%		

COMPILED TOTALS:							COMPILED DIFFERENCES:			
	Traditional		Both		Progressive			Totals:	2/96:	5/96:
TRT	76	13%	416	35%	330	56%	**T**	-11	-16	-5
CON	77	24%	249	39%	137	43%	**B**	-4	-7	1
diff		-11		-4		13	**P**	13	12	13

Percent should be interpreted as follows: of the total different modes of instruction used, that is the percent teachers used that particular mode. The *difference* (diff) in percent should be interpreted as: of the total number of modes used, treatment teachers used that mode more (if a +) or less (if a –), than control teachers.

The *percent difference* (% diff) represents the rate of difference between control and treatment teachers. Since high rates may be related to very small differences, only those rates that are high and accompanied by large differences were considered noteworthy, i.e., show up as important

differences in classroom practice between control and treatment teachers.

Compiled data were accumulated according to mode categories based on whether the mode is more "traditional" or "progressive" or "both." The compiled percent difference should be interpreted as: of the total number of strategies listed, this represents the percent teachers used traditional (**T**), both (**B**), or progressive (**P**) strategies. This number adjusts for the difference in numbers of participating control and treatment teachers, and makes the total comparable.

Shaded boxes indicate differences that are important in some way, and should be noted. The differences are considered important or "noteworthy" if they are greater than or less than 5% (+ or – 5) AND if the percent difference is larger (40% or larger).

Once Jean Young had done this type of analysis for each of the six different codes and had reviewed all the teachers' additional written and verbal responses, she summarized her analysis, as follows:

Overall Analysis:
- differences are generally in the expected direction, i.e., traditional percent differences are negative and progressive percent differences are positive.
- there are noteworthy (important) differences in every code category.

Emphasis Codes::
Teachers were asked to list topics for each log and record the emphasis placed on each for that lesson. There are three important findings:

- VINE Follow-Through teachers emphasize long-term projects.
- Control teachers emphasize "learn facts."
- VINE Follow-Through teachers use substantively more progressive strategies.

Introduction Codes:
Teachers were asked to code emphases placed during introductions to their lessons. Note that there are no particular traditional or progressive strategies listed because two to several of these should be used in introducing any topic. Some, however, can be considered as more inquiry-based than others, e.g., provide a rational is probably more inquiry-oriented than explaining an activity. There are three important findings:

- Control teaches more often explain an activity as part of their introduction.
- VINE Follow-Through teachers *less* often assess prior knowledge as an introduction, however, they used this strategy more often in the spring than in the fall. In addition, VINE Follow-Through teachers who were interviewed reported using entire lessons to assess prior knowledge. This finding, therefore, may not appropriately indicate differences between control and VINE Follow-Through teachers with regard to assessing prior student knowledge.
- VINE Follow-Through teachers more often relate the current lesson or activity to previous ones.

Modes of Instruction Codes:
Teachers were asked to report instructional strategies they used. This is an important category in that it provides an overview of teaching strategies used. There are four important findings:

- Control teachers lecture more often.
- VINE Follow-Through teachers engage their students in more out-of-class activities.

- Control teachers engage in more traditional modes of instruction overall.
- VINE Follow-Through teachers engage in more progressives modes of instruction overall.

Student Activities Codes:
Teachers were asked to report activities engaged in by students. All teachers tended to use "Laboratory or hands-on activity" most often. There is one important finding:

- Control teachers engage in having their students use worksheets more often.

Assessment Strategies Codes:
Teachers were asked to report the kind of assessment strategies they used during the lesson. All teachers tended to use more observation of group work and students' skills and discussion or recitation responses. There was one important finding:

- VINE Follow-Through teachers use more progressive assessment strategies overall.

Materials Used Codes:
Teachers were asked to report the kind of materials they used in teaching. In reviewing their "other" entries, it was clear that many teachers under-reported both "Laboratory equipment" and "Manipulatives." The following numbers have not been adjusted to reflect this. All teachers tended to use more worksheets and hands-on equipment. Analysis results show four important findings:

- Control teachers use the assigned textbooks for the class more often.
- Control teachers have their students use worksheets more often.
- VINE Follow-Through teachers have their students use more laboratory equipment.
- Control teachers use more traditional materials overall.

Qualitative Data:
Teachers entered on the log forms information about: lesson purposes and intended outcomes; overall context of the lesson; and, described how they introduced the lesson. These qualitative data provide a view of what was going on in the classroom and how the lessons were being conducted.

Through writing about the lesson, the teachers illustrated:

- the nature of the lesson, e.g., "students will learn the parts of a plant";
- they provided information on what skills were being addressed, e.g., students "measure"; and,
- described the extent to which the lesson was teacher- or student-directed, e.g., "students brain-stormed questions and we decided which ones to answer."

Overall, the control teachers provided interesting, hands-on lessons to their students that seemed to be both fun and relevant to students. The teachers engaged students in several science process skills and in cooperative learning groups. Most of the lessons were teacher-directed, however, with few teachers actively seeking and pursuing students' questions.

As the data analysis shows, there were several differences in strategies between control and treatment teachers even though the control teachers seemed to be well on their way toward using "best practice" strategies. These differences showed up in the treatment teacher descriptions as:

- students making decisions as a whole group or in small groups;
- students collecting and communicating data to one another, which meant they also had to learn to communicate clearly;
- teachers asking questions that had no one, right answer; and,
- starting lessons with questions or expanding on a previous lesson.

These strategies all reflect the goal of the VINE Follow-Through project to include more constructivist strategies and engage students in the process of doing science. (Appendix E-3, pp. 2-4)

Cost

We incurred three types of costs in using teacher logs. First, there was the cost of compensating teachers for the time they spent filling out the logs. We paid them each $100 for 20 completed logs. The first few logs took longer to complete, because teachers were getting familiar with the questions and, in some cases, finding that they needed to think about their lessons in new and different ways. In general, VINE Follow-Through teachers estimated that it took 15 to 20 minutes to complete a log once they had gotten started. DOE study teachers were given $50 to complete logs for one month (20 logs), and reported taking 5-10 minutes to complete a daily log. Porter et. al. gave teachers $200 to complete logs every day for one school semester.

A second, additional cost was incurred to copy and mail the forms, including self-addressed stamped envelopes for return of the completed documents.

The third cost was for the professional evaluator conducting the study. The teacher log portion of the VINE Follow-Through evaluation contract amounted to approximately $7,000 and included distributing and collecting the logs and surveys, compiling and analyzing responses, conducting follow-up teacher phone interviews to clarify log entries and corroborate data, and writing a report of findings.

What We Learned

Our evaluator discovered 20 "noteworthy differences" between the classroom practices of VINE Follow-Through "treatment" teachers and comparable control teachers. (See pp. 74-76) In Figure 15, we have summarized her findings to show the ways in which the teachers' practices are different.

Figure 15. Summary of Teacher's Classroom Practices

VINE Follow-Through Teachers

- emphasize long-term projects
- more often relate a current lesson to a previous one as they introduce it
- engage students in more out-of-class activities
- have students use laboratory equipment more often
- have students make decisions as a class or in small groups
- have students collect data and communicate it to one another
- ask questions that have no one, right answer
- use substantively more progressive teaching and assessment strategies

Control Teachers

- emphasize learning facts
- more often explain an activity as they introduce a lesson
- assess students prior knowledge more as they introduce a lesson
- lecture more often
- have their students use worksheets more often
- use assigned textbook for the class more often
- use more traditional modes of instruction and materials overall

We were pleased to see that this project had positively impacted the classrooms of participating teachers. We initiated the study to assess whether the Follow-Through project effected the way teachers integrate VINE experiences into their classes' activities. However, we found that the project appears to have had an even broader impact. As our evaluator pointed out in the summary of her report, "It should be noted that through interviews and documents reviewed, VINE Follow-Through teachers reported that the differences noted here *do* represent their overall classroom practice." In addition, she noted that the findings are even more remarkable given that control teachers were well on their way to incorporating "best practices" in their classrooms. (Appendix E-3, p. 5)

Procedurally, we found teacher logs to be an affordable alternative to classroom observations. But, as described in the following section, we also learned some things that we could have done better.

What We Could Have Done Better

We found that it was more difficult than we had anticipated to get teachers to complete the logs. In order to get a good response rate, three things appear to be needed. First, there should be someone who is part of the project to remind teachers about completing logs and to be responsible for collecting the logs. The best response rate for the VINE Follow-Through study came from a team in which an administrator encouraged the teachers to complete logs, and collected the logs for the evaluator. Second, teachers must understand why they are doing logs and they must buy into the process from the beginning. The data collection and evaluation process should be modeled and addressed as an integral part of workshops and/or summer institutes along with other

aspects of the project. Third, there should be some compensation for doing the logs, but, as implied above, this alone is not sufficient for teachers to take time out of their busy days to complete the logs.

In addition, we should have involved the university and/or curriculum specialist members of each team in completing two or three "corroborating logs" as they visited teachers' classrooms. Comparing the corroborating information with that from teachers would further ensure that the teacher-reported data were an accurate representation of their classroom practice. The corroborating logs would have to be completed on the same day, on the same topic, and during the same time period for which the teacher completed a daily log.

Obviously these improvements would have added to the overall cost of the evaluation—perhaps by 15%. We feel that the expenditure would have been a reasonable investment that would have made the evaluation go more smoothly.

For future, similar studies, the teacher log instrument should be changed in small ways. For example, VINE Follow-Through teachers felt the order of some items should be changed, and other items should be slightly reworded or further explained to increase clarity. In addition, a question or item should be added relating to the extent to which teachers integrate subject areas, which is an important aspect of "best practice" teaching and learning.

What are the outcomes for teens who serve as VINE volunteer leaders?

In 1988 some VINE Programs began involving high school teens. They met with success and recommended the use of teen leaders to other sites. As interest in service learning grew and the availability of adult volunteers declined (due to increased numbers of adults being employed), more sites came to rely on teen volunteers. By 1994 the majority of VINE volunteers across the country were teenagers.

Local program coordinators felt these teens were benefiting from their involvement and wanted to evaluate the program's impact on them. Coordinators in two cities led the way. Both Louisville (KY) and Broward County (FL) decided to focus mini-studies on teen volunteers in 1991. (See p. 26.) These mini-studies were different in size and scope, but in both, teens said their volunteer experience had increased their self-esteem. Florida teens said it was a "great teaching experience", and 74% of the Kentucky teens said it "changed the way they think about teaching". In Louisville, 65% of the teens reported that their volunteer experience had "some" or "much" influence on their career choice. In their explanations, two types of career choices were frequently mentioned: teaching/working with children and ecology/environmental vocations.

See Appendix B for more information about the 1991 Mini-Studies and how they were conducted.

In 1994, program coordinators in Boston, Denver, Baltimore, Ft. Lauderdale and New Orleans wanted to participate in a multi-city study of teens. They agreed on three main purposes:

- to measure outcomes for participating teens in the areas of (1) science/ecology, (2) personal growth/leadership, and (3) career exploration.
- to identify ways their programs could be improved to better meet teens' needs and interests.
- to develop instruments and evaluation techniques that could be used by any VINE Program to evaluate teen outcomes.

Selection of and planning with the evaluators for this study was done in a collaborative way. Using faxes and conference calls, the local coordinators worked with NAAEE staff to review proposals, select an evaluator, and define the study. With specific agendas for each call and advanced preparations by all participants prior to the calls, this decision-making and planning process worked well. Once the coordinators, project director, and selected evaluator—Goodman Research Group, Inc.—had all agreed on the common elements of the study, the evaluators worked individually with the project director and each site coordinator to carry out the study.

Data Collection and Analysis

See Appendix D for details about and reports from the Goodman Research Group's 1994-95 Study.

Goodman Research Group's 1994-95 Study collected both quantitative and qualitative data. Data from the high school teachers' perspectives was used to corroborate data collected directly from high school teens. Qualitative data from both students and teachers enhanced the quantitative data and enriched the final report. For example, the following data regarding teen's personal growth/leadership were gathered.

On the Teen Survey administered at the end of the program, questions #5 and #10, shown in Figure 16, specifically addressed personal growth/leadership.

Figure 16. Questions from Teen Survey

5. What was the most important thing you learned about being the leader of a group?

10. Compared to before you started this program, do you have *more, less,* or *about the same amount* of confidence in the following? (*Circle one*)

a) your overall confidence

more	less	about the same
51%	1%	48%

b) being responsible for a small group of children

more	less	about the same
66%	3%	31%

c) teaching science to children

more	less	about the same
56%	7%	37%

d) being the leader of a group

more	less	about the same
62%	2%	36%

The most common reply to #5 was "learning about responsibility and patience" (31%). Another 20% said "learning to set a good example for the children" was most important. In addition to *learning* these things, the teens reported in #10 that their confidence in these areas grew too. Responses given to 10 b) and 10 d) by teens in Denver and New Orleans were especially high—with 75% responding "more."

To confirm the growth that teens reported, teachers were asked to judge how much their teens had grown in eight different areas using the question format shown in Figure 17.

Figure 17. Questions from Teachers/Club Leader Survey

Since the beginning of the program, how much do you think teens have grown in their... (*Circle one number*)	None	A little	Some	A lot
	1	2	3	4
self-confidence	1	2	3	4
knowledge of ecology/biology concepts	1	2	3	4

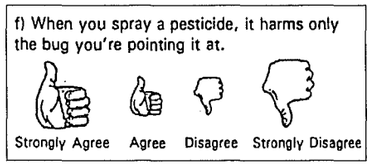
Ten out of twelve teachers reported their teens had grown "a lot" in self-confidence—corroborating the teens' responses. (See Appendix D-5, pp. 14-15.)

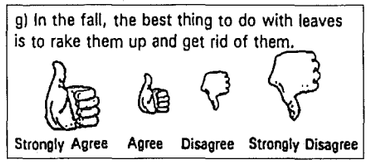
To supplement this quantitative data, qualitative data regarding personal growth/leadership was gathered by engaging teens in focus groups and in the development of a program flyer. (See Appendix D-7, pp. 10-13 for details.) In both of these formats, students brought up the importance of being a role model and having patience, and the thrill of having children look up to you. It was clear that one teen understood a benefit of being a respected leader when he/she said in a focus group, "You get friendship from little kids who look up to you. You walk down the street , and they say 'Hi!'" Another teen described what it means to be a role model as: "Acting like myself...sometimes teachers are role models. I think a role model should be considered to be a leader, someone you look up to."

Similar sets of quantitative and qualitative data from teens and their teachers were gathered for career exploration and for science/ecology impacts. For example, to measure content understandings, the Goodman Research Group asked teachers whether teens had grown in their "knowledge of ecology/biology concepts", as shown in Figure 17. Seven out of twelve teachers circled "a lot"; five out of twelve marked "some".

Teens were asked specific questions regarding ecology/biology concepts, such as questions f) and g) in Figure 18.

Figure 18. Teen Survey Questions about Ecological Concepts





By working with local program coordinators, the Goodman Group tailored these items to reflect the content of each city's program — deleting items that were inappropriate and adding other items depending on the local resources and activities done. Responses to these items are shown in Table 23. A large majority responded correctly

to the pesticide item. The leaf item netted less "disagree" responses, but showed marked pre- and post- change.

Table 23. Responses to Ecological Concept Questions

	Agree/Strongly Agree	Disagree/Strongly Disagree
When you spray a pesticide, it harms only the bug you are pointing it at.	22	78
In the fall, the best thing to do with leaves is to rake them up and get rid of them.	37	63

Pre-program results from Boston and Denver indicated that only 45% of the teens disagreed with the leaf statement. Scores from the same teens at the end of the program confirmed that more teens (36% more) *disagreed* or *strongly disagreed* with this statement.

Teenagers' comments during the focus groups also indicated that they felt they had learned ecological/biological concepts. Specific concepts they mentioned:

" I can identify different plants to stay away from, like poison ivy...and different birds...what bugs do and what good they do."

"Bugs are important to the environment."

"I was learning while I was teaching them. I learned about different leaves."

A complete copy of the Goodman Research Group's Evaluation is included in Appendix D-5. Since one of the main purposes of this study was the development of instruments and evaluation techniques that could be used by any VINE Program to evaluate teen outcomes, the Goodman Group's final report is accompanied by a second document. Their "Guidelines for Future Evaluation of Teens in VINE Programs by Individual Sites" is in Appendix D-7 and includes suggestions for engaging teens in focus groups and in creating authentic products, such as a program flyer or photojournal. By using the quantitative tools in D-7 pre- and post-VINE participation, program leaders can track the growth of teens and/or identify program aspects in need of change.

What We Learned

This was the first study we had done that included a **mix of quantitative and qualitative evaluation techniques**. The local program coordinators found this to be a very attractive feature of the proposal submitted by the Goodman Research Group and was a major factor in their selection to do the teen study. As in the Inverness Study, we found it useful and informative to hear what participants said about the program to outside evaluators in focus groups, site visits, and phone interviews. We found both the quotes and the teen products convincing—and we liked their richness and authenticity. But we also valued the numerical results. We have found that many people find it more convincing to hear reports of outcomes that are backed up with numbers. For example: The majority of teens participating in VINE have

more confidence overall at the end of the program compared to when they start. Over 60% have more confidence in being responsible for a small group of children and in being the leader of a group.

As in earlier studies, we found it important to look at data for each site separately in addition to looking at combined totals. That was especially true for the "personal growth" aspects of this teen study. Slightly over half of the teen participants said they had *more confidence overall* at the end of the program than they did when they first became involved. However, for Denver teens the number was 63%. Since alternative school students with attendance problems and records with law enforcement agencies were the primary Denver participants, one might conclude that exceptional gains could be expected for such students. But 75% of students in both Denver and New Orleans (a city with average and above average students involved) reported more confidence *leading a group* and *being responsible for a small group* of children. So other variables must be involved.

We learned a good deal about ways to strengthen the teen aspects of VINE from the more **negative** results. For example, over 80% of teens "liked" or "really liked" the program and working with children. However, 27% of the teens responded that "having to work with difficult children" was the thing they liked least about the program. This, and other data, pointed local program coordinators to an area that needed attention, and to potential solutions, such as:

- having each teen work with a partner, so that there were two teens working with each group of younger children (an arrangement preferred by 84% of the teens),
- focusing more time in training sessions on strategies for working with difficult children (suggested by both teens and their teachers),
- figuring out ways that elementary teachers can provide teens with more support in dealing with misbehaving children, and
- enabling the teens to work with the children more frequently and/or over a longer period of time (suggested by 46% of the teens) and to take a longer field trip together (an idea that gained consensus in teen focus groups and was mentioned by teachers)—however, there were also complaints about the amount of school the teens already missed. (Appendix D-5, pp. 17-21)

The Goodman Study also highlighted the need to be clearer about program objectives and expectations with the teens—especially in the areas of content and career exploration. Program coordinators articulated several ecological concepts that they expected teens to grasp—e.g., the diversity of plants and animals in a schoolyard, the relative abundance of different types of organisms, the diversity of habitats and ways in which they vary. But teen responses showed mixed levels of understandings of these concepts. (See Appendix D-5, p. 12)The evaluators suggested that training could more clearly address these concepts both in print and in the context of the activities to achieve the intended outcomes and strengthen the program. High school teachers

could, of course, play a significant role in building the teens' conceptual understandings, but many of them felt they needed assistance to be able to do this. (Appendix D-5, p. 17)

Unexpected Findings

We were surprised that teens' survey responses indicated they did *not* feel that VINE had helped them "think about what kind of a job you might like to do in the future". In contrast to their responses on the survey, teens' responses in focus groups and alternative assessments indicated that they were learning things that influenced their career choices. Teachers believed that the program enabled teens to think about career and life decisions "some" (6 out of 12) or "a lot" (5 out of 12). (See Appendix D-5, p. 16)

Since 65% of the teens responding in the 1991 Louisville mini-study said that their VINE experience influenced their career choice "some" or "very much", we had expected a similar response. Several explanations for the differences came to mind:

- As with the ecological content aspects described above, attention to the use of these experiences in thinking about career choices may need to be built into the training sessions in a more overt way.
- Kentucky teens may have thought about careers in a more all-inclusive way. For example, one Kentucky teen wrote "It may not help with my career but in my family life. I learned a lot about kids and how to deal with them." In the 1994 study, teens from the five cities involved may have only thought in terms of paid jobs.
- The degree to which teens experienced frustrations with "difficult kids" may have influenced their responses.
- The types of students recruited for the program as well as their previous experiences and interests may have been very different.

Clearly this question merits further study.

What We Could Have Done Better

In this study as in the 1992-94 study, we were caught in a time-bind. Since the school year had already begun and teens in three of the five cities had already been participating in the program prior to the start of the study, we were unable to collect pre- and post-data for the majority of the teens. (See Appendix D-5, p. 2) Clearly it would be best to have teens complete both pre- and post-surveys—rather than to rely on teens' reports of their own growth at the end of the program and on the corroborating evidence from focus groups , teen products (flyers and photojournals) and teachers. The other advantage of a study spanning the whole school year is that the time between pre- and post-surveys is obviously longer, and there is a greater likelihood of documenting change.

Personal Reflections on What We've Learned

What have we learned? Obviously, we've learned a tremendous amount about VINE Programs! We've detailed the answers we've found in response to each of the questions we've asked on the preceeding pages. Those answers enable us to confidently make accurate claims about our program and say, for instance, that VINE Programs have long-term impacts on children—with participants being significantly more positive about and interested in science (especially life sciences) than non-participants. But as we've indicated throughout this publication, we have also learned much regarding evaluation. Since we contracted with a professional evaluator for our first external evaluation six years ago, we've learned three overarching lessons.

Evaluation, like research, is an on-going process which provides both answers and new questions.

For me, it has very much been a professional growth process—which has required me to look at things in new ways and which always teaches me something I hadn't anticipated. Evaluation and working with evaluators has forced me to more clearly define objectives and to focus on the most important questions—valuable exercises for any learner.

With experience, finding the right evaluator for a certain evaluation task gets easier.

As demands for accountability and evaluations have increased, paid work for evaluators has increased, and the number of people dedicating their careers to evaluation has increased. And with experience, we're all getting better at it.

Because I believe evaluation is important, I tend to read the articles in professional journals and newsletters about evaluation. Periodically I send away for a book or study cited in an article. I talk with other program directors and Principal Investigators on grants about evaluations and evaluators. And I ask officers at foundations for their recommendations. As a result, I've increased my knowledge of evaluators, their specific interests and skills.

This is most important because even though the number of experienced evaluators has increased, it is frequently a challenge finding the right one with the needed expertise and time available to tackle your project. When selecting from evaluators that we've not previously worked with, we have used a "request for proposals" (RFP) procedure. It has been enlightening to compare the evaluation plans and budgets that

various evaluators propose and to see reports they have done for previous clients. While we have learned much from the diverse approaches new evaluators have brought to our projects, we also value the working relationships we've established and the degree to which people we've already worked with understand our program.

Evaluations that begin with clearly articulated objectives and expectations run more smoothly.

What you want to know, and why it is important to know that, must be stated in writing. While there are many intriguing questions that may be fascinating to answer, resources for conducting evaluations are limited. So, it is most important to focus on the core elements and objectives of a program and avoid the lure of exploring interesting but peripheral issues—especially when they are issues that your program has not addressed head-on. Two examples illustrate well a more naive and a more solidly-grounded evaluation approach. Both concern the impact of our programs on teachers.

- In 1992, we naively thought that we would be able to measure difference in teachers' attitudes towards and confidence in teaching science, based on the fact that their students participated in VINE programs. (See page 65.)
- In 1996, following development of an intensive VINE Follow-Through professional development program, we used teacher logs to show how that program changed teachers' classroom practice. (See pages 68-78.)

In the first case, we were not able to measure differences. In the second case, our evaluation documented the results of our intensive efforts.

As program managers, we have the responsibility of asking questions about what we are achieving through our programs. We need to depend on professional evaluators to give us their best judgements and advice regarding *how* to measure or find answers to the questions we've posed. As part of the essential step of clarifying objectives and expectations for evaluation studies, we've learned to ask and discuss in detail with our evaluators many specifics. For example, What will it take to carry out the recommended measure(s)? By that we mean not only what financial resources/budget, but also all the details regarding how the job will get done. This is especially important for studies involving questionnaires or other paper instruments. For example, who will make the copies, distribute, collect, and code them? How many do we need? How much time will that take? Is it manageable? Is there a reasonable expectation that we'll be able to measure a difference? Is there a less intrusive and/or less labor-intensive method of collecting the evidence we need?

We have had the best relationships with evaluators when we've reached agreement on these kinds of questions and done this kind of detailed planning early on. With periodic meetings along the way, we've been able to keep on track and make mid-course corrections when the unexpected arises.

Looking Forward

Much remains to be done regarding the evaluation of VINE Program impacts. First and foremost, we need to address **outcomes for participating children.** We need instruments that will enable us to learn more about the skills gained by participants and their conceptual understandings. Since we have suggested possible directions to pursue under "What We Could Have Done Better" on pages 61-62, we will not repeat those thoughts here. Suffice it to say that such instruments will enable local VINE program coordinators to (1) measure student outcomes, (2) compare results across sites and learn which techniques are producing greater gains, and (3) strengthen and focus the delivery of our programs to enhance their impact.

Second, we need to use the instruments we already have to do **follow-up studies** and confirm the findings we've gathered to date. Do our programs regularly produce a lasting impact in fifth graders (or were the 1993-94 results just a fluke)? Are former VINE participants different from their peers by the time they reach middle school? As the VINE Follow-Through teams engage more colleagues in building on VINE investigations will their classroom practices also change? Have improvements in teen training sessions led to greater gains for the teens in the area of ecology content and career exploration?

The third area I would like to pursue stems from my view of **evaluation as professional development**. Local VINE program coordinators have repeatedly noted how valuable their cross-site visits have been—enabling them to see one another's programs in action, stimulating collegial discussions, and providing them with insights regarding their own programs. In a 1995 volume on new directions for program evaluations sponsored by the American Evaluation Association, Mark Jenness and Zoe Barley describe "cluster evaluation" as a "collaborative method for evaluating the impact of a set of projects with similar goals and objectives."* As an evaluation technique it is expensive and time-consuming; but as a process that engages colleagues in determining the impact of projects and advancing systemic reform, it is an exciting process. Since I first read about Jenness and Barley's work with the W.K. Kellogg Foundation on community health programs, I've dreamed of having several VINE Program sites engage in a cluster evaluation. Until I find the kinds of resources necessary for such an ambitious undertaking, I will continue to pursue evaluations with my VINE Network colleagues in incremental steps as opportunities arise.

*"Using Cluster Evaluation in the Context of Science Education Reform," Mark Jenness, Zoe A. Barley, Emerging Roles of Evaluation in Science Education Reform, Spring 1995, No. 65, pp. 53-69.

And finally, I want to develop **partnerships with universities** that will indeed enable us to pursue evaluation studies on a regular basis.* Large multi-year grants enable contracts with evaluation experts that are of great significance for the projects involved and, as they are shared, for the field in general. By developing on-going partnerships with institutions of higher education, we can develop means for answering questions that will move our programs forward and provide university students with real-world learning experiences. My preference for these, as well as all evaluation studies, is that they would lead to real-world products—publications in newsletters or journals to share not only programmatic findings but discoveries about the evaluation process.

Much remains to be learned, and it is important that evaluation studies continue to be supported by both our institutions and our funders.

*A discussion of this idea was first initiated by Ted Mills of Oklahoma State University at a VINE Network Steering Committee Meeting in May, 1996.

Appendices — Completed Studies and Their Findings

Appendix A: 1986-87 University of Colorado-Denver Graduate Student Study

Evaluators: Genevieve M. Kruzel and Chuck Bayard

How contacted: Ms. Kruzel had read about the new program in a newsletter and asked if a student team could contribute to the program by conducting surveys on some aspect(s) of the program and analyzing the results while fulfilling a requirement for their graduate course in the School of Public Affairs.

Cost: The graduate students volunteered their time. The only "cost" was the time the program coordinator spent with them to define the study, review procedures, critique survey instruments, etc.

Purpose of the study: The purpose of the study was to collect information and opinions from program participants regarding the value of the program. Since this was our first opportunity to involve impartial outsiders in an evaluation of the program, we were eager to see whether their results would validate the internal, formative evaluations we had been doing.

What was done: Survey instruments were created for 3 different types of program participants: (1) participating children; (2) volunteers who had received their training and were leading small groups of children in VINE Program investigations; and (3) the adults in charge of VINE Program delivery at a school or after-school site and the parents of participating children.

Because neither the graduate students nor the program coordinator had experience surveying large groups and boosting response rates, we began naively and learned much. In 1986-87, 2,234 children participated in Denver's program at a total of 18 sites (8 schools and 10 after-school sites) through the leadership of over 100 volunteers. The graduate students mailed surveys to volunteers and adults at VINE program sites, interviewed children in small groups, and sent surveys home to those children's parents with mail-in envelopes. Responses were collected from:

34 volunteers
28 adults including:
- 5 teachers
- 9 informal educators/youth leaders
- 14 parents
- [The basic survey questions were individualized for each of these three sub-groups.]

66 children (from only one or two schools)

Had we known then what we know now, we would not only have insisted on a larger sample, but, more importantly, a sample that represented the diverse audiences being served. Overall, 45% of participating children were from families living at or below poverty level;

46% were from ethnically diverse, non-Anglo backgrounds. Individual sites ranged from 10% to 100% poverty level, and from 82% Anglo to 100% African-American and Hispanic. We would also have created survey instruments that were user-friendly for recent immigrants and non-English readers/speakers.

NOTE: While this study had major shortcomings, it got us started and gave us an initial experience in summative evaluation. It also convinced us to build into all future grant proposals funds to hire professional evaluators.

SUMMARY OF PROGRAM EVALUATION

Conducted November 1986, Report completed April 1987
by Genevieve M. Kruzel and Chuck Bayard
Graduate School of Public Affairs, University of Colorado-Denver

Two CU-Denver students evaluated the Project in 1986-87, administering written and oral questionnaires to program participants. They collected responses from 28 teachers, parents and youth leaders, 66 children, and 34 volunteers.

Teachers, parents and youth leaders surveyed said that the program presented their children with new learning opportunities.

82% indicated that this was the first time their children had done outdoor investigations using scientific aids (magnifying lenses, sweepnets, etc).

71% said it was the first time they had found answers to questions about nature by looking and experimenting.

75% indicated it was the first time they had shared with others discoveries about neighborhood plants and animals.

A clear majority (57 to 80%) said that, since participating in Audubon activities, their children had shown a greater interest in science, had an increased curiosity in nature, and asked more questions about science/nature.

Children surveyed had vivid memories of the Audubon activities in which they'd participated and described the program as a fun experience (31%), where one finds different insects, leaves, etc. (23%) and learns about/studies nature (30%).

91% of the volunteers said they were "satisfied" or "very satisfied" with the program and most frequently said it gave them a chance to work with children (29%) or learn about nature with children (26%) — opportunities that they would not have otherwise.

The researchers concluded: "the program is working very well as intended and makes a significant contribution to satisfying the interests of the target population."

Appendix B: 1990-91 Inverness Research Associates' Study

Evaluators: Dr. Mark St. John, Barbara Heenan, Becky McClaskey
Inverness Research Associates
P.O. Box 313
Inverness, CA 94937

Recommended by: National Science Foundation Program Officer

Contract cost: $23,000 (of that total, $5,350 were spent on travel)

Purpose of study: The purpose of this study was to assess the outcomes and lessons learned from a 3-year dissemination grant. Through that grant, Denver Audubon's Urban Education Project staff was to help 6 to 7 cities establish similar programs. Each city was to adapt the program to meet local needs and build on local resources. The grant provided each city with start-up materials, technical advice and support, and opportunities to share information and experiences with each other. However, each city was expected to fund all on-going project costs locally.

In the 3rd year of the grant, the outside evaluators were to:

- evaluate the configurations the education projects had taken in various settings,
- assess the value of the dissemination strategies,
- describe the degree to which each city had succeeded in establishing an education project and the outcomes it was achieving.

What was done: Mark St. John and/or his designee visited each of the 6 cities. In one or two day visits, they met with local program coordinators, school teachers and administrators, staff members of non-school sites hosting the program, and leaders of institutions/organizations sponsoring the program. They also observed the program in action and interacted with participating volunteers and children. Final products included: A Summary of Findings; individual case studies for Arlington (TX), Boston, Broward County (Ft. Lauderdale, FL), Louisville, Prescott (AZ), and Seattle; An Executive Summary; and Local Research Project Study ("mini-study") Guidelines. [Note: The first and last product listed are in Appendix B-5 and B-7.]

To supplement the main study, each city was provided with a copy of the mini-study guidelines and allowed to decide whether there were one or more question(s) they wanted to study locally. Every city chose to do a mini-study using a locally-identified graduate student, educator, newspaper reporter, or project volunteer. Contracts for these ranged from $250 to $1,000 with the dissemination grant paying up to $1,000/city. This resulted in the following reports:

Participant Observation study:
"Participant-Observer Mini-Study" (Seattle, WA; March 1991)
Outside Observation study:
"Outside Observation of the Denver Audubon Society's NSF-Sponsored Urban Education Project as Implemented in Prescott, Arizona Schools by Prescott Audubon Society" (Prescott, AZ; January 1991)
Studies of Volunteers:
"Urban Education Project Study of Volunteers" (Birmingham, AL; May 1991)
"Local Research Project, 'A Study of Volunteers'" (Arlington, TX; March 1991)
"A Study of High School Volunteers" (Broward County, FL; April 1991)
"The Urban Ecology Project Louisville, Kentucky: An Evaluative Study of High School Volunteers" (Louisville, KY; April 1991)
Study of Teachers:
"The Seattle Audubon Project, Evaluation Report" (Seattle, WA; April 1991)
Studies of Students:
"An Interview with Children Using OBIS Materials, Seattle Public School System" (Seattle, WA; April 1991)
"Evaluation of the Broward Outdoor Natural Urban Studies: Impact on Participating Fourth Graders" (Broward County, FL; March 1991)

Quotes from *A Study of the Dissemination of Denver Audubon's Urban Education Project: A Summary of Findings*

Inverness Research Associates, June 1991.

The projects studied:

- offer children a rare opportunity...to explore, investigate, and learn about the natural world right in their own neighborhoods. (p. 10) ...learning "how to see" can be a novel and powerful experience. Children & guides often have the experience of "Wow! I never saw that before!" (p. 11)
- are curriculum-led. The Outdoor Biology Instructional Strategies (OBIS activities) provide a solid curricular foundation for all sites...and also provide a kind of "quality control" for the projects. (p. 8)
- give many children chances to experience a sense of success with science activities for the first time (p. 9) and to see science as personal, value-laden, connected with real issues in the environment, and fun as well. (p. 12)
- provide an intense hands-on science experience which the schools themselves are unable to provide. The program simultaneously provides lessons in environmental education that are not abstract, but rather are grounded in the schools' own yards. (p. 13)
- require a small adult-student ratio, usually 1 volunteer to every 5 or 6 students. There is a strong egalitarian flavor to the small groups. All class, color, and sex distinctions are erased in the excitement of finding a colony of ants under an old rotting board. (p. 9)
- provide a vehicle for parents, scientists, naturalists, other interested lay adults and high schoolers to participate directly in the school's life and to work with young children,...to provide young (often minority) children with older positive role models,...and strengthen the link between schools and the rest of the community. (p. 13)
- serve as a useful and very visible model for teachers and administrators... illustrating well many characteristics of the nation's educational 'reform agenda' (e.g., cooperative learning, peer teaching, inquiry learning, use of the local environment, etc.) (p. 13)
- lie between and bridge, established institutions. They serve as nodes in a network that connect schools with community groups, museums, conservation groups, parents, senior citizens, and universities. (p. 1) ...As schools continue to suffer budgetary reductions, they will have to look for outside resources to offer such activities to students and to meet the demands of the national reform efforts in science education. (p. 21)

A STUDY OF THE DISSEMINATION OF DENVER AUDUBON'S URBAN EDUCATION PROJECT:

A SUMMARY OF FINDINGS, JUNE 1991

In July 1991, leaders of the programs described here decided to form a network of "**V**olunteeer-led **I**nvestigations of **N**eighborhood **E**cology" programs. The group became the **VINE Network** and their programs are now collectively referred to as **VINE Programs**.

OVERVIEW

The Urban Education Projects (UEPs) derived from the Denver Audubon Society's original model represent an experiment of national significance in science education. These outdoor education projects operate in what might be called the semi-formal learning domain. The UEPs are not of the schools, nor are they of the museums or other informal learning institutions. Rather, these UEPs are adjunct to formal school programs or are found in clubs and after-school programs. This semi-formal learning domain is becoming increasingly important in American life and offers new opportunities for providing America's youth with positive experiences in learning science and mathematics.

A second reason the UEPs represent an important experiment is that they lie between, and bridge, established institutions. They serve as nodes in a network that connect schools with community groups, museums, conservation groups, parents, senior citizens, and universities. As the demands on schools increase, and as their resources will apparently continue to decrease, there is an increasing need to supplement school learning with other semi-structured and non-structured opportunities.

A third reason that the UEP experiment is interesting has to do with its multi-dimensional nature. This is not only a science education or an environmental education program. Viewed from the outside, the UEP activities are also programs that increase civic awareness, self-esteem, communication, and leadership.

Fourth and finally, the dissemination of the Urban Education Projects represents an experiment in program replication. Over the last seven years the Denver Audubon Project has developed a program that is based upon a well-tested and finely articulated model. NSF funding has provided an opportunity for other sites to adopt and apply this model. This experiment shows that the model is sound and that it offers a good balance between focus and discretion. The experience to date shows that it is possible for local sites to develop their own programs while still adhering to the essential characteristics of the model. The combined experiences of the local sites offer many good lessons about how to support the "dissemination" of a successful program.

BACKGROUND

The Denver Audubon Society's Urban Education Project

The Denver Audubon Society conceived of the Urban Education Project in 1984. Supported in 1984-85 by a $29,000 grant from an anonymous donor and, in 1985-87 by a $154,000 grant from the National Science Foundation, the Denver Urban Education Project was initiated by the Denver Audubon Society in order to foster an appreciation of nature in young children living in urban environments. A local steering committee composed of Audubon members and others from local colleges, environmental centers, and public and private educational institutions initiated the program following a well-articulated model. Each city accepted the tenets of the original model which included the following:

- A program without walls. The first principle of the model is that children would explore their local environment. Rather than housing activities at an established nature center, the project is centered in the local community. The UEP wished to convey the idea that nature is accessible to everyone, and that nature is found everywhere.

- A proven and tested curriculum. Rather then undertake the costly and difficult task of inventing its own curricula, the UEP relies almost exclusively upon the activities of the Outdoor Biology Instructional Strategies (OBIS) curricula, developed by the Lawrence Hall of Science in the 1970's with funding from NSF.

  In addition, the OBIS activities selected for the UEPs are those that engage students directly in investigations with plants, animals and habitats, rather than simulation games or crafts-oriented activities. Hands-on science experiences, not facts or information, are emphasized, and children develop skills necessary to observe, to use scientific tools, to record, compare, and analyze, and to apply critical thinking to reach conclusions.

- Volunteer leaders. The projects do not depend on "science experts," but rather allow children to be guided by "lay naturalists" -- anyone who demonstrates an interest in and shares enthusiasm for investigating nature out-of-doors.

- Supporting existing programs. To avoid the huge costs and efforts required to establish new organizations, the UEP works with other existing programs, where children already are meeting and engaged. For example,

the UEP activities supplement and enrich programs already happening in the schools, in after school programs, in Boy's and Girl's Clubs, etc.

As much a community outreach program as a hands-on environmental education program, the Denver Audubon Society's Urban Education Project has now been operating for six years, and has fully funded its $30,000 annual budget through local contributions since 1987. While it has grown and evolved, it still adheres tightly to the basic model described above. Currently, the Denver program annually involves 1,100 to 1,400 eight to twelve year old children in outdoor investigations of plants and animals that live in the children's immediate surroundings. Typically, 40% of the participants are minorities, largely Black and Hispanic, and one-third of the children come from families living at or below the poverty level. 200 volunteers are recruited and trained each year to implement and support the program.

As word of Denver's UEP traveled through the Audubon and environmental education networks, other communities expressed an interest in replicating the project. In response to the widespread interest the project has spawned, the Denver Audubon Society developed and wrote a resource guide, Volunteers Teaching Children, to assist others in duplicating the program in their own cities.

The NSF Dissemination Project

In 1988 Karen Hollweg, then the Denver Audubon Society Education Director, conducted workshops across the country for groups interested in establishing local UEPs in seven cities. As an outgrowth of those workshops, the interested groups, under Karen's leadership, applied for and received a three-year $383,000 NSF grant to support the dissemination of Denver Audubon's Urban Education Project.

The purposes of the Dissemination Project were:

- to establish locally-funded projects similar to Denver's in 6 or 7 cities.

- to establish a network of local project leaders.

- to describe and evaluate the configurations the different projects developed in their various settings as they implemented their programs.

- to write and publish a revised edition of Volunteers Teaching Children which would include the lessons learned from the dissemination project.

To qualify as a dissemination site each community had to assemble a local steering group composed of some combination of Audubon, school, informal institution, university

and/or community group leaders. Relying on the leadership and expertise of the Dissemination Project coordinator, and taking advantage of the lessons learned in Denver in previous years, each site then implemented the UEP according to its local strengths and needs. Grant monies provided funds to meet the start-up costs at each site, but each city had to commit to generating support for the annual operating costs of its program. Grant monies also provided for technical advice and support from the Denver staff and volunteers and for cross-site visits, as well as yearly "round-ups" of all the site coordinators.

This Study

This study was undertaken as part of the Dissemination Grant in order to document and share not only the variety of the configurations evolved at each of the Urban Education Projects, but also the lessons learned at each site during the process of implementation. The study was conducted from the spring of 1990 through the spring of 1991, in the second and third (final) years of the project.

In the course of carrying out the study, the evaluators made site visits to six of the seven UEP cities. The site visits included interviews with people in a variety of spheres involved in the UEPs. Within the UEPs themselves, coordinators and key volunteers were interviewed. In the schools, principals, teachers, students, and school district personnel, e.g., district superintendents or science curriculum coordinators, were visited. Within the community, museum staff or Audubon members contributed their perspectives on the UEPs. Each site visit also included observations of children and volunteers "in action" participating in OBIS activities.

The products of this study are organized in three major sections:

- This **Summary of Findings**, which provides a description of the range of configurations the UEPs developed during the three years of their operations. It also provides a description and analysis of the common issues and dilemmas shared by the sites as they went about the process of starting and maintaining UEPs.

- The **Case Studies**, which outline in detail the history, context, operations and impacts of the UEPs we encountered in the six cities we visited.

- The **Executive Summary**, which summarizes the main findings of the study.

There are two audiences for this study. The Summary of Findings and the Executive Summary should be of interest to funders and informal education leadership, as well as

to those interested in applying the general information in the summary to their own efforts in starting a UEP. The Case Studies, especially in conjunction with the revised resource book, Volunteers Teaching Children, will hopefully be of interest to those designing and operating their own projects.

The Seven Sites

Seven cities have participated in the three year Dissemination Project. In this section of the report we provide a brief overview of the configuration of each of the Urban Education Projects. For more detail, the reader should refer to the complete case studies.

Arlington, Texas

Arlington, Texas is a largely suburban city, an extension of the Dallas-Ft.Worth urban complex. The Arlington community has a history of support for environmental education, led by both the school district and the local parks.

In Arlington, the UEP, called the Outdoor Investigations Project, is "housed" within the Arlington Independent School District, under the direct jurisdiction of the elementary science and health coordinator. The program is delivered to fourth graders by parent volunteers (PTA members) recruited by the individual schools. The project currently operates in three of the 35 elementary schools in the district. In addition, the local Boy's Club has incorporated the program into its summer camp program.

Birmingham, Alabama[1]

The UEP at the Birmingham, Alabama site, the Sidewalk Safari program, is housed in the Ruffner Mountain Nature Center. Staffed by adult volunteers recruited from a variety of sources (environmental educators, college students, etc.) and a part-time coordinator, it is the only UEP that serves children solely in informal settings, through after-school programs in community and recreation centers.

Also in contrast to the other UEPs, the overwhelming majority of children who participate in the program are minorities, and well over half are at or below the poverty

[1] Because of budgetary restrictions and other scheduling difficulties, we were unable to complete a case study of this site.

level. The project has been plagued by frequent turnover of staff and volunteers. Over the past three years, the Birmingham UEP has served a total of approximately 250 children.

Boston, Massachusetts

Although the Boston UEP severed formal ties with the Dissemination Project in the spring of 1990, and although the former home of the project, the Boston Audubon office, closed, the project has continued on its own under the sponsorship of the Massachusetts Audubon Society. The project, now called the Teen/Elementary Teaching Partnerships, serves elementary students in five elementary schools, which "buy" the program to supplement their science or environmental education offerings.

Primarily high school volunteers (although Harvard students serve as volunteers at one of the elementary schools) from biology or science classes serve as teachers in the Teen/Elementary Teaching Partnerships. They are recruited and trained by a part-time coordinator, who now works out of the Massachusetts Audubon Society office.

Broward County, Florida

The Broward County UEP, Broward Outdoor Natural Urban Studies (BONUS), is housed with the Broward County Audubon Society. BONUS serves approximately 1,500 fourth grade students in thirteen out of the 109 elementary schools in the local school district, Broward County Public Schools.

BONUS uses both adult and high school volunteers, depending on the volunteer capabilities of the elementary school. Where parent volunteers are available, schools are asked to recruit them. Where parent volunteers are unavailable, high school students from science classes, ecology clubs, or Future Educators of America clubs are recruited though high school "contact teachers," and bused to the participating elementary schools. The project is currently managed by a 3/4-time paid coordinator.

Louisville, Kentucky

The UEP in Louisville began through the collaboration of a strong community coalition consisting of environmentalists from the Louisville Museum of History and Science, Jefferson County Schools, the local school district, the Louisville Audubon Society, and other city organizations. Today the Urban Ecology (UE) program is housed within the museum. The program offers fall, winter and spring sessions to elementary schools for a

fee, and offers activities to day camps during the summer. This year alone (1990-91) over 2,500 elementary students participated in the program.

Only high school students are used as volunteers in Louisville. Over 200 high school students served as volunteers this year after receiving extensive training in the use of OBIS, not only from their high school "contact" teacher, but also from the UE half-time paid coordinator. In the summertime teens are trained and supervised by the UE coordinator under the Job Training and Partnership Act program.

Prescott, Arizona

The UEP in Prescott, a rural community of 22,000 with a high percentage of retired professionals, resides with the Prescott Audubon Society. The UEP now has programs in six elementary schools, five in Prescott itself, and one in neighboring Prescott Valley. This year, the project served approximately 400 students.

The Prescott UEP is unique among the UEPs in that it relies on all volunteer leadership. The volunteer coordinator of the project, a former president of Prescott Audubon, devotes approximately ten to fifteen hours a week to managing the project. Adult volunteers, drawn from the Audubon Society, PTAs and the school district volunteer pool, are used as OBIS tutors.

Seattle, Washington

The Seattle, Washington UEP is called Finding Urban Nature (FUN). Like the Prescott project, its home is with the local Audubon chapter. The Seattle Audubon Society is strong and active, with a membership of over 5,000. As a result, this local chapter is able to provide funding for a half-time paid coordinator, as well as office space for the FUN project.

FUN relies primarily on adult volunteers, recruited either by the schools who participate in the program or by the FUN staff. This year approximately 80 volunteers with fourth graders from 12 schools participated.

FINDINGS

The UEP Model

As pointed out earlier, the UEPs all adhere to the basic model established by the original Denver program. In looking across all seven sites that we studied, we were able to extract the following general lessons about the most essential characteristics of the UEP model.

The OBIS Activities Provide a Solid Curricular Foundation for All of the Sites

The OBIS activities were designed to provide young children with hands-on, outdoor, biology-related learning experiences. The OBIS activities were also designed for informal (non-school) settings with leaders that were not experts in science or even in teaching. It is a testament to their design that the OBIS activities have worked well in all of the sites.

All of the UEPs are curriculum-led. The ideas and the materials for each UEP session come straight from OBIS. Even with minimal training, both adult and high school volunteers succeed in leading OBIS activities.

OBIS also provides a kind of "quality control" for the UEPs. The careful design of the activities ensures that they will work with young children in a range of outdoor settings, while at the same time enhancing the quality of the scientific ideas addressed. We did not encounter any UEP leaders who were not OBIS enthusiasts, or who did not recognize the value of the OBIS activities in giving scientific substance to the program.

The OBIS curriculum is robust and resilient. It withstands a variety of negative factors and constraints, e.g., classroom teachers not providing follow-up in the classroom, unruly children, tutors of all ages unknowledgeable in science, inclement weather, etc. In spite of all these things that can and do go wrong, OBIS still works.

OBIS conveys a strong message about the nature of learning. In addition to the scientific and environmental content it contains, OBIS also strongly values exploration, curiosity, and excitement. Both for the volunteers and the students who use them, the materials transmit the message that the process of investigation is at least as or more important than the content that is covered. Both children and volunteers explained to us that "learning is more than reading in books or writing in workbooks." "You can learn with your eyes, ears and hands." And "You can learn for yourself, first hand, you don't have to rely on an outside authority."

OBIS also conveys strong messages about the environment: being outdoors is fun. Nature is everywhere and accessible to everyone. Out of one's appreciation of nature, one wants to preserve the plants and animals that live in the surroundings.

Learning in Small Groups Is Successful

Another essential aspect of the UEP model (and one that is closely tied to the use of OBIS) is working in small groups. The basic activity format consists of groups of 3 to 6 students carrying out an OBIS exploration under the guidance of an adult (or teenage) volunteer. This means that the projects require a small adult-student ratio, usually 1 volunteer to every 5 or 6 students.

There are several important benefits to the small group learning situations the UEPs provide.

- The small group format and interactions promote a climate of fun and exploration. The group also encourages sharing of observations, discussion, and debate. These interactions are an important part of the cooperative learning process, and they increase the value of "hands-on" learning experiences.[2]

- The small group creates a new context for learning -- one that is non-authoritarian and intimate. All members of the group become equal when they get down on their knees to examine the roots of a dandelion or pursue some of the other challenges provided by the OBIS activity cards. Consequently, the role of the adult tends to become the guide or friend or grandparent, rather than the expert or the authority.

- There is a strong egalitarian flavor to the small groups. All class, color, and sex distinctions are erased in the excitement of finding a colony of ants under an old rotting board. Consequently, many children experience a sense of success with science activities for the first time.

Exploring the Immediate Environment: A Program Without Walls

The UEP model also includes exploring the environment of the local neighborhood, even in the most urban inner-city environments. The projects emphasize the idea that nature

[2] It is a simple fact of classroom life that elementary teachers cannot provide children with these kind of supervised small group experiences. Almost every teacher we spoke with noted the value of the UEP in providing this kind of intimate learning opportunity.

is available right outside the door. Investigation and exploration do not require "high-tech" instruments or special settings, but rather can be conducted on one's own with the simplest of materials.

The outdoors affects children and volunteers alike in positive ways. In this sense, the natural, outdoor phenomena "carries" the program, just as the curriculum (OBIS) design does. The natural phenomena they explore are inherently interesting and motivating.

The Experience of the Student

During our site visits we observed many UEPs and OBIS activities in operation. There was remarkable consistency across projects in the degree to which the children were, in fact, engaging in hands-on exploratory learning. We saw excitement and eagerness in their responses to the challenges posed by the OBIS activities. It is clear that for many of these children, both urban and rural, the projects offer a rare opportunity for them to explore, investigate, and learn about the natural world right in their own neighborhoods.

The kinds of learning experiences the projects offer <u>are</u> different than those children more typically encounter in their school science curriculum. The UEP experiences mirror well the attributes of learning that reform efforts in science education are demanding. A summary of recent research[3] describes the following content and instructional strategies as important, particularly for "at-risk" students:

- *content which is either culture-free, or draws on the urban environment and relates to the daily lives of students outside of school...*
- *content which provides a view of science as more than a white, male domain...*
- *content which uses resources outside the school, such as museums, zoos, gardens... particularly since they (disadvantaged students) are less likely to encounter such informal learning experiences outside of school...*
- *approaches that use science content as a vehicle for teaching language... and higher order thinking skills...*

[3] Loucks-Horsley, Susan, et al. <u>Developing and Supporting Teachers for Elementary School Science Education</u>. The National Center for Improving Science Education. 1989, p. 14.

- *cooperative learning strategies, which have significant impact on achievement, motivation and social skills of minority and poor students...*
- *experiential and inquiry-based instruction, which has impact on cognitive growth... and internalization of locus of control...*
- *sensitivity to cultural differences between teachers and students which result in different ways of viewing the natural world...*

The well-designed OBIS activities, conducted by enthusiastic volunteers in small group settings in the local environment do succeed in providing these kinds of learning experiences that many school science programs simply cannot provide -- largely because of time, logistics, and preparation.

Equally important to the success of the UEPs is that the program happens in a context that is "not school." Many children who have not been successful in the traditional classroom environment flourish in this new context. For example, a boy in Seattle who had previously performed poorly in academics surprised his teacher with a perceptive and articulate thank you note to his UEP leader:

> *I'm very happy that you are taking the time off to do this Audubon Society thing. The part I liked the most is the part about the spider webs. I like being able to have fun and work at the same time. I also like looking through the magnifying glass. All the other kids and I thank you for your good doings. It's fun to study things up close (instead of on television).*

Learning to observe nature closely -- learning "how to see"-- can be a novel and powerful experience. Children and guides often have the experience of "Wow! I never saw that before!" All of this becomes especially stimulating when contrasted to how most of our modern and urban "seeing" is done -- through either the car window or the television screen. Familiar, "flat" places (a school yard, vacant lot, etc.) suddenly become rich and meaningful.

Close interaction with nature may also bring about changes in the children's attitudes toward nature.

> *Before I came here, I thought all spiders bit. But when I started learning about bugs not biting, that gave me more experience to not be afraid of bugs. I learned to appreciate the specialness of bugs.*

A strong conservation ethic also runs through the OBIS materials and many of the project coordinators. As a result, children tend to become environmentalists and

advocates for taking care of the earth. One child wrote to his town's mayor when the park they were using for the activities was scheduled for destruction to make way for highway construction:

> *Dear Mayor: I don't think it is right to cut down the trees for a road we don't need... A park is a fun place to play...I hope you would not cut so many trees but you guys are going to do it more and more...then here comes the day the park is gone... P.S. Please if you make a road through Granite Creek please leave some trees. P.S.S. Please leave some grass.*

In summary, as much as learning the "facts" of science, children are, in a sense, being introduced to the "culture" of science and of scientific investigation. They see science as personal, value-laden, connected with real issues in the environment, and fun as well:

> *I used to think science was boring. My brother is in 7th grade and he told me how boring science is. But with this science (the OBIS activities) we get to actually do it, not just read about it.*

We witnessed a vivid example of this kind of science investigation in action when the children and their UEP leaders at one site discovered a set of dried and bleached dog bones in an empty field near their school. The group of adults and children became very excited by the bones, taking them back to their class to examine them more closely and to reconstruct the skeleton. It seems doubtful that the group would have responded in quite the same way if they hadn't acculturated themselves to "scientific discovering" through their interactions with the OBIS activities over the course of the previous months.

The Unique Position and Functions of the Urban Education Projects

Because the UEPs live "between worlds," rather than within a specific institutional context or school culture, they are not bound by the restrictions that determine conduct within that culture. This freedom permits people to behave and relate to each other in new and different ways. Perhaps the most striking feature in observing the UEPs in action is the quality of the interactions between the people involved. For example, we saw:

- elementary boys and girls engaging in animated discussions about natural phenomena they had never seen or touched before.
- high school students (usually cynical) working very sincerely with small groups of third and fourth graders.

- senior citizens very much enjoying a "grandparent" relationship with groups of young children (in a way that parents and teachers cannot).
- young parent volunteers discovering an educational role as they work with young students in small groups.

While the programmatic model of the UEPs is very clear, the institutional identity of the UEPs is highly ambiguous. UEPs are in a sense "homeless," not fitting into any recognized educational niches. The projects serve multiple functions as they float between established institutions -- schools, Audubon chapters, museums, nature centers, parent groups, and volunteer and other community organizations.

Serving the Elementary Schools

The most obvious benefit for elementary schools involved in the project derives from the instruction the young students receive. For many of the schools we observed, the UEP is providing an intense hands-on science experience which the schools themselves are unable to provide. The program simultaneously provides lessons in environmental education that are not abstract, but rather are grounded in the schools' own yards.

There are other more indirect benefits for the schools that participate with the UEPs. Because the UEPs come into the school from the outside community, the UEPs are helping to break down the isolation of the schools. They provide a vehicle for parent participation in the school's life, giving parents meaningful educational roles and an appropriate arena to work directly with the students. The UEPs provide an opportunity for scientists, naturalists, and other interested lay people to work with young children. In those sites that use teenage volunteers, the UEPs provide young (often minority) children with older positive role models (also often minorities). They are also vehicles for strengthening the link between schools and other volunteer and community organizations, e.g., PTA, Audubon, and the Boy's Club.

Finally, to some extent, we saw the UEPs serving as a useful and very visible model for teachers and administrators. The program in action illustrates well many characteristics of the nations educational "reform agenda" (e.g., cooperative learning, peer teaching, inquiry learning, use of the local environment, etc.).

Serving the High Schools

Several UEPs made extensive use of high school students as leaders of the programs for the elementary students. In some programs, participation in the UEP is often credited as part of the curriculum for a biology or ecology class. In other programs, tutoring in

the UEP was included as a club activity (the Future Educators of America, Ecology Club, or a Service Club) and served as a welcome and meaningful job for the club to do.

While a UEP is construed to be for the benefit of young children, in fact, it might just as easily be seen as a high school leadership program, designed primarily to build the confidence and self-esteem of the high school tutors.

Serving the Host Institution (Audubon Society or Science Center)

For the organization that houses the program, the UEP provides a good vehicle for the pursuit of the institution's educational mission. The home institution needs ways to build relationships with schools, cultural organizations, and other community groups. The UEP is a good vehicle for "outreach," providing a chance for the institution to strengthen and extend its network, developing the relationships it needs to maintain a "high profile" in the community.

Serving Clubs, After-School Programs

Some of the UEPs have spawned programs outside of the school arena, in very informal settings, such as summer camps, clubs, and after-school programs. In these settings, the OBIS activities and the UEP small group format provide answers to some of the problems that beset these informal programs.

Typically, the staff members of these informal programs are not highly educated or highly paid. Most, like elementary teachers, feel incapable and/or unprepared to teach ecology or biology, and like their teaching counterparts, welcome the arrival of trained volunteers. They need activities that are educational in nature, but that can be done with little preparation or background. The OBIS activities meet these criteria and require little in the way of materials or expense -- another important criteria for these settings. Finally, the OBIS outdoor explorations can break the monotony of standard after-school activities.

An Urban Education Project faces a different set of issues when it moves from the semi-formal to the informal setting. In clubs and after-school settings, children are free to come and go both on any given day, and also any given time. This makes it difficult to plan activities and logistics. Also, because the staffs are not used to activities that require advanced organization and scheduling, they may have difficulty helping "pave the way" for the UEP volunteers' visit, e.g., gathering the children, focusing their attention on the activitiy they will do, etc.

Nevertheless, some sites have succeeded in using the UEP format in informal settings. They discovered that preparation of the site staff is one key ingredient. When the site

staff is cooperative and instrumental in recruiting and organizing the kids beforehand, and when they personally participate actively in the program, the activities proceed more smoothly. Also, sites with more organized "captive audiences" and a tradition of adult-led activities are the most successful.

A brief description of three such programs -- a summer program in Louisville, a Boy's Club in Arlington, and after-school programs in Birmingham -- are described in the appendix to this report.

The External Validity of the UEP Model

It is clear from observing the projects in action at multiple sites that the OBIS activities carried out in small group formats are highly successful in giving students the kinds of positive, hands-on learning experiences envisioned in national educational reforms. Hence, we see the "internal validity" of the UEPs to be quite high. What is also clear from our site visits is that the UEPs are also characterized by a kind of fragility. Their external validity -- the degree to which the world recognizes and supports the programs -- is much weaker.

The same ambiguity and homelessness that allows the projects freedom also makes their continued funding an issue. In the projects we visited, issues of the programs' survival were far more critical than the issues of their effectiveness. We were able to identify some common issues faced by all sites as they worked hard to develop a base of continuing support.

Leadership

The most important element in establishing and in expanding a UEP is leadership. The most successful sites are those where one person, or a team of two, takes personal ownership of the project and dedicates themselves to its success. The charisma and energy of a leader is key to the early success of the project, and yet such a leader may unintentionally create a barrier to the future growth (and even survival) of the program. They must find ways to bring others into leadership roles, and to "replace themselves," or the entire program relies too much on their own personal energy.

The leaders of the UEPs require almost missionary-like attitudes: energy, enthusiasm, commitment to young people, concern about the environment, interest in the community, and dedication to a hands-on educational approach. They need to know something about science, biology, and the environment. They also require a wide range of practical skills. Leaders told us they needed to know how to: articulate (and sell) the project's vision, raise money and recruit volunteers, work with community groups and school

districts, be able to teach both adults and young children, manage materials, and coordinate complex schedules.

While these programs were often initiated by volunteer leaders, all but one had at least a half-time paid coordinator by the third year of the project. In the long-run, UEPs seem unlikely to succeed unless they reach the point where they are able to support a full or half-time paid coordinator. Making the transition from a volunteer to a paid coordinator is not always easy, and it marks a significant change in the project's development and evolution.

Volunteers

The UEPs are volunteer programs. Their success depends on the ability to recruit many good volunteers. To work well, the projects need continuity in the volunteer staff -- so that children can develop relationships with adults and so that from year to year there are volunteers who know the system, can train new volunteers, and continue to carry the torch.

But volunteers, by their very nature, tend to be transitory. In the nation today, particularly in urban settings, there are many families which are headed by one parent, or which have both parents working. Consequently, it is not easy to recruit volunteers except in upper SES neighborhoods and schools.

Thus the UEPs rely on different types of volunteers, and there are strengths and weaknesses to each type. PTA members and other school volunteers tend to "follow their children," so that rarely do these volunteers work with the program for more than one year. Audubon volunteers, often older, are often passionate about nature and the environmental movement, but may be reluctant to work with groups of children. Teenagers have proven to be very good volunteers (especially for lower SES schools), but need extensive training and support. Perhaps the strongest programs have a "diversified portfolio" approach, using several different sources for their volunteer pool.[4]

Finally, it should be noted that it takes a great deal of time and effort to recruit, train, schedule, and support a volunteer team. A successful program requires not only a charismatic or visionary person to inspire the volunteers, but also a person with relentless persistence and attention to detail to manage the logistics and scheduling.

[4] Prescott, for example, found that school volunteers and Audubon volunteers brought different strengths to the program. In Louisville, both high school students and federal Job Training Partnership Act (JTPA) participants served as OBIS leaders.

Finding a Home for the UEP

As we have already described, the UEP is not a central part of the schools, museums or Audubon Society. While a UEP can be housed in any of these types of institutions, it is often more of "a boarder than a member of the family." The commitment of the home institution must be won by showing that the UEP provides a net benefit to that institution.

We have seen examples of three different solutions to finding institutional homes for the UEPs. Each has some advantages and disadvantages:

- Programs centered in the school district (Arlington) have the advantage of being on the "inside" already. They have the disadvantage of having to compete against the "basics," and the program may be a very small part of a district's overall educational concerns. In times of budget contractions, "enrichment" programs, like the UEP, may be the first to go.

- Programs centered in a museum or nature center (Louisville, Birmingham) can tie in with the existing educational and outreach efforts of the institution. They can draw upon the expertise of museum staff and use museum resources in their programs. They can benefit from the goodwill and credibility that informal institutions often enjoy in their communities. However, like programs in schools, the UEP has to prove its educational worth and financial viability to the administration in order to survive.

- Programs centered in local Audubon Chapters (Broward County, Seattle, Prescott, Boston) enjoy the advantages of being associated with the Audubon Society. Potentially, they can draw upon the membership for volunteers, and they may have access to local nature centers and staff for additional resources. However, they generally lack experience and expertise in working with school systems. Moreover, some Audubon chapters are stronger and more educationally oriented than others. If the local chapter does not make a financial commitment to the program, or if it cannot afford to support a part-time coordinator, the UEP is likely to fail. There is also some danger of seeing the UEP as not completely aligned with the mission of the chapter, or even seeing it as a "tail that might someday begin to wag the dog."

Funding Approaches: Bake Sales vs. Line Items

In addition to the start-up costs provided by the NSF Dissemination Grant, the UEPs receive their on-going funding from their host institutions, community donations, and/or

fees they charge students. They must balance the support they receive from funders or institutions with the fees they must charge for their services.

We encountered two different schools of thought about the best approach to garnering support for the projects. Some considerations about the various sources of funds emerged in our interviews:

- A program that relies on grants, or even on-line items in school district budgets, can receive substantial amounts of support. It is, however, always at risk. When conditions change, or the program is no longer the newest around, then the funders can eliminate it with one stroke of the pencil. By contrast, a program that lives on its earned income is more likely to "live within its means" and survive the vagaries of institutional budget gyrations.

- When a program relies on its own local fundraising efforts and when it charges fees for services delivered, the program quickly learns its real market value. However, such market-driven funding tends to limit the ambition and scope of program efforts. Also, when fees are charged, it tends to drive the UEP away from the lower economic and SES areas it was originally intended to serve. (This trend is exacerbated by the lack of volunteers in those areas.)

- There is some feeling that the very charging of at least a small fee for the program tends to make local schools and teachers "take the program more seriously."

The UEPs are seen as "Extra-Curricular"

Closely related to the issue of its status within its own home institution is the way that local school districts relate to the project. In general, we found that most schools thought of the UEP as "extra-curricular." Most typically, a UEP was offered to the school district by the local Audubon chapter or the nearby science museum, and thus, the program was most often seen as a supplement -- " a nice extra" -- that enriched the activities of the school.

There is some irony here in that most school administrators felt that hands-on science and environmental education were important parts of the curricula. They also almost unanimously felt that their schools were "not doing enough" in these areas. Yet few schools we visited made significant efforts to integrate the program into their own core curricula. Often their science programs do not interact with the UEP at all, even though in some schools the UEP was probably the only hands-on science the children were receiving.

Looking across sites we learned some general lessons about the ways that UEPs most successfully interacted with the schools:

- It is important early on to gain the support of the superintendent, district curriculum consultants, or well-respected principals so that they can introduce the program to the individual schools. Initially, they tend to be skeptical of outsiders coming to help the schools, but after a year of proven good results, they switch around to becoming program advocates.

- Similarly it is important to have "lead" teachers and/or principals at individual schools who become champions for the program. These people play important roles serving as entry points into individual schools and help to coordinate the program as local contact people (often coordinating school volunteers, for example).

There are many barriers and constraints in working with the schools that a UEP must overcome. These include issues such as arranging that children be released from classes, finding time to meet with teachers, arranging extended periods of time for the UEP activities, and when high schoolers are involved, obtaining permission slips, and, most difficult, providing bus transportation.

The UEPs are Labor-Intensive

A lot of work and time is necessary to deliver the program. UEP staff and volunteers must arrange for and store materials, schedule volunteers and UEP activities, provide transportation, carry out trainings, and actually do the activities with the students. To provide each student with three to eight hours of hands-on small group activities requires many more hours of work "behind the scenes."

Lessons Learned About the Dissemination of the UEP

The UEP programs at the seven sites were supported by the NSF Dissemination grant for a period of three years. In talking with the coordinator, Karen Hollweg, and in talking with the directors at each site the following kinds of support were seen as being very valuable:

- Ongoing communication, including site visits, between the director and each site was seen as crucial. Not only did the director provide answers to questions, but she supplied moral support and encouragement. Not inconsequentially, she also provided an expectation that the project would continue, grow, and succeed.

- Yearly conferences involving all sites ("roundups") provided a sense of shared mission between participants as well as a strong sense of "rejuvenation."

- The idea that all sites were members of a single experiment -- that they were part of a network of like-minded folks -- allowed the directors to talk more freely about difficult issues confronting them. More practically, the network provided opportunities to save money through bulk purchases of supplies and OBIS materials.

- The grant provided an opportunity for directors to make site visits to at least one other project. This was seen as a very valuable learning opportunity.

There were, of course, barriers and problems that arose during the dissemination process. For example, staff at the individual sites were often so busy with the work of implementing the program that they had little time left over to communicate with other sites.

In some sites, questions arose about the best use of the Dissemination funds. The original grant from NSF deliberately provided only very limited start-up funds to each of the individual projects, believing it was important that these projects be "weaned" early on from NSF support. We encountered some resentfulness about spending money on Dissemination activities and processes while the individual projects were struggling very hard to raise funds locally.

In retrospect it appears that the kinds of support offered by the dissemination grant were often necessary but not sufficient for the success of the individual projects. The mentoring of the grant director was helpful in both practical and psychological ways. The site visits, roundups, and network connections all provided the individual project leaders with a larger perspective of their efforts -- at times when they were buried deeply in the details of creating their own local UEPs.

The Future: Creating a National Network of UEPs

This Dissemination project provides a kind of feasibility proof for the UEP model. More specifically, it shows that:

- the UEP model (OBIS, small groups, local environments) provides children with positive learning experiences that otherwise they would not have.

- the UEP model is both robust and flexible enough to be adapted to a variety of settings.

- by working together in a network, individual sites can learn from previous experience, and from each other, to increase greatly the chances that local programs will succeed.

It is important to note that "the jury is still out" on the long-term success of these programs. If there is no continuing connection or network between them, it is not clear how many of these UEPs will continue to sustain themselves over the next few years. To date, only a few have found solid institutionalized support for their programs.

The climate and demand for programs like the UEP will, in all likelihood, continue to grow over the next decade. Hands-on science activities and programs that deal with the environment are both in high demand. As schools continue to suffer budgetary reductions, they will have to look for outside resources to offer such activities to students and to meet the demands of the national reform efforts in science education.

Moreover, community groups, museums, and societies like the Audubon society are exploring ways to serve the educational needs of young children more and more. The UEP model offers them a vehicle for doing exactly that. As the existing UEPs mature and stabilize, they may have more time and energy available to share their experiences and expertise with newer sites.

In addition, networks can offer individual institutions or projects several kinds of leverage and synergy that they lack standing alone. The network has greater funding leverage and external visibility. It allows for cross-fertilization and sharing of ideas. A network could help individual project leaders develop a new identity that reflects a national mission and effort. Finally, a network of UEPs might be the most effective way to build on the work that has been done and to extend the model throughout the nation.

The Denver Audubon Society's

NSF-Sponsored Urban Education Project

The Background of the Project

The Denver chapter of the Audubon Society created the Urban Education Project (UEP) to teach inner city children about their natural surroundings through experience and first-hand investigation. Volunteers, teachers, and other participants are encouraged to "get down on their hands and knees" to learn along with the children, and to support the general atmosphere of curiosity, exploration, and discovery.

The Denver Audubon Society received a second grant from NSF in order to disseminate their project to other sites around the country. There are currently seven sites where the UEP is being implemented: Denver, CO; Prescott, AZ; Arlington, TX; Louisville, KY; Birmingham, AL; Broward County, FL; and Seattle, WA. At these sites the program varies in the way it is implemented and structured. There are different types of volunteers (e.g. PTA and Audubon Society members), and a variety of settings, ranging from the schools to the more informal setting of boys and girls clubs.

So that they would not have to devote their resources to developing environmental education curricula, the programs are adapting already existing science and outdoor education materials. Specifically, the program uses activities of the Outdoor Biology Instructional Strategies (OBIS), a NSF program developed and field tested by the Lawrence Hall of Science at the University of California, Berkeley. OBIS is essentially a set of outdoor education activities aimed at the upper elementary/middle school grade levels. The OBIS activities are flexible enough to be adapted to various contexts. In addition, OBIS activities can be done with relatively low cost materials.

Study Rationale

Inverness Research Associates (IRA) of Inverness, California has been contracted by the Denver Audubon Society and NSF to do a study of the dissemination of the Urban Education Project. IRA is a small research firm which works on the assessment and evaluation of various math and science education projects across the country.

Our Goal

Our goal is to document the Urban Education Project and the way the program is working at the seven sites. We want to understand at each site how it is structured, operated and funded. As much as possible, we want to estimate its impact on the students, who are the final recipients of the project's endeavors. We are looking for answers to questions, such as:

- What is the nature of the learning experience for children in this "semi-formal" educational experience, and what is the role of the UEP in the students' overall exposure to science?
- How well does it work to have volunteers, ranging from parents to Audubon Society members, to retired people, to teens teaching science?
- What is the relationship of the program to the schools?

We are also looking to answer more specific questions about the way the program varies between sites, and that is where the individual site research projects we describe here can contribute. This informal "request for proposals" provides guidelines for small local research projects that, in combination, will contribute to our understanding of this innovative national program.

We are proposing the list of projects below as topics of research that would be useful for us in our study of the Audubon's UEP. Each project is also described in more detail.

A List of Projects

1. Participant Observation: Being an OBIS / UEP Volunteer
2. Outside Observation: OBIS / UEP Activities
3. A Study of Volunteers
4. A Study of the Program, Teachers and Schools
5. A Study of the Students

Participant Observation:

Being an OBIS / UEP Volunteer

Overview

Purpose: To document the researcher's own experience as a volunteer. In this role he or she will:

- be a participant in and contributor to the program;
- interact with children in an informal, natural environment;
- find out what it's like to use the OBIS materials, to do the activities.

It would involve:

1) going through the same training that the local volunteers go through;

2) getting to know teachers or other adults responsible for children in the program (e.g. Boy's Club or Girl Scout director);

3) actually carrying out the OBIS activities with the children.

The project would be a good educational as well as research opportunity for students exploring science/environmental education, those enrolled in a regular teacher credential program, or others interested in volunteer/community work.

Some Research Questions

1) What is it like to be a volunteer? How thorough was the training? How well did it prepare you to do the activities? To what extent did the program take full advantage of your interests and background?

2) How well did the activities work? Which worked best, worst? Why?

3) What were the benefits and costs to you? to the students?

4) What could other sites learn from your experience?

Methods

The participant observer must get connected with the school or community organization involved. He becomes a regular volunteer and goes to training sessions. She does activities with students, keeping a journal that records the program's progress as well as other observations, comments, and feelings throughout the experience.

In addition to carrying out the OBIS activities, the researcher might also examine the overall science education of his or her group of students as it happens in the classroom. This would be useful to get a sense of how the OBIS activities fit in.

Product

This research project would produce a short report that provides a personal view of the program, from the perspective of the volunteer. It could take the form of a journal or log, and would comment on the program from an insider's point of view. Perceptive insights into the strengths and weaknesses of the program are more important than "objectivity."

Outside Observation:

OBIS / UEP Activities

Overview

Purpose: To watch the program in operation as a " outside observer," providing the perspective of one who does not have the role of any one player (e.g. volunteer or student). It would involve attending and observing the program's activities. These observations might focus solely on the activities the students are engaged in, or it might take a broader view, observing the volunteer training and planning sessions as well.

Through this project the researcher would:

- be able to compare various activities and their strengths and weaknesses;
- see how the volunteers and children work together;
- see the role of the teacher in the actual activity;
- infer the kinds of benefits the students are getting.

This could be done over a semester, or throughout the year. The researcher might follow one group of students throughout his or her study, or she might include all students and volunteers in the observations.

Research Questions

1) Which activities did they do? Why? How much time was spent in preparing the children to do the activities, and how much time was spent actually doing them?

2) How much time did the volunteer spend preparing the activity?

3) Which activities worked well and which others not so well? Why?

4) What kinds of logistical difficulties were there in the actual doing of the activities (e.g. ran out of materials; not enough time, etc.)?

5) What was the relationship between the student and the volunteer? How well did the volunteer manage the kids?

6) What did the children actually do before and after the activities? During the activities, to what extent are they "on purpose" and engaged with their investigations?

7) What kinds of benefits (skills, knowledge, attitudes) does it appear that the program is providing the students?

Methods

Find out when the activities will be taking place, do any preliminary reading and preparation, and then attend and observe the activity.

Product

A short report that answers the above research questions, and portrays the reality of the program as it is actually occurring at that site.

A Study of Volunteers

Overview

Purpose: To document the experience of being a UEP volunteer, through the use of focus groups and individual interviews.

This project is rather like an anthropological study, and would be interesting to students in that field, as well as to students of education.

Research Questions for the Volunteers

1) What is your background and motivation for getting started in the program?

2) Is your role in the program clear to you?

3) How confident do you feel teaching about science and nature?

4) What are you perceptions about how you influence the students (e.g. do you see a change in the students' understanding between visits; can you build on previous visits in later ones)?

5) What kinds of personal relationships do you have with students? "Teacher" relationships?

6) What are the logistical or organizational strengths and weaknesses of the program?

7) How easy is it to use OBIS activities?

8) How long have you been involved with the program; when did you begin? Are you likely to continue with it? Why? What's in it for you?

9) How effective were the training workshops? Did they adequately prepare you for your role as a UEP volunteer?

Methods

Phone or (better) personal interviews with individual volunteers, drawn from a sample that reflects the different types of volunteers (e.g all Auduboners) or a mixed group (e.g. retired folk and PTA members). These interviews could be done one-on-one or they could be done with a small group using a "focus group" format.

Product

Interview transcripts or notes, and brief report providing a summary of findings. The report should discuss the overall efficacy of using volunteers as educators, illuminating the questions above as well as discussing the differences between various types of volunteers, and the role of the volunteer in providing quality experiences for children in outdoor investigation.

A Study of the Program, Teachers and Schools

Overview

Purpose: To study the connection between the program and the schools. In particular, this study would focus on the teachers' role in the UEP; their expectations, desires, and understanding of how OBIS / UEP activities fit into their curricula, schedule and educational philosophy.

This project would most likely be interesting to and useful for teacher candidates, and students of science education.

Research Questions

1) How did the teacher find out about and get involved in the program (e.g. teacher sought it out v.s. principal deciding school would do it)?

2) How long has the teacher and his or her class been involved with the program?

3) To what extent and in what ways is the teacher involved in the actual activities?

4) What are the benefits and costs to the teacher in having the program at her or his school?

5) What other science is being taught at this grade level? Has the UEP increased the time spent on science for these students?

6) To what extent do the teachers try to integrate the content of OBIS activities with classroom work? What are some examples of the way in which this is done? What are the barriers to such integration?

7) Is there an overlap of the OBIS activities with subjects other than science (e.g. social studies, writing)?

Methods

Tape record interviews with individual teachers and focus groups.

Product

Interview transcripts (or notes) and a report that provides a brief summary of findings.

A Study of the Students

Overview

Purpose: To understand how the UEP is impacting the students who participate. In particular, we wish to know the ways in which the program is affecting:

- the scientific understanding of the students
- their ability to do an investigation
- their curiosity and interest in the natural world
- their values (eg. the science and environmental knowledge and ethic of the student)

Some examples of questions to ask the students

1) What surprised you?

2) How are Audubon activities different from classroom science?

3) What makes a good volunteer and teacher?

4) How often do you "do" science in your classroom? How often do you go on science or nature-related field trips? Are these field trips different from Audubon activities? How?

5) What do you think you learned from the activities?

For example:

- names of plants and animals;
- how to do investigation;
- how to work together;
- how to explain what you saw.

[Note: Interviewer may need to probe to get the kids thinking about what they did in addition to facts and information that they learned, since the latter is usually

what is considered "the best answer" (i.e., to get the "right" answer or say what they think an adult wants to hear).

6) If you were to recommend to your teacher and/or your principal whether the program should be kept or not, what would you tell them? Reasons why?

Methods

Arrange discussions with groups of students who have participated (this year or last year). Tape record these discussions. Keep the conversation light and informal, asking the students to "teach you" about the program -- what they do, what they have learned, why they like and don't like about it, etc.

Product

Interview transcripts or notes and a report providing a summary of findings.

Appendix C: 1992-94 University of Denver Study

Evaluators: Dr. Jill Burruss, Dr. Jean Judson, and staff University of Denver, Bureau of Educational Services

Current phone numbers: Burruss 757-221-2361; Judson 303-777-4355

Recommended by: U.S. Department of Education's National Diffusion Network evaluators, RMC Research Corporation

Contract cost: $20,445

Purpose of study: to develop and use instruments to assess:

- the impact of VINE Programs on students, including skill, attitude, and concept outcomes, and
- the impact of VINE Programs on teachers, including their attitudes toward science/outdoor investigations and the learning experiences they are able to provide their students

Existing validated instruments were to be used whenever possible, so that the results from our samples could be compared with those from larger samples.

Who was involved: Public school teachers and students in Seattle (WA), Denver (CO), and Broward County (Ft. Lauderdale, FL) were involved. Over the two years, total participants numbered:

1,393	4th grade VINE Program participants,
410	4th grade non-participants from matched schools,
82	Participating and control teachers, and
1,156	5th graders who did and did not participate in VINE as 4th graders.

The students represented a cross-section of students in these 3 urban school districts, and their demographics mirror those of VINE program participants: 55% children of color, and an average of 30% (with a range from 3% to 93%) living at or below poverty level. The teachers, schools, and their educational offerings were compared with and found similar to the larger nation-wide sample included in the U.S. Department of Education's 1990 National Assessment of Educational Progress (NAEP).

Local VINE coordinators and/or others with whom they worked were paid to distribute, collect, and code both surveys and other completed instruments from children and teachers. Local educators with

experiences in both formal and informal settings were contracted to observe VINE program sessions and use a checklist to assess whether the program was being implemented as intended. To thank control teachers for their participation, we provided a one year NSTA Science and Children subscription to their schools. These local expenses cost an additional $2,000 for each of the two years.

What was done: In 1992-93 and 1993-94, the following instruments were used to gather feedback from students, teachers and administrators.

	Year	
Student Questionnaire (Pre and Post)	92-93	93-94
Outdoor Activity Survey- Student	92-93	93-94
Draw the Schoolyard (Pre and Post)- Student	92-93	93-94
5th Grade Follow-up Survey -Student		93-94
Outdoor Activity Survey - Teacher	92-93	93-94
Teacher Perspectives	92-93	93-94
Teacher Questionnaire	92-93	93-94
Administrator Survey	92-93	
Observation Checklist	92-93	93-94

Statistical analyses were made using SPSS-X software.

RESULTS OF AN EVALUATION
OUTCOMES FOR STUDENTS & TEACHERS IN VINE PROGRAMS *

In 1992-94, we studied VINE Programs in Seattle (FUN), Denver (UEP), and Broward County, FL (BONUS). The study, done in conjunction with the public schools participating in these environmental education programs, included surveys and observations of 1,393 4th graders, 410 comparable 4th graders NOT participating, their 82 teachers, and 1,156 5th graders who did and did not participate as 4th graders. The students represent a cross-section of those in these urban school districts and their demographics mirror those of VINE program participants: 55% children of color, and an average of 30% (with a range from 3% to 93%) living at or below poverty level. The teachers, schools, and their educational offerings studied here were comparable to the larger nation-wide sample included in the U.S. Department of Educations's 1990 National Assessment of Educational Progress (NAEP).

VINE Programs provided participating students with a series of 5 to 9 volunteer-led, small group outdoor investigations on their school grounds. **Such experiences would not have been available to these students without VINE Programs. The Programs enable these students to do significantly more plant/animal projects or experiments than are typically available to 4th graders nationally.**

- 71% of the teachers reported that the program's schoolyard investigations are not similar to their regular program.
- 66% of teachers said they would try to provide similar experiences if these programs were not available to them, but 77% of those said they do not have or could not get the additional personnel that allows for the small group instruction and individual attention provided by VINE.
- Both students and teachers like the VINE Programs. 83% of students and 92% of teachers wanted to do more outdoor activities like these.
- 73% of students and 91% of teachers (and, in retrospect, 70% of 5th graders) reported they learned something new from VINE.
- A comparison of student drawings of the schoolyard's creatures and plants done before and after VINE revealed that 75% of the 4th graders were applying concepts they had learned in VINE following their participation.

The VINE Programs had a long-term impact on participating students. 5th graders who had participated in VINE the previous year reported that with VINE Programs they studied things in the environment, learned about animals, insects and plants, and learned how to do activities and experiments. The majority considered it to be "science". 67% said that VINE increased their interest in science primarily because they liked it and felt it helped them do better in school (e.g. get better grades, learn more). When compared to 5th graders who had not participated, the former participants were **significantly more positive about** science (I like it, it's fun), **and interested in science**, in doing activities and experiments, and in the life sciences (plants, etc.). They also report doing significantly more activities and experiments at home. Only 15% of the former participants were doing VINE-like activities with their 5th grade class.

77% of teachers reported that the VINE Programs influenced their teaching and/or curriculum because of the way it excited, encouraged and involved their students and provided them with a model for using hands-on activities in their teaching. Most teachers integrate the different curriculum areas in their teaching and used a combination of time from science, reading, language arts and social studies for VINE. The teachers consider the programs to be science primarily because students are outdoors studying things in the environment and are doing activities and hands-on experiments. Only 41% of the teachers have received specific training in teaching science and 24% prefer teaching science over any other subject area. However, 78% would like to work with other teachers to improve their science program and 74% would like to participate in workshops/inservices on science.

* Conducted by the University of Denver, Bureau of Educational Services Evaluation Team for the North American Association for Environmental Education with support from the National Science Foundation. 9/94

VINE

VOLUNTEER-LED INVESTIGATIONS INTO NEIGHBORHOOD ECOLOGY

Evaluation Report
Year 2

An Evaluation of Outcomes for Students and Teachers Participating in the VINE Program at Three Sites

University of Denver
Bureau of Educational Services Evaluation Team
Jill D. Burruss, Ph.D.
Jean Judson, Ph.D.
Laurie Harris, M.A.

August 1994

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Introduction and Overview

PURPOSE OF THE EVALUATION

This report focuses on Year Two of the VINE program's evaluation and provides both a second year and a full program look at the VINE program as it is implemented in three locations, Denver, Seattle, and Broward County, Florida. VINE, Volunteer-led Investigations into Neighborhood Ecology, provides science activities that engage young children with hands-on experiences investigating the natural environments at their own school and in their own neighborhoods. Lay naturalists, both adults and teenagers, are used to involve the students in the inquiry and to assist in their collection of and reflection on experimental and observational data. The second year's evaluation was designed to demonstrate continuation of previous trends and thus to reduce results and findings based upon or significantly influenced by chance. It was also designed to explore the longer term impact of the program on children following participation in VINE.

As with the Year One's Report, this evaluation is also part of National Science Foundation's grant evaluation requirement. The evaluation team again looked at site and teacher comparison to national data, at delivery of program, and at satisfaction with the program. The audience for this report continues to be the site coordinators and teams and the Director of the VINE project and her NSF grant officer. Those parties are expected to share it with constituents and other interested parties.

Limitations

Due to the variability inherent in using intact groups in multiple sites, the following evaluation types were initially considered and discarded at the onset of this program evaluation.

- amount of science information learned (increased content knowledge)

Because different teachers and schools bring varying backgrounds, interests, and philosophies into the project, determining the effect of the VINE project on actual student content learning is nearly impossible to tease out of the entire learning experience. Some teachers used the VINE program as a supplement and continued the discussions and lessons in class; other teachers viewed VINE as their science class and spent no additional time on continuation aspects. At some schools, the VINE projects were part of a strong emphasis on science and hands-on learning; at other schools these activities were seen as special separate activities, not connected to the regular school program. Some children engaged in supplemental science learning, both in and out of the formal school classroom, and other children only got as much as was presented by the lay naturalists. This type of variability confounds any attempt to directly attribute science learning to these projects without significant amounts of on-site observation and frequent follow- ups. Since that was not possible in terms of time, resources, or accessibility, actual measurement of science content was deemed inconclusive and thus not appropriate. Also since conventional pre and post testing of students generally takes significant class time and teacher/volunteer coordination, it was not viewed as desirable by site coordinators.

- impact on teaching, style and substance (increased focus on inquiry and science teaching)

Since there was no way to observe each participating teacher in the classroom prior to the activities, we could not ascertain how much emphasis on science and inquiry was actually present in the classroom before the VINE activities started. Even asking that as a question presented some problems as teachers know what is expected in this time of educational reform and that data is always suspect unless it is supported by evidence of action. Triangulation of data (observation supporting an instrument response) is the only way to look at that in a meaningful fashion. This is also true in a post hoc situation; we have to observe the classroom after the conclusion of these activities, and over a longer period of time, to ascertain the impact on teaching. With this other data, pre and post levels would have been useful for comparison purposes. Since that data was not available or collectible, this type of evaluation was also discarded.

Limitations identified in the Year One Report continue to be in effect: teachers agreed to voluntary participation; no random assignment of students or teachers was possible; incomplete or inappropriate responses to instruments were found; data was missing; and some problems arose with miscoding. Input from the teachers on the Year One process reduced the amount of instruments and paper work for this year but it was still considered excessive by some individuals.

Given the above natural limitations, much of the emphasis of the evaluation focused on looking at attitudes towards science and science teaching while adding a component that addressed increased time and involvement in science activities. The IEA study of Science III (1992) noted that although 10 year old students in the United States understood the importance of science, their level of interest in science was extremely low when compared internationally.

> The teaching of science in the United States at the primary level does not match the expectations of the students generated by their assessment of the importance of science. Their low level of interest in science in the classroom is a criticism of the presentation of science in the schools, in view of the high level of importance which they assign to science. (Keeves, 1992, p.127)[1]

The VINE project believed that providing fun and intellectually stimulating hands-on science activities might increase or stabilize student interest in science while increasing the actual amount of time spent on science for some students. For all intents and purposes it appears to have done just that. Both students and teachers liked the VINE activities and volunteers, and their interest in this type of science increased or continued to be strong.

Method

This evaluation was a quasi-experimental study that was conducted over a two-year period. The first year included data from matched control and experimental school in three sites. The schools were matched on size, location, and student population. The First Year Report contained a detailed summary of the data. The second year data was both supportive and added information. Data were gathered from instruments designed to match those used by NAEP (1990), those typically used by the VINE program, and those used by other science programs.

Data were gathered by VINE program coordinators at each site and sent to the evaluation team for analysis. Each site, school, teacher, and student was assigned a code. Each instrument was coded to insure confidentiality for all

1 Keeves, J. P. (1992). The IEA study of science III: Changes in science education and achievement, 1970 to 1984. Oxford, NY: Published for the International Association for the Evaluation of Educational Achievement by Pergamon Press.

participants. Evaluators did not have access to the lists that matched participants and codes.

Data analysis for each instrument included calculating frequencies of responses and descriptive information as appropriate including range of responses, average response, most common response, and other statistical information. SPSS-X, a software program for statistical analysis was used. Comparisons between groups was also made to determine statistical significance ($\alpha = .05$ unless otherwise noted). When comparisons to national data were made, that data was from the National Assessment for Education Progress (NAEP). The data represent the opinions and judgments of those participating.

INSTRUMENTS

The instruments used for this evaluation were:

	Year	
Student Questionnaire (Pre and Post)	92-93	93-94
Outdoor Activity Survey - Student	92-93	93-94
Draw the Schoolyard (Pre and Post) - Student	92-93	93-94
5th Grade Follow-up Survey - Student		93-94
Outdoor Activity Survey - Teacher	92-93	93-94
Teacher Perspectives	92-93	93-94
Teacher Questionnaire	92-93	93-94
Administrator Survey	92-93	
Observations	92-93	93-94

SAMPLE

The schools that were a part of this evaluation were located in public school districts in Denver, Colorado, Broward County, Florida, and Seattle,

Washington. The evaluation team did not participate in the site or school selection. Permission to conduct the evaluation was obtained from each site. Students were from the classes of teachers who had agreed to participate in the VINE program. School, teacher, and student descriptions are included in the report. Sample sizes are shown in Table 1 and Table 2.

Table 1
Sample Size

	VINE 92-93	VINE 93-94	Control 92-93
Students*	821	944	409
Females	406	463	200
Males	394	478	209
	VINE 92-94		Control 92-93
Teachers †	54		28
Females	32		24
Males	22		4
	VINE 92-94		
Administrators	19		
	VINE 92-93	VINE 93-94	
Observers	110	135	
Outside Observers	58	55	
Teacher Observers	52	79	
	93-94		
5th Graders			
Previous Participants	621		
Nonparticipants	535		

* Student totals for VINE taken from Student Outdoor Activity Survey. Student totals for Control taken from Student Questionnaire Pre/Post. Some responses were missing so subgroups may not equal total number.
† Teacher totals taken from Teacher Questionnaire.

Table 2
Sample Size by City

VINE STUDENTS*	Total	Females	Males
Denver 92-93	166	78	88
Broward County 92-93	296	153	143
Seattle 92-93	173	85	88
CONTROL STUDENTS			
Denver 92-93	96	40	56
Broward County 92-93	218	111	107
Seattle 92-93	95	47	48
VINE STUDENTS			
Denver 93-94	157	75	82
Broward County 93-94	338	168	169
Seattle 93-94	263	134	129
VINE TEACHERS**			
Denver 92-94	14	10	4
Broward County 92-94	24	16	8
Seattle 92-94	16	10	6
	TOTAL	TOTAL CLASSES	NEW CLASSES
NUMBER OF SCHOOLS***			
VINE 92-93	10	46	NA
CONTROL 92-93	9	32	NA
VINE 93-94	14	49	13
NUMBER OF DISADVANTAGED URBAN SCHOOLS			
VINE 92-93	2	6	NA
CONTROL 92-93	1	1	NA
VINE 93-94	2	8	3

* Number of students was calculated by including only those students who had completed a Student Questionnaire before VINE and a Student Questionnaire after VINE. The actual number of students participating in VINE was higher.
** Number of teachers was calculated from the number of VINE teachers who returned Teacher Questionnaires. The actual number of teachers was higher.

*** All classes did not return information.

Results

1. HOW DOES THIS SAMPLE COMPARE TO THE NATIONAL PROFILE?

Schools

Schools participating in the VINE program were similar to other schools throughout the United States according to data collected for the National Assessment of Educational Progress (NAEP) for 1990. They had approximately 180 school days per year and the length of the day was around six hours. Schools in Denver and Broward County were within the usual range of size for schools in the U. S and averaged 650 students in Denver and 950 students in Broward County. The schools in Seattle were slightly smaller with enrollments that ranged from 385 to 520. Class size ranged from 15 to 32 and averaged 27 students. Schools in this evaluation reported spending more than 5 hours per week teaching reading and language, 5 hours per week teaching math, 4 hours per week teaching science, 3 hours per week teaching history, geography, physical education and health, 1 to 2 hours per week teaching computers, art, music, and foreign language. These averages were comparable to national norms. More than 80% of the schools who responded to the questions reported that they had no science consultant or resource science teacher. More than 70% of the school responding reported that they did not have a curriculum specialist. More than 60% of the teachers reported that they teach as a part of a team and are teaching at their preferred grade level.

Teachers

Teachers in this study were similar to the national norms. In general, they can be described as female, white, with 14 years teaching experience (range 1 - 37 years), and a B.A. degree. Specific percentages are included in Table 3 along with information about the training and participation of teachers in the VINE program. More information from teachers is included in the appendix.

Table 3
School and Teacher Profiles

Teachers

	VINE study	NAEP [2]
Females	60%	73%
Males	41%	27%
Ethnicity		
White	79%	75%
Black	11%	16%
Hispanic	6%	6%
Asian	4%	2%
Years teaching experience	14	15
Educational level	BA 63% MA/EDS 37%	BA 64% MA/EDS 36%

Schools

	VINE Schools	NAEP
Number of school days	180	CO = 180 FL = 180 WA = 180
Number of hours in school day	6	CO = not specified FL = 5 instructional WA = 5.5
Enrollment	650	443 (in Central Cities)

VINE Teachers

Years in Audubon 2

Participated in National Science Foundation (NSF) workshops
yes=13% no=85%

Participated in National Science Teachers Association (NSTA) workshops
yes=0% no=100%

Received specific training in science teaching
yes=41% no=59%

Science consultant in school
yes=20% no=80%

Prefer teaching this grade
yes=81% no=19%

2 National Center for Education Statistics. Schools and Staffing in the United States: A Statistical Profile, 1990-91 (SASS). Washington, DC: U. S. Department of Education, Office of Educational Research and Improvement

The teachers participating in VINE for the first time during the 1993-94 school year were like those that had previously participated in VINE. The new group of teachers in Broward County had a larger percentage of males, but the composition of the total group was still primarily female. The new group of teachers in Broward County also reported less frequently that they taught as a part of a team and they reported that they preferred the grade level they were teaching less often. The new group of teachers from Seattle also had a higher percentage of males, and taught less frequently as part of a team. However, the total group reported that they did teach as part of a team and that they preferred the grade level they were teaching.

Type of Community

In this study, comparisons were made with NAEP data whenever possible. One of the classifications used was Type of Community. Four mutually exclusive community types were used in the NAEP study -- Advantaged Urban, Disadvantaged Urban, Extreme Rural, and Other. Type of Community was decided according to information about

> "parents' occupation obtained from the Principal's Questionnaire completed by each sampled school, indices were developed such that for each assessment approximately the 10 percent of the most extreme advantaged urban, disadvantaged urban, and rural school are classified into the first three categories. The remaining approximately 70 percent of the schools are classified into the "other" category." (p. 261)[3]

The Disadvantaged Urban and Other classifications were used for comparisons in this study. "Disadvantaged Urban students reside in metropolitan statistical areas and attend schools where a high proportion of the students' parents are on

3 National Center for Education Statistics. (Sept. 1993). National Assessment of Educational Progress 1992: Reading Report Card for the National and the States. Washington, DC: Educational Testing Service.

welfare or are not regularly employed." (p. 261)[4] . For the purposes of the VINE evaluation, schools were considered to be Disadvantaged Urban if the percentage of students participating in the free lunch program was 50% or more.

Students

Students participating in this study were almost all 4th graders and were evenly split between male and female. Their average age was 9 years old at the time the first Student Questionnaire was administered and 10 and the time of the second administration. The age range was from 7 to 12. More information on gender, ethnicity, and economic status is presented in Table 4.

2. IS VINE BEING DELIVERED AS INTENDED?

The delivery of the VINE program was assessed by outside observers and teachers involved in the program. Outside observers had a professional background in science or in science education. The observers were given a checklist of elements that are a part of the VINE program. They were to evaluate the delivery of the program as it occurred. The responses of teachers and observers both supported the program delivery. Teachers and observers agreed on all areas except teachers saw themselves as being more involved than did the outside observers. Data from the observations is shown in Table 5 and observational data by city is included in the appendix. The observations strongly supported that the program is being delivered as intended.

4 *Ibid*

Table 4

Student Profiles	Gender*	Ethnicity**	Percent on free lunch***
1992-93			
All VINE Students	Girls=50% Boys=50%	White=45% Black=16% Hispanic=25% Asian=13% American Indian=1%	30% range 3% to 71%
All Control Students	Girls=48% Boys=52%	White=45% Black=23% Hispanic=16% Asian=14% American Indian=2%	32% range 4% to 93%
Denver VINE	Girls=48% Boys=52%	White=38% Black=2% Hispanic=58% Asian=1% American Indian=2%	16% range 3% to 28%
Denver Control	Girls=42% Boys=58%	White=37% Black=18% Hispanic=35% Asian=6% American Indian=3%	18% range 8% to 27%
Broward County VINE	Girls=53% Boys=47%	White=62% Black=25% Hispanic=10% Asian=3% American Indian=0%	32% range 6% to 52%
Broward County Control	Girls=52% Boys=48%	White=59% Black=33% Hispanic=6% Asian=2% American Indian=0%	37% range 4% to 93%
Seattle VINE	Girls=49% Boys=51%	White=36% Black=21% Hispanic=7% Asian=34% American Indian=2%	41% range 25% to 71%
Seattle Control	Girls=49% Boys=51%	White=39% Black=18% Hispanic=6% Asian=33% American Indian=2%	42% range 36% to 49%
			Type of Community
NAEP ****	Girls=49% Boys=51%	White=70% Black=15% Hispanic=11% Asian=2% American Indian=2%	Disadvantaged Urban=9% Other=69% Advantaged Urban=11% Extreme Rural=11%

* Gender as reported on Post Student Questionnaire
** Ethnicity as reported by schools
*** Denver=% qualified for AFDC (as reported by schools)
Broward County=% on free and reduced lunch (as reported by schools)
Seattle=% on totally free lunch (as reported by schools)
**** The 1990 Science Report Card: NAEP's Assessment of Fourth, Eighth, and Twelfth Graders

Table 5

Delivery of VINE program
Observations (reported by percent)

	92-93*		93-94**
Eager to see leader	100		100
Groups			
of 6	58		67
of 4-8	38		23
smaller or larger	4		10
Gathered			
in circle	81		84
loosely	18		14
not gathered	1		2
Challenged			
issued	88		91
not issued	12		10
Directions			
clear	75		80
sort of clear	22		20
confusing	3		0
Boundaries			
shown	86		87
not shown	14		13
Groups			
pairs or small groups	98		97
large groups	2		3
whole class	0		0
Outdoors			
on site	96		97
adjacent to site	4		2
away from school	0		1
Volunteer interaction			
with children	89		88
volunteer talks	11		11
little guidance	0		1
Equipment			
used by students	92		95
used by some students	8		2
used by volunteer	0		2
not used	0		0

Table 5 (continued)

	92-93*		93-94**
Student involvement			
very involved	91		84
somewhat involved	9		16
not involved	0		0
bored	0		0
Student interaction			
with activity	97		99
not with activity	3		2
not interacting	0		0
Teacher			
involved	75		79
occasionally involved	15		14
with only one group	5		2
not involved	5		6
Cleaning up materials			
by all students and volunteers	59		64
by some students and volunteers	36		31
none	5		5
Volunteer cleans			
yes	99		100
no	1		0
Group discussion			
each group	68		66
some groups	28		32
none	4		2
Talk about next session			
each group	42		45
none	58		55
Follow up discussion by class			
yes	77		73
no	21		26
go back to regular activities	2		1
Follow up discussion by volunteers			
yes	46		88
no	54		12

* 92-93 All observers=110, Teacher observers=58, Outside observers=52
** 93-94 All observers=135, Teacher observers=79, Outside observers=55

Denver Observations

The observations from Denver were very positive. Students were eager to see their leaders (100% yes) and were outdoors on the project site and organized in groups of 6 around the leader. They were issued the challenge for that activity by the leader who also explained the materials and tools to be used and pointed out the boundaries. The volunteer leaders interacted with the children as they used the tools and were involved in the activity. The classroom teacher was also involved with the students. The students and volunteers cleaned and reassembled the equipment. Each group discussed and compared their findings and talked about the next session. The volunteer team discussed their activity. The high school students who were volunteers discussed their activity with their teachers. Of those that were reported, Litter Critters was observed the most frequently (52%), followed by Birds Nests (43%).

Broward County Observations

Broward County students were also eager to see their volunteer leaders. They gathered outdoors in small groups around their leaders and were issued the challenge for the activity. The leader explained the materials and pointed out the boundaries. The volunteers interacted with the students as they used the tools and were involved in the activity. There teachers circulated among the groups and were available to handle problems. Students and volunteers cleaned and reassembled the equipment. Like the Denver groups, Broward County students and volunteers discussed their findings. Some of the groups (53%) talked about the next session. The volunteer groups discussed their successes and failures after the activity. Broward County observers did not report the name of the activity that was observed.

Seattle Observations

The Seattle observation data were similar to that of Broward County and Denver. Students were eager to see the volunteer leaders (100% yes). They gather in small groups around the leader and were issued the activity challenge. The leaders explained the materials and pointed the boundaries of the outdoor activity site. The volunteers interacted with the students as the students used their tools and were active with the lesson. The teachers moved among groups and were available to handle any problems. Some of the groups helped the volunteers clean and reassemble the equipment. After the activity the groups discussed their findings, but few of the groups talked about the next session. The volunteers discussed their problems and successes and the students discussed the activity back in the classroom. The activities that were observed in Seattle were Roots and Shoots (51%) and Flower Powder (49%).

3. WHAT IS THE IMPACT OF THE VINE PROGRAM?

a. How has the VINE program influenced student perceptions of their learning?

Draw the Schoolyard

Students were asked to draw what they had seen in the schoolyard before they participated in the VINE activities and again after the activities. A random sample of the Draw the Schoolyard pictures were analyzed using three criteria: application; organization or context; and complexity.

1. Application was considered to mean application of the information presented in a VINE activity. For example, if a student placed a bird's nest in a bush or tree in a post-VINE drawing, and had not done so in a pre-VINE drawing, it was considered a change in application.

2. Organization or context was defined as the logical coherence of the picture. Some students organized their pictures by drawing a literal representation of the schoolyard. If they used this context, then change was considered to be shown by adding more to that context. Some students used a diagram or listing of objects from the schoolyard. It they used this organization for the picture, change might have been shown by the number of items drawn.
3. Complexity was considered to be the amount and type of detail included in the drawing. An example of change might be a student who randomly placed legs on a drawing of spider before VINE, and placed the legs correctly after VINE.

The problems associated with using the three criteria are that changes demonstrated by students may be due to maturation or learning not related to VINE, and conversely that students may not have shown change because of their stage of development.

The evaluation of pictures was conducted by using the following procedures. A team of evaluators worked together on a set of pictures to determine the criteria and what would constitute "Noticeable change", "Some change", and "No change". A pre and post drawing done by the same student were placed side by side and examined. After the three criteria were developed and standards set for demonstrated change, a single evaluator examined the randomly chosen set of pictures (N=105). This procedure controlled the subjective nature of the evaluation as much as possible.

The results of this analysis showed the most change in application. Seventy-five percent of the student drawings examined showed some or noticeable change. Only 47% showed some or noticeable change in context, and and 40% showed some or noticeable change in complexity. These results appear

to indicate that students were able to apply what they learned in VINE activities in drawing their schoolyard. Drawings from all three locations showed similar patterns. Figures 1-4 illustrate the changes. Noticeable change and some change were compressed, and change was compared to no change. Expanded graphs are in the appendix.

Figure 1

Draw the Schoolyard Summary

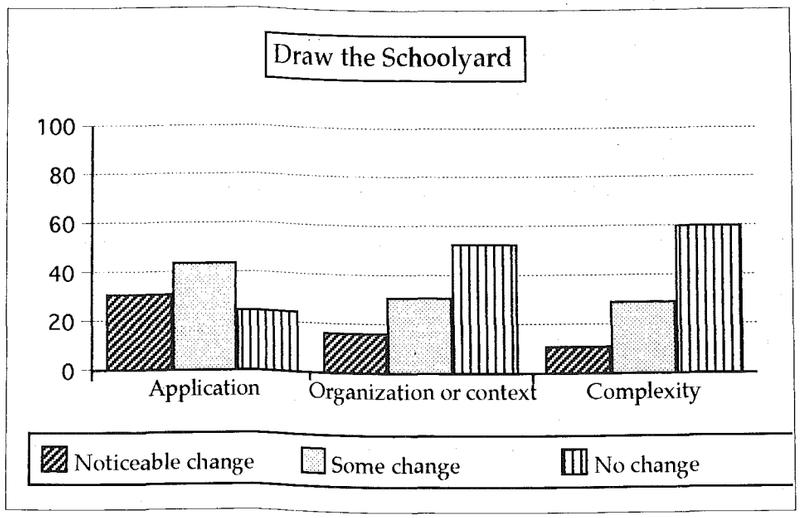
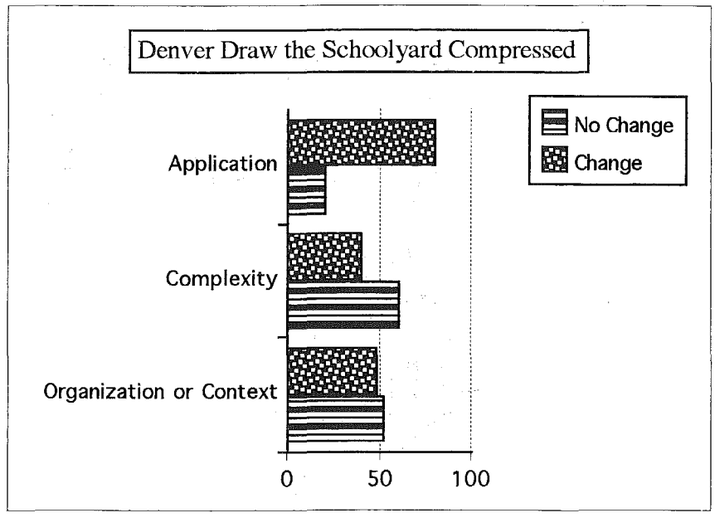


Figure 2

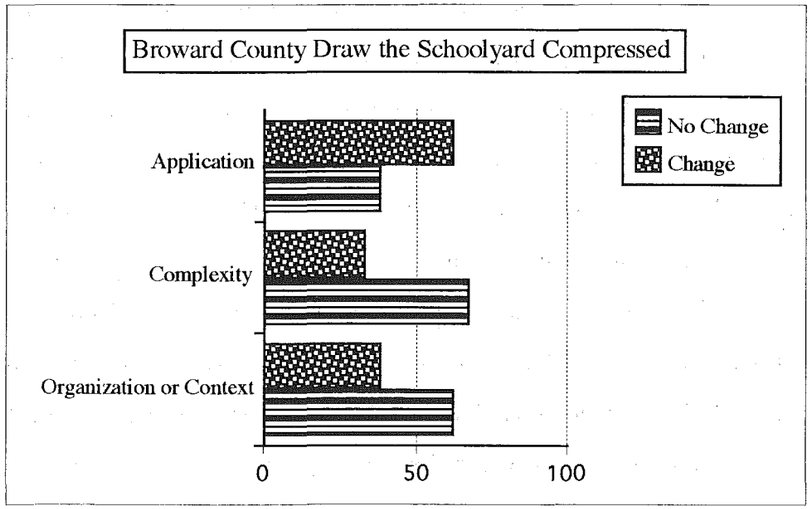
Denver Draw the Schoolyard



Change includes Some Change and Noticeable Change

Figure 3

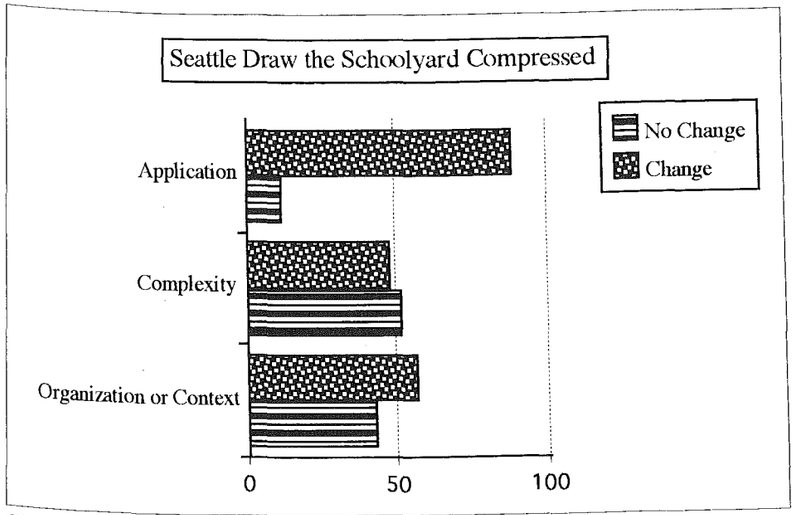
Broward County Draw the Schoolyard



Change includes Some Change and Noticeable Change

Figure 4

Seattle Draw the Schoolyard



Change includes Some Change and Noticeable Change

Outdoor Activity Survey

Student were asked on the Outdoor Activity Survey if they had learned something that they did not know before they did the outdoor activities. Students and teachers were very positive in their responses. Fifth graders who had previously participated in the program were also asked if they had learned something new, and they also agreed that they had. A summary of the responses is shown in Table 6.

Responses in each city were also very positive. In Denver, 77% of the students responded "yes" and an additional 15% responded "somewhat". All (100%) of their teachers responded that they felt their students had learned something new. In Broward County, 71% of the students reported that they had learned something and 20% reported "somewhat". Eighty-seven percent of Broward County teachers responded "yes" and 13% responded "somewhat"'.

Seattle students were similar to the other cities. Seventy-one percent reported that they had learned something new and 18% responded "somewhat". All (100%) of the Seattle teachers responded that their students had learned something new.

Table 6

Students Learned Something New

	Yes	Somewhat	No
VINE students 1992-93 N=821	74 %	20 %	6 %
VINE students 1993-94 N=944	72 %	18 %	10 %
Teachers 1992-93 N=64	89 %	11 %	0 %
Teachers 1992-93 N=33	93 %	7 %	0 %
Previous VINE participants N=621	70 %	not a choice	30 %

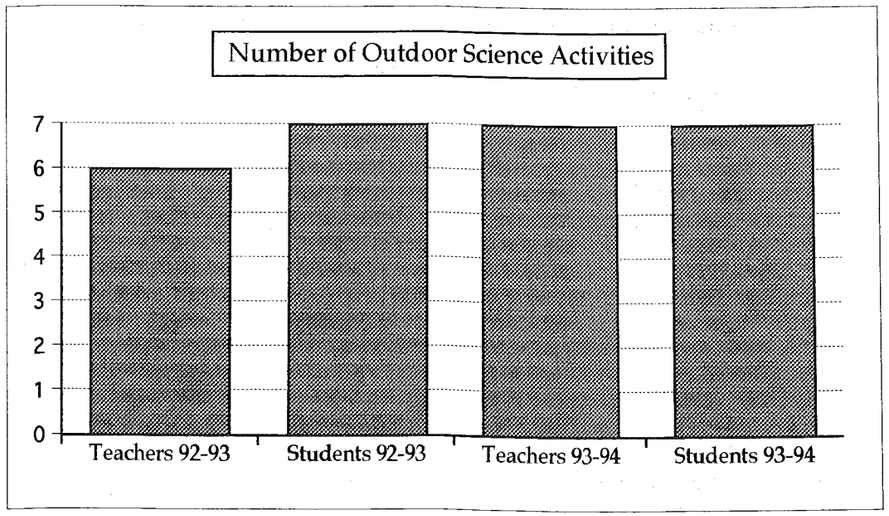
b. Does the presence of the VINE program increase the number of outdoor science activities offered to students?

The number of outdoor science activities offered to students was reported by teachers and students. Only those students participating in the VINE program were involved in the outdoor activities. During the 1992-93 school year, there were 9 control schools, but none of the students attending a control school participated in the outdoor activities as delivered by the VINE program. The average number of outdoor activities reported by teachers and students

indicate that students are receiving more outdoor activities as a result of the VINE program. Figure 5 shows the number of outdoor activities.

Figure 5

Number of Outdoor Science Activities



Further support to indicate that the VINE program may increase the number of outdoor science activities offered to children was shown in the responses to the Outdoor Activity Survey. One of the questions asked whether participants wanted to do more outdoor activities. Students were very positive in their responses. Teachers were also asked if they would like to do more outdoor activities, and if they thought that their students would like to do more outdoor activities. Again, the responses were very positive as can be seen in Table 7.

Table 7

Want More Outdoor Science Activities Like VINE

	Students (n=821) 92-93			Students (n=944) 93-94			Teacher s (n=64) 92-93			Teacher s (n=33) 93-94		
	Yes	Some what	No	Yes	Some what	No	Yes	Some what	No	Yes	Some what	No
Teacher wants more							91 %	9 %	0 %	93 %	7 %	0 %
Student wants more	84 %	12 %	4 %	83 %	12 %	5 %	96 %	4 %	0 %	100 %	0 %	0 %

Fifth grade students who had previously participated in the VINE program were asked if they were doing outdoor activities this year like those they did last year. Only 25% said that they were, while 75% responded that they were not. This information suggests that the presence of the VINE program does increase the number of outdoor science activities offered to students.

c. Does the presence of the VINE program increase the number of students participating in outdoor science and/or plant or animal activities?

Student Questionnaire

The increase in the number of students participating in outdoor science activities and plant and animal activities can be seen by comparing the responses of students before the VINE program with the responses of the same students after the VINE program. Students completed a Student Questionnaire before and after VINE. Comparisons were made between pretest (before VINE) responses and post test (after VINE) responses for students participating in the VINE program during the two years included in this study. In the first year of

the study, students from control schools also completed a Student Questionnaire in the fall and in the spring.

Significant increases were found in the number of students participating in VINE who reported doing experiments with plants or animals for both years. No increase was found in the number of students who reported doing experiments with plants or animals in the control schools used during the first year. There was a significant difference between the VINE and control students on the post test. More VINE students reported doing experiments or projects with plants or animals.

A significant increase was also found in the number of students who reported the frequency of outdoor science activities. Those participating in the VINE program reported more frequent outdoor science activities on the Student Questionnaire administered after VINE. The control group did not report a significant increase. VINE students also reported a higher frequency of outdoor science activities compared to the control group.

Schools that were classified as Disadvantaged Urban were compared with other schools. Disadvantaged Urban was a classification of schools used in the NAEP analysis to indicate schools where a significant percentage of the students were classified as economically disadvantaged by the district. Separate analyses were done with these schools to determine if there were any differences. Students from Disadvantaged Urban schools also showed a significant increase. More students reported that they did experiments or projects with plants or animals after VINE. The same results were found in frequency of outdoor science activities. Students reported doing outdoor science activities more frequently after VINE.

Students were asked how often they did outdoor science activities that were not a part of school. These responses tended to be mixed. Some students

appeared to interpret VINE activities as being a part of school, while others saw VINE as not a part of school. The only group that reported an increased frequency in outdoor activities that were not a part of school were the VINE participants in 1992-93.

The question about experiments or projects with plants or animals was compared with data from NAEP. The NAEP questions were asked on only one occasion rather than before and after like the VINE questions. All NAEP students and Disadvantaged Urban NAEP students were significantly lower than VINE students when the NAEP responses were compared to the VINE post test responses. Tables 8-10 illustrate the increase in number of students who reported participating in plant or animal experiments or project and outdoor science activities.

Table 8

Experiments or Projects with Plants or Animals

		Significant differences p < .01
VINE Pre 1992-93 N=636	Yes=64%	
VINE Post 1992-93 N=636	Yes=85%	Significant increase
VINE Pre 1992-93 Disadvantaged Urban N=83	Yes=58%	
VINE Post 1992-93 Disadvantaged Urban N=83	Yes=81%	Significant increase
Control Pre 1992-93 N=410	Yes=68%	
Control Post 1992-93 N=410	Yes=68%	No difference
VINE Pre 1993-94 N=758	Yes=74%	
VINE Post 1993-94 N=758	Yes=82%	Significant increase
VINE Pre 1993-94 Disadvantaged Urban N=97	Yes=63%	
VINE Post 1993-94 Disadvantaged Urban N=97	Yes=79%	Significant increase
NAEP All 1990 N=3631	Yes=58%	Significantly lower than VINE students
NAEP 1990 Disadvantaged Urban N=418	Yes=55%	Significantly lower than VINE students

Table 9

Frequency of Outdoor Science Activities

	Almost every day	Several times a week	About once a week	Less than once a week	Never	AVE.	SIGNIFICANT DIFFERENCE p < .01
VINE Pre 1992-93 N=636	9 %	9 %	13 %	29 %	39 %	Less than once a week (3.8)	
VINE Post 1992-93 N=636	4 %	10 %	22 %	47 %	16 %	Less than once a week (3.6)	More frequent
VINE Pre 1992-93 Disadvantaged Urban N=83	0 %	13 %	7 %	34 %	45 %	Less than once a week (4.1)	
VINE Post 1992-93 Disadvantaged Urban N=83	16 %	1 %	18 %	37 %	28 %	Less than once a week (3.6)	More frequent
Control Pre 1992-93 N=410	5 %	6 %	15 %	30 %	44 %	Less than once a week (4.0)	
Control Post 1992-93 N=410	5 %	4 %	10 %	48 %	33 %	Less than once a week (4.0)	No difference
VINE Pre 1993-94 N=758	7 %	7 &	14 %	10 %	62 %	Less than once a week (4.1)	
VINE Post 1993-94 N=758	4 %	8 %	28 %	40 %	19 %	Less than once a week (3.6)	More frequent
VINE Pre 1993-94 Disadvantaged Urban N=97	4 %	3 %	9 %	8 %	76 %	Less than once a week (4.4)	
VINE Post 1993-94 Disadvantaged Urban N=97	5 %	9 %	22 %	41 %	23 %	Less than once a week (3.7)	More frequent

Table 10

Frequency of Outdoor Science Activities Not Part of School

	Almost every day	Several times a week	About once a week	Less than once a week	Never	AVE.	SIGNIFICANT DIFFERENCE
VINE Pre 1992-93 N=636	12 %	11 %	16 %	24 %	37 %	Less than once a week (3.6)	
VINE Post 1992-93 N=636	9 %	9 %	26 %	31 %	25 %	Less than once a week (3.5)	More frequent $p < .05$
VINE Pre 1992-93 Disadvantaged Urban N=83	11 %	13 %	12 %	23 %	40 %	Less than once a week (3.7)	
VINE Post 1992-93 Disadvantaged Urban N=83	9 %	11 %	19 %	30 %	32 %	Less than once a week (3.6)	No difference
Control Pre 1992-93 N=410	10 %	13 %	17 %	24 %	37 %	Less than once a week (3.6)	
Control Post 1992-93 N=410	8 %	8 %	17 %	32 %	36 %	Less than once a week (3.8)	No difference
VINE Pre 1993-94 N=758	13 %	8 %	18 %	23 %	37 %	Less than once a week (3.6)	
VINE Post 1993-94 N=758	11 %	10 %	21 %	28 %	31 %	Less than once a week (3.6)	No difference
VINE Pre 1993-94 Disadvantaged Urban N=97	19 %	9 %	17 %	20 %	35 %	Less than once a week (3.4)	
VINE Post 1993-94 Disadvantaged Urban N=97	15 %	6 %	13 %	24 %	40 %	Less than once a week (3.7)	No difference

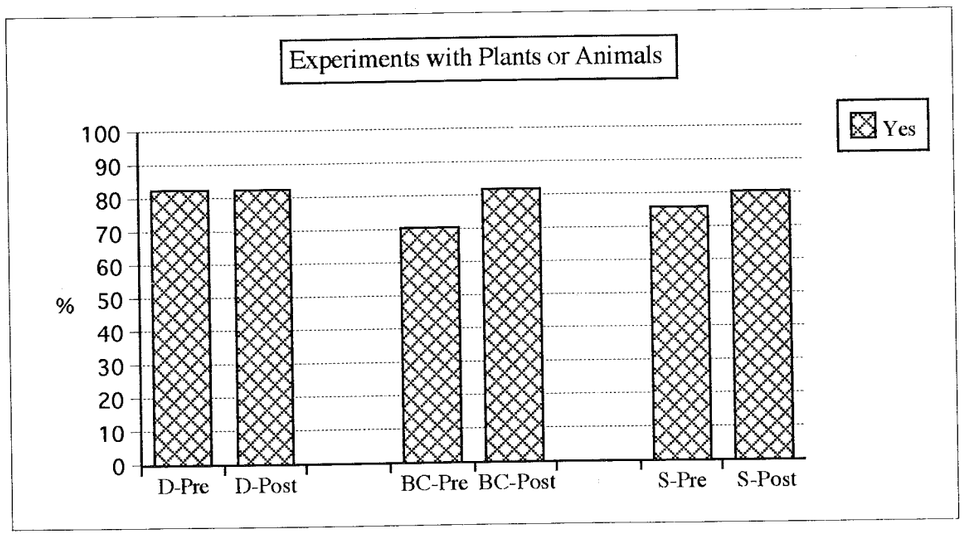
City Comparisons 1993-94

Seattle reported having outdoor science more frequently than the other cities. Denver students reported that they did outdoor science more frequently on the post test. Broward County students reported that they did experiments with plants or animal more frequently on the post test. They also reported that they did outdoor science activities more frequently. Seattle students agreed with those from the other locations that they had more outdoor science. The following figures (6-9) illustrate those responses.

Figure 6

Have you ever done experiments or projects at home or in school with plants or animals?

(Comparison of Yes responses before the VINE program with Yes responses after the VINE program.)



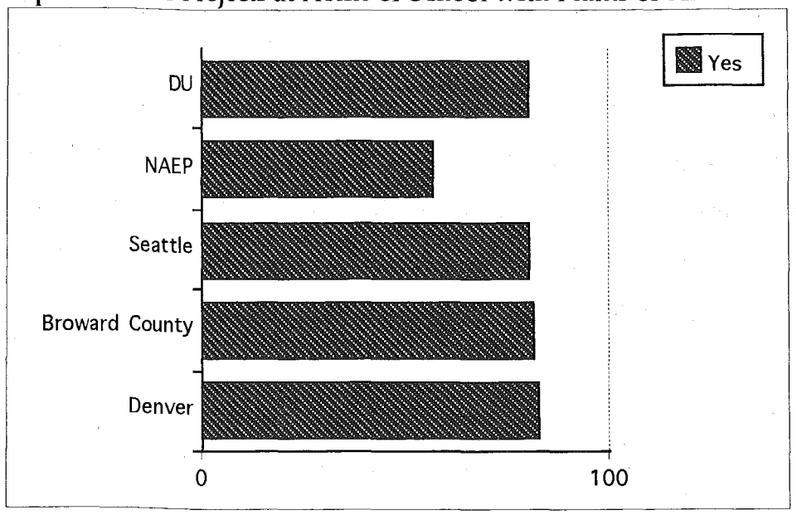
D-Pre=Denver Pretest
D-Post=Denver Post test (no significant difference)

BC-Pre=Broward County Pretest
BC-Post=Broward County Post test (significant difference $p < .01$)

S-Pre=Seattle Pretest
S-Post=Seattle Post test (no significant difference)

Figure 7

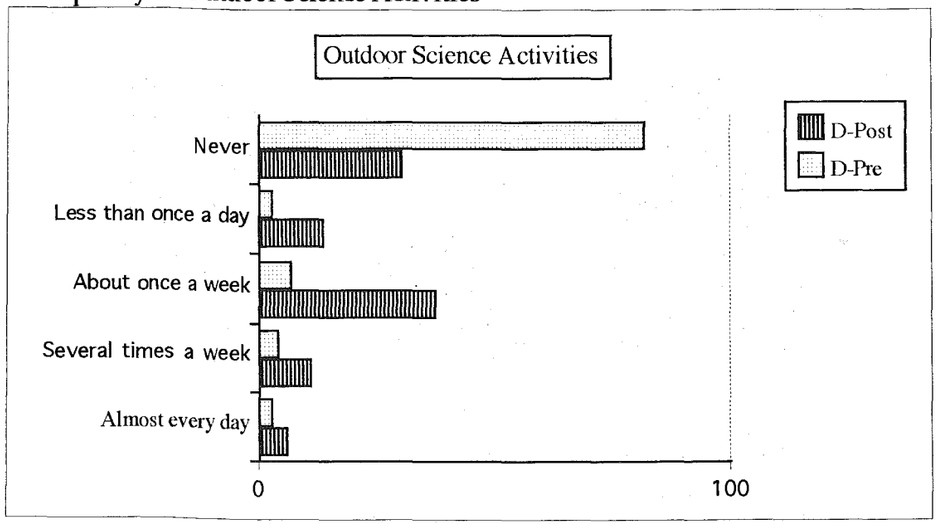
Experiments or Projects at Home or School with Plants or Animals



DU = VINE Disadvantaged Urban
NAEP = National Assessment of Educational Progress (1990)
Yes responses on post test assessments (DU, Seattle, Broward County, Denver)

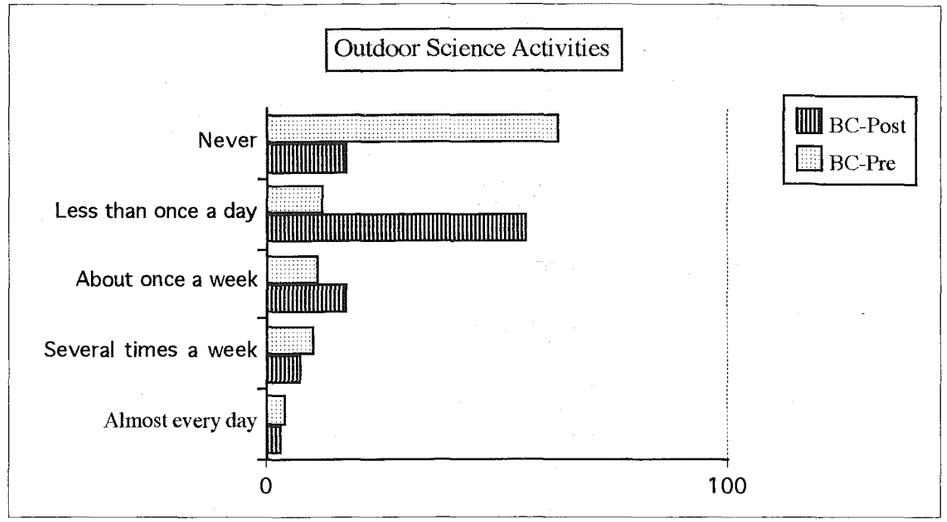
Figure 8

Frequency of Outdoor Science Activities



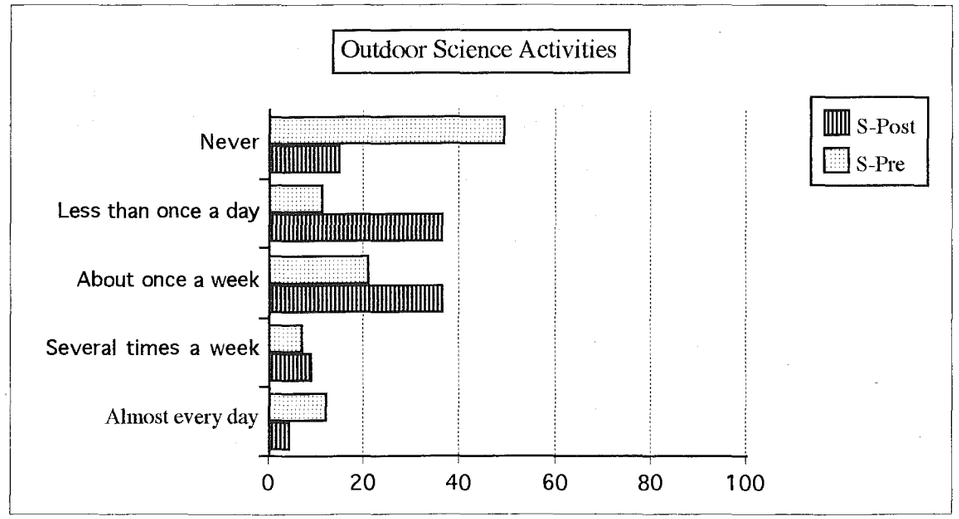
D-Pre=Denver Pretest D-Post=Denver Post test

Denver students reported that they participated in outdoor science activities more frequently ($p < .01$) after the VINE program.



BC-Pre=Broward County Pretest BC-Post=Broward County Post test

Broward County students also reported that they participated in outdoor science activities more frequently ($p < .01$) after the VINE program.

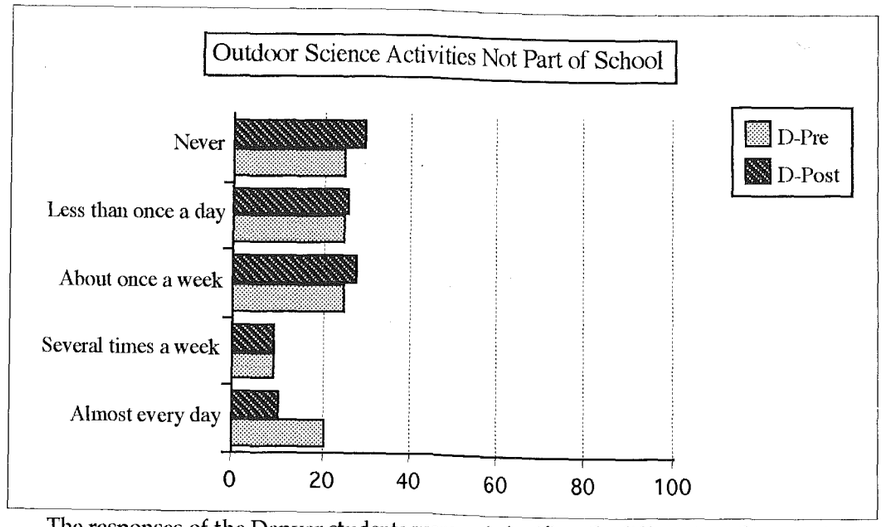


S-Pre=Seattle Pretest S-Post=Seattle Post test

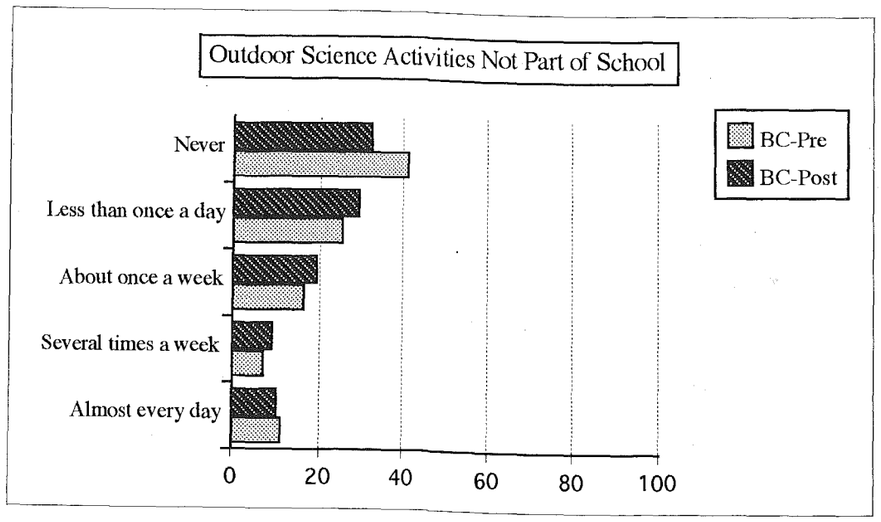
Seattle students also reported that they participated in outdoor science activities more frequently ($p < .01$) after the VINE program.

Figure 9

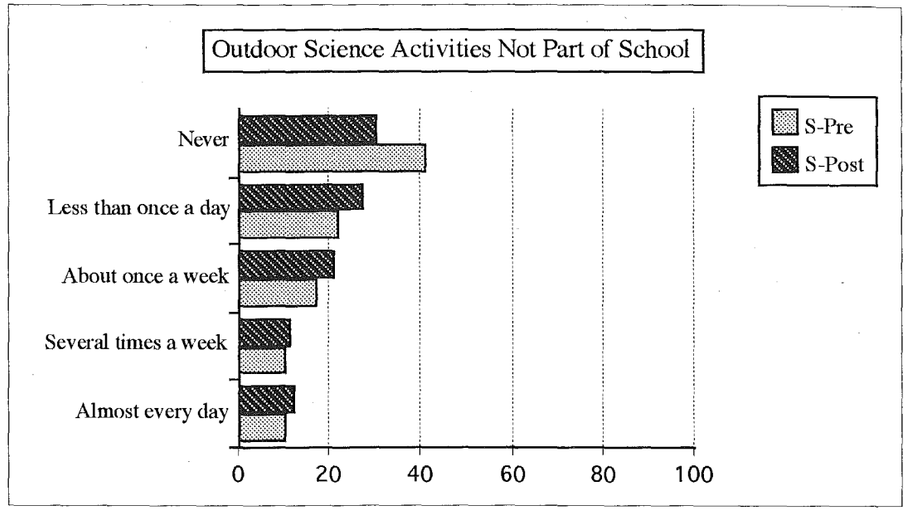
Frequency of Outdoor Science Activities Not as a Part of School



The responses of the Denver students were not significantly different on the post test as compared to the pretest ($p < .07$).



The responses of the Broward County students like those of the Denver students. They showed a tendency to respond that they had outdoor science that was not a part of school more frequently, but the difference from pretest to post test was not significant ($p < .07$).



Students from Seattle reported that they had outdoor science that was not a part of school significantly more frequently on the post test ($p < .05$).

d. What is the continuing impact of the program as reported by 5th grade students?

A follow-up questionnaire was administered to fifth grade students from all three sites. Students included both those who had participated in last year's VINE activities and those who had not. Both the participant and non-participant groups were given the same initial set of questions to assess their attitudes and interest in science, but the participant group was also given an additional set of questions about VINE activities. The open-ended questions in the survey were summarized into 8-10 general response categories based on the students' answers. Responses were then assessed to see if any differences between the groups existed. Results indicated that VINE activities had a positive effect on children's attitudes about and interest in science.

Definitions of science

Previous participants and nonparticipants were asked what they thought of when they heard or read the word "science". While both groups responded with similar categories to the question of how they define science, the groups differed in the proportion of responses in each category. Those who had participated in VINE activities the previous year tended to give significantly more definitional responses that contained positive feelings about science. Results are summarized in Table 11.

Table 11

Definitions of science

	Previous Participant in VINE N= 621	Nonparticipants N=535
Activities or experiments	30 %	31 %
Specific subjects (Astronomy, Rockets, Animals)	23 %	21 %
Positive feelings (I like science; Science is fun)*	22 %	14 %
Learning and being challenged	8 %	8 %
Related to school (Science is what we study in school; Science is taking tests.)	4 %	5 %
Things that happen in the world (Becoming a biologist; Studying global warming)	3 %	5 %
Negative feelings (Science is boring; Science is yucky.)	3 %	5 %
Other	7 %	11 %

* Significantly more positive feelings toward science were expressed by previous VINE participants ($p < .01$)

Interest in science

Both groups were asked if they were interested in science. If they answered that they were, they were asked to explain what they were the most interested in, what they had done in school that got them interested, and what they had done out of school to get them interested in science. A significantly larger percentage of the fifth graders who had participated in VINE the previous year, reported being interested in science in comparison with those who had not been part of the program. Because more of the previous participants answered that they were interested in science, more of them also reported specific areas of interest in science. Significantly more of the previous participants reported that they had done things in school and out of school that got them interested in science. When previous participants who reported being interested in science were compared to nonparticipants who also reported being interested in science, some significant differences were found. Previous VINE participants reported that they were most interested in life sciences such as learning about plants or studying insects. Previous participants also reported that they had done activities and experiments in school and learned about science at school. Nonparticipants were more likely to report that they had done nothing in school that got them interested in science. Previous participants reported doing home activities or experiments that got them interested in science. Their responses appear to indicate that the VINE program has a continuing positive impact on students. Table 12 shows the results.

Responses of previous VINE participants

Students who had previously participated in the VINE program were asked a set of questions about their experiences. The majority of the students considered VINE activities to be "science" activities. For those who did, studying

things in the environment was the most cited reason why they considered VINE to be science. They also said that they were learning about science, they liked science, and had fun in VINE. The majority also felt they had learned something new from the VINE activities, with 22% identifying "learning about animals or insects" and 12% identifying "learning about plants" as the top two areas of learning mentioned. When asked about the outdoor activities they remembered doing in VINE, 39% referred to "activities with insects," 22% referred to "activities with plants," and 10% mentioned "activities with birds." Results are summarized in Table 13.

Table 12

Interest in science

	Previous Participant in VINE N= 621	Nonparticipants N=535
Are you interested in science? *		
Yes †	85 %	74 %
No	15 %	27 %
If you are interested in science, what are you most interested in?*†	84% responded	73% responded
Doing activities or experiments	25 %	22 %
Life sciences (ex. plants) ††	23 %	16 %
Physical sciences (ex. rockets)	17 %	15 %
Earth sciences (ex. rocks)	5 %	5 %
General science	5 %	2 %
Chemistry	3 %	5 %
Learning new things	3 %	3 %
Other subjects	0 %	1 %
Other	4 %	4 %
If you are interested in science, what have you done in school?*†	88% responded	74% responded
Activities or experiments ††	48 %	38 %
Learning about science in general †††	9 %	6 %
Nothing •	8 %	11 %
Learning about life sciences	6 %	5 %
Learning about physical sciences	5 %	4 %
Teacher influence (ex. My teacher does fun things)	4 %	2 %
Learning about earth sciences	2 %	2 %
Learning about chemistry	1 %	1 %
Successful experiences (ex. I get good grades in science)	1 %	0 %
Other	7 %	5 %
If you are interested in science, what have you done out of school?*†	89% responded	72% responded
Home activities or experiments ††	40 %	31 %
Nothing	16 %	13 %
Outdoor experiences (ex. hiking, gardening)	6 %	4 %
Reading or TV (ex. Read animal books)	6 %	5 %
Go to exhibits (ex. museums)	5 %	5 %
Organized camps or classes (ex. Museum classes)	3 %	2 %
Adult influences (ex. Do things with my mom)	3 %	1 %
Other	10 %	11 %

* Percentage of total number of Previous VINE Participants or Nonparticipants was reported
† Significantly more or the Previous VINE Participants reported having areas of interest in science ($p < .01$), and having done things in school ($p < .01$) and out of school that got them interested in science ($p < .05$)
†† Significantly more of the Previous VINE Participants answered in this way ($p < .01$)
††† Significantly more of the Previous VINE Participants answered in this way ($p < .05$)
• Significantly more of the Nonparticipants answered in this way ($p < .05$)

Table 13
Responses of previous VINE participants

	Previous VINE Participants N=621
Do you consider Audubon activities to be science?	
Yes	88 %
No	12 %
Why/Why not?	
Because we study things in the environment	42 %
Because we learn science	16 %
Positive feelings (Because I like science; Audubon is fun)	15 %
Because we do activities and experiments	10 %
Because we will use it in the future	6 %
Because we do it in school	1 %
Negative feelings (I hate science)	1 %
Other	10 %
Did you learn something new?	
Yes	70 %
No	30 %
What did you learn?	
About animals or insects	33 %
About plants	17 %
How to do activities or experiments	13 %
How to make birds nests or feeders	6 %
About environment impact (ex. pollution)	4 %
About water or soil	3 %
How to use scientific tools (ex. magnifying glasses)	2 %
Other	11 %
What do you remember?	
Activities with insects	42 %
Activities with plants	24 %
Activities with birds	10 %
Activities with water or soil	4 %
Using scientific tools	3 %
Being outside	2 %
Nothing	1 %
Other	5 %

Continuation of outdoor activities and interest in science

Only 25% of the students who were previous participants indicated that they were currently doing outdoor activities similar to those done in VINE. Of that 25%, most of them reported doing outdoor activities at school with teachers. Most of them reported that they were learning about nature. Table 14 shows their responses.

The previous participants were asked if the VINE program increased their interest in science. Their responses were positive. Sixty-seven percent reported that VINE activities had increased their interest in science. When asked to explain why, 39% reported increased positive feelings about science as presented in the VINE program and 24% reported reasons that were connected to school like better grades or increased science learning. The responses are summarized in Table 14.

The information gathered from 5th grade students appears to support the continuing impact of the VINE program. Previous participants report positive feelings and attitudes toward science. They also reported that they learned something new from the program, and have an increased interest in science. According to their responses, they do not have the opportunity to study science using outdoor activities without the presence of the VINE program.

Table 14

Continuing impact of VINE

	Previous VINE Participants N=621
Are you doing outdoor activities this year?	
Yes	25 %
No	75 %
If yes, where are you doing them? (N=148)	
At school	65 %
At camp	11 %
At home	9 %
Other	15 %
If yes, with whom? (N=145)	
Teachers or school	83 %
Parents or relatives	8 %
Self	6 %
Friends	3 %
If yes, what are you doing? (N=136)	
Learning about nature	46 %
Going camping or hiking	9 %
Planting flowers or gardening	4 %
Other (miscellaneous personal)	55 %
Has Audubon increased your interest in science?	
Yes	67 %
No	32 %
Why/Why not?	
Positive feeling (ex. I like science)	39 %
Connection to school (I get better grades)	24 %
Negative feelings (Science is boring)	13 %
I already knew what we learned in Audubon	5 %
I was already interested in science	4 %
Being outdoors	3 %
Doing activities and experiments	3 %
Other	9 %

e. How has the VINE program influenced teachers?

Teachers were asked if the VINE project has influenced their teaching and/or curriculum. Of the teachers that responded (N=46), 77% said "Yes" and 23% said "No". Reasons that were given were:

Positive influence (ex. excited, encouraged, involved students)	33%
Preteaching to prepare or follow-up after activities	15%
Encouraged me to use hands-on activities	15%
Other (individual responses)	12%
Gave me new ideas or information	12%
Encouraged me to do outdoor activities	6%
Encouraged me to teach environmental studies	6%

Responses from each city were similar.

INFLUENCED TEACHING AND/OR CURRICULUM:

	Yes	No
Denver (n=10)	78%	22%
Broward County (n=22)	71%	29%
Seattle (n=14)	86%	14%

Denver teacher reported that the VINE program has influenced their teaching by exciting, encouraging, and involving students in science (43%) and by providing a model for teachers of hands-on activities (29%). Broward County teachers reported the same type of encouragement for their students (36%), as did Seattle teachers (25%). Seattle teachers also reported that VINE had given them new ideas and information (25%).

Teachers were asked if they would try to provide activities similar to VINE. A summary of results in shown in Table 15.

Table 15

Provide Similar Experiences
(N=46)

Would you provide activities?						
Yes	66 %					
No	34 %					
Do you have or could you get...	Interest	Classroom time	Preparation time	Materials	Specialized training	Additional personnel
Yes	98 %	81 %	57 %	52 %	45 %	23 %
No	2 %	19 %	43 %	29 %	55 %	77 %

Responses varied from city to city.

PROVIDE ACTIVITIES SIMILAR TO VINE:

	Yes	No
Denver	44%	56%
Broward County	80%	20%
Seattle	58%	42%

Although teachers seemed to have the interest and the ability to find the time to provide experiences similar to VINE for their students, they were more unsure about finding the time for preparation, being able to provide the materials, and not certain of being able to acquire the specialized training. They did not feel they had or could get the additional personnel that allows for the small group instruction and individual attention provided by the VINE program.

4. DOES THE PRESENCE OF VINE ALTER THE ATTITUDES OF STUDENTS TOWARD SCIENCE?

Student Questionnaire

On the Student Questionnaire, students were asked if they liked science. The same question was asked on the pretest before the students participated in the VINE program and again on the post test when they had finished the activities. Students liked science before the VINE program and they still liked it after the program ended. A higher percentage of students participating in the VINE program reported liking science than those who were a part of the National Assessment of Education Progress (NAEP) in 1990. There was little difference between VINE students in schools classified as Disadvantaged Urban and students attending other schools. Table 16 is a summary of the results. Figure 10 shows a comparison of each city, NAEP data, and Disadvantaged Urban school student responses. Figure 11 is a comparison of pre and post data for each city. Because the number of students who reported that they liked science was so high on the pretest measure, there was very little chance of an increase in positive responses.

Table 16

Students Who Like Science

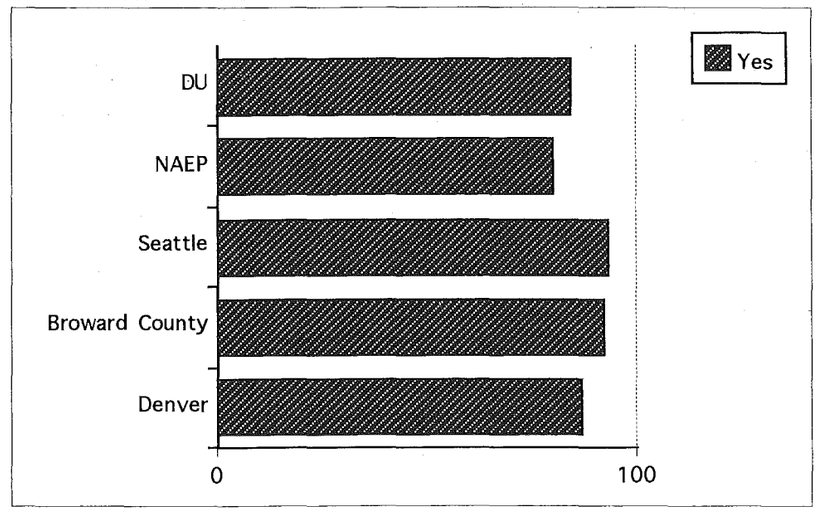
	Yes	No
1992-93•		
VINE Pre (n=636)	91%	8%
VINE Post (n=636)	90%	10%
VINE Disadvantaged Urban Pre (n=83)	86%	12%
VINE Disadvantaged Urban Post (n=83)	88%	12%
Control Pre (n=410)	89%	11%
Control Post (n=410)	90%	10%
1993-94•		
VINE Pre (n=758)	91%	9%
VINE Post (n=758)	91%	9%
VINE Disadvantaged Urban Pre (n=97)	88%	12%
VINE Disadvantaged Urban Post (n=97)	92%	7%
NAEP (1990)[5]		
All (n=5008)	80%	
Disadvantages Urban (n=593)	78%	

- There was no significant increase in number of students reporting that they liked science, however VINE participants reported liking science more frequently than did those participating in the NAEP study.

5 Jones, L. R., Mullis, I. V.S., Raizen, S. A., Weiss, I. R., & Weston, E. A. (1992). The 1990 science report card: NAEP's assessment of fourth, eighth, and twelfth graders. Washington, DC: Prepared by EDUCATIONAL TESTING SERVICE under contract with the National Center for Education Statistics.

Figure 10

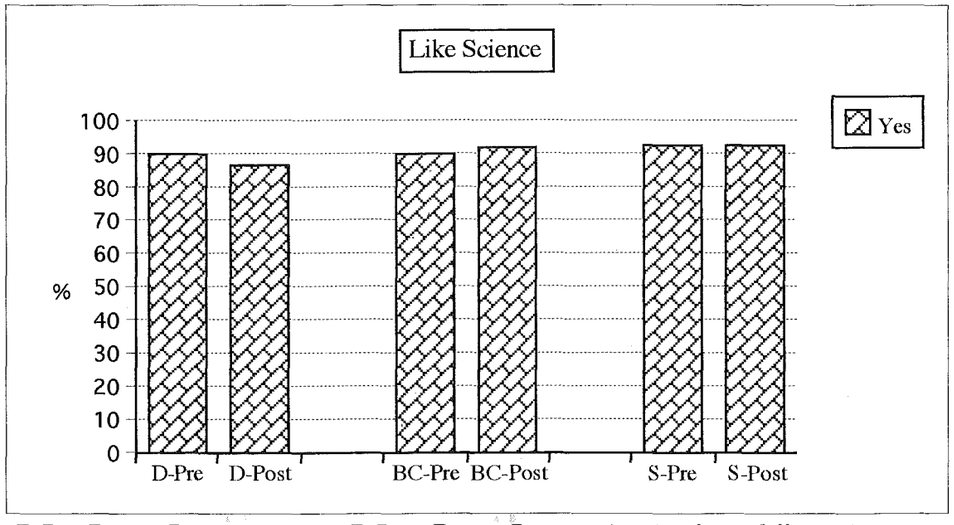
Students Who Like Science



DU= VINE Disadvantaged Urban
NAEP= National Assessment of Educational Progress (1990)
Yes responses on post test assessments (DU, Seattle, Broward County, Denver)

Figure 11

Students Who Like Science Before and After VINE



D-Pre=Denver Pretest
D-Post=Denver Post test (no significant difference)
BC-Pre=Broward County Pretest
BC-Post=Broward County Post test (no significant difference)
S-Pre=Seattle Pretest
S-Post=Seattle Post test (no significant difference)

Outdoor Activity Survey

Students were given a questionnaire to rate how they felt about the outdoor activities they participated in during the VINE program. For both years the survey results showed that the students liked the activities and had positive things to say about the program. The responses of the students appeared to indicate positive attitudes toward outdoor science activities as presented by the VINE program. Responses by city are summarized in the appendix and a summary of responses are summarized later in this report.

Denver Students

The majority of Denver students reported that they participated in 8 outdoor activities through the VINE program. Most found the activities fun and liked being outdoors. They did not feel the activities were too long. They tended to like the materials and the activity leader. Seventy-seven percent reported having learned something new as a result of the outdoor activities. While most of the Denver students (69%) stated that they discussed the activities back in the classroom, 21% stated that they discussed them only somewhat and 11% said they did not discuss them. The majority wanted to do more activities like the VINE program.

Broward County Students

Most Broward County students reported that they participated in 5 outdoor activities. Most felt the activities were fun and not too long. They also liked being outdoors, the materials used, and the activity leaders. Most students said they learned something new as well. About half of the Broward County students reported that they didn't always discuss the activities once they got back to the classroom, while 30% said they did discuss them and 20% said they

didn't discuss them at all. The students definitely wanted to do more activities like this.

Seattle Students

Seattle students reported participating in a varying number of outdoor activities ranging from 5 to 9 activities. Although the percentage was lower than the other two sites, a majority of Seattle students still felt the activities were fun . Similar to the other sites, the students did not think the activities were boring, enjoyed being outdoors, and did not believe the activities were too long . They also liked the materials used and the activity leaders. Most of the students reported that they learned something from the activities. Class discussion results were mixed, with 57% saying they did discuss the activities, 30% saying they discussed them somewhat, and 13% reporting they did not discuss them. Seattle students also wanted to do more outdoor activities like the VINE program.

Student Likes

When asked what they liked most about the outside science activities, results showed that students from the three sites liked a wide variety of the activities offered. Included among the responses were: growing plants, making bird nests, catching bugs, being outside, having bug races, looking at birds, learning about nature, learning new things, and having helpful and fun activity leaders. The following are some of the statements written by students:

"I liked going outside and learning about science."

"We got to see plants' roots and experiment with bugs."

"That you could learn about nature while you had fun and looked at it."

"I liked making birds' nests and hiding them. I liked digging up plants to see the roots."

"The bugs - they are a beautiful part of nature."

"We learned new facts about science."

"I thought it was great doing an outdoor science activity."

"That the leaders were nice and helped me when I needed help."

Student Dislikes

When asked what they liked least about the activities, students tended to state conditions surrounding the activities rather than the activities themselves. Included among the responses were: rainy or cold weather, hot weather, getting dirty, and windy days that "blow stuff away." Some did mention certain activities, such as catching bugs or making flowers. However, many of the students stated that there was nothing about the activities that they didn't like.

The following are some of the statements written by students:

"I liked least when it rained and it was wet."

"It was cold."

"Having to come back inside the school."

"That it was hot and we got itchy from the grass."

"Not everybody got a turn."

"I can't answer that because nothing was boring."

"We had to pick up gross bugs."

"I didn't hate anything because I learned at least one thing every time I went."

"You did not get alot of time to find things."

Outdoor Activity Remembered Best

Following are some of the statements made by the students themselves about the outdoor activities they remembered best:

"I liked roots and shoots, because I can now tell the differences of a fibrous root and a tap root."

"I remember best is about leaves. We collected lots of different kinds: holly leaves, maple leaves, tree leaves and lots more!"

"I liked making a bird's nest with the stuff I found: mud to give it a firm surface and grass to pad it. It took awhile to make it perfect."

"What I remember best is catching bugs with nets! It was really fun!"

"I had a great time catching dragonflies and all sorts of bugs. Our leader was very helpful and when it got boring, he made it fun."

"I love when we had water, soil, and other things for making a plant. It was so fun. We made our own and took care of it."

"Holding the birds because you can't really ever hold a bird alive because they are a lot faster than you are."

"I remember when we looked for bugs. That was the funnest one for me...I found all kinds of odd little bugs. It was a nice day."

Additional information from Student Questionnaire

Students were asked about how often they had science and the frequency of different types of science activities including: reading a science textbook; discussing a science news event; working with other students on a science problem; giving an oral or written science report, and doing science experiments. Before and after VINE percentages for each year are reported for the group as a

whole, for the Disadvantaged Urban group, and for NAEP students. The NAEP study did not include pre and post testing, so there is only one set of data. Tables 17-22 contain summaries of the results. Summaries by city are in the appendix.

Averages for each group were compared, so occasionally a statistical difference was found between average scores, even though there was no practical difference. The statistical difference is reported with a note that indicates there was no practical difference.

Frequency of science

Students did not report any changes in frequency of science from the beginning of VINE to the end. They reported having science several times a week both before and after. An interesting note is that the students in the NAEP study reported that they had science less frequently than the students in this VINE study. Another interesting note is that students in Disadvantaged Urban schools report having science less frequently than the other schools in this study. Table 17 shows the results. By city, Seattle students tended to report that they have science less frequently than Denver or Broward County.

Reading a science textbook

Students did not report any changes in the frequency of reading a science textbook. The average response for all groups of students was "About once a week". Table 18 illustrates a summary of the results. By city, Seattle students reported using textbooks less frequently.

Discussing a science news event

Students did not report any change in the frequency of discussing a science news event. The average response was "About once a week". Results are

shown in Table 19. Seattle students reported discussing news events less frequently than students in Denver or Broward County.

Working with other students on a science problem

Students reported no change in the frequency in working with others on a science problem. The average response was "About once a week". Students from Disadvantaged Urban schools in 1993-94 tended to report working with others less frequently than students in the other schools. Those same students also reported that they worked with others more frequently after VINE, although those differences were not practically significant because the average response both before and after VINE was "Less than once a week". Results are summarized in Table 20.

Giving an oral or written science report

Students reported no change in the frequency of giving oral or written science reports. The average response was "Less than once a week". Responses are shown in Table 21.

Frequency of science experiments

Students reported no change in the frequency of doing science experiments. The average response was "Less than once a week". Students from Disadvantaged Urban schools in 1993-94 reported an increase in frequency of science experiments on the post test measure, but the average response remained "Less than once a week" so the increase was not of practical significance. Table 22 illustrates the responses.

Table 17

Frequency of science

	Almost every day	Several times a week	About once a week	Less than once a week	Never	AVE.	SIGNIFICANT DIFFERENCE p < .01
VINE Pre 1992-93 N=636	38 %	31 %	22 %	7 %	1 %	Several times a week (2.0)	
VINE Post 1992-93 N=636	29 %	33 %	27 %	10 %	1 %	Several times a week (2.2)	Less frequent (No practical difference)
VINE Pre 1992-93 Disadvantaged Urban N=83	6 %	8 %	58 %	27 %	1 %	About once a week (3.1)	
VINE Post 1992-93 Disadvantaged Urban N=83	22 %	16 %	37 &	16 %	9 %	About once a week (2.7)	More frequent (No practical difference)*
VINE Pre 1993-94 N=758	29 %	28 %	27 %	9 %	6 %	Several times a week (2.3)	
VINE Post 1993-94 N=758	22 %	32 %	32 %	10 %	4 %	Several times a week (2.4)	No difference
VINE Pre 1993-94 Disadvantaged Urban N=97	14 %	12 %	54 %	13 %	6 %	About once a week (2.8)	
VINE Post 1993-94 Disadvantaged Urban N=97	20 %	16 %	36 %	22 %	7 %	About once a week (2.8)	No difference*
NAEP 1990 N=6260	51 %	21 %	14 %	8 %	6 %	About once a week (2.7)	Less frequent than VINE schools

* VINE Disadvantaged Urban schools report having science less frequently than other VINE schools

Table 18

Frequency of Reading a Science Textbook

	Almost every day	Several times a week	About once a week	Less than once a week	Never	AVE.	SIGNIFICANT DIFFERENCE p < .01
VINE Pre 1992-93 N=636	23 %	28 %	19 %	9 %	22 %	About once a week (2.7)	
VINE Post 1992-93 N=636	12 %	20 %	23 %	25 %	21 %	About once a week (3.2)	Less frequent (No practical difference)
VINE Pre 1992-93 Disadvantaged Urban N=83	26 %	17 %	25 %	9 %	24 %	About once a week (2.8)	
VINE Post 1992-93 Disadvantaged Urban N=83	21 %	8 %	23 %	15 %	30 %	About once a week (3.2)	Less frequent (No practical difference)
VINE Pre 1993-94 N=758	18 %	30 %	23 %	10 %	20 %	About once a week (2.8)	
VINE Post 1993-94 N=758	13 %	24 %	22 %	15 %	26 %	About once a week (3.2)	Less frequent (No practical difference)
VINE Pre 1993-94 Disadvantaged Urban N=97	17 %	17 %	26 %	14 %	26 %	About once a week (3.1)	
VINE Post 1993-94 Disadvantaged Urban N=97	18 %	12 %	31 %	14 %	26 %	About once a week (3.2)	No difference

Table 19

Frequency of Discussing a Science News Event

	Almost every day	Several times a week	About once a week	Less than once a week	Never	AVE.	SIGNIFICANT DIFFERENCE $p < .01$
VINE Pre 1992-93 N=636	9 %	14 %	32 %	19 %	27 %	About once a week (3.4)	
VINE Post 1992-93 N=636	10 %	17 %	34 %	19 %	20 %	About once a week (3.2)	More frequent (No practical difference)
VINE Pre 1992-93 Disadvantaged Urban N=83	6 %	16 %	42 %	18 %	18 %	About once a week (3.3)	
VINE Post 1992-93 Disadvantaged Urban N=83	11 %	19 %	30 %	15 %	25 %	About once a week (3.2)	No difference
VINE Pre 1993-94 N=758	10 %	21 %	31 %	16 %	21 %	About once a week (3.2)	
VINE Post 1993-94 N=758	10 %	14 %	34 %	26 %	17 %	About once a week (3.3)	No difference
VINE Pre 1993-94 Disadvantaged Urban N=97	10 %	16 %	20 %	20 %	33 %	Less than once a week (3.5)	
VINE Post 1993-94 Disadvantaged Urban N=97	6 %	21 %	33 %	16 %	24 %	About once a week (3.3)	No difference

Table 20

Frequency of Working with Other Students on Science Problems

	Almost every day	Several times a week	About once a week	Less than once a week	Never	AVE.	SIGNIFICANT DIFFERENCE $p < .01$
VINE Pre 1992-93 N=636	12 %	20 %	23 %	22 %	24 %	About once a week (3.3)	
VINE Post 1992-93 N=636	12 %	19 %	20 %	32 %	17 %	About once a week (3.2)	No difference
VINE Pre 1992-93 Disadvantaged Urban N=83	5 %	35 %	11 %	30 %	20 %	About once a week (3.2)	
VINE Post 1992-93 Disadvantaged Urban N=83	16 %	7 %	21 %	16 %	40 %	Less than once a week (3.6)	Less frequent
VINE Pre 1993-94 N=758	13 %	18 %	25 %	17 %	26 %	About once a week (3.3)	
VINE Post 1993-94 N=758	9 %	16 %	30 %	26 %	19 %	About once a week (3.3)	No difference
VINE Pre 1993-94 Disadvantaged Urban N=97	6 %	9 %	17 %	19 %	49 %	Less than once a week (3.9)	
VINE Post 1993-94 Disadvantaged Urban N=97	6 %	14 %	28 %	29 %	23 %	Less than once a week (3.5)	More frequent (No practical difference)

Table 21

Frequency of giving oral or written science reports

	Almost every day	Several times a week	About once a week	Less than once a week	Never	AVE.	SIGNIFICANT DIFFERENCE p < .01
VINE Pre 1992-93 N=636	5 %	10 %	12 %	30 %	43 %	Less than once a week (4.0)	
VINE Post 1992-93 N=636	5 %	5 %	17 %	40 %	33 %	Less than once a week (3.9)	No difference
VINE Pre 1992-93 Disadvantaged Urban N=83	4 %	4 %	15 %	33 %	45 %	Less than once a week (4.1)	
VINE Post 1992-93 Disadvantaged Urban N=83	9 %	6 %	11 %	22 %	52 %	Less than once a week (4.0)	No difference
VINE Pre 1993-94 N=758	9 %	8 %	25 %	15 %	43 %	Less than once a week (3.8)	
VINE Post 1993-94 N=758	4 %	6 %	16 %	39 %	35 %	Less than once a week (4.0)	Less frequent (No practical difference)
VINE Pre 1993-94 Disadvantaged Urban N=97	7 %	9 %	15 %	11 %	59 %	Less than once a week (4.0)	
VINE Post 1993-94 Disadvantaged Urban N=97	2 %	6 %	11 %	23 %	58 %	Less than once a week (4.3)	Less frequent (No practical difference)

Table 22

Frequency of Doing Science Experiments

	Almost every day	Several times a week	About once a week	Less than once a week	Never	AVE.	SIGNIFICANT DIFFERENCE p < .01
VINE Pre 1992-93 N=636	11 %	14 %	17 %	32 %	26 %	Less than once a week (3.5)	
VINE Post 1992-93 N=636	5 %	13 %	23 %	41 %	17 %	Less than once a week (3.5)	No difference
VINE Pre 1992-93 Disadvantaged Urban N=83	4 %	21 %	9 %	31 %	35 %	Less than once a week (3.7)	
VINE Post 1992-93 Disadvantaged Urban N=83	7 %	7 %	11 %	26 %	49 %	Less than once a week (4.0)	No difference
VINE Pre 1993-94 N=758	13 %	7 %	33 %	19 %	28 %	About once a week (3.4)	
VINE Post 1993-94 N=758	6 %	8 %	36 %	35 %	16 %	Less than once a week (3.5)	No difference
VINE Pre 1993-94 Disadvantaged Urban N=97	4 %	7 %	11 %	17 %	61 %	Less than once a week (4.2)	
VINE Post 1993-94 Disadvantaged Urban N=97	5 %	6 %	22 %	33 %	33 %	Less than once a week (3.8)	More frequent (No practical difference)

5. DOES THE PRESENCE OF VINE ALTER THE ATTITUDES OF TEACHERS TOWARD SCIENCE?

Teacher attitudes toward science were assessed in several different ways. Teachers were asked their perspectives on teaching science and how they felt about different teaching situations both before and after VINE. They were asked specifically about the VINE program, whether or not they considered it to be science, and how it compares to their regular science class. They were asked to evaluate the outdoor science activities provided in the VINE program. Teachers also provided information about the time and techniques they used in science, language arts, social studies, and math. These responses were combined to produce a picture of the teachers participating in the VINE program as positive and supportive of science and of the VINE program. Responses by city are included in the appendix.

Attitudes and perspectives

Teachers were asked about their perspectives and attitudes toward science before they participated in VINE and again afterwards. The number of teachers responding is shown in Table 23. The teachers in the VINE schools were similar to those in the control school, and neither group reported any significant change from the pretest to the post test. Since these teachers had an average of 14 years of experience, a pre-post measure over a 1 year period would not be likely to show much change. Also, since many of the perspectives and attitudes toward science were very positive, it would be difficult to show a significant change. Because there were no practical differences between the groups, only the responses of the VINE teachers on the post test are reported. Responses of

teachers new to VINE in 1993-94 were combined with those of the teachers who participated both years unless otherwise noted.

Table 23

Number of Teacher Responses*

	Pre	Post	New 93-94**
Denver VINE	10	12	0
Denver Control	5	5	
Broward County VINE	20	18	6
Broward County Control	11	12	
Seattle VINE	8	8	3
Seattle Control	7	7	
All VINE	38	38	9
All Control	23	24	

* Perspectives on Teaching Science.
** New teachers only completed a post test measure

Teachers participating in the VINE program were asked if they enjoyed science. As with the students, a high percentage of the teachers (91%) agreed that they personally enjoyed science. They also agreed that they enjoyed discussing science topics with other teachers, and would like to work with a science consultant and with other teachers to improve their science programs. However, they do not agree that they prefer teaching science over any other subject area. The summary of these teacher attitudes are shown in Table 24.

Table 24

Teacher perspectives and attitudes
(N=47)

Agreement that...	Agree	Undecided	Disagree
...I personally enjoy science	91 %	2 %	7 %
...I enjoy discussing science topics with other teachers	77 %	20 %	4 %
...I would like to work with a science consultant to improve my science program	74 %	26 %	0 %
...I would like to work with other teachers to improve my science program	78 %	13 %	9 %
...I prefer teaching science over any other subject area	24 %	26 %	50 %
...I would like to participate in workshops/in-services on science	74 %	17 %	9 %
...I would be interested in being part of an experimental science project	52 %	28 %	20 %

Teachers indicated that they were confident in their abilities to follow science textbook or guides. They were not as confident when unexpected problems came up, and even less confident with involving students when the teacher did not have adequate knowledge about a topic. Teachers were generally not bothered by student questions or departing from the textbook. Teachers reported that they were comfortable in visualizing science, using real-world science and open-ended questions, and dealing with differing student opinions. They also reported that they were comfortable in working with other teachers, using student collected data, and doing experiments that do not have a single correct answer. Teacher responses are summarized in Table 25.

Table 25

Confidence in Teaching Science
(N=47)

Confidence in...	Confident	Moderately confident	Not confident
...following a textbook unit	78 %	15 %	7 %
...following a school and/or curriculum guide	82 %	15 %	2 %
...involving students with a topic about which you feel a lack of knowledge	44 %	28 %	28 %
...problems or questions that arise unexpectedly	59 %	26 %	15 %
Bothered by...	**Not bothered**	**Sometimes bothered**	**Bothered**
...students asking questions I can't answer	83 %	11 %	7 %
...being asked to depart from the textbook	80 %	17 %	2 %
...having to create own teaching activities in science	59 %	26 %	15 %
Comfort level with...	**Comfortable**	**Moderately comfortable**	**Not comfortable**
...visualizing science as occurring everywhere	83 %	15 %	2 %
...using real world science as a focus for science study	78 %	17 %	4 %
...focusing on activities without necessarily reaching an answer	83 %	11 %	7 %
...dealing with differing student opinions	94 %	4 %	2 %
...dealing with other teachers in connection with school-wide projects	80 %	15 %	4 %
...conducting class discussions about student collected data or observations	91 %	7 %	2 %
...doing experiments that do not have single correct answers	76 %	22 %	2 %

Teachers reported on the amount of responsibility they have for teaching science. Most of them (57%) are totally responsible for teaching science, with 38% partially responsible, and 5% reporting no responsibility for teaching science. They reported that they have been involved with the VINE program for an average of 2 years. Most have not participated in National Science

Foundation (NSF) workshops (85%) or National Science Teachers Association (NSTA) workshops (100%). Forty-one percent of the teachers participating in the VINE program reported that they had received specific training in science teaching or content, and 59% reported that they had not.

VINE as science

Another way of examining the attitudes of teachers toward science and the VINE program is to look at whether or not teachers consider VINE to be science, and to compare VINE to regular science instruction. Teachers were asked if they thought the VINE activities were science, as were 5th graders who had participated in VINE the previous year. All of the teachers and 88% of the students agreed that the VINE activities were science. They also agreed that VINE was science because students were outdoors studying things in the environment. Teachers also reported that the students were doing activities and hands-on experiments in science. Table 26 summarizes the responses.

Teachers were asked if the VINE activities were similar to regular science instruction. Only 30% responded "Yes", while 70% said "No". Of the 9 teachers who responded with an example of how they were similar, 4 said that both VINE and regular science used hands-on activities, and 3 said that both used outdoor activities. Results are shown in Table 27.

Teachers new to the VINE program were compared with those who had previously participated. Teachers who were new to VINE during the 1993-94 school year had the same perspectives as those who had previously participated in the program. The only significant difference between teachers that were new to VINE and those who had previously participated was in the years of experience in VINE. Previously participating teachers reported an average of 3 years of participation, while new teachers reported only 1 year of participation.

Table 26

VINE Activities and the Regular Science Program

	Teachers N=46		Previous VINE Participants N=621
Do you consider Audubon activities to be science?		Do you consider Audubon activities to be science?	
Yes	100 %	Yes	88 %
No	0 %	No	12 %
Why/Why not?		Why/Why not?	
Because students are outdoors studying things in the environment	41 %	Because we study things in the environment	42 %
Because students are doings activities and hand-on experiments	33 %	Because we learn science	16 %
Because students are learning and doing science	13 %	Positive feelings (Because I like science; Audubon is fun)	15 %
Other	11 %	Because we do activities and experiments	10 %
		Other	10 %
		Because we will use it in the future	6 %
		Because we do it in school	1 %
		Negative feelings (I hate science)	1 %
Are Audubon activities similar to regular science?			
Yes	30 %		
No	71 %		
Examples of similar activities			
Hands-on activities	44 %		
Outdoor activities	33 %		
Small group activities	11 %		
Other	11 %		

Survey of Teachers Participating in the VINE Program

Teachers participating in the VINE program were surveyed during the 1993-94 school year. Teacher reported on the time spent in different subject areas and the techniques they used. Teacher who had previously participated in VINE reported spending more time on science than did teachers new to the program. Most of the teachers reported that they integrate science into other areas of study. Many teachers said that they integrate it into a combination of areas like reading and social studies. They reported that they get time for the VINE activities from a combination of areas, for example, a little time from math, a little from science, and some from reading. Table 27 illustrates the responses of teachers when asked about science and VINE time and teaching techniques.

Teachers were asked about the time they spend on other subjects and the teaching techniques they use. Their responses are shown in Table 28. They rely heavily on traditional teaching techniques such as lecture, question and answer, drill and practice, and other teacher-directed activities. Different techniques are used depending on the subject. Texts or films were mentioned the most frequently in teaching social studies, and hands-on activities like manipulatives were mentioned the most often in teaching math.

These responses appear to show a positive attitude of teachers toward science because teachers with experience in the VINE program spend more time on science. Many teachers reported using small group work which is similar to the small groups used in VINE activities, and most teachers said that they integrated science into the curriculum.

Table 27

Time and techniques in Teaching Science
(N=46)

Science (3 hours/week, range=1 to 6, teachers new to VINE =2 hours/week)

Techniques

	Always	Frequently	Occasionally	Rarely	Never	Average
Small Group Work	12%	51%	35%	2%	0%	Frequently (2.3)
Individual Work	7%	58%	28%	7%	0%	Frequently (2.3)
Lecture	2%	59%	27%	9%	2%	Occasionally (2.5)
Inquiry/Hands-On	0%	44%	47%	9%	0%	Occasionally (2.7)
Text	12%	41%	21%	19%	7%	Ocassionally (2.7)
Outdoor Activities	0%	9%	55%	30%	7%	Ocassionally (3.3)
Lab Experiments	0%	21%	35%	33%	12%	Occasionally (3.3)
Field Trips	0%	7%	57%	23%	14%	Occasionally (3.4)
Computer Activities	0%	7%	35%	33%	26%	Rarely (3.8)

Do you integrate science into other areas of study?

Yes	89%
No	11%

In what areas?

Combinations of areas	62%
Reading-Language Arts	28%
Social Studies	5%
Math	3%
Other	3%

Where do you get the time for Audubon activities?

Combination of areas	28%
Science	23%
Reading-Language Arts	18%
Other	18%
I just make time	10%
Social Studies	3%
Math	3%

Table 28

Times and Techniques in Other Subjects
(N=46)

Language Arts/English (6 hours/week, range=1 to 20)

Common techniques	number of times mentioned
Traditional (ex. lecture, teacher directed)	25
Group work	20
Texts or films	15
Products (ex. presentations, reports)	9
Individual work (ex. independent study)	8
Class discussion	7
Other (ex. unique to teacher)	6
Games (ex. simulations, role-playing)	5
Hands-on activities (ex. manipulatives)	3

Social Studies/History (3 hours/week, range=1 to 6)

Common techniques	number of times mentioned
Texts or films	20
Traditional (ex. lecture, teacher directed)	18
Products (ex. presentations, reports)	10
Group work	10
Class discussion	9
Hands-on activities (ex. manipulatives)	5
Games (ex. simulations, role-playing)	5
Individual work (ex. independent study)	1
Current events (ex. news topics)	1

Math (5 hours/week, range=1 to 7)

Common techniques	number of times mentioned
Traditional (ex. lecture, teacher directed)	28
Hands-on activities (ex. manipulatives)	26
Texts or films	15
Group work	13
Class discussion	9
Games (ex. simulations, role-playing)	9
Other (ex. unique to teacher)	7
Products (ex. presentations, reports)	2
Individual work (ex. independent study)	1

Outdoor activities

The teachers from all three sites felt overwhelmingly positively about the outdoor activities. Their responses seem to support the positive attitudes of teachers toward science as it is being presented in the VINE program. Table 29 shows the student and teacher responses for each year. Teachers were asked their opinions about how their students felt. They reported that their students enjoyed the program, learned from it, and wanted to more outdoor activities. Teachers were also asked if they wanted to do more outdoor activities. Again their responses were very positive. Ninety-three percent of them agreed that they would like more outdoor activities. Teachers who had participated in the VINE program were very positive in their attitudes toward science and toward VINE.

<u>Denver Teachers</u>

Almost all Denver teachers reported that 8 outdoor activities were done with their class this past year. One stated that 5 outdoor activities were conducted. All the teachers from Denver felt that the activities were fun for the students and not too long, that the students liked being outdoors, that they liked the materials used and the leaders, and that they learned something new from the activities. The majority did not think the activities were boring for the kids. Most (60%) also said they discussed the activities back in the classroom while 40% said somewhat discussed the activities afterwards. All of them, however, felt the students wanted to do more of these outdoor activities in the future and all of the teachers also wanted more outdoor activities.

Broward County Teachers

Most Broward County teachers (79%) reported that 5 outdoor activities were conducted with the students during the past year, although a couple reported doing 6 activities and one reported doing 4 activities. As with Denver, teachers from this site were overwhelmingly enthusiastic about the program. They all thought the activities were fun, that they weren't boring, and that the kids liked using the materials provided. The majority of teachers felt the students enjoyed being outdoors, liked their leaders, and learned something new from the activities. Most did not think the activities were too long. While class discussion about the activities was held the majority of the time (60% yes), it was conducted inconsistently 40% of the time. All teachers from Broward County believed the students wanted more outdoor activities like the ones offered through the VINE program. Eighty-seven percent of the teachers also wanted more outdoor activities and additional 13% responded "somewhat".

Seattle Teachers

With the exception of a couple of teachers, most Seattle teachers stated that 8 outdoor activities were held during the past year. One reported doing 9 activities and one reported doing 11 activities with their classes. Again, all of the teachers felt the activities were fun for the students. The majority of them also thought that the activities were not boring or too long, and that the students liked being outdoors and using the materials. All of them felt the students liked the activity leaders, learned something new, and wanted to do more outdoor activities in the future. Class discussion was held more consistently with Seattle teachers, although one teacher reported somewhat discussing the activities and one reported not discussing the activities at all afterwards. All of the teachers responded that they would like to have more outdoor science activities.

Table 29

Outdoor Activity Survey
(by percent of those responding)
Number of students (92-93)=821
Number of students (93-94)=944
Number of teachers (92-93)=64
Number of teachers (93-94)=33

	Student Responses 92-93			Student Responses 93-94			Teacher Responses 92-93			Teacher Responses 93-94		
	Yes	Some what	No	Yes	Some what	No	Yes	Some what	No	Yes	Some what	No
Fun	84	15	1	84	15	1	93	7	0	100	0	0
Boring	3	19	77	3	20	77	0	10	90	0	6	94
Liked outdoors	87	11	2	85	13	2	96	4	0	94	6	0
Too long	6	15	79	7	15	78	2	7	91	0	12	88
Liked materials	74	22	4	75	21	4	96	4	0	97	3	0
Liked leader	85	13	2	81	14	5	74	26	0	93	7	0
Learned something	74	20	6	72	18	10	89	11	0	93	7	0
Discussed in class	39	41	20	47	37	16	74	26	0	64	32	4
Students want more	84	12	4	83	12	5	96	4	0	100	0	0
Teachers want more							91	9	0	93	7	0

Conclusions

Findings

1. The schools, teachers, and students who participated in the VINE program were comparable to NAEP profile data. Students and teachers in the VINE schools were not significantly different than those in the control schools.
2. The VINE program was being delivered as intended.
3. The VINE program had a positive impact on students and teachers.
   a. Students drawings showed that they were applying the information they learned doing the VINE activities. Students and teachers agreed that students had learned something new in the VINE program.
   b. Students and teachers reported that they were doing outdoor science activities because of the VINE program. Both teachers and students agreed that they would like to do more outdoor activities like these. Students who had previously participated reported that they no longer do outdoor science activities like they did when they were participating in the VINE program.
   c. More students reported that they were participating in outdoor science activities, and in projects or experiments with plants or animals after the VINE program. A higher percentage of VINE students reported participating in these kinds of activities than was reported by students nationwide according to NAEP (1990) data.
   d. Fifth grade students who had previously participated in the VINE program were more interested in science than were a control group of fifth graders. They also defined science using words that contained more positive feelings.

   e. Teachers in all three locations reported that the VINE program had influenced their teaching and/or curriculum, and that they would like to continue using outdoor activities.
4. Students liked science before they participated in the VINE program and they continued to like science afterwards. They were very positive in their feelings about the VINE program.
5. Teachers also liked science before and after the VINE program, and were very positive in their feelings about the VINE program.

Summary

The VINE program provides fun and intellectually stimulating hands-on science activities. The activities are enjoyed by students and teachers alike. The activities increase or maintain student interest in science, and increase the amount of time students spend on outdoor activities. Teachers are influenced by the activities and would like to continue to provide them for their students.

Recommendations

1. It is recommended that the VINE program be continued. A strong and committed group of volunteers should be identified and training provided so that they can continue to facilitate the delivery of the program with high standards of quality. The use of high school students as small group leaders has been successful and popular with the elementary age students. Continued cooperation with high schools would benefit the goals of the VINE program.
2. More activities similar to those already being used should be developed. Hands-on science projects that actively involve students and promote science learning will encourage participation.
3. Seek additional funding for continuation and expansion of the VINE program.

4. Teachers expressed an interest in VINE-type activities. Additional materials and training for teachers would be beneficial.

Appendix B

Instruments

Appendix C-5

Name: _____ **School:** _____
(Please print.)

**********(cut here)

Code: _____ **Date:** _____

Student Questionnaire

Grade:_____ **I am a: Girl** ☐ **Boy** ☐. **I am** ☐ **years old.**

Directions: Fill in the boxes that best answer these questions.

1. **Have you ever done experiments or projects at home or in school with plants or animals?** ☐ **Yes** ☐ **No**

2. **Do you like science?** ☐ **Yes** ☐ **No**

3. **How often do you have science in school?**
   - ☐ A. Almost every day
   - ☐ B. Several times a week
   - ☐ C. About once a week
   - ☐ D. Less than once a week
   - ☐ E. Never

Questions 4- 9: When you study science in school, how often do you do each of the following? (Check the box with the best answer.)

		Almost every day	Several times a week	About once a week	Less than once a week	Never
4.	Read a science textbook	☐	☐	☐	☐	☐
5.	Discuss a science news event	☐	☐	☐	☐	☐
6.	Work with other students on a science problem	☐	☐	☐	☐	☐
7.	Give an oral or written science report	☐	☐	☐	☐	☐
8.	Do science experiments	☐	☐	☐	☐	☐
9.	Do outdoor science activities	☐	☐	☐	☐	☐

10. **How often do you participate in <u>outdoor</u> science activities, <u>not as a part of school</u>?**
    - ☐ A. Almost every day
    - ☐ B. Several times a week
    - ☐ C. About once a week
    - ☐ D. Less than once a week
    - ☐ E. Never

'Draw the School yard's Creatures and Plants' Directions:

To the Teacher or Activity leader
(Done at tables, desks, on floor ... wherever they are used to drawing)

1. Hand out a sheet of this prepared paper to each student. They are to orient the paper horizontally. (See example.) Please ask that they print their first and last names. This information will be removed following coding and thus the students will remain anonymous.
2. Please have them use pencils.
3. Amount of time: Please use 20 minutes for this activity; let them know how long they have and remind them a few minutes before closure.
4. Call the group to attention.
5. Read them the following directions:

****

Students. Holding your paper the long way, please, in the upper right hand corner, print your name, first and last, on the sheet.

Pre-code _____ _____
your name (printed)

We are interested in knowing what you have seen in your school yard. Please draw all the types of living things (creatures and plants) that you have seen in the school yard and where you have seen them. For example, if you saw something in a bush, also draw the bush. Draw each one as well as you can. Please put the name or label of each below or next to each creature or plant that you draw.

Some examples: If you have seen three <u>different kinds of birds</u> that are found in the school yard, draw (and label if you can) all three. If there are six of the <u>same kind of bird</u>, draw only one as an example.

You have 20 minutes to complete this. Your papers will be collected at the end of this time. This is not a test and will not be graded. Everyone has different drawing abilities so all we ask is that you do your best. What we need is a complete record of all the living things you have seen in your school yard and, in general, where you saw them.

Thank you for helping us with this!

Your name, printed

Pre-code

Name:_____ **School:**_____
(Please Print)

**********(cut here)

Code:_____ **Date:**_____

Outdoor Activity Survey

Age: _____ **Gender:** Girl ☐ Boy ☐

I did ..... (number) of outdoor science activities with my class this year.
Directions: Please answer the questions as best you can by writing in an answer or filling in the boxes.

1. What did you like most about your outside science activities?

_____
_____
_____

2. What did you like least about your outside science activities?

_____
_____
_____

	Yes	Somewhat	No
3. The activities were fun.	☐	☐	☐
4. The activities were boring.	☐	☐	☐
5. I liked being outdoors.	☐	☐	☐
6. The activities were too long.	☐	☐	☐
7. I liked the materials we used.	☐	☐	☐
8. I liked our activity leader(s).	☐	☐	☐
9. I learned something that I didn't know before I did the outdoor activities.	☐	☐	☐
10. Back in the classroom, we discussed the activities.	☐	☐	☐
11. I want to do more outdoor activities like these.	☐	☐	☐

12. On the back of this paper, briefly describe the one outdoor activity you remember best.

Adapted from the "Environmental Attitude Survey" used by David M. Andrews in his doctoral thesis: The Interrelationships Among the Cognitive, Affective and Behavioral Domains in an Outdoor Environmental Education Program, University of Maine, 1978.

****

Do not write above this line! It will be cut off the paper.
Thank you!

Name: _____ **School Name:** _____

**********(cut here)

Grade: _____ **Date:** _____

Outdoor Activity Survey (T)

Code: _____

There were ..... (number) outdoor science activities done with my class this year.

From what part of the school day did you take the time to do these activities? (Please circle those appropriate.) science math language arts art music social studies physical education other.....

Directions: Please answer the questions as best you can by writing in an answer or filling in the boxes.

1. What did your students like most about these outdoor science activities?

_____
_____
_____

2. What did your students like least about these outdoor science activities?

_____
_____
_____

	Yes	Somewhat	No
3. The activities for students were fun.	☐	☐	☐

How do you know this?

_____
_____

4. The activities were boring.	☐	☐	☐

How do you know this?

_____
_____

5. They liked being outdoors.	☐	☐	☐

How do you know this?

_____
_____

6. The activities were too long.	☐	☐	☐

How do you know this?

_____
_____(over)

	Yes	Somewhat	No
7. They liked the materials.	☐	☐	☐

How do you know this?

____

____

	Yes	Somewhat	No
8. They liked the activity leader.	☐	☐	☐

How do you know this?

____

____

	Yes	Somewhat	No
9. They learned something that they didn't know before they did the outdoor activities.	☐	☐	☐

How do you know this?

____

____

	Yes	Somewhat	No
10. Back in the classroom, we discussed the activities.	☐	☐	☐

How do you know this?

____

____

	Yes	Somewhat	No
11. They want to do more outdoor activities like these.	☐	☐	☐

How do you know this?

____

____

	Yes	Somewhat	No
12. I want to do more outdoor activities like these.	☐	☐	☐

● ●

For teachers new to the Audubon activities this year:

How many outdoor science activities did you and your class do last year? ________

How many outdoor science activities will you have done with your class by the end of this school year? (Do not include the number of Audubon activities your class has done.) ________

Name: ______________________________

School: ______________________________

** **(Cut Here)**

Code: ____________________ **Grade:** __________ **Date:** ______________

Teacher Survey

Directions: Please answer the questions as best you can by writing an answer in the space provided or by filling in the appropriate box.

1. For the following three areas:

   a. How much time per week (in hours) do you spend specifically on this area?
   b. What are your three most commonly used teaching techniques for each area?

Area	Time	Techniques Used
A. Language Arts/English	______	______________________________ ______________________________ ______________________________
B. Social Studies/History	______	______________________________ ______________________________ ______________________________
C. Math	______	______________________________ ______________________________ ______________________________

2. When you teach science, how often do you use the following techniques/strategies per week? Please mark the appropriate box for each technique.

Technique	Always	Frequently	Occasionally	Rarely	Never
A. Lecture	☐	☐	☐	☐	☐
B. Inquiry/Hands-On Experimentation	☐	☐	☐	☐	☐
C. Lab Experiments	☐	☐	☐	☐	☐
D. Field Trips	☐	☐	☐	☐	☐
E. Pairs/Small Group Work	☐	☐	☐	☐	☐
F. Individual Work/Independent Study	☐	☐	☐	☐	☐
G. Outdoor Activities	☐	☐	☐	☐	☐
H. Text (read and question)	☐	☐	☐	☐	☐
I. Computer Activities	☐	☐	☐	☐	☐

Place a * next to the letter of the one you like best.

3. How much time per week (in hours) do you spend specifically on science ? _____

4. Do you integrate science into other areas of study?
☐ Yes ☐ No

If yes, in what areas? _____

5. From where in your daily schedule do you get the time for the Audubon activities?

_____

6. Do you consider the Audubon activities to be "science" ?
☐ Yes ☐ No

Why/Why not ?_____

_____

7. Are these activities similar to ones you do in your regular "science" instruction ?
☐ Yes ☐ No

If yes, examples_____

8. Would you try to provide similar experiences to the ones Audubon provides, if they were not here?
☐ Yes ☐ No

9. Do you have or could you get the following to provide those experiences?

A.	Interest	☐ Yes	☐ No
B.	Time Classroom	☐ Yes	☐ No
C.	Time Preparation	☐ Yes	☐ No
D.	Materials	☐ Yes	☐ No
E.	Additional Personnel	☐ Yes	☐ No
F.	Specialized Training	☐ Yes	☐ No

10. Has the Audubon project influenced your teaching and/or curriculum?
☐ Yes ☐ No

How ?:_____

_____

_____

Name: _____
School Name: _____
Grade level: _____

****

Code: _____ **Date:** _____
(Please leave the code area blank. To preserve confidentiality, your response will be coded and your name and school name removed before being submitted for data entry.)

Teacher Questionnaire

To our new teachers: This is a modified version of an instrument used last year to collect information on teachers and schools in this program. We are interested in collecting some personal information on you to complete our profile on teachers participating in this program. We have omitted some questions that are primarily related to the school as we have that information from last year. For that reason, the questions are no longer numberically in sequence. Thank you for your assistance in this.

Please check the appropriate box for each question or write-in your answer in the space provided.

1. What is your gender? Female ☐ Male ☐

2. How do you describe yourself?

- ☐ A. American Indian or Alaskan Native
- ☐ B. Asian or Pacific Islander
- ☐ C. Hispanic, regardless of race
- ☐ D. Black, not of Hispanic origin
- ☐ E. White, not of Hispanic origin

3. Counting this year how many total years of teaching experience do you have?

☐☐ (total)

4. What is the highest academic degree you hold?

- ☐ A. Bachelor's degree
- ☐ B. Master's degree
- ☐ C. Education specialist or special certificate (past master's degree)
- ☐ D. Doctorate
- ☐ F. Professional degree (M.D., L.L.B., J.D., D.D.S.)

5. On the average, how many students do you typically have in your class?

☐☐ total number

Questions 14-26: If the following subjects are taught to fourth grade students, how much instruction is typically provided each week? Circle one letter on each line.

	Not taught	less than 1 hr.	1-2 hrs.	3-4 hrs.	5 hrs.	more than 5 hrs.
14. reading/ language arts	A	B	C	D	E	F
15. mathematics	A	B	C	D	E	F
16. science	A	B	C	D	E	F
17. computers	A	B	C	D	E	F
18. social studies	A	B	C	D	E	F
19. history	A	B	C	D	E	F
20. geography	A	B	C	D	E	F
21. foreign language	A	B	C	D	E	F
22. art	A	B	C	D	E	F
23. music	A	B	C	D	E	F
24. physical education	A	B	C	D	E	F
25. health	A	B	C	D	E	F
26. other	A	B	C	D	E	F

Questions 39-49: How many of the following types of specialists or aides are available to work in your classroom?

	more than 1	1	less than 1	none
47. science consultant	☐	☐	☐	☐
48. curriculum specialist	☐	☐	☐	☐
49. resource - science teacher	☐	☐	☐	☐

55. Do you operate as part of a team of teachers responsible for fourth graders? ☐ yes ☐ no

56. Is this grade level your preferred assignment? ☐ yes ☐ no

Name:____________________ **School name:**________________

** (cut here)

Code :______________ **Date:** ______________

Your grade assignment:________

Perspectives on teaching science:

I am responsible for teaching science to my students: (circle one)

totally **partially** (you and another person) **not at all** (they go to someone else)

Please indicate your response on the scales to the right by circling one number on the continuum.

	Very Confident 1	2	Moderately Confident 3	4	Not Confident 5
How confident do you feel about.... 1. following a textbook unit?	1	2	3	4	5
2. following a school and/or curriculum guide?	1	2	3	4	5
3. involving students with a topic about which you feel a lack of knowledge?	1	2	3	4	5
4. problems or questions that arise unexpectedly?	1	2	3	4	5

	Not at all		Sometimes		Always
How often do the following bother you ... 5. students asking questions you can't answer?	1	2	3	4	5
6. being asked to depart from the textbook?	1	2	3	4	5
7. having to create your own teaching activities in science?	1	2	3	4	5

	Very		Moderately		Not at all
How comfortable are you in... 8. visualizing science as occurring everywhere?	1	2	3	4	5
9. using real world science as a focus for science study?	1	2	3	4	5
10. focusing on activities without necessarily reaching an answer?	1	2	3	4	5

Adapted from "Perspectives on Teaching Science" used to evaluate the Iowa Chautauqua Program by Robert E. Yager, et. al., Science Education Center, The University of Iowa, Iowa City, Iowa.

How comfortable are you in...

	Very				Not at all
11. dealing with differing student opinions?	1	2	3	4	5
12. dealing with other teachers in connection with school-wide projects?	1	2	3	4	5
13. conducting class discussions about student collected data or observations?	1	2	3	4	5
14. doing experiments that do not have single correct answers?	1	2	3	4	5

	Strongly agree	Slightly agree	Undecided	Slightly disagree	Strongly disagree
15. I personally enjoy science.	1	2	3	4	5
16. I enjoy discussing science topics with other teachers.	1	2	3	4	5
17. I would like to work with a science consultant to improve my program.	1	2	3	4	5
18. I would like to work with other teachers to improve my science program.	1	2	3	4	5
19. I prefer teaching science over any other subject area.	1	2	3	4	5
20. I would like to participate in workshops/in-services on science.	1	2	3	4	5
21. I would be interested in being part of an experimental science project.	1	2	3	4	5

-----Questions continue on the next page ------

Questions 22-26 Please assist us by providing the following specific information about yourself:

☐ 22. The number of years you have been teaching, including this year

☐ 23. The number of years you have been involved with this Audubon program

☐ yes ☐ no 24. Have you participated in National Science Foundation Teacher Workshops before? (Any type of workshop) If yes, please list them:

☐ yes ☐ no 25. Have you participated in any NSTA (National Science Teachers Association) workshops before? If yes, please list them:

☐ yes ☐ no 26. Have you received specific training in science teaching or content, other than those listed above. If yes, please describe below.

Directions to Observers:

This instrument is designed to help us assess whether or not the program is being provided as intended. In order to gain a sense of what is actually delivered in this program, you are asked to:

1. familiarize yourself with this form and the day's activity, paying special attention to the "Challenge";
2. arrive prior to the beginning of the activity so you can see the opening minutes;
3. circulate among the groups and students after the initial directions have been given; and
4. remain outside and observe the volunteers as they complete responsibilities associated with this activity.
5. While observing, please check off those statements on the form that pertain to the three time periods listed:
   a. as the activity begins
   b. during the activity and at closure
   c. after the conclusion of the activity

In cases where there are multiple responses, choose the one most typical for that question. If there is only one response, please check the line if it is present and leave it blank if it is not present. If there are comments that you would like to add to give us a better feel for what is actually going on during the activity, please feel free to write them on the back of the second sheet. Thank you for your assistance!

Site: _____

Date: _____ Time: _____ Class: _____

Observer's name: _____

Title of Investigation Observed: _____

As the activity begins:

_____Children are excited to see "their" volunteer/leader and anxious to go outside.

_____Children are organized in groups of 6. (Some groups may have 1 or 2 more or less.)

_____Children are organized in groups of 4 to 8.

_____Children are organized in groups smaller than 4 and/or larger than 8.

_____Volunteer/leaders have their children come together in a circle.

_____Volunteer/leaders have their children loosely collected.

_____Volunteer/leaders do not collect their children in a group.

_____Volunteer/leaders issue the "challenge" to their children.

_____Volunteer/leaders do not issue the "challenge".

_____Volunteer/leaders clearly explain to their group what to do and show how to use the materials/tools.

_____Volunteer/leaders explain more or less what to do.

_____Volunteer/leaders give confusing directions about what to do.

_____Volunteer/leaders show the group the boundaries of their study areas.

_____Volunteer/leaders do not point out the group's study area.

As the activity proceeds:

_____Children are outdoors in pairs and/or small groups.

_____Children are in large groups (10 or more per group).

_____Children are together as a class.

_____Children are outdoors on the project site.

_____Children are outdoors in an area adjacent to the project site.

_____Children are outdoors in an area within walking distance or away from school grounds.

_____Each volunteer interacts with children individually, in pairs, and as a group—listening, questioning, directing, and encouraging.

_____Each volunteer talks to the group most of the time.

_____Each volunteer/leader provides little guidance to his/her group.

_____Tools and simple scientific equipment are being used by pairs and individual students.

_____Tools and simple scientific equipment are being used by only some children.

_____Tools and simple scientific equipment are used primarily by the volunteer.

_____Tools and scientific equipment are not being used.

_____Children seem to be very involved in the activity.

_____Children seem to be somewhat involved in all or parts of the activity.

_____Children seem to be involved in something unrelated to the activity.

_____Children seem to be bored and/or passive.

_____Children are interacting with each other, their volunteer, the plants and/or animals and/or habitat being investigated in the activity.

_____Children are interacting with other people and things unrelated to the activity.

_____Children are not interacting with anyone or anything.

_____The teacher/staff is circulating, observing, and ready to take care of discipline or first aid problems.

_____The teacher/staff is intervening occasionally, as needed for discipline, etc.

_____The teacher/staff is participating with one group only.

_____The teacher/staff is doing something seemingly unrelated to the activity or is not visibly present.

At the end of the activity:

_____Each group of kids and volunteers clean and reassemble their equipment.

_____Some groups of kids and volunteers clean and reassemble their equipment.

_____Groups of kids disband with no responsibility for equipment.

_____The staff/volunteer cleans or reassembles equipment.

_____No one cleans or reassembles the group's equipment.

_____Each group discusses and compares their findings from this activity.

_____Some groups discuss and compare their findings from this activity.

_____Each group makes no comparisons and has no discussion.

_____Each group talks about their next session.

_____Each group makes no reference to future sessions.

_____The volunteer team discusses sucesses and problems with reference to future activities.

_____The volunteer team departs without further reference to the program and/or what comes next for this group.

Directions to Teacher Observers:

This instrument is designed to help us assess whether or not the program is being delivered as intended. In order to gain a sense of what is actually going on, you are asked to:

1. familiarize yourself with this form and the day's activity, paying special attention to the "challenge";

2. be on site at the beginning of the activity so you can see the opening minutes; and

3. circulate among the groups and students after the initial directions have been given.

4. While observing, please check off those statements on the form that pertain to the three time periods listed:
   a. as the activity begins
   b. during the activity and at closure
   c. after the conclusion of the activity

In cases where there are multiple responses, choose the one most typical for that question. If there is only one response, please check the line if it is present and leave it blank if it is not present. If there are comments that you would like to add to give us a better feel for what is actually going on during the activity, please feel free to write them on the back of the second sheet. Thank you for your assistance!

Site: _____

Date: _____ Time: _____ Class: _____

Teacher's name: _____

As the activity begins:

_____ Children are excited to see "their" volunteer/leader and anxious to go outside.

_____ Children are organized in groups of 6. (Some groups may have 1 or 2 more or less.)

_____ Children are organized in groups of 4 to 8.

_____ Children are organized in groups smaller than 4 and/or larger than 8.

_____ Volunteer/leaders have their children come together in a circle.

_____ Volunteer/leaders have their children loosely collected.

_____ Volunteer/leaders do not collect their children in a group.

_____ Volunteer/leaders issue the "challenge" to their children.

_____ Volunteer/leaders do not issue the "challenge".

_____ Volunteer/leaders clearly explain to their group what to do and show how to use the materials/tools.

_____ Volunteer/leaders explain more or less what to do.

_____ Volunteer/leaders give confusing directions about what to do.

_____ Volunteer/leaders show the group the boundaries of their study areas.

_____ Volunteer/leaders do not point out the group's study area.

As the activity proceeds:

_____ Children are outdoors in pairs and/or small groups.

_____ Children are in large groups (10 or more per group).

_____ Children are together as a class.

_____ Children are outdoors on the project site.

_____ Children are outdoors in an area adjacent to the project site.

_____ Children are outdoors in an area within walking distance or away from school grounds.

_____ Each volunteer interacts with children individually, in pairs, and as a group—listening, questioning, directing, and encouraging.

_____ Each volunteer talks to the group most of the time.

_____ Each volunteer/leader provides little guidance to his/her group.

_____ Tools and simple scientific equipment are being used by pairs and individual students.

_____ Tools and simple scientific equipment are being used by only some children.

_____ Tools and simple scientific equipment are used primarily by the volunteer.

_____ Tools and scientific equipment are not being used.

_____ Children seem to be very involved in the activity.

_____ Children seem to be somewhat involved in all or parts of the activity.

_____ Children seem to be involved in something unrelated to the activity.

_____ Children seem to be bored and/or passive.

_____ Children are interacting with each other, their volunteer, the plants and/or animals and/or habitat being investigated in the activity.

_____ Children are interacting with other people and things unrelated to the activity.

_____ Children are not interacting with anyone or anything.

_____ The teacher/staff is circulating, observing, and ready to take care of discipline or first aid problems.

_____ The teacher/staff is intervening occasionally, as needed for discipline, etc.

_____ The teacher/staff is participating with one group only.

_____ The teacher/staff is doing something seemingly unrelated to the activity or is not visibly present.

At the end of the activity:

_____ Each group of kids and volunteers clean and reassemble their equipment.

_____ Some groups of kids and volunteers clean and reassemble their equipment.

_____ Groups of kids disband with no responsibility for equipment.

_____ The staff/volunteer cleans or reassembles equipment.

_____ No one cleans or reassembles the group's equipment.

_____ Each group discusses and compares their findings from this activity.

_____ Some groups discuss and compare their findings from this activity.

_____ Each group makes no comparisons and has no discussion.

_____ Each group talks about their next session.

_____ Each group makes no reference to future sessions.

_____ The teacher and the class discuss their findings and integrate the activity into their ongoing curriculum.

_____ The teacher and the class return to their regular classroom activities.

_____ The teacher and the class go home without further reference to the investigation.

Name:_____
In the 4th grade last year I was in _____school
and my teacher's name was _____

****

Code:_____ Date:_____

5th grade Student Follow-Up Questionnaire

Directions:
Please fill in the boxes and blanks that best answer these questions.

1. What do you think of when you hear or read the word "science"?

_____

_____

2. Are you interested in science?

☐ Yes ☐ No

If yes, what are you most interested in?

_____

What have you done in school that got you interested in science?

_____

What have you done out of school that got you interested in science?

_____

3. Were you a part of the Audubon activities last year as a 4th grader? (You used magnifying glasses, went outside, and worked in small groups of students.)

☐ Yes ☐ No **If No, please stop here.**

IF YES, PLEASE CONTINUE ON BACK.

4. Do you consider the Audubon activities to be "science" activities?

☐ Yes ☐ No

Why/Why not? _____

_____

_____

5. Did you learn something new from these activities?

☐ Yes ☐ No

If yes, what? _____

_____

_____

6. What do you remember doing during the outdoor activities with Audubon volunteers? _____

_____

_____

_____

7. Are you doing outdoor science activities this year, like the Audubon ones from last year?

☐ Yes ☐ No

If yes, Where? _____ With Whom? _____

What are you doing? _____

8. Has doing the Audubon activities increased your interest in science?

☐ Yes ☐ No

Why/Why not? _____

_____

_____

Appendix D: 1995 Goodman Research Group's Study

Evaluators: Dr. Irene Goodman and Colleen Manning
Goodman Research Group, Inc.
26 Lee Street, Suite 1
Cambridge, MA 02139-2204

Recommended by: A colleague—Phyllis Katz, director of the Hands-On Science Program.

Contract cost: $14,370

Purpose of study: The purpose of this study was to:

- evaluate teen growth as a result of their experiences with the VINE Program in the areas of science/ecology, personal growth/leadership, and career exploration.
- identify ways VINE Programs can be strengthened to better meet teens' needs.
- create, test and validate instruments that can be readily used to assess the impact of VINE Programs on teens, and provide instructions for the further use of those instruments.

Who was involved: 259 teen volunteers and their 12 high school teacher/club sponsors who participated in VINE Programs in Baltimore, Boston, Denver, Ft. Lauderdale, and New Orleans in the 1994-95 school year. The teenagers ranged from 14 to 20 years old, 70% were female, and 62% were African American or Hispanic. Additional details about the sample are included in the Goodman Evaluation, D-5, pp. 2-3 and 25.

What was done: The Goodman researchers developed instruments and worked with the project director and local program coordinators to tailor the instruments for use at individual sites. Instruments developed and used to complete this study included:

- Pre-Project Teen Survey (administered to 85 teens by local program coordinators)
- Post-Project Teen Survey (administered by teachers or local coordinators)
- Teacher/club leader survey (mailed with postage-paid return envelopes)
- Semi-structured phone interviews (to follow up on Teacher Survey)
- Alternative Assessment Protocols for creating a photojournal or a program flyer with a group of teen volunteers
- Teen Focus Groups, Observations, and In-person Teacher Interviews conducted during site visits in Denver and Boston

For quantitative measures, the evaluators coded responses and used STUDENT SYSTAT to analyze the data. Input from qualitative measures was incorporated into appropriate sections of the final report and copies of student products (flyer and photojournal) were provided to both the project director and local program coordinators.

NAAEE
NORTH AMERICAN ASSOCIATION FOR ENVIRONMENTAL EDUCATION

Major Findings of an Evaluation of Teens in Volunteer-led Investigations of Neighborhood Ecology Programs

Goodman Research Group, Inc. of Cambridge, MA surveyed 259 teens as they completed their participation in the 1994-1995 Volunteer-led Investigations of Neighborhood Ecology (VINE) programs. Forty-six of those teens were also surveyed prior to their involvement in the programs, although pre- and post-program data collection were relatively close in time. In addition, the teachers/club leaders whose classes/clubs participated in the VINE programs were surveyed, both by mail and phone. The five program sites with strong teen involvement who participated in the evaluation were Baltimore, Boston, Denver, Fort Lauderdale, and New Orleans.

Program Satisfaction

Teens and teachers are extremely satisfied with the program overall. Teens especially like working with younger children and teaching them about science. Teachers of teens especially like that the program pairs teens with younger children, and feel a sense of community is created between the high schools and elementary schools that work together.

The Impact of VINE Programs on Teens

Science/Ecology
Through their experiences in the program, teens grow in their appreciation for the environment, their understanding of what science is, their knowledge of ecology/biology concepts, their use of science skills, and their interest in science. They appreciate the gravity of environmental problems, and, at the same time, are aware that they can be a part of solving these problems. They also have an appreciation for and a responsiveness toward what can help and harm their environment.

Personal growth/Leadership
Teens have more confidence overall at the end of the program compared to when they start. Specifically, they have more confidence in being responsible for a small group of children, being the leader of a group, and teaching science to children. Teens indicate they have a clearer sense both of what it means to be a leader and of the benefits one experiences in leadership positions. Teens develop a sense of community-mindedness through their volunteer work in this program, and are likely to participate in other volunteer programs in the future.

GOODMAN RESEARCH GROUP, INC.
Evaluation ❖ Policy and Program Development ❖ Market Research

IRENE F. GOODMAN, ED.D.
President

An Evaluation of Teens in Volunteer-led Investigations of Neighborhood Ecology Programs

Volunteer-led Investigations of Neighborhood Ecology (VINE) programs give elementary school children the opportunity to explore the plants, animals and ecological relationships that are a part of their school's natural environment. VINE programs started in 1985 with adult volunteers leading young children on outdoor investigations. In 1988, teenagers began to become involved in select programs across the United States. Over the last few years, an increasing number of VINE programs have involved teens as a new source of volunteers to lead the younger children on investigations. Goodman Research Group, Inc. of Cambridge, MA undertook this evaluation in order to examine the outcomes for teens who participate as volunteers.

The focus of the evaluation was to assess the impact of the program on teens in the areas of science/ecology, personal growth/leadership, and career exploration, and to determine how the program might be strengthened to better meet the teens' needs. In addition, it was an objective of this evaluation to determine how local VINE programs might best conduct self assessment in the future to answer questions about the teen component of the program.

This report presents the major findings of the evaluation, including the significant quantitative results as well as descriptive information and representative quotes. The findings are organized into the areas of science/ecology, personal growth/leadership, career exploration, and suggestions for program improvement. At the end of the report, we include a summary of results and our recommendations for the program. Accompanying the report is a booklet — GUIDELINES FOR FUTURE EVALUATION OF VINE PROGRAMS BY INDIVIDUAL SITES — which contains recommended evaluation instruments and techniques for use by local sites employing the VINE program.

SAMPLE AND MEASURES

The evaluation sample included all teens and all teachers/club leaders involved in VINE programs from five cities with strong teen involvement — Baltimore, Boston, Denver, Fort Lauderdale, and New Orleans. Exhibit 1 displays background data on the teens.

26 LEE STREET, SUITE 1, CAMBRIDGE, MA 02139-2204 PHONE 617-491-7033 FAX 617-864-2399

Exhibit 1: Profile of Teens

- The teens ranged in age from 14 to 20 (average age 15 ½). Most teens were in ninth or tenth grade.
- Over two thirds (70%) of participants were female.
- Almost all the teens were participating in the program for the first time; 13% had previously participated.
- Over half (56%) of the teens had done volunteer work before becoming involved in this program. Places they had done volunteer work included childcare programs, schools, churches, hospitals, nursing homes, libraries, and community centers.
- Nearly half of the participants (49%) described themselves as Black or African American; over a fifth (23%) were White or Caucasian; and 13% were Hispanic.
- Two thirds of teens said that, in general, they were more outgoing than shy.

At three sites, only post-program data were collected, while at the other two sites, both pre- and post-program data were collected. The number of teens completing surveys, as well as the number of teachers surveyed and interviewed is displayed in Exhibit 2.

Exhibit 2: Summary of Data Collected from Teens and Teachers

Site/City	# Pre-program teen surveys	# Post-program teen surveys	# Pre/Post Matches	# Teacher Surveys	# Teacher Interviews
Baltimore	not administered	85	—	4	2
Boston	58	48	26	2	2
Denver	27	38	20	2	3
Ft. Lauderdale	not administered	45	—	2	2
New Orleans	not administered	43	—	2	—
Total	**85**	**259**	**46**	**12**	**9**

The Project Coordinators in each city worked with two to four high schools. The number of teens involved, their dates of involvement, the sequence of training and leading investigations, the number of investigations led, and the demographic information of teens differed, not only from city to city, but among high schools in the same city. (See Appendix A for an overview of the program sites.) The number of teens from whom we collected data at any given high school was too small to warrant analysis and discussion of differences in results across schools. Exhibit 3 shows the activities carried out by teens at each site.

Exhibit 3: Activities Conducted at VINE Sites

Name of Activity	Baltimore	Boston	Denver	Fort Lauderdale	New Orleans
Plant Hunt		X	X	X	X
Super Soils	X*	X*	X	X	X
Litter Critters	X*	X*		X	
Animals in a Grassland	X*		X	X	X
Envirolopes				X	X
Isopods	X*		X		
Worms, Bird Nests		X	X		
Magnifiers, Invent an Animal, Ponding, Bird Observer		X*			
Bird Feeders			X		
Ants, Roots and Shoots, Sound Off, What Lives Here	X*				

* This activity was not done by all of the high schools at this site.

Written pre- and post-VINE teen surveys

Three basic surveys were developed by the evaluators to send to teen participants at the program sites: (1) a pre-program survey, (2) a post-program survey, and (3) a post-program survey designed for sites where it was not possible to gather pre-program data.

At the point in time the evaluators joined the project, three of the five programs (Baltimore, Fort Lauderdale, and New Orleans) were already underway, so administering a pre-program survey to teens from these three cities was not possible. We were, able to collect pre-program data from Boston and Denver teens, although there was not a great deal of time between pre- and post-test data collection (two months, in some cases).

In addition to developing the three basic surveys, after phone consultation with the Project Coordinator at each site, surveys were tailored for individual sites — adding, deleting, or revising certain questions. The surveys were sent to the Project Coordinators, with instructions for administering them and a postage-paid return envelope. The surveys were administered to the teens by either the Coordinator or the teens' teacher.

The teen surveys addressed the areas of major interest to the evaluation: science/ecology, personal growth/leadership, and career exploration. In addition, the pre-program survey, and the post-program survey for sites where no pre-program data was collected, gathered background information from the teens.

Teacher/club leader surveys
A written survey was mailed in April 1995 to each of the seventeen teachers/club leaders whose classes participated in VINE programs. A letter explaining the survey and a postage-paid return envelope were included. The surveys assessed teachers' perceptions of teens' growth in the areas of science/ecology, personal/growth, and career exploration, as well as their perceptions of the program overall.

Semi-structured phone interviews were conducted in May and June to follow up on information gathered through the surveys. These interviews focused on teachers' perceptions of program effectiveness and their suggestions for improvements and changes. Reminder postcards were sent to survey non-respondents, as well as to those who failed to respond to messages requesting an interview.

Alternative Assessments
Two alternative assessments were developed and piloted as evaluation techniques to augment the traditional paper-pencil measures. They were both structured by a protocol which can be found in the GUIDELINES FOR FUTURE EVALUATION OF VINE PROGRAMS BY INDIVIDUAL SITES, accompanying this report. Both final alternative assessment products also accompany this report. The assessments are briefly described below.

Photojournal: A photojournal was created by the teen participants in one of the Boston area schools with the help of their teacher and the evaluators. The students photographed their experiences in the program and wrote down their thoughts to accompany the pictures.

Program flyer: We gave another Boston area school the task of helping us design a "flyer" that could be given out to new students who are thinking about joining the program next year. We asked them to design the flyer together, and gave their teacher questions to guide a discussion around the content of the flyer.

Qualitative methods
Several qualitative methods were used during site visits to Boston and Denver VINE programs. These included observations of teens being trained by the Project Coordinator, as well as observations of teens leading investigations with the younger children, two focus groups with teen participants at Boston area schools, in-person interviews with teachers of teens, and in-person interviews with teachers of the elementary school children whose classes were led by the teens in the investigations.

These qualitative methods provided us with a context in which to develop the evaluation instruments, as well as interpret the quantitative data and make recommendations. Some of this qualitative information has been previously discussed in an earlier report (site visit to Denver), and some of the information has been included here to enhance the reporting of the quantitative data.

RESULTS

The results of **post-program** teen surveys and the teacher surveys and phone interviews from all five sites are presented and discussed together. These results include perceived impact of the program on teens in the areas of science/ecology, personal growth/leadership, and career exploration. Where there are differences between cities, this is noted in the report. Where there are pre- and post-VINE differences for Boston and Denver, these are also presented. It should be noted that there was very little time between completion of pre- and post-program surveys, making it difficult to measure change over time.

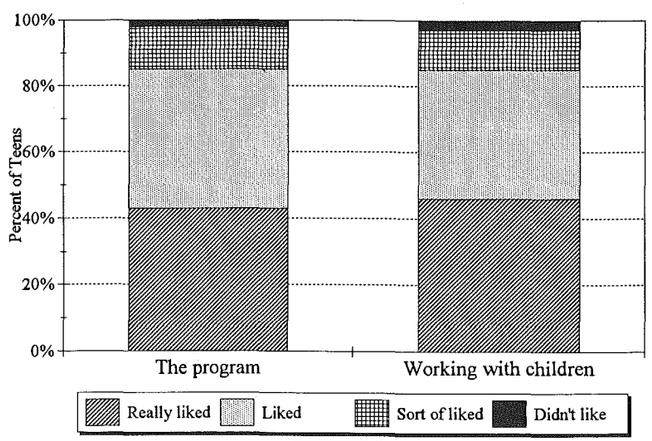
PROGRAM SATISFACTION

Teens were extremely satisfied with the program overall. They especially liked working with younger children and teaching them about science. Teen reports also indicate that teens developed a sense of community-mindedness in that they are likely to participate in other volunteer programs in the future. Similarly, teachers of teens especially liked that the program paired teens with younger children. Teachers also mentioned the sense of community created by the program. Results are presented separately for teens and teachers below.

Teen Satisfaction

The overwhelming majority of teens both liked the program and liked working with younger children. Those results are displayed in Exhibit 4.

Exhibit 4: Program Satisfaction
Teen Reports

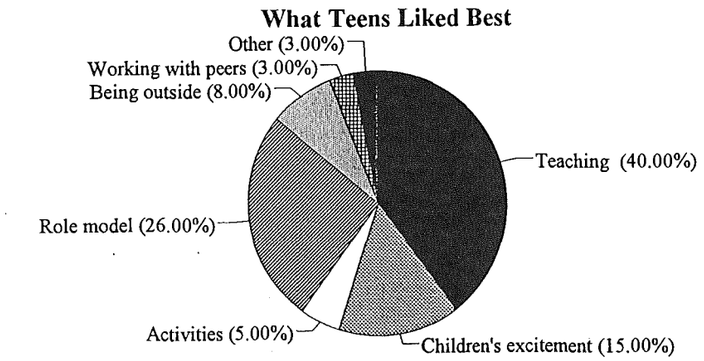


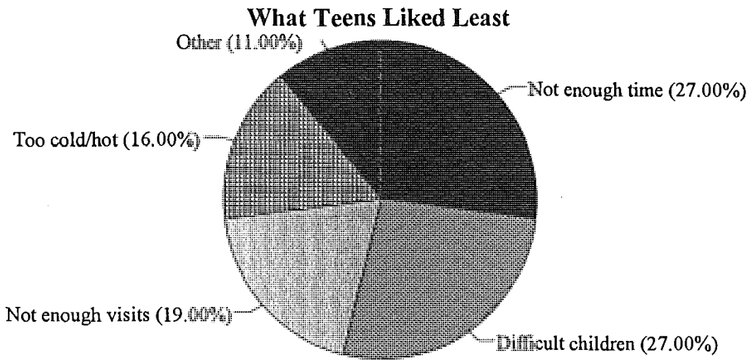
Teens from New Orleans reported that they *really liked* working with children with greater frequency than did teens from other cities; nearly three quarters (73%) of teens from New Orleans *really liked* working with children compared to a third to a half at other sites.

Eighty percent of teen participants were either *likely* or *very likely* to volunteer for this program again, if given the choice, and nearly three quarters said they were also *likely* or *very likely* to volunteer for **another** community service program as well.

The aspects of the program the teens liked best and least are presented in Exhibit 5 below.

Exhibit 5: What Teens Liked Best and Least About VINE Programs





In addition to teaching science to the children being their favorite part of the program, teens most often cited working with children as their *reason* for participating in the program. Seventy-nine percent of teens had previously worked with children; over half (58%) had been leaders of a group of children before their involvement in this program; and over two thirds (68%) had previously taught something to children.

Almost two thirds of teens reported that the most difficult aspect of working with the children was their behavior (i.e., fooling around, etc.), although this was less of an issue with the teens in Boston than it was with teens from other cities. This may be explained by the fact that, on average, Boston teens met with the elementary schools more frequently than did teens at other sites, and may have learned over time how to handle difficult behavior.

Boston teens reported with greater frequency than did the other sites that not seeing the children enough was difficult, which also may be explained by their more frequent visits. Seeing the younger children more frequently, they may have felt closer to them, making it more difficult to go for a period of time without seeing them. Fort Lauderdale teens reported with greater frequency that the most difficult part about working with younger children was when the younger children didn't understand the activity.

Eighty-four percent of teens prefer to teach activities to the children with a partner rather than alone. Although the majority of teens in each city would rather work with a partner, reports were higher for teens in Baltimore (92%) and Boston (91%), than for teens in Denver (80%), Fort Lauderdale (74%), or New Orleans (68%).

Teacher Satisfaction

Of the twelve teachers who participated in the evaluation, eight of them taught a science class, and three led a school club that participated in the program. The majority of the teachers taught science at more than one grade level, and did not have any specific requirements for teen participation in this program. Nine of them actually participated in the outdoor investigations led by the teens. Seven teachers found the program materials *very* relevant to their class topics; three found them *somewhat* relevant, and two found them *a little* relevant.

In both their written surveys and follow-up phone interviews, most teachers indicated that what they liked best about the program was that it paired teens and elementary school children. There was a subtle difference among sites as to why they found this aspect of the program particularly appealing. Florida, Denver, and New Orleans teachers focused on benefits to teens thought this was the best part of the program because it helped the teens in the area of personal growth and leadership. Boston and Baltimore teachers focused more on the idea that it was a unique opportunity for the older students and younger students to work together.

Similarly, Florida teachers also mentioned that one of the best parts of the program was that it establishes a network between the elementary schools and high schools. Another Baltimore teacher also referred to the sense of community created by the program.

Only one respondent, from Florida, talked about the "nuts and bolts" of the program, listing solid training, interesting hands-on oriented topics and qualified leadership as among the best parts. And only one teacher, from Boston, mentioned the area of science/ecology in response to this question. He felt the best part of the program was that it strengthened teens' understanding of concepts and observation skills; he also referred to the strengthening of confidence and self-esteem.

THE IMPACT OF THE VINE PROGRAM ON TEENS

Both teens and teachers reported benefits of the program to teens in the areas of science/ecology and personal growth/leadership. In the area of science/ecology, the results indicate teen growth in appreciation for the environment, understanding of what science is, knowledge of ecology/biology concepts, use of science skills, and interest in science. In terms of personal growth, teens had more confidence overall at the end of the program compared to when they had started. Specifically, they had more confidence in being responsible for a small group of children, being the leader of a group, and teaching science to children.

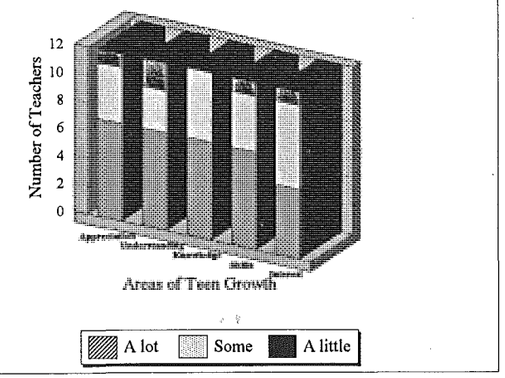
Science/Ecology

> *"I can identify different plants to stay away from, like poison ivy...and different birds...what bugs do and what good they do."*
>
> *"Bugs are important to the environment."*
>
> *"I was learning while I was teaching them. I learned about different leaves."*

(comments made during focus groups with teens about specific science concepts they had learned)

Teachers were asked to indicate whether teens had grown *none, a little, some,* or *a lot* in several different areas related to science/ecology. Most of the twelve teachers saw *some* or *a lot* of growth in the areas of teens' appreciation for the environment, understanding of what science is, knowledge of ecology/biology concepts, use of science skills, and interest in science. Results are presented in Exhibit 6.

Exhibit 6: Teen Growth in Science
Teacher Reports



Teen results in the area of science/ecology are presented below.

Appreciation for the outdoor/"natural" environment
In order to assess teens' appreciation for the environment, we surveyed them about what they had learned about the environment from the program overall, and asked specific questions about the potential impact of people on the environment. We also asked teens if they agreed or disagreed with a number of statements which were designed to yield information about the teens' appreciation of the outdoors.

When asked what they learned about the environment from the program, the one most common response from teens (43%) was learning about different kinds of plants and animals (or insects). About a fifth (18%) said they learned about the **importance** of the environment.

In order to assess the teens' understanding of the potential impact — both positive and negative — of people on the "natural" environment, we asked about things people do that help and hurt the environment. In terms of helping the environment, most teens (50%) said recycling, and another 30% mentioned keeping it clean and picking up trash. Other responses included planting and carpooling. In terms of things people do that hurt the environment, 58% said littering, and 26% said polluting. The pre-program survey given to teens in Boston and Denver yielded the same responses.

Teens were also asked how strongly they agreed or disagreed (i.e., *strongly agree*, *agree*, *disagree*, or *strongly disagree*) with a number of statements about the environment. The statements and results are displayed in Exhibit 7 on the following page.

Exhibit 7: Teen Agreement/Disagreement with Statements about the Environment

	Agree/Strongly Agree	Disagree/Strongly Disagree
Eventually, environmental problems will just go away on their own.	15%	85%
Nothing I do will really have an effect on the environment one way or another.	17	83
Bugs are totally cool.	49	51
Digging in the dirt is gross.	42	58
Scientific tools are very expensive to buy.	70	30
When you spray a pesticide, it harms only the bug you're pointing it at.	22	78
In the fall, the best thing to do with leaves is to rake them up and get rid of them.*	37	63

*** Pre-program** results from Boston and Denver indicate that only 45% of those teens *disagreed* with this statement. Change scores for the teens from whom we had both pre- and post-program data confirm that more teens (36% more) *disagreed* or more *strongly disagreed* with this statement at the close of the program.

Understanding of what science is/Knowledge of ecology/biology concepts
The surveys contained a variety of questions, developed in consultation with the Program Director and the Project Coordinators at individual sites, designed to assess teens' understanding of science and knowledge of selected ecology/biology concepts.

Teens had a general idea of how to define science. When asked what the word science means, nearly two thirds (62%) said it means the *study* of living/non-living things, the world, nature, or the environment. Other definitions included discovery, experiments, and the environment (with no mention of study).

One of the program goals for teens in the area of ecology/biology concepts is for them to have an understanding of the range of quantity and scale of diversity of plants and animals living at the sites where they were trained and/or led investigations. On the surveys, teens were asked to write the number of plants, and the number of animals, they thought lived right outside their schools, as well as provide some examples of each.

The number of plants they thought lived right outside their schools ranged from 0 to 1000, with the average being 58. Excluding one outlier (one teen said 1 million animals), the number of animals ranged from 0 to 1,000, the average being 39. Just over half the teens provided examples of plants, and over two thirds gave examples of animals. The examples they provided were fairly basic and were similar across all sites. For plants, examples included trees, grass, bushes, and flowers; only occasionally did anyone offer a more specific example. Examples given for animals tended to include squirrels, dogs, and cats.

In Boston and Denver, over two thirds (68%) of teens reported that they had observed plants or animals outside prior to their involvement in the program. Over half (58%) said they had used a magnifying lens to examine plants or animals, and 63% had hunted for and found living things outside.

Program staff also felt that teens should have a sense of the relative abundance of living things in their environment. Over half the teens (55%) correctly identified *insects*, from among five groups, as the group that contained the largest number of living things. Teens from Fort Lauderdale more frequently answered this question correctly — 70% of them identified insects, compared to 57% from Denver, 55% from Baltimore, 49% from Boston, and 40% from New Orleans. Fort Lauderdale was the only site at which all schools at that site conducted both the *Litter Critters* activity and the *Animals in a Grassland* activity. In addition, for the most part, teen participants from Fort Lauderdale were members of ecology clubs. On the pre-program survey, 49% of Boston and Denver teens had correctly answered this question.

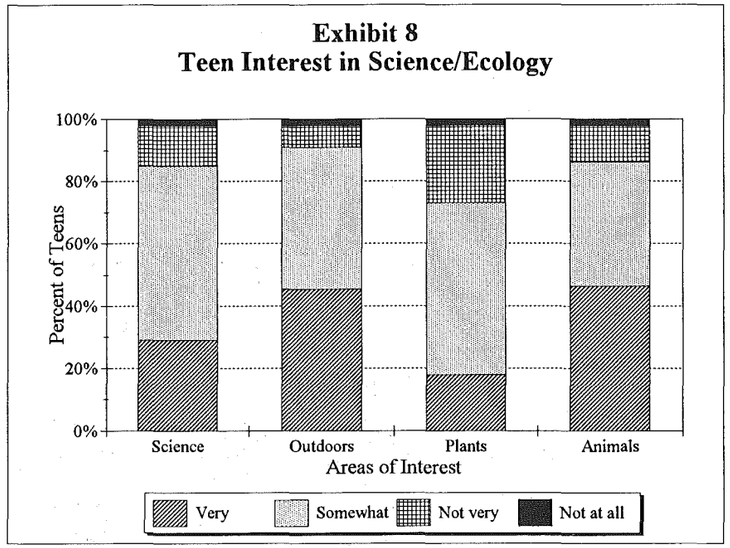
Another concept of particular interest to the program was decomposition. When asked what happens to a plant when it dies, 45% said that it decomposes. Over a quarter said it acts as a fertilizer, helping other plants to grow. Fourteen percent described ways in which it changes physically (e.g., changes color).

Program staff felt that at the end of the program, teens should be able to define the word habitat. Most teens (69%) defined a habitat as a place where people or animals live. The remaining teens defined it as the environment, or one's surroundings, without mentioning it as a place where one *lives*.

Interest in science

Teens were asked how interested they were in science, the outdoors, plants, and animals. The majority of teens were either *somewhat* or *very* interested in all of these areas, with animals and the outdoors receiving the highest ratings. In Boston and Denver, about two thirds of teens stayed the same in their interest in the outdoors, plants, and animals from pre- to post-program; about a fifth had **greater** interest. Results are displayed in Exhibit 8.

Exhibit 8
Teen Interest in Science/Ecology



Personal Growth/Leadership

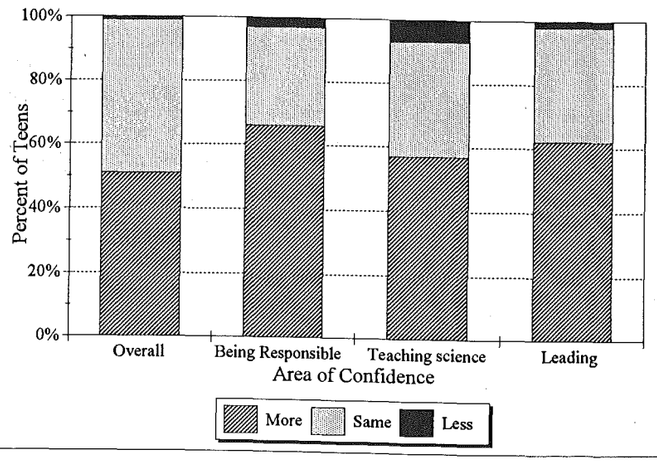
Teens and teachers report that teens had more confidence overall at the end of the program compared to when they had started. Specifically, they had more confidence in being responsible for a small group of children, being the leader of a group, and teaching science to children. In addition to feeling more confident as leaders, teens indicate they have a clearer sense both of what it means to be a leader and of the benefits one experiences in leadership positions.

"You get friendships from little kids who look up to you. You walk down the street, and they say Hi!" (teen participant)

Self-confidence

Changes in teens' confidence over the time they spent in the program are shown in Exhibit 9. Over half of the teen participants said they had more confidence overall at the end of the program than they did when they first became involved. Reports of more overall confidence were slightly higher for Denver (63% of Denver teens were more confident) than for Fort Lauderdale (55%), Boston (52%), or Baltimore (45%). Teachers also reported teen growth in the area of **self-**confidence; when asked whether teens had grown *none, a little, some,* or *a lot,* ten out of twelve teachers who responded said *a lot*.

Exhibit 9: Change in Teen Confidence
Overall and With Children



The percentage of teens who said they had more confidence than they did prior to their VINE participation in being responsible for a small group of children and in being the leader of a group were higher for Denver and New Orleans than for other sites. Three quarters of teens in Denver and New Orleans reported more confidence in these areas.

Leadership

"acting like myself...sometimes teachers are role models. I think a role model should be considered to be a leader, someone you look up to." (a teen describing what it means to be a role model)

Teens were asked about the most important thing they learned about being the leader of a group; the most common reply was "learning about responsibility and patience" (31%). Another fifth said learning to set a good example for the children was most important.

During a focus group discussion with teens in Boston about what skills are needed to be an effective teacher**,** teens mentioned leadership skills, patience, being good at talking, and experience. A few students discussed their experience teaching, with a major focus of discussion on disruptive or problem students. Most teens said they could have benefitted from having more training on how to deal with younger children's behavior.

The teens had many examples of the ways they handled children who talked too much, didn't listen, or who were generally unruly. Some role-played what they would say to the child to get him or her to pay attention or to participate. Others said that they would make the child feel bad or foolish. Some said that they would try to involve children over and over, and if they did not finally listen, they gave up. One student said, *"I snapped my fingers and said be quiet. It worked."* Some of their methods for working with children were learned from their own teachers, past and present.

When asked, "What would you tell someone who's interested in becoming a leader?", teens were generally positive in their descriptions. Examples of their responses include:

- *"It's a lot of work, but you get a lot out of it."*
- *"They've got to be strong."*
- *"They've got to like working with kids because they're hard to work with."*
- *"They can aggravate you. They talk and interrupt."*
- *"You need patience."*
- *"I learned that if you have fun with kids they learn faster. If you teach them and they're not having fun, you lose their attention span."*

School Attendance

At some sites, where school attendance is a problem, coordinators are interested in whether the VINE program has an impact. Eighty percent of teens reported that the program did not affect their school attendance. About a fifth of teens from Boston and Denver said they attended more

because of the program, compared to 8% from Baltimore who said they attended more. (This question was not asked of teens in Fort Lauderdale and New Orleans.)

Half of the teachers reported the program has no effect on the teens' school attendance, while the other half reported teens attended more because of the program. No one said teens had attended less because of the program.

A quarter of teens said they had missed no days of school in the last month (i.e., the month prior to that during which they completed the survey); a third said they had missed one or two days, and another quarter had missed three to five days. The remaining 11% had missed more than five days of school in the last month.

Most teens reported getting either A/B's or B/C's in school. Boston and Denver teens were asked about their grades on both pre- and post-program surveys. Most reported no change in grades, while seven of reported better grades on the post- than on the pre-program survey, and two reported worse grades.

Career Exploration

When asked about their plans for after high school, most teens (63%) said they plan to attend a four year college. These reports were quite a bit lower in Denver, where less than a fifth plan to attend a four year college. The majority of teens in Denver (44%) indicated they planned to work full time after high school.

On the written surveys, teens indicated that they did not feel that the program had helped them think about what kind of a job they might like to do in the future. However, in focus groups and alternative assessments conducted with teens, some said they do want to have careers involving children (e.g., teacher, childcare, pediatrician), while others said they had learned that they didn't want their career to involve children. Teens were interested in a very broad range of jobs, but a third said they wanted to be in the medical field (i.e., doctor, nurse, veterinarian).

Teachers believed that the program enabled teens to think about career and life decisions. Their reports were positive, with six indicating teens had grown *some* in their ability to make such decisions, and five reporting *a lot* of growth in this area.

STRENGTHENING VINE PROGRAMS

Suggestions for Improvement

The evaluation had as one of its central concerns how the program can be strengthened to better meet the teens' needs. Specifically, we were looking for ways in which the program could be revised to improve opportunities for teen growth in the areas of science/ecology, personal growth/leadership, and career exploration. We were also interested in whether there were other needs of the teens that could be addressed by the program, or by an extension of the program. Aside from what the quantitative survey data yielded about various aspects of the program, we also asked both teens and teachers/club leaders for any suggestions they had for improving the program. Our own recommendations are included at the end of this report.

Teens

We asked the teens for any suggestions they had for ways that this program could be made better for high school students like themselves. For the most part, teens suggested being allowed to spend more time with the elementary school children (e.g., do more activities with the kids, get to know the kids better, etc.).

During the course of a focus group one student brought up that teens went through a lot of training for each investigation, but only used it for that one day. They would have benefitted from teaching the same lesson more than once. Other students would have liked to use the knowledge from one topic over the course of two investigations (preferably in the same week). Another suggestion, for which there was much consensus, was a field trip, in that it would present another great opportunity to teach the elementary school children.

Teachers

Teachers were asked, both on the surveys and in interviews, about the parts of the program they felt needed the most improvement. In addition, we asked them to make specific suggestions for several different areas of the program. Teachers' responses were varied, both among and within sites. They are presented here by site.

<u>Baltimore</u>

- Funding for transportation to sites would be an improvement.
- Simplify the activities.
- Have the Project Coordinator do both introduction and closure at the elementary schools with the entire group (teens and younger children). Sometimes teens are too shy to take the lead with their group so the students who they're teaching don't

really know what they're doing, why they're doing it, and what they're supposed to learn.

- Provide high schools with additional activities to build into the curriculum.
- Provide some high school level supplemental material to help give students background knowledge.

Boston

- Expand the program to include more high school students.
- The time spent with elementary school students should be earlier in the day.
- The training sessions and the investigations should be closer together in time.
- Expand the number of activities.
- Build evaluation into the program; elementary students should fill out pre- and post-test questionnaires.

Denver

- There is a need for better communication among adults involved in the program (i.e., Project Coordinator and high school teachers) — specifically with respect to scheduling. More advance planning needs to happen before students register for classes.
- Follow-up is a missing piece.

Fort Lauderdale

- Publicize both the need for and the goals of the program to other teachers/club leaders in the high school, and try to obtain more support from high school administrators.
- Scheduling needs improvement — specifically, students miss a lot of school.
- A field trip or outing with teens and elementary students to a nature preserve or park, or a combined beach clean-up effort, would help promote team spirit.

New Orleans

- Better coordination is needed on the part of elementary schools.
- The program should be expanded over a longer period of time.
- An hour question and answer after several related activities are done would allow extension of ideas and closure on concepts.
- Coordinate activities with topics being taught in the teens' classrooms.
- There is a need for more input from the elementary school teachers.

In general, teachers felt that a more formal teacher orientation to the program would be very helpful for them. Most of them also indicated that they were more concerned with their teens than they were with their curriculum, so that they were willing — with a good orientation — to schedule their curriculum around the program. They felt that structuring their class around the program would provide the teens with a more solid overall experience in science.

Another common theme that emerged from teachers was that there needs to be greater agreement on the goals and purpose of the activities. Although teachers felt that teens were learning from doing the activities, most felt the overall point was not really being internalized. They attributed this to a lack of understanding of the overall purpose of doing the activity.

In terms of follow up, everyone talked about a lack of funding resources preventing further activities. Most teachers are on tight budgets, and some reported current spending freezes in their schools.

Training Sessions

> *"They gave us information on what to expect, but we had to find out on our own how it would go."* (a teen participant discussing the training sessions)

The five cities each had different models of teen training. Training sessions varied from site to site in terms of length, number of sessions per investigation, length of time between session and investigation, and the number of people conducting the sessions and their level of involvement (e.g., teacher/club leader, other assistants). It was not possible to control for all these differences across sites, nevertheless all the training sessions had essentially the same components, and both teens and teachers/club leaders were asked to rate these components.

Teens rated the trainings in terms of **how good** the sessions were in helping them accomplish different parts of the program. Teachers/club leaders were asked to rate the **effectiveness** of these same aspects of the trainings. Explaining how to use all the materials and supplies received the highest ratings from teens and teachers. Teachers also felt helping teens carry out activities with the younger children was one of the most effective areas of training, while teens responses were positive but more mixed. Helping teens learn how to handle the kids and helping teens budget their time while teaching received positive, but more mixed, reviews from both teachers and teens. Results for teens and teachers are presented separately in Exhibits 10 and 11 on the following page.

Exhibit 10: Training Sessions
Teen Ratings of Effectiveness

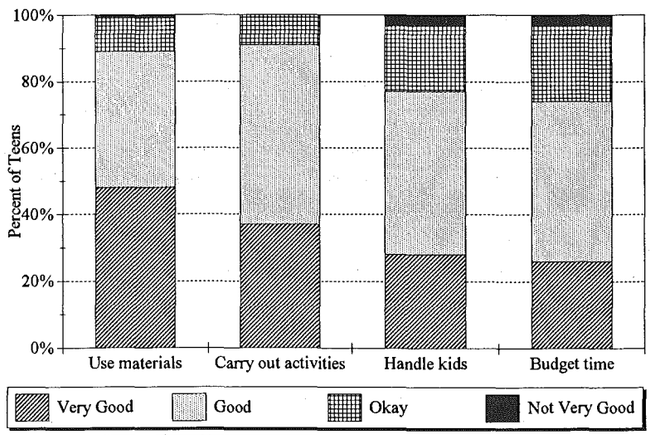
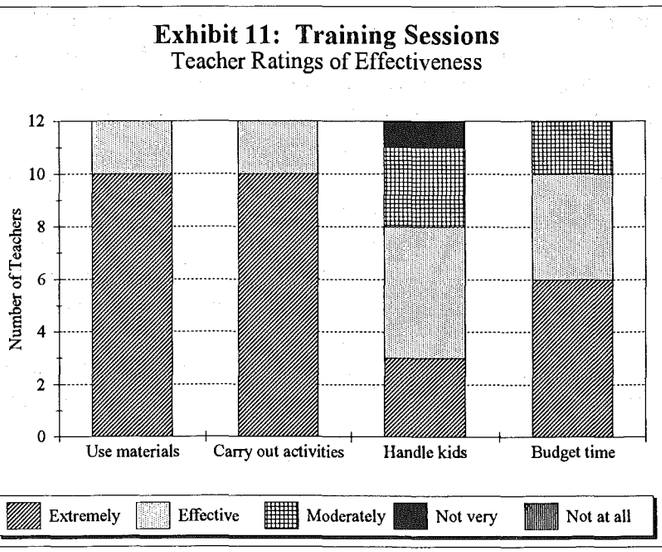


Exhibit 11: Training Sessions
Teacher Ratings of Effectiveness



Teens from Fort Lauderdale and New Orleans consistently rated these various aspects of their training higher than did teens from the other three sites.

Teachers were also asked for any specific suggestions they had for improving the trainings. These included:

Baltimore
- do more role playing of problems they may encounter

Boston
- double periods seem to work better
- a special time should be set up for the elementary school teachers to be trained so they can do some follow-up activities with the kids

Denver
- schedule trainings closer to times of investigations

Fort Lauderdale
- more emphasis on controlling younger students (discipline, etc.)
- more actual practice of the skills
- during the school day — not during lunches because teachers will not allow release time
- summer or weekend training for high school kids

New Orleans
- allow more than one opportunity for students to train
- give teachers activities prior to training so they can review concepts with students

Several teachers, during phone or in-person interviews, discussed the difficulty teens have in working with younger children who have behavior issues. Some pointed out that many of the teens themselves have struggled with their own behavior problems, so to be around children who can sometimes get out of control presents a real challenge to them. It was generally agreed among teachers that teen training sessions need to better address this issue of handling behavior problems that arise when working with the younger children.

PHOTOJOURNAL RESULTS

In helping the teens from one of the high schools in Boston put together a photojournal, we were able to gather rich qualitative data on their experiences in the program. In thinking about the ways their involvement in the program will benefit them in the long run, teens focused on long-term educational (e.g., college), personal (e.g., learning patience, leadership), and career/life (e.g., parenting, getting a job) benefits.

Teens expressed gains they had made in terms of confidence, choosing to take pictures of themselves in leadership roles with the younger children. One important finding that emerged from the photojournal was that the way teens conceptualized their leadership roles did not preclude them being learners along with the younger children.

At least one teen learned through the program that she wanted her future work to involve younger children, while other teens focused more on what they had learned they did not want their future jobs to include. This part of the exercise served as a reminder that, given the choice or chance, teenagers often tend to focus on the negative. Awareness of this tendency is helpful in designing future evaluations. Negativity aside, teens' pictures and comments in this area also underscore the difficulty that teens encountered in working with younger children who don't always listen and do what is expected of them and also convey the sense of nervousness they sometimes felt in their roles as leaders.

The teens used the photojournal to communicate what they had learned about science and the environment in the program. Some teens merely recounted something they had **done,** or focused on their **teaching** of science to the younger children, rather than describing what they had learned. The photojournal work of other teens indicated that the program had helped correct some common stereotypes related to science (e.g., that insects are to be feared). The pictures and accompanying comments in this area also indicate that teens' overall appreciation for and awareness of the environment had increased as a result of the program.

The photojournal, in a general way, emphasized the needs of the teens. For instance, when asked to express, through the photojournal, the most important thing they got out of the program that they hadn't experienced elsewhere, teens emphasized the *attention* they received from the children. It also was telling of teens' abilities in writing and presentation, and indicated their need for these areas to be addressed.

On the following page is a summary of the results of this evaluation and our recommendations for the program and for future evaluations. Recommended evaluation instruments and techniques can be found in the attached booklet: GUIDELINES FOR FUTURE EVALUATION OF VINE PROGRAMS BY INDIVIDUAL SITES.

SUMMARY AND RECOMMENDATIONS

- Teens reported that they had more confidence at the end of the program than they did before they became involved. In addition, although teachers reported teen growth in the area of science/ecology, their written and verbal comments focused on gains made in the area of personal growth/leadership. ***We recommend that program staff take these gains into consideration by including specific references to this area of growth in the training sessions.***

- While it is a goal of the program to have an impact on teens in terms of career exploration, this area is not being addressed in current training sessions. ***We recommend building the area of career exploration into the training sessions in a more overt way.***

- Although teens clearly enjoyed working with children, their least favorite part of the program was working with **difficult** children. ***We recommend that this issue be more actively addressed in future trainings; it may even warrant its own training session.*** Given some clear guidelines, this is also something that the teachers/club leaders may be able to take on.

- The majority of teens would prefer to lead investigations with a partner. ***We recommend that teens be paired if that is their preference, even if it means the pair has a larger group of younger children to teach.*** Paired leaders may also help address the issue of working with difficult children.

- Not all teachers/club leaders were actively involved in the investigations at the elementary schools, some for legitimate reasons (e.g., other responsibilities during meeting time, school unable to pay for a substitute), but some who weren't involved could have been. ***The program staff should consider having a specific strategy in place for involving the teachers in the investigations.*** For instance, make it their responsibility to help teens who have difficult children in their groups, or have them keep field notes to assist in program evaluation.

- It also appeared, based on site observations, that the elementary teachers may be an under-utilized resource. ***We recommend that elementary teachers be delegated a specific responsibility, such as shadowing younger children who have a tendency to act up.***

- Most teachers thought it would be helpful to conduct a more formal teacher orientation (indicating their willingness to attend). ***We recommend that a meeting at the beginning of year includes high school and elementary school teachers together so as to explain their roles and the goals for each group of students.***

We also recommend that each high school teacher, and each elementary school teacher, be given a schedule of activities at the beginning of year.

- A few teachers mentioned the idea of introduction and closure at the investigations, indicating a perceived need for teens to be helped to process, integrate, and internalize what they are doing.

Similarly, from observations of both trainings and investigations, it was our sense that the overall goal for teens in the program was to be **successful** in leading the children. For some, this meant merely imitating their trainer, without a deeper sense of purpose.

In order for teens to have a deeper understanding of what they are doing, the program staff should consider clarifying what teens are supposed to learn from each activity. These should be statements in the form of goals and objectives, and the statements should be measurable for purposes of evaluation. It may be helpful to include the goals and objectives for activities on the activity cards.

For example, for the Plant Hunt activity, a goal is for teens to have an understanding of the range of quantity and scale of diversity of the plants in their environment. In the training for this activity, it would be helpful for teens to hear that this is the purpose of the exercise, and for there to be some discussion about how many plants they think they'll find, before showing them the materials they'll be using and jumping right into a discussion of what they're going to do with the younger children.

- Although coordinating and scheduling issues were mentioned by teachers, most were unable to suggest improvements in this area. One person suggested training teens during the summer or on weekends. ***In order to allow for efficient communication, we suggest that programs consider paving the way for electronic mail between teachers and Coordinators.***

- ***We recommend that the program staff consider scheduling training sessions closer in time to the investigations.***

- Site visits are critical to the process of any evaluation and play a crucial role in shaping both the interpretation of the quantitative data and the recommendations for the program. ***We recommend that any future program evaluation include site visits to all sites participating in the evaluation.***

APPENDIX A: OVERVIEW OF VINE PROGRAM SITES

City	High School & # Teens	Sequence of "Rounds"	Profile of Teens
Baltimore	6 schools 100 teens total	wk 1: train wk 2: elem. sch. repeat 3 times lead each activity once	C or better ave. predominantly ♀ 97% African American biology class
Boston	Dorchester 20 teens	wk 1: train wk 2: elem. sch. repeat 3 times with 5th graders lead each activity once	special community garden class selected from applications and interviews
	Roxbury 18 teens	wk 1: train wk 2: elem. sch. wk 3: elem. sch. repeat 9 times with 2nd graders lead each activity twice	multi-lingual bio. class 50% Spanish 25% Somali 25% Native English-speakers
	S. Boston 25-30 teens	wk 1: train wk 2: elem. sch. repeat 3 times with 3rd graders lead each activity once	self-selected volunteers Latino/Hispanic B/C students mostly 10th grade
Denver	Wm. Smith 30 → 15 (drop off)	wk 1: train and go to 1 elem. sch. wk 2: go to 2 elem. schs. repeat 3-4 times with 4th graders lead each activity 1-3 times	records with law single parents low SES 50% African American
	Zuni 35 each week 10-12 consistent		mostly attendance problems 90% Latino/Hispanic
Fort Lauderdale	3 schools 60-80 teens total	2-3 hr. training month 1: 1 activity with 2 classes back to back month 2: another activity with 2 classes repeat twice with 4th graders lead each activity twice	general range of students 70% Anglo 15 % Latino/Hispanic 15% African American mostly ecology clubs
New Orleans	3-4 schools 80 teens total	wk 1: train wk 2: elem. sch. repeat 4 times with 4th graders	80% inner city schools 20% magnet schools African American avg. to above avg. teacher selects volunteers

GUIDELINES FOR FUTURE EVALUATION OF TEENS IN VINE PROGRAMS BY INDIVIDUAL SITES

Goodman Research Group, Inc.
Cambridge, MA.
August 1995

GUIDELINES FOR SURVEYS

All surveys were developed by Goodman Research Group in consultation with VINE program staff in order to ascertain the effectiveness of the teen component of VINE programs across the country. In particular, the surveys were designed to gather information about teens' appreciation for the environment, their understanding of science, their knowledge of selected ecology/biology concepts, their interest in science/ecology, their use of science skills, their self-confidence, their ability to try out new roles, their school attendance, and their career plans (See Appendix E for which survey questions pertain to each of these areas).

Teen Surveys

Appended to these guidelines are samples of the two surveys used by Goodman Research Group, Inc. in the 1995 evaluation of VINE programs, and recommended for future use by individual sites.

Appendix A, "WHAT DO *YOU* THINK?", is the pre-program survey, to be administered to teens prior to their involvement in the program. During the first orientation meeting with teens is an ideal time to administer this survey.

Appendix B, "POST-VINE TEEN SURVEY", is meant to be administered to teens at or toward the end of their involvement in the program. What seemed to work best at several sites this year was to hold an end-of-the-year party and administer the survey at that time. Alternatively, some Project Coordinators requested that teachers/club leaders administer the surveys to teens during their regularly scheduled class/club time.

Recommendations for administering surveys to teens

- Let the students know that this is a survey of their opinions, not a test, and that the information they write down will help to improve the program that they are (will be) involved in. When you introduce the survey, you might want to let them know that you'd really like to find out what they think, that it's fun to express opinions, etc.

- It is essential that you check to be certain that the students fill in each page of the survey. Let the students know that there are questions on the back sides of the pages. Then, check their surveys as they hand them in.

- If students have difficulty coming up with answers to questions, you may want to suggest that they go on to the next question, and go back later after they have had time to think about it. Encourage them to write down something for each question, but do not push them to answer a question if they can't think of anything.

- While teens are completing surveys, it is recommended that one or two adults (program staff or the teen's teacher or club leader) circulate around the room to keep teens focused and to answer questions. If a student needs your help in comprehending a question, feel free to interpret the question. Try to be helpful without answering the question for them.

Since the teens and the programs vary from site to site, these surveys were tailored during the course of our evaluation according to concerns/specific interests expressed to us by the local Project Coordinators. The following samples contain all the questions we developed for use in the current evaluation, regardless of whether or not they were used by every site. These questions have been shown to work with teens of various abilities.

In future use by individual sites, they may be adapted (questions deleted or added). Use of pictures (e.g., faces, thumbs up/down — See Appendix B, questions 11 and 24) in addition to words on rating scales may be desirable depending on the group of teens.

It is recommended that project staff at each site review and clarify the overall goals and specific objectives for teens in their programs prior to undertaking future assessment of their program, as it is the goals and objectives of a program (which may change from year to year) that provide the framework for designing any type of evaluation (external or internal).

For example, if, in addition to the overall VINE goals, a goal of your local program is to improve the public speaking skills of teens, you may want to add to question 17 on the pre-program survey the following choice:

☐ spoken in front of a group of people;

and to question 18 on the pre-program survey:

d) **speaking in front of groups of people**

Very Confident	Somewhat Confident	Not very Confident	Not at all Confident

The pre-test responses will inform you about any public speaking experience teens have had prior to their involvement in the program, and how confident they feel in this area. If they have had prior experience in this area, you can find out more about and build on their previous experiences. If not, you know that their public speaking experiences in this program will be "firsts". Including a question about confidence will enable you to draw comparisons between their confidence in this area prior to and after involvement in the program. This will help you get a sense of whether the program may be having an affect on teens' confidence in public speaking.

☞ **It is strongly recommended that sites administer both a pre- and post-program survey to teen participants.**

Adult Sponsor Surveys

Appendix C contains the adult sponsor survey, which individual sites may distribute to teachers or club leaders of the teens. Project Coordinators will already know the answers to some of the questions we asked, and therefore, some questions can be omitted in future use of the survey by individual sites (e.g., questions 1-4, and 9 and 10).

With advance planning and a class list, the sites may elect to add a chart to the survey and ask teachers to rate students individually (in addition to as a whole) on each of the variables listed in question 8. For example:

Areas of growth 1 = none 2 = a little 3 = some 4 = a lot	Student #1	Student #2	Student #3	Student #4	Student #5
appreciation for the outdoors	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
understanding of what science is	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4

It should be recognized that even if sites work with more than one teacher and surveys are filled out anonymously, teachers may still be reluctant to make any critical or negative comments about the program. To reduce this bias, sites should have adult sponsor surveys mailed back rather than collecting them in person, and may even want to consider having someone not directly involved with teachers oversee this aspect of any future internal evaluation.

Coding Surveys

In order to analyze the data using a computer program, responses to surveys will need to be coded. Coding refers to the assignment of numbers to answers of questions to allow for data entry and simple data analysis.

- For yes/no questions, this is very straightforward - yes = 1 and no = 0:

  Have you ever done any other volunteer work?

  ☐ Yes **(=1)** ☐ No **(=0)**

- For questions where the respondent is asked to check one of several possible answers, we assign each answer a number:

  What is your favorite subject in school? *(Check one)*

  ☐ English **(=1)** ☐ Math **(=2)** ☐ History **(=3)**

- For questions where respondents are able to check more than one answer, each answer is treated as its own *variable*, and coded individually (i.e., if the respondent checked that answer = 1; if respondent didn't check that answer = 0):

  Why have you decided to participate in this program?
  (Check all your reason)

  ☐ It's part of a class I'm taking
  If checked = 1; if not checked = 0

  ☐ My teacher suggested it.
  If checked = 1; if not checked = 0

  ☐ A friend/classmate recommended it.
  If checked = 1; if not checked = 0

- For open-ended questions, the person coding the questions must work backwards so to speak. The "coder" must look at all the various answers that respondents gave, and come up with a set of categories that encompass all these answers. Each category than gets a numerical code.

  For example, let's look at the question, **What was the most important thing you learned about being the leader of a group?** You look through all the surveys and find certain answers keep popping up, such as, "it's hard", "the kids don't listen", "I'm a good leader", and "you have to have a lot of patience". You can let each of these common answers be a category, and assign each one a number:

  it's hard = 1, the kids don't listen = 2, I'm a good leader = 3, etc.

  Returning to the surveys, you code each person's answer to this question depending into which of the categories you came up with it best fits (e.g., the answer "I learned I'm a natural at being in charge", best fits into the category "I'm a good leader", so it would be coded as 3.).

Another way to code open-ended questions is to think about what kind of information you really want from the question, and then code it accordingly. For instance, using the same example, let's say what you really wanted to know was simply whether what the teens learned about being the leader of a group was something positive or negative. You could let **positive answers = 1** and **negative answers = 2**, and code accordingly. If you develop this type of coding system, you should always have a category for neutral, or mixed (both positive and negative), answers.

It's always important to have an "other" category when developing a coding system for open-ended questions. There are always a few answers that just don't seem to fit into any of your categories, no matter how exhaustive your list is.

If you decide to design additional questions for a survey, given all the time and effort involved in coding open-ended questions, wherever possible you should try to anticipate the possible answers to a question and provide these answers for respondents to check...we call these "pre-coded" questions.

Appendix D is a *codebook* for the, WHAT DO YOU THINK?, survey. A *codebook* is a copy of a survey in which each question has been marked to show how it will be coded.

Data Analysis

After coding surveys, the data can then be entered into a data set, and analyzed using a simple analysis program that counts up frequencies for each variable. There are a number of spreadsheet software programs that have a statistical capability. Local colleges or high school computer centers may be able to give you information about such programs. For this evaluation, the evaluators used STUDENT SYSTAT which is a program in which you can both enter data, and then run simple statistics. It can be used with PC or MAC, and is available through *Course Technologies* in Cambridge, MA [(800) 648-7450].

Although it is possible to conduct manual data analysis on the results of these surveys, this type of analysis has definite disadvantages. It is more time consuming, and allows for more human error. It also makes it hard to share your data with other program sites, and make comparisons between sites. If all sites, however, had their analysis computerized, this would be relatively easy.

Using an analysis program also allows you to more efficiently compare local data gathered at different points in time. The program will match data sets according to a certain variable (e.g., ID number), and will run change scores (e.g., In the spring of 1995, more teens (36% more) in the Boston and Denver programs *disagreed* or more *strongly disagreed* that the best thing to do with leaves in the fall is to rake the up and get rid of them. This result was indicated by a change score for this item. See pre-test question 20g and post-test question 24g.)

ALTERNATIVE ASSESSMENTS

Using surveys is the best way to gather quantitative data of interest to your program. In addition to surveys, we recommend the use of an alternative assessment. Qualitative data gathered through use of alternative assessments enhances the reporting of the quantitative data, and captures what numbers sometimes don't. The alternative assessments also become products which maybe useful in promoting programs.

GUIDELINES FOR CREATING A PHOTOJOURNAL

One of the "alternative" assessments developed and explored by the evaluators has been the creation of a photojournal by the teen participants (with the help of either the Project Coordinator, or in our case, the teens' teacher). The activity allows the students to photograph their experiences in the program and write down their thoughts to accompany the pictures. We recommend future use of this assessment for three reasons:

- The teens love it;
- Teachers are enthusiastic about it, *and indicate a willingness to take on the responsibility for it*; and
- The information gathered through the exercise is useful; it tells you something about what the teens are gaining by being involved in the program, it adds depth to the quantitative data gathered through the surveys, and it creates a product which individual sites may find useful to share with future teen participants, teachers, or across VINE program sites.

Steps to take

Project Coordinators may want to present the idea to teachers/club leaders as something they would like them to take on in their classrooms/clubs. These guidelines can be photocopied and shared with teachers/club leaders.

1. Decide at what point in the program you want to initiate this activity. We recommend starting mid-way through the program (at which point the teens will have some concrete thoughts on some of the topics below), and stretching the activity out over the second half of the program.

2. Decide how many "one-use" cameras you are able or want to purchase. We used only one camera at a time in Boston, and it worked quite well. The teens' teacher was responsible for bringing the camera to each training and investigation, and for circulating it among students. The students would stop her and ask for the camera when they were inspired to take a picture.

3. Conduct a pre-assessment session with the teens approximately one week before you want them to start taking pictures. The session should include the following:

- An overview of the activity (i.e., photographs and writing will form a photojournal which will be shown to other teenagers who are considering participating in the program to give them an idea of what it's all about and what they can expect to get out of it)

- A discussion of what it means to be a "photojournalist", including some examples of photojournalism (e.g., National Geographic magazines, Life magazine, Jim Hubbard's book Shooting Back, etc.)

- Instructions for using the cameras (i.e., distance from objects, indoor vs. outdoor, handling of camera, etc.)

- Guidelines for, or brainstorming about, picture-taking: ask teens to write down on index cards their thoughts on the following topics at this point in the program, and then ask them to think about pictures they could take that would represent their thoughts on the topic:
  Suggested Topics:
  a) the most enjoyable part of the program
  b) the scariest part of the program
  c) what it's like *before* you lead your first outdoor investigation with kids
  d) what it's like *after* you've led a few investigations
  e) the worst or most embarrassing thing that has happened to you
  f) the number one reason a teenager like you should be a volunteer with this program
  g) the most important thing that this program gives you that you don't get anywhere else
  h) something you're doing in this program that makes you feel good about yourself
  i) the biggest responsibility you have as a volunteer
  j) a habitat
  k) what you're learning about the environment through the program
  l) what you're learning about science through this program

4. The camera(s) should be available for the teens to use at all the remaining trainings and investigations. The idea is that the pre-assessment discussion of what photojournalism means, and the brainstorming about specific aspects of the program, will serve as a springboard or trigger for the teens to take meaningful pictures. Both the Project Coordinator and the teacher/club leader should expect to facilitate picture-taking.

5. After the pictures have been developed, toward the end of the program, a post-assessment session should be set up to guide the teens through writing a few sentences to accompany each picture. The pictures may then be assembled into a photojournal, and if desired, circulated among program sites.

GUIDELINES FOR CONDUCTING FOCUS GROUPS WITH TEENS

Another means of assessing what students have learned from the program, and how their attitudes may have changed over time, is to conduct a focus group.

- The ideal size for a focus group is eight to ten persons, so if your group is larger than that, you may want to consider doing more than one focus group (perhaps at a different point in time). It is best to allow an hour and a half for the discussion.

- Have the students arrange their chairs in either a circle or a square so that they will be able to see and hear everything that is going on and actively participate in the discussion.

- It may be helpful to start off the focus group by asking the students if any of them have ever participated in a focus group. Then briefly describe to the group what a focus group is and why you are doing it.

- Emphasize the importance of giving each student the opportunity to express his or her opinion, and of letting each person complete what he or she wants to say.

- It may be a good idea to say the students' names when you sense that they want to share something, or you can have them raise their hands to indicate they have something to say. If you have a small group you might be able to conduct the discussion without such formalities.

- Some students will find it difficult to speak during a focus group. Make an effort to get them involved, without putting them "on the spot". Conversely, some students will want to talk all of the time. You can try to minimize this by letting them know that you appreciate what they have said, but that you need to hear from everyone in the group.

- Focus groups can take place at any point in time during the program to inform the process, or at the end of the program to help assess outcomes. We conducted a focus group at the end of the program in Boston. On the next page are questions we posed to the teens which could be used in the future by individual sites should they wish to conduct their own focus group. *In the focus group we conducted, we also used pictures of teens involved in program activities in order to prompt discussion, and enable us to ask specific questions.*

GUIDING QUESTIONS FOR VINE PROGRAM FOCUS GROUPS

The goals of the VINE program - What is the program all about? What do you do when they go to the elementary school? What is the *purpose* of doing all those activities with the younger kids? What is it that you are trying to teach the younger kids?

How the program works - How would you explain this program to someone who's never been involved in it?

Why high school students should get involved in the program - What would they get out of being involved? Think about what you got out of it... Did you learn some specific science concepts? What were they? Did you grow personally? In what ways? Did it help you at all to think about what kind of career you might want to have in the future?

What high school students learn in this program - What do they learn about science? About the outdoors? About working with younger children?

Important skills - What kind of skills are needed to work with the kids and to do the activities? What is the easiest part of working with them? The most difficult part?

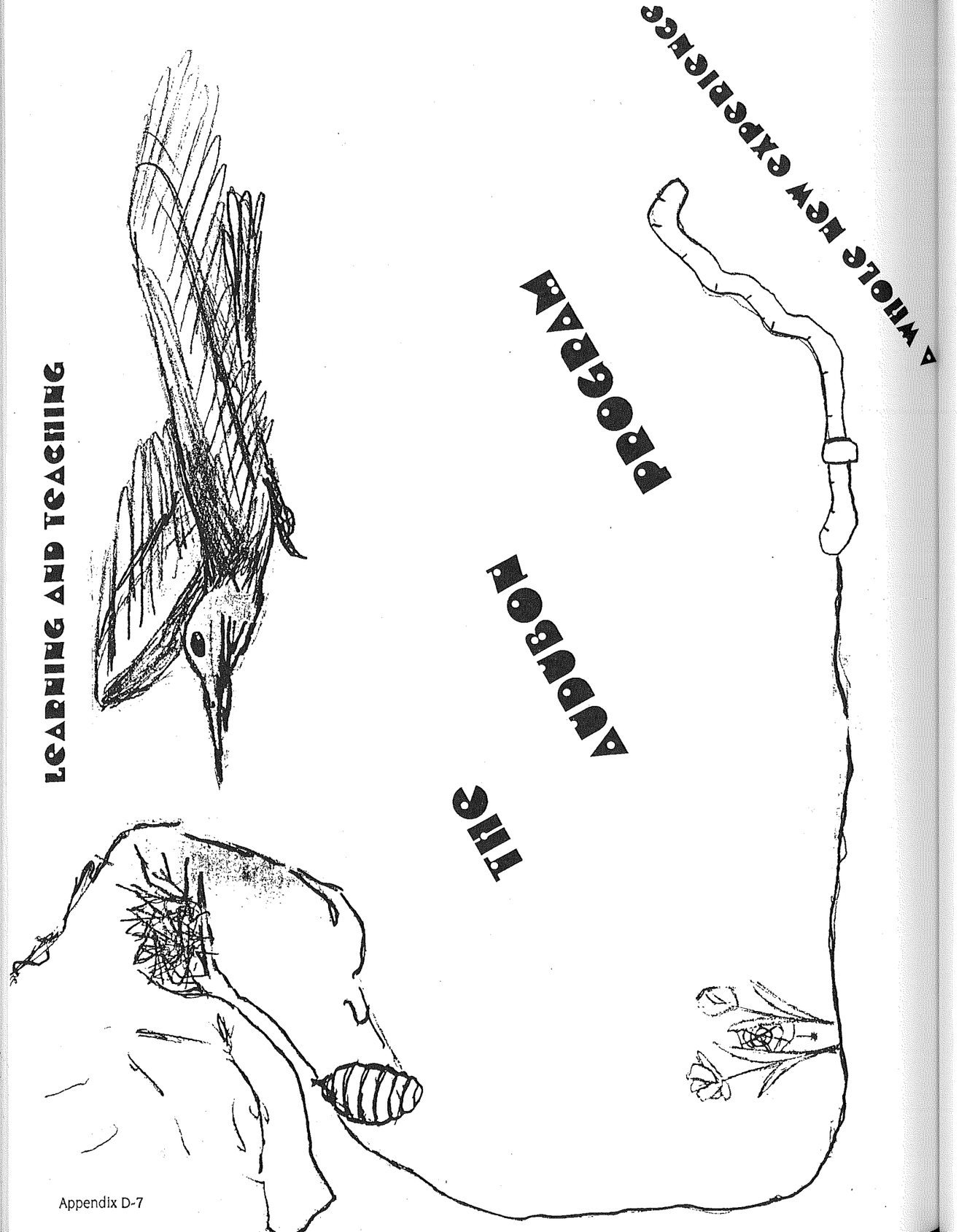
DESIGNING A PROGRAM FLYER

Aside from gathering both quantitative and qualitative data in the course of an evaluation, it is often helpful to try to gather the same types of information in a variety of ways. This is also a means of determining which of several evaluation techniques works best with any given group.

In addition to using the above questions in a focus group format, we also had a Boston area teacher pilot them in another activity he led with his students. We gave the group the task of helping us design a "flyer" (see next page) that could be given out to new students who are thinking about doing the program next year. We asked them to design the flyer together, and gave the teacher the questions to guide the discussion around the content of the flyer. We taped the discussion and found it very informative, as well as enjoyable for the teacher and the students.

Students generated a variety of "headings" for the flyer including:

- SHOW US WHAT U GOT!
- THE BIRDS AND THE BEES! REALLY!
- WANT TO BE A ROLE MODEL?
- CAN YOU DO A BETTER JOB THAN YOUR TEACHER? GIVE TEACHING A TRY!
- INTERESTED IN SCIENCE? WANT TO TEACH? NO EXPERIENCE NECESSARY!



I. The Goals Of The VINE Program

- To teach elementary school kids
- To teach high school students about...

  science... how to identify plants, birds, and insects
  and about patience!

- To be a role model for younger kids

II. How The Program Works

- First...
  they teach you and then...
  you go teach the kids
- For the program to work, you have to...
  communicate with kids...
  listen to the kids and then tell them what you want

III. Why High School Students Should Get Involved In The Program

- you get experience in teaching
  and
- you make new friends

IV. What High School Students Learn In This Program

- you learn to think about the outdoors
- you learn that it's not easy being a teacher

V. Important Skills

- patience
- intelligence
- memory
- friendliness
- respect

APPENDIX A

WHAT DO *YOU* THINK?

1. **Your name:** _____

2. **Your age:** _____

3. **Why have you decided to participate in this program?** *(Check all your reasons)*
☐ It's part of my class.
☐ My teacher suggested it.
☐ A friend/classmate recommended it.
☐ A club I belong to recommended it.
☐ I want to get community service credit.
☐ I want to get academic credit.
☐ I want to get out of class.
☐ I want to work with children.
☐ I want to help the environment.
☐ other; *describe* _____

4. **When did you start volunteering with this program?** *(Check one)*
☐ 1994-95 ☐ 1993-94 ☐ 1992-93

5. **Have you ever done any other volunteer work?** ☐ Yes ☐ No
If yes, please describe the volunteer work:

6. a) **What is your favorite subject in school?**
☐ English ☐ Math ☐ History
☐ Foreign language ☐ Science ☐ Art
☐ P.E./Gym ☐ Geography ☐ Computers
☐ Other; what? _____

b) **What is your least favorite?**
☐ English ☐ Math ☐ History
☐ Foreign language ☐ Science ☐ Art
☐ P.E./Gym ☐ Geography ☐ Computers
☐ Other; what? _____

7. **How many different kinds of plants do you think live right outside your school? Write the number here:** _____

Can you think of any examples of plants that live right outside your school?

8. **How many different kinds of animals do you think live right outside your school? Write the number here:** _____

Can you think of any examples of animals that live right outside your school?

9. **What does the word *science* mean?**

10. **Which of these groups do you think contains the largest number of living things?** *(Check one)*
☐ trees
☐ insects
☐ fish
☐ birds
☐ people

11. **What do you think happens to a plant when it dies?**

12. **How interested are you are in...** *(Circle one)*

a) science

Very Interested	Somewhat Interested	Not very Interested	Not at all Interested

b) the outdoors

Very Interested	Somewhat Interested	Not very Interested	Not at all Interested

c) plants

Very Interested	Somewhat Interested	Not very Interested	Not at all Interested

d) animals

Very Interested	Somewhat Interested	Not very Interested	Not at all Interested

13. **What does the word *habitat* mean?**

14. **What are some things people do that "help" the environment?**

15. **What are some things people do that "hurt" the environment?**

16. **Pretend you've just met someone who doesn't know what a *scientist* is. In the space below, try to explain to them what a scientist is.**

17. **Have you done any of the following activities before?** *(Check all that you've done)*
- ☐ worked with children
- ☐ been a leader of a group of children
- ☐ taught something to children

18. **How confident are you in...** *(Circle one)*

a) being responsible for a small group of children

Very Confident | Somewhat Confident | Not very Confident | Not at all Confident

b) teaching science to children

Very Confident | Somewhat Confident | Not very Confident | Not at all Confident

c) being the leader of a group

Very Confident | Somewhat Confident | Not very Confident | Not at all Confident

19. **Have you done any of the following activities before?** *(Check all that you've done)*
- ☐ observed plants or animals outside
- ☐ used a magnifying lens to carefully examine plants or animals outside
- ☐ hunted for and found things living outside

20. **How strongly do you agree or disagree with the following statements?** *(Circle one)*

a) Eventually, environmental problems will just go away on their own.

Strongly Agree Agree Disagree Strongly Disagree

b) Nothing I do will really have an effect on the environment one way or another.

Strongly Agree Agree Disagree Strongly Disagree

c) Bugs are totally cool.

Strongly Agree Agree Disagree Strongly Disagree

d) Digging in the dirt is gross.

Strongly Agree Agree Disagree Strongly Disagree

e) Scientific tools are very expensive to buy.

Strongly Agree Agree Disagree Strongly Disagree

f) When you spray a pesticide, it harms only the bug you're pointing it at.

Strongly Agree Agree Disagree Strongly Disagree

g) In the fall, the best thing to do with leaves is to rake them up and get rid of them.

Strongly Agree Agree Disagree Strongly Disagree

Finally, just a few more questions about yourself...

21. **Are you?** Female ☐ Male ☐

22. **How do you describe yourself?** *(Check)*
☐ Black or African American ☐ Asian ☐ Native American
☐ White or Caucasian ☐ Latino or Spanish American ☐ Other: *describe* _____

23. **In general, do you consider yourself...**
☐ a shy person or ☐ an outgoing person

24. **Do any children live in your house with you?**

☐ Yes ☐ No

If you checked yes, how old are the children? Write their ages here:

_____

25. **Name of your High School:** _____

26. **Circle your grade level:** 9th 10th 11th 12th

27. **What grade do you *usually* get in school?** *(Circle only one)*

A A/B B B/C C C/D D F

28. **About how many days of school did you miss *last month*?** *(Check only one)*
- ☐ none
- ☐ 1 - 2 days
- ☐ 3 - 5 days
- ☐ more than 5 days

29. **What do you plan to do after high school?** *(Check all that you plan to do)*
- ☐ work part time
- ☐ work full time
- ☐ go to a 2 year college, vocational, technical, or business school
- ☐ go to a 4 year college
- ☐ enlist in the military
- ☐ other; *describe* _____

30. **What kind of job or career would you like to have when you've finished your education?**

PLEASE WRITE ANYTHING ELSE YOU'D LIKE TO SAY ABOUT YOURSELF OR ABOUT VOLUNTEERING FOR THIS PROGRAM ON THE BACK OF THIS PAGE

APPENDIX B

POST-VINE TEEN SURVEY

1. **Your name:** _____

2. **How much did you like the VINE program?**
(Circle one)

Really liked Liked Sort of liked Didn't like

3. **What did you like *best* about the program?**
(Check the <u>one</u> that you liked best)
☐ teaching the children about science
☐ being a role model for the children
☐ the children's excitement about it
☐ getting to do the activities
☐ working with other people my age
☐ being outside
☐ other; what? _____

4. **What did you like *least* about the program?**
(Check the <u>one</u> that you liked least)
☐ there wasn't enough time to do the activities
☐ going outside when it was very cold or hot
☐ having to work with difficult children
☐ the program didn't last long enough
☐ other; what? _____

5. **What was the most important thing you learned about being the leader of a group?**

6. **How much did you like working with younger children during this program?**
(Circle one)

Really liked Liked Sort of liked Didn't like

7. **What was most difficult about working with younger children?** *(Check only <u>one</u> response)*
☐ their behavior (i.e., fooling around, etc.)
☐ not knowing answers to questions they asked
☐ not seeing them enough
☐ when they didn't understand the activity
☐ when they didn't want to do the activity
☐ other; what? _____

8. **Which way do you prefer to teach activities with the younger children?**
☐ alone or ☐ with a partner

9. **How many activities did you teach the younger children?** _____

10. **Compared to before you started this program, do you have *more*, *less*, or *about the same amount of* confidence in the following?**
(Circle one)

a) your overall confidence
more less about the same

b) being responsible for a small group of children
more less about the same

c) teaching science to children
more less about the same

d) being the leader of a group
more less about the same

11. **How good were the trainings in...**
(Circle one)

a) helping you carry out the activities with the kids

Very good Good Okay Not very-good

b) helping you learn how to handle the kids

Very good Good Okay Not very good

c) explaining how to use all the materials and supplies

Very good Good Okay Not very good

d) helping you budget your time while teaching

Very good Good Okay Not very good

12. **How likely would you be to do the following next year?** *(Circle one)*

a) **volunteer for this program again**

Very likely	Likely	Somewhat likely	Not at all likely

b) **volunteer for another community service program**

Very likely	Likely	Somewhat likely	Not at all likely

13. **Do you have any suggestions for ways that this program could be made better for high school students like you?**

14. **Write the *number* of different kinds of plants you think live right outside your school:**

_____

Give 2 or 3 examples of plants that live there:

1) _____
2) _____
3) _____

15. **Write the *number* of different kinds of animals you think live right outside your school:** _____

Give 2 or 3 examples of animals that live there:

1) _____
2) _____
3) _____

16. **Which of these groups do you think contains the largest number of living things?** *(Check one)*

- ☐ trees
- ☐ insects
- ☐ fish
- ☐ birds
- ☐ people

17. **What does the word *science* mean?**

18. **What do you think happens to a plant when it dies?**

19. **How interested are you are in...**

a) **science**

Very Interested	Somewhat Interested	Not very Interested	Not at all Interested

b) **the outdoors**

Very Interested	Somewhat Interested	Not very Interested	Not at all Interested

c) **plants**

Very Interested	Somewhat Interested	Not very Interested	Not at all Interested

d) **animals**

Very Interested	Somewhat Interested	Not very Interested	Not at all Interested

20. **What does the word *habitat* mean?**

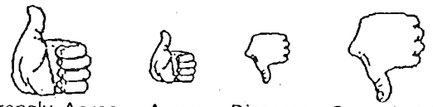
21. **What did you learn about the environment from the VINE program?**

22. **What are some things people do that "help" the environment?**

23. **What are some things people do that "hurt" the environment?**

24. **How strongly do you agree or disagree with the following statements?** *(Circle one)*

a) Eventually, environmental problems will just go away on their own.

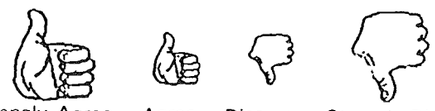


Strongly Agree Agree Disagree Strongly Disagree

b) Nothing I do will really have an effect on the environment one way or another.

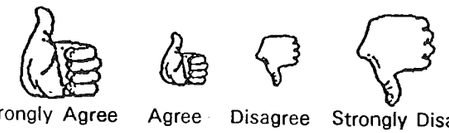
Strongly Agree Agree Disagree Strongly Disagree

c) Bugs are totally cool.



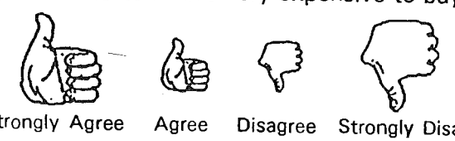
Strongly Agree Agree Disagree Strongly Disagree

d) Digging in the dirt is gross.



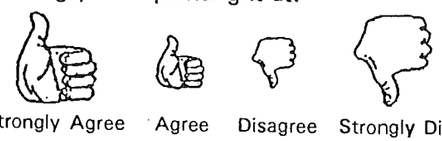
Strongly Agree Agree Disagree Strongly Disagree

e) Scientific tools are very expensive to buy.



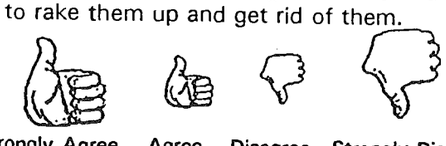
Strongly Agree Agree Disagree Strongly Disagree

f) When you spray a pesticide, it harms only the bug you're pointing it at.



Strongly Agree Agree Disagree Strongly Disagree

g) In the fall, the best thing to do with leaves is to rake them up and get rid of them.



Strongly Agree Agree Disagree Strongly Disagree

Finally, just a few more questions about yourself...

25. **What grade do you *usually* get in school?** *(Circle only one)*

A A/B B B/C C C/D D F

26. **About how many days of school did you miss *last month*?** *(Check only one)*

- ☐ none
- ☐ 1 - 2 days
- ☐ 3 - 5 days
- ☐ more than 5 days

27. **Did this program affect your school attendance?**

- ☐ I went to school *more* because of the program
- ☐ I went to school *less* because of the program
- ☐ It didn't affect my school attendance

28. **What do you plan to do after high school?** *(Check all that you plan to do)*

- ☐ work part time
- ☐ work full time
- ☐ go to a 2 year college, vocational, technical, or business school
- ☐ go to a 4 year college
- ☐ enlist in the military
- ☐ other; *describe* _____

29. **How much did the VINE program help you think about what kind of a job you might like to do in the future?**

Not much A little bit Some A lot

30. **What kind of job or career would you like to have when you've finished your education?**

APPENDIX C

WHAT DO *YOU* THINK? CODE BOOK

1. **Your name:** _____

2. **Your age:** _____

3. **Why have you decided to participate in this program?** *(Check all your reasons)*
☐ It's part of my class.
☐ My teacher suggested it.
☐ A friend/classmate recommended it.
☐ A club I belong to recommended it.
☐ I want to get community service credit.
☐ I want to get academic credit.
☐ I want to get out of class.
☐ I want to work with children.
☐ I want to help the environment.
☐ other; *describe* _____
1 = checked box
0 = didn't check

4. **When did you start volunteering with this program?** *(Check one)*
1 = ☐ 1994-95 2 = ☐ 1993-94 3 = ☐ 1992-93

5. **Have you ever done any other volunteer work?** 1 = ☐ Yes 0 = ☐ No
If yes, please describe the volunteer work:
open-ended (o-e)

6. a) **What is your favorite subject in school?**
1 = ☐ English 2 = ☐ Math 3 = ☐ History
4 = ☐ Foreign language 5 = ☐ Science 6 = ☐ Art
7 = ☐ P.E./Gym 8 = ☐ Geography 9 = ☐ Computers
10 = ☐ Other; what? _____

b) **What is your least favorite?** (same as above)
☐ English ☐ Math ☐ History
☐ Foreign language ☐ Science ☐ Art
☐ P.E./Gym ☐ Geography ☐ Computers
☐ Other; what? _____

7. **How many different kinds of plants do you think live right outside your school? Write the number here:** enter #

Can you think of any examples of plants that live right outside your school?
o-e

8. **How many different kinds of animals do you think live right outside your school? Write the number here:** #

Can you think of any examples of animals that live right outside your school?
o-e

9. **What does the word *science* mean?**
o-e

10. **Which of these groups do you think contains the largest number of living things?** *(Check one)*
1 = ☐ trees
2 = ☐ insects
3 = ☐ fish
4 = ☐ birds
5 = ☐ people

11. **What do you think happens to a plant when it dies?**
o-e

12. **How interested are you are in...** *(Circle one)*

	1 = Very Interested	2 = Somewhat Interested	3 = Not very Interested	4 = Not at all Interested
a) **science**	1 = Very Interested	2 = Somewhat Interested	3 = Not very Interested	4 = Not at all Interested
b) **the outdoors**	Very Interested	Somewhat Interested	Not very Interested	Not at all Interested
c) **plants**	Very Interested	Somewhat Interested	Not very Interested	Not at all Interested
d) **animals**	Very Interested	Somewhat Interested	Not very Interested	Not at all Interested

13. **What does the word *habitat* mean?**

D-e

14. **What are some things people do that "help" the environment?**

D-e

15. **What are some things people do that "hurt" the environment?**

D-e

16. **Pretend you've just met someone who doesn't know what a *scientist* is. In the space below, try to explain to them what a scientist is.**

D-e

17. **Have you done any of the following activities before?** *(Check all that you've done)*

1=☐ worked with children
2=☐ been a leader of a group of children
3=☐ taught something to children

18. **How confident are you in...** *(Circle one)*

a) being responsible for a small group of children

1= Very Confident | 2= Somewhat Confident | 3= Not very Confident | 4= Not at all Confident

b) teaching science to children

Very Confident | Somewhat Confident | Not very Confident | Not at all Confident

c) being the leader of a group

Very Confident | Somewhat Confident | Not very Confident | Not at all Confident

19. **Have you done any of the following activities before?** *(Check all that you've done)*

1=☐ observed plants or animals outside
2=☐ used a magnifying lens to carefully examine plants or animals outside
3=☐ hunted for and found things living outside

20. **How strongly do you agree or disagree with the following statements?** *(Circle one)*

a) Eventually, environmental problems will just go away on their own.

1= Strongly Agree | 2= Agree | 3= Disagree | 4= Strongly Disagree

b) Nothing I do will really have an effect on the environment one way or another.

Strongly Agree Agree Disagree Strongly Disagree

c) Bugs are totally cool.

Strongly Agree Agree Disagree Strongly Disagree

d) Digging in the dirt is gross.

Strongly Agree Agree Disagree Strongly Disagree

e) Scientific tools are very expensive to buy.

Strongly Agree Agree Disagree Strongly Disagree

f) When you spray a pesticide, it harms only the bug you're pointing it at.

Strongly Agree Agree Disagree Strongly Disagree

g) In the fall, the best thing to do with leaves is to rake them up and get rid of them.

Strongly Agree Agree Disagree Strongly Disagree

Finally, just a few more questions about yourself...

21. **Are you?** 1= Female ☐ 2= Male ☐

22. **How do you describe yourself?** *(Check)*

1=☐ Black or African American 2=☐ Asian 3=☐ Native American
4=☐ White or Caucasian 5=☐ Latino or Spanish American 6=☐ Other: *describe* _____

23. **In general, do you consider yourself...**

1=☐ a shy person or 2=☐ an outgoing person

24. **Do any children live in your house with you?**

1=☐ Yes 0=☐ No

If you checked yes, how old are the children? Write their ages here:

_____

25. **Name of your High School:** _____

26. **Circle your grade level:** 9= 9th 10= 10th 11= 11th 12= 12th

27. **What grade do you *usually* get in school?** *(Circle only one)*

1= A 2= A/B 3= B 4= B/C 5= C 6= C/D 7= D 8= F

28. **About how many days of school did you miss *last month*?** *(Check only one)*

0=☐ none
1=☐ 1 - 2 days
2=☐ 3 - 5 days
3=☐ more than 5 days

29. **What do you plan to do after high school?** *(Check all that you plan to do)*

1=☐ work part time
2=☐ work full time
3=☐ go to a 2 year college, vocational, technical, or business school
4=☐ go to a 4 year college
5=☐ enlist in the military
6=☐ other; *describe* _____

30. **What kind of job or career would you like to have when you've finished your education?**

D-e

PLEASE WRITE ANYTHING ELSE YOU'D LIKE TO SAY ABOUT YOURSELF OR ABOUT VOLUNTEERING FOR THIS PROGRAM ON THE BACK OF THIS PAGE

APPENDIX D

TEACHER/CLUB LEADER SURVEY

Name: _____ School: _____

1. In what way do you participate in the program?

- ☐ I teach a science class that participates
- ☐ I lead a school club that participates
- ☐ I lead a non-school club that participates
- ☐ other; describe _____

2. For each class/club you teach in which students are participating in this program, please fill in the following information.

Class Subject/Name of Club	Grade level	# students

3. Please provide a brief and general description of the group of students who are participating in this program in terms of overall academic ability, science knowledge and skills, and social skills and leadership.

4. Did you have any requirements for teen participation in this program? ☐ Yes ☐ No
If yes, please list them:

5. Have any of the teens in your class or club chosen *not* to participate in this program?
☐ Yes; ***how many haven't participated*?** _____ ☐ No

***If yes*, what are their reasons for choosing not to participate?**

If one or more haven't participated, what have they done instead?

6. How relevant have the materials been to your class topics or club activities?
Not at all A little Somewhat Very
***Please explain*:**

7. How effective have the trainings led by the Project Coordinator been in the following areas? *(Circle one number for each item.)*

	Not at all effective		Moderately effective		Extremely effective
helping teens carry out the activities with the younger children	1	2	3	4	5
helping teens learn how to handle the younger children	1	2	3	4	5
explaining to teens how to use all the materials and supplies	1	2	3	4	5
helping teens budget their time while teaching the younger children	1	2	3	4	5

8. Since beginning this program, how much do you think your teens have grown in their... *(Circle one number)*	None	A little	Some	A lot
appreciation for the outdoors/"natural" environment	1	2	3	4
understanding of what science is	1	2	3	4
knowledge of ecology/biology concepts	1	2	3	4
interest in science/ecology	1	2	3	4
use of science skills (i.e., observation)	1	2	3	4
self-confidence	1	2	3	4
ability to learn and try out new roles (i.e., guiding, leading, teaching, explaining, etc.)	1	2	3	4
ability to make new and/or reinforce previous career and/or life decisions (i.e., interest in science, education, or environment careers, or in parenting)	1	2	3	4

9. Please describe the nature of your contact with the Project Coordinator (i.e., How often do you see him or her? How much time do you spend talking? What do you talk about?):

10. Do you participate in the investigations the teens lead with the younger children?

☐ Yes ☐ No

If yes, please describe how you participate:

11. In general, has this program had an effect on the teens' school attendance?

- ☐ Teens have attended more because of the program
- ☐ Teens have attended less because of the program
- ☐ The program has had no effect on attendance
- ☐ Other; *describe* _____

12. a)What is the best part of this program?

b)The part you feel needs the most improvement?

13. In each of the following areas, please write your suggestions for ways that the program could be made better, both for teenagers, and for teachers/club leaders like yourself:

a) trainings:

b) scheduling:

c) activities:

d) follow-up:

e) integration into curriculum:

PLEASE WRITE ANY OTHER COMMENTS ON THE BACK OF THIS SHEET

The following table shows the relationship between survey questions and areas of major interest to the evaluation:

	Science/ecology	Personal growth/leadership	Career Exploration
Pre-program survey	Questions 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 19, 20	Questions 18, 23, 27, 28	Questions 29, 30
Post-program survey	Questions 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24	Questions 5, 10, 25, 26, 27	Questions 28, 29, 30
Adult sponsor survey	Questions 8a, b, c, d, e	Questions 8f, g, 11	Questions 8h

Appendix E: 1995-96 M. Jean Young's Study

Evaluator: Dr. M. Jean Young
MJ Young & Associates
6605 N. Foothills Drive
Tucson, AZ 85718

Recommended by: Dr. Susan Loucks-Horsely, a professional evaluator and expert in educational change.

Contract cost: Approximately $10,000 (The study described here is one part of a multi-year contract to evaluate the NSF-funded VINE Follow-Through Project.)

Purpose of study: Jean Young's 1995-96 study reported in this document is one aspect of a larger study designed to answer the question: What is the impact of the VINE Follow-Through Project on teachers and to what degree is change happening in their classrooms? Here, we focus on teachers' classroom practice and whether teachers participating in the project include more constuctivist strategies in their teaching and engage students more actively in doing science.

Who was involved and what was done: Teachers were asked to complete 20 closed-format "teacher logs" when they engaged their students in VINE -related activities. Control teachers were identified in the same schools as teachers participating in the project or in schools with similar student populations and geographic locations. Control teachers not participating in VINE programs completed logs when they engaged their students in science activities, especially field-related or out-of-class activities, during the same period of time. A total of nine control teachers and 15 project/treatment teachers turned in completed logs in addition to a background information sheet and a post-log reflection sheet. Follow-up phone interviews were used to clarify log and survey information.

The evaluator compiled and analyzed the logs using an Excel spreadsheet. See Appendix E-3 for details about this analysis.

Teacher Log Data: VINE Follow-Through

The overall goal of the VINE Follow-Through project with regard to teachers' classroom practice is to include more constructivist strategies and more science, in particular engaging students in the process of doing science. Pre-coded teacher logs were the primary method used to assess this goal.

DATA COLLECTION

Teachers participating in the VINE Follow-Through (F-T) project and teachers from same or similar schools (schools in the same geographic area with similar student populations) were asked to fill out a total of 20 pre-coded "teacher logs," 10 in the fall and 10 in the spring. VINE F-T participants were the "treatment" teachers; teachers who came from the same or similar schools were the "control" teachers. All teachers were asked to complete the logs every time they engaged their students in VINE-related activities, with the exception of Kentucky control teachers. Since control teachers in Kentucky were not engaged in VINE activities, they were asked to complete logs during the same period of time as the treatment teachers when engaging their students in science activities, especially field-related or out-of-class activities. A total of nine control teachers participated; a total of 15 treatment teachers participated.

DATA INTERPRETATION

Please refer to a "Daily Log" sheet when reviewing the results of the following teacher log analysis. The data were analyzed using an Excel spreadsheet. The following refers to the page entitled "TOTAL COMPILED DATA - T. LOGS".

There is a data analysis sheet for each set of teacher log codes (one set of codes/page). The top six rows under "Codes" are total log item responses (strategies teachers used in the classroom) for control teachers (CON) and treatment teachers (TRT). The number '2' indicates responses on fall logs; the number '5' indicates responses on spring logs. Numbers not designated with a '2' or a '5' are combined totals for fall and spring.

T,B, and P designate traditional (T), both (B) or progressive (P) strategies. "Progressive" means that the strategy has been advocated in the *National Science Education Standards* and the American Association for the Advancement of Science *Benchmarks for Science Literacy*. The VINE F-T project focused on these strategies by promoting constructivism and engaging students in the process of doing science. "Traditional" strategies are

characterized by lecture-recitation-seatwork-textbook types of strategies that have been shown to be less effective if *overused*. "Both" are strategies that may be more "progressive" or more "traditional" depending on the context.

PERCENT should be interpreted as: Given the total number of strategies used, that is the percent teachers used a particular strategy. The *differences* in percent (diff, diff 5, diff 2) should be interpreted as: Given the total number of strategies used, treatment teachers used that strategy more (if a +) or less (if a -), than control teachers.

The *percent difference* (% diff, % 5, % 2) represents the rate of difference between control and treatment teachers. Since high rates may be related to very small differences, only those rates that are high and accompanied by large differences were considered noteworthy, i.e., are considered important differences in classroom practice between control and treatment teachers.

COMPILED. Data were compiled according to strategy categories based on whether the strategy is more "traditional," "progressive," or "both." The compiled percent difference should be interpreted as: Given the total number of strategies listed, this represents the percent teachers used traditional (T), both (B) or progressive (P) strategies. This percent figure adjusts for differences in numbers of participating control and treatment teachers, making the totals comparable.

BOLDED BOXES. Bolded boxes indicate differences that are important in some way, and should be noted. The differences are considered "important" or noteworthy if they are greater than or less than 5% difference (+ or - 5) AND if the percent difference is large (40% or larger).

ANALYSIS

Overall Analysis:
- differences are generally in the expected direction, i.e., traditional percent differences are negative and progressive percent differences are positive.
- there are noteworthy (important) differences in every code category.

Emphasis Codes:
Teachers were asked to list topics for each log and record the emphasis placed on each for that lesson. There are three important findings:
- VINE F-T emphasize long-term projects.
- Control teachers emphasize "learn facts."
- VINE F-T teachers use substantively more progressive strategies.

Introduction Codes:
Teachers were asked to code emphases placed during introductions to their lessons. Note that there are no particular traditional or progressive strategies listed because two to several of these should be used in introducing any topic. Some, however, can be considered as more inquiry-based than others, e.g., provide a rationale is probably more inquiry-oriented than explaining an activity. There are three important findings:
- Control teachers more often explain an activity as part of their introduction.
- VINE F-T teachers *less* often assess prior knowledge as an introduction, however, they used this strategy more often in the spring than in the fall. In addition, VINE F-T teachers who were interviewed reported using entire lessons to assess prior knowledge. This finding, therefore, may not appropriately indicate differences between control and VINE F-T teachers with regard to assessing prior student knowledge.
- VINE F-T teachers more often relate the current lesson or activity to previous ones.

Modes of Instruction Codes:
Teachers were asked to report instructional strategies they used. This is an important category in that it provides an overview of teaching strategies used. There are four important findings:
- Control teachers lecture more often.
- VINE F-T teachers engage their students in more out-of-class activities.
- Control teachers engage in more traditional modes of instruction overall.
- VINE F-T teachers engage in more progressives modes of instruction overall.

Student Activities Codes:
Teachers were asked to report activities engaged in by students. All teachers tended to use "Laboratory or hands-on activity" most often. There is one important finding:
- Control teachers engage in having their students use worksheets more often.

Assessment Strategies Codes:
Teachers were asked to report the kind of assessment strategies they used during the lesson. All teachers tended to use more observation of group work and students' skills and discussion or recitation responses. There was one important finding:
- VINE F-T teachers use more progressive assessment strategies overall.

Materials Used Codes:
Teachers were asked to report the kind of materials they used in teaching the lesson. In reviewing their "other" entries, it was clear that many teachers underreported both "Laboratory equipment" and "Manipulatives." The following numbers have not been adjusted to reflect this. All teachers tended to use more worksheets and hands-on equipment. Analysis results show four important findings:
- Control teachers use the assigned textbook for the class more often.

- Control teachers have their students use worksheets more often.
- VINE F-T teachers have their students use more laboratory equipment.
- Control teachers use more traditional materials overall.

Qualitative Data:
Teachers entered information about: lesson purposes and intended outcomes; overall context of the lesson; and, described how they introduced the lesson. These qualitative data provided a view of what was going on in the classroom and how the lessons were being conducted.

Through writing about the lesson, the teachers illustrated:
- the nature of the lesson, e.g., "students will learn the parts of a plant";
- they provided information on what skills were being addressed, e.g., students "measure"; and,
- described the extent to which the lesson was teacher- or student-directed, e.g., "students brainstormed questions and we decided which ones to answer."

Overall, the control teachers provided interesting, hands-on lessons to their students that seemed to be both fun and relevant to students. The teachers engaged students in several science process skills and in cooperative learning groups. Most of the lessons were teacher-directed, however, with few teachers actively seeking and pursuing students' questions.

As the data analysis shows, there were several differences in strategies between control and treatment teachers even though the control teachers seemed to be well on their way toward using "best practice" strategies. These differences showed up in the treatment teacher descriptions as:
- students making decisions as a whole group or in small groups;
- students collecting and communicating data to one another, which meant they also had to learn to communicate clearly;
- teachers asking questions that had no one, right answer; and,
- starting lessons with questions or expanding on a previous lesson.

These strategies all reflect the goal of the VINE Follow-Through project to include more constructivist strategies and engage students in the process of doing science.

SUMMARY

The teacher log data were used to assess differences in classroom practice as a result of participation in the VINE Follow-Through project. Since the data were collected during VINE activities, the analysis results are not meant to indicate overall differences in teacher practice but illustrate direct effects of the VINE Follow-Through project. Additional information from interviews

and documents do indicate, however, that strategies reported on the logs *do* represent VINE F-T teachers' overall classroom practice.

Teacher log analysis shows that treatment teachers (VINE Follow-Through participants) exhibit clear and important differences in practice from control teachers (who teach in the same or similar schools as treatment teachers). With very few exceptions, teachers participating in the program collectively use "traditional" practices less overall (represented by negative numbers for practices designated with a 'T') and "progressive" practices more overall (represented by positive numbers for practices designated with a 'P'), than control teachers. There are also some important specific differences in every teacher log category. These differences are particularly meaningful since control teachers also exhibit many "best practice" strategies.

Science reform promotes progressive teaching and learning strategies as "best practice." In using more of these strategies, then, project participants are engaging in more best practice classroom strategies than their fellow teachers, and to a meaningful degree.

Notes about the Analysis:

There are several points that come to light as a result of completing the compiled analysis:

- Teachers should complete logs for 20 days over the course of a year in order to get a good idea of their overall practice, rather than a shorter period of time.
- Differences between control and treatment teachers are best determined through:
  - differences in percent and how much more or less treatment teachers use a strategy (% difference on the chart), and
  - compiled information about percent differences in traditional, both, and progressive practices.
- Teacher logs appear to be a good way to determine "notable" differences between program participants and their non-participant colleagues (control teachers). Teacher logs seem to be able to detect differences even when control teachers are "excellent teachers" (i.e., use a lot of "best practice" strategies). For example, this analysis showed 20 notable differences between VINE F-T and the control teachers who often used a variety of best practice strategies.

Teacher Logs
Fall 1995

Teacher _____ Grade Level _____

Background Information (Complete one)

1. Please indicate the number of students in this class who are in the following race/ethnic categories:

American Indian or Alaskan Native	_____ %
Asian or Pacific Islander	_____ %
Black, Non-Hispanic	_____ %
Hispanic	_____ %
White, Non-Hispanic	_____ %
	Total = 100%

2. How many Limited English Proficiency or English as a second language students are in the class?

_____ Number of LEP students _____ Number of ESL students

3. What is the total number of students in the class? _____ Total students

4. Which of the following best describes the ability level of the students? (*Circle One.*)

Fairly homogeneous and low in ability	1
Fairly homogeneous and average in ability	2
Fairly homogeneous and high in ability	3
Heterogeneous, with a mixture of two or more abilities	4

5. How often do you teach science each week (including science integrated with other subjects)? _____ Minutes

6. How would you characterize your school (e.g., highly innovative, traditional) and/or does it have a specific philosophy (e.g. involves parents in some special or unique way) and/or is it engaged in a reform effort (e.g., developing a new curriculum)?

Daily Logs Number of students _____ Date _____

1. List the 2-3 intended outcomes, or state the general purpose of the lesson.

2. Approximately how many minutes (throughout the day) were spent on activities directly related to the lesson? _____ Minutes

3. What is the overall context of the lesson, e.g. is it part of a unit or long-term project, and if so, is the lesson at the beginning of the unit or project, near the middle?

4. Indicate the name of each content topic or activity (see instructions) covered in this lesson in the spaces; circle each emphasis that applies. (If more than three topics were covered, indicate the three that were most important.)

(Circle all that apply for each topic.)

Topic 1 _____

Topic 2 _____

Topic 3 _____

Emphasis	Topic 1	Topic 2	Topic 3
Learn facts or definitions	1	2	3
Understand science concepts or principles	1	2	3
Learn real-world applications of science	1	2	3
Follow a written procedure to do an investigation	1	2	3
Design experiments to answer question(s)	1	2	3
Collect data (e.g., observe, measure)	1	2	3
Interpret data (e.g., compare, estimate, recognize patterns)	1	2	3
Engage in thinking skills (e.g., predict, infer, evaluate)	1	2	3
Develop skills in working collaboratively	1	2	3
Develop communication skills (e.g., writing, giving presentations)	1	2	3
Work on a long-term project that incorporates many of the above	1	2	3

5. Describe below how you introduced the lesson, then circle all that apply to the overall emphasis of the introduction .

Description:

Introduction emphasis: (*Circle all that apply.*)

Provide overview	1
Explain activity	2
Relate this lesson/activity to previous lessons/activities	3
Provide rationale for doing the activity	4
Assess prior knowledge	5
Other (please specify) _____	

6. What modes of instruction were used during this lesson? (*Circle all that apply.*)

Lecture	1
Teacher demonstration	2
Recitation/drill/practice	3
Correct or review homework	4
Whole class discussion	5
Students working in pairs/teams/small groups	6
Students working independently	7
Students engage in out-of-class activities (including fieldwork)	8
Other (please specify) _____	

7. What activities did students engage in during this lesson? (*Circle all that apply.*)

Listen and take notes	1
Complete worksheets or do practice problems in class	2
Write in journals or logs	3
Take a test/quiz/exam	4
Read a textbook in class	5
Laboratory or hands-on activity	6
Work on computer	7
Other (please specify) _____	

8. What assessment strategy(ies) did you use during this lesson, if any? (*Circle all that apply.*)

Multiple-choice/short answer test or quiz	1
Essay/type test or quiz	2
Discussion or recitation responses (participation)	3
Observation of group work	4
Oral reports or presentation of students' work	5
Journal or log entries	6
Homework assignments	7
Observing students' skills in lab work or hands-on activities	8
Other (please specify) _____	

9. What materials did you use during this lesson? (*Circle all that apply.*)

Assigned textbook for the class	1
Other textbook	2
Workbook or worksheets	3
Laboratory equipment (implements, instruments)	4
Manipulatives (hands-on equipment)	5
Audio-visual (films, film strips, videos)	6
Computers	7
Test manual or commercially made test sheets	8
Other (please specify)_____	

Teacher _____ Grade Level _____

Post-Lesson Reflections (Complete one after completing 10 logs)

1. If you were to teach this sequence of lessons again, what would you do differently, if anything? Why or why not?

2. To what extent do you feel the intended outcomes of this sequence of lessons were achieved?

3. What do you think is different, if anything, between the way you taught this sequence of lessons last year and this year? How (in what ways) is it different and why is it different?

TOTAL COMPILED DATA - T. LOGS

COMPILED 2/96 AND 5/96 DATA: Treatment - Control Teacher Comparisons

Emphasis Codes:

	lrn facts	rl-wrld	undrstd	fol. proc.	design	collect	intrpret	thinkg	collab.	commun.	lng-trm	TOTALS
TRT 5	113	203	196	105	71	169	162	206	156	137	133	352
TRT 2	118	173	186	79	32	159	177	208	191	135	135	337
Total	231	376	382	184	103	328	339	414	347	272	268	689
CON 5	73	96	96	36	25	65	69	92	68	46	28	159
CON 2	112	116	117	22	26	80	93	87	82	49	39	211
Total	185	212	213	58	51	145	162	179	150	95	67	370
PERCENT (Note totals may not always equal 100 because of rounding off)												
Total T	7	12	12	6	3	10	10	13	11	8	8	100
Total C	12	14	14	4	3	10	11	12	10	6	4	100
diff	-5	-2	-2	2	0	0	-1	1	1	2	4	
diff 5	-4	-2	-2	1	0	1	0	-1	-1	1	4	
diff 2	-7	-3	-2	2	1	0	0	2	2	2	3	
% diff	-71%	-17%	-17%	33%	0%	0%	-10%	8%	9%	25%	50%	
% 5	-57%	-17%	-17%	17%	0%	10%	0%	-8%	-11%	13%	50%	
% 2	-50%	-21%	-14%	67%	33%	0%	0%	18%	20%	33%	60%	
COMPILED:												
	Traditional		Both		Progressive			Totals:	5/96:	2/96:		
TRT	415	13%	607	19%	2125	66%		-3	-3	-3		
CON	243	16%	357	24%	917	60%		-5	0	3		
diff		-3		-5		6		6	3	12		

TOTAL COMPILED DATA - T. LOGS

COMPILED 2/96 AND 5/96 DATA: Treatment - Control Teacher Comparisons

Introduction Codes:

	overvw	explain	rel.prev	ratnale	prior	TOTALS
TRT 5	105	103	104	93	80	485
TRT 2	98	111	102	100	66	477
Total	203	214	206	193	146	962
CON 5	52	62	43	50	41	248
CON 2	56	72	57	55	51	291
Total	108	134	100	105	92	539

PERCENT (Note totals may not always equal 100 because of rounding off)

Total T	21	22	21	20	15	99
Total C	20	25	19	19	17	100
diff	1	-3	2	1	-2	
diff 5	1	-4	4	-1	-1	
diff 2	2	-2	1	2	-4	
% diff	5%	-14%	10%	5%	-13%	
% 5	5%	-19%	19%	-5%	-6%	
% 2	11%	-8%	5%	11%	-22%	

COMPILED:

Totals:	69%	73%	70%	66%	50%
	68%	84%	63%	66%	58%
	1	-11	7	0	-8

COMPILED

Totals:	5/96:	2/96:
1	-2	3
-11	-19	-6
7	10	5
0	-8	6
-8	-4	-12

TOTAL COMPILED DATA - T. LOGS

COMPILED 2/96 AND 5/96 DATA: Treatment - Control Teacher Comparisons

Modes of Instruction Codes:

	lecture	t. demo	recit.	hmwrk	discus.	teams	indepnt.	out-clas	TOTALS
TRT 5	35	51	3	3	101	97	46	69	405
TRT 2	33	63	5	2	101	104	49	60	417
Total	68	114	8	5	202	201	95	129	822
CON 5	25	36	0	0	35	42	25	19	182
CON 2	39	51	13	5	52	54	45	22	281
Total	64	87	13	5	87	96	70	41	463
	T	B	T	B	B	P	B	P	

PERCENT (Note totals may not always equal 100 because of rounding off)

Total T	8	14	1	1	25	24	12	16	101
Total C	14	19	3	1	19	21	15	9	101
diff	-6	-5	-2	0	6	3	-3	7	
diff 5	-5	-7	1	1	6	1	-3	7	
diff 2	-6	-3	-4	-2	5	6	-4	4	
% diff	-75%	-36%	-200%	0%	24%	13%	-25%	44%	
% 5	-56%	-54%	100%	100%	24%	4%	-27%	41%	
% 2	-43%	-17%	-80%	-100%	26%	32%	-25%	75%	

COMPILED:

	Traditional		Both		Progressive			Totals:	5/96:	2/96:
TRT	76	13%	416	35%	330	56%		-11	-5	-16
CON	77	24%	249	39%	137	43%		-4	1	-7
diff		-11		-4		13		13	13	12

TOTAL COMPILED DATA - T. LOGS

COMPILED 2/96 AND 5/96 DATA: Treatment - Control Teacher Comparisons

Student Activities Codes:

	listen	wrkshts	logs	test	txtbk	hnds-on	comptr	TOTALS
TRT 5	46	28	62	5	6	102	6	255
TRT 2	33	18	39	1	1	106	12	210
Total	79	46	101	6	7	208	18	465
CON 5	22	20	23	0	4	42	4	115
CON 2	23	21	15	4	4	66	0	133
Total	45	41	38	4	8	108	4	248
	T	T	P	B	T	P	P	

PERCENT (Note totals may not always equal 100 because of rounding off)

Total T	17	10	22	1	1	45	4	100
Total C	18	16	15	2	3	44	2	100
diff	-1	-6	7	-1	-2	1	2	
diff 5	-1	-6	4	2	-1	3	-1	
diff 2	-1	-7	2	-3	-3	0	6	
% diff	-6%	-60%	32%	-100%	-200%	2%	50%	
% 5	-6%	-55%	17%	100%	-50%	8%	-50%	
% 2	-6%	-44%	18%	-100%	-100%	0%	100%	

COMPILED:

	Traditional		Both		Progressive		Totals:	5/96:	2/96:
TRT	132	15%	6	2%	327	37%	-5	-4	0
CON	94	20%	4	3%	150	31%	-1	3	-3
diff		-5		-1		6	6	-8	5

TOTAL COMPILED DATA - T. LOGS

COMPILED 2/96 AND 5/96 DATA: Treatment - Control Teacher Comparisons

Assessment Strategies Codes:

	shrt ans	essay	disc	observ	present	logs	hmwrk	obs skils	TOTALS
TRT 5	4	4	61	92	41	58	10	89	359
TRT 2	2	4	84	96	42	42	7	84	361
Total	6	8	145	188	83	100	17	173	720
CON 5	2	2	36	38	14	26	5	29	152
CON 2	3	4	44	52	20	14	13	45	195
Total	5	6	80	90	34	40	18	74	347
	T	B	B	P	P	P	B	B	

PERCENT (Note totals may not always equal 100 because of rounding off)

Total T	1	1	20	26	11	14	2	24	99
Total C	1	2	23	26	10	11	5	21	99
diff	0	-1	-3	0	1	3	-3	3	
diff 5	0	0	-7	1	2	-1	0	6	
diff 2	-1	-1	0	0	2	5	5	0	
% diff	0%	-100%	-15%	0%	9%	21%	-150%	13%	
% 5	0%	0%	-41%	4%	18%	-6%	0%	24%	
% 2	-50%	-50%	0%	0%	20%	71%	71%	0%	

COMPILED:

	Traditional		Both		Progressive		Totals:	5/96:	2/96:
TRT	6	2%	343	29%	371	42%	-1	0	-2
CON	5	3%	178	28%	164	34%	1	2	0
diff		-1		1		8	8	7	9

TOTAL COMPILED DATA - T. LOGS

COMPILED 2/96 AND 5/96 DATA: Treatment - Control Teacher Comparisons

Materials Used Codes:

	asign txt	oth txt	wrkshts	lab equp	hnds-on	A-V	comptr	test man	TOTALS
TRT 5	7	5	34	53	59	4	6	1	169
TRT 2	6	7	29	38	52	6	14	0	152
Total	13	12	63	91	111	10	20	1	321
CON 5	5	1	22	17	34	3	3	0	85
CON 2	13	3	34	11	41	17	3	2	124
Total	18	4	56	28	75	20	6	2	209
	T	B	T	P	P	B	P	T	

PERCENT (Note totals may not always equal 100 because of rounding off)

Total T	4	4	20	28	35	3	6	0	100
Total C	9	2	27	13	36	10	3	1	101
diff	-5	2	-7	15	-1	-7	3	-1	
diff 5	-2	2	-6	11	-5	-2	0	1	
diff 2	-6	3	-8	16	1	-10	7	-2	
% diff	-125%	50%	-35%	54%	-3%	-233%	50%	0%	
% 5	-50%	67%	-30%	35%	-14%	-100%	0%	100%	
% 2	-60%	150%	-30%	178%	3%	-71%	350%	-100%	

COMPILED:

	Traditional		Both		Progressive			Totals:	5/96:	2/96:
TRT	77	9%	22	4%	222	25%		-7	-3	-10
CON	76	16%	24	8%	109	23%		-4	0	-7
diff		-7		-4		2		2	1	2

North American Association for Environmental Education

NAAEE is a network of professionals and students working in the field of environmental education throughout North America and in over 45 countries around the world. Since 1971, the Association has promoted environmental education and supported the work of environmental educators. There are many environmental interest groups, and many organizations dedicated to improving education. NAAEE uniquely combines and integrates both of these perspectives, and takes a cooperative, nonconfrontational approach to promoting education about environmental issues.

The Association is made up of people who have thought seriously over lifetimes about how people become literate concerning environmental issues. NAAEE members believe education must go beyond consciousness-raising about these issues. It must prepare people to think together about the difficult decisions they have to make concerning environmental stewardship, and to work together to improve, and try to solve, environmental problems.

NAAEE recognizes the need for a coherent body of information about environmental issues. Its members also recognize that information and analysis are only part of an effective education program. To be truly effective, this body of knowledge must be integrated into all aspects of the curriculum and into all types of educating institutions for the widest array of audiences.

In order to translate theory into reality, and provide tangible support for environmental education and environmental educators, NAAEE engages in a variety of programs and activities. Some examples are the annual conference at varying North American sites, an extensive publications program, the Environmental Education Training Institute, the VINE (Volunteer-led Investigations of Neighborhood Ecology) Network, the Environmental Issues Forums (EIF) program, the NAAEE Policy Institute, the Environmental Education and Training Partnership (EETAP), and NAAEE's Environmental Education Standards Project.

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