

EDUCATING
YOUNG PEOPLE
about

Water



A Guide to Program Planning and Evaluation



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Sponsored by the
US Department of
Agriculture,
Cooperative Extension
Water Quality
Initiative Team



A Guide to Program Planning and Evaluation

Sponsored by the United States Department of Agriculture, Cooperative State Research and Extension Service (USDA CSREES) under the direction of Gregory Crosby, National Program Leader for youth science education, and the Cooperative Extension Water Quality Initiative Team, Andrew J. Weber, Chair.

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Table of Contents



Introduction to <i>A Guide to Program Planning and Evaluation</i>	3
What do we know about youth water education programs?	3
Curriculum and programming gaps	4
Successful program features	4
Successful programming strategies	5
Setting up a successful water education program	5
Key elements of a successful water education program	6
A sense of place, stewardship, and community action	6
Planning and evaluating for success	7
Planning	7
Evaluating	7
Using the checklists	8
Using the resources	8
Managing for success: the role of the “instigator”	9
<hr/>	
Water Program Planning Checklist	11
Who should use this checklist?	11
How to use the checklist	11
1. Program planning overview/review	12
2. Assessing community water education needs	14
3. Identifying networks and partners	16
4. Reviewing organizational support	18
5. Determining goals and objectives	20
6. Designing your program	22
7. Choosing a program delivery strategy	27
8. Evaluating your program	30
<hr/>	
Water Program Evaluation Checklist	32
Who should use this checklist?	33
How to use this checklist	33
1. Looking at your results — overview/summery	34
2. Organization mission	36
3. Why do this program?	37
4. Program support, partners and networks	39
5. Program goals, design and access	41
6. Program delivery	44
7. Evaluation	46
<hr/>	
Resources	48



A Guide to Program Planning and Evaluation

Americans care about water. For decades we have invested enormous resources—public and private, financial and educational—in improving its quality, preserving its quantity, and protecting it as a resource. A national survey in 1993 showed that concern is still vital. It found that people strongly support solutions to help ease water problems even after they have considered the associated costs.¹

Surprisingly, however, the same survey shows that individual citizens are taking little action to improve freshwater quality or to conserve the amount of water they use. Even more shocking, young people ages 12-17 neither listed water as an environmental issue they would like to know more about nor knew the basics of water information when given a quiz. The quiz is in the Resources section of this book.

Given this fundamental failure of personal action, it is no wonder there are many national water quality improvement goals that we have not attained. Recognizing this fact, the final report of Water Quality 2000, a cooperative effort of more than 80 public, private, and nonprofit organizations to develop a new national policy for US water quality and resource protection, calls for more personal action.²

“Much work remains,” this report says. “The American people, as individuals and collectively as members of the community, [must take] responsibility for protecting water resources.” The report recommends environmental education and training programs to help meet this personal action goal. It also calls for a new national water resources policy which integrates land and water resource planning and management.

These Water Quality 2000 recommendations reinforce our fundamental principle: a successful water education program is one which results in action that protects or improves water quantity or quality. This guide is based on that principle.

What do we know about youth water education programs?

Water education is not new, and, as the 1993 survey suggests, it has had some success among adults. Its apparent failure among youth is troubling, however. Concern about this lack of youth awareness prompted the Cooperative State Research Education and Extension Service of the US Department of Agriculture to ask leaders from around the country to address the question “how can we make youth water education more effective?” Youth education in nonformal settings (4-H, summer camps, etc.) was a special focus of this project because of the USDA’s long history with such programs.



This project built on work done in 1991 to collect and summarize available curriculum resources. At that time, a team of national experts developed a list of water education topics that should be covered and environmental education goals that should be met by such materials. *Educating Young People About Water: A Guide to Goals and Resources*³ reports which topics and goals are included in each curriculum. Topics and goals are also in the Resources section of this book.

Curriculum and programming gaps

When project staff evaluated the available curriculum materials against the water education topic list and environmental education criteria, they found many materials with interesting and challenging activities and some relatively comprehensive ones, but they consistently found important gaps:

- Information about water is often not integrated into an ecosystems approach.
- The study of ecology and science is usually not connected to a young person's everyday life.
- Materials often do not explain how young people can personally help improve water quality.
- Materials do not clearly show how young people can transfer investigation and evaluation skills from the school setting to personal life decisions.
- When environmental action skills are described, they frequently focus on home and school settings with little attention to the community.
- Hands-on, community action, experiential, and other nontraditional ways of learning are ignored or marginalized to "further activities" sections.
- Important topics—water related careers, home water treatment, risk assessment, and recreational use of water—are generally neglected.

However, **the most critical gap in youth water education** was revealed by a 1993 Louis Harris survey of 10,375 children in grades 4-12:⁴

Without some intervention to focus attention on environmental problems in ways that attract children, many who are interested in the environment will be deflected by other pressing issues.

The survey goes on to say: "There is a strong appetite among American children for learning about and working to improve the environment. Activities should be organized so that the children themselves make the key decisions about which problems to address, specific activities to deal with these problems, and formulation of strategy for carrying out these activities."

Successful program features

The USDA National Review Team also wanted to define success in water education programs. To do this they reviewed research studies about environmental and water education and informally evaluated existing successful water education programs. These programs, and the measures used to identify them, are described in more detail elsewhere.⁵

The research studies (listed in the Resources section of this book) suggest that successful nonformal water education programs include three key components: education, personal motivation, and predictable and rewarding structure.



Education

- the program is grounded in good science education principles
- the activities use investigation and develop scientific thinking skills
- the activities help develop critical thinking skills
- the program (or its partners) provides the knowledge base necessary for effective action

Personal motivation

- youth have the opportunity to learn and practice water management skills and to make a commitment to using those skills
- youth learn something that they can do when they get home
- youth are stimulated to take action about water concerns within their community setting
- youth develop one or more “life skills”

Predictable and rewarding structure

- the program has a reliable sponsor
- the program provides a consistent, predictable offering
- the program challenges youth and their adult leaders
- the program includes a fun/recreation component

Successful programming strategies

Evaluation of successful water education programs revealed several important programming strategies:

- consciously using the best elements of program planning methodology (see Planning Checklist sections 5 and 6)
- clearly defining ways that youth can become involved in the community and its water concerns
- offering activities that youth could do successfully given their resources and abilities
- accepting or validating the environmental management actions which the youth have chosen (even if the adults have different priorities) when proposing any environmental education effort
- evaluating the program and using those evaluations to improve the next program offering
- taking advantage of the unique qualities of water and its easy availability to make learning fun for youth and to keep them involved

Setting up a successful water education program

Using the information collected and advice from the directors of successful programs, the team developed the following list of successful water education program elements. These are designed not only to inform, but to help motivate young people to take action.

Making education natural⁶

Cheryl Charles, who coordinated development of Project Learning Tree and Project Wild education materials, encourages education planners to keep in mind seven principles of management drawn from natural systems.

- Cooperation is a natural tendency. Figure out ways to design programs that allow for cooperation to occur.
- In natural systems, energy is expended optimally. Design programs to provide time for nourishment, rest, caring for others, and reflection.
- Change is continuous. Listen to your audience and co-create.
- Organisms self-regulate. Figure out how learners can take responsibility for their learning and whether they are learning what they want to learn.
- Every organism has a niche. Every person involved in a project matters because everyone has a contribution to make.
- Diversity tends to be an indicator of health. Create a setting in which wholeness can incorporate diversity. Make sure that there is diversity in instructional approaches and in how people can share what they have learned.
- Everything is connected to everything else. No matter what you do, it will have ripple effects. Think of ways to stay in touch with other educators.



10 Success Elements

1

Goals

2

Community
water issues

3

Stewardship

4

Youth needs

5

Youth as partners

6

Community
partners

7

Organizational
support

8

Design furthers
goals

9

Effective delivery

10

Evaluation

The Planning Checklist on page 11 will help you integrate these elements into your program.

Key elements of a successful water education program

- 1 It has stated goals about water education for youth. Youth should:
 - understand basic water science and its ecology
 - be able to collect and analyze information about environmental and socio-economic conditions relevant to local water decisions
 - be able to evaluate impacts and alternatives for community decisions about water
 - be able to apply new information in the community
 - have the opportunity to practice personal water management skills and make a personal commitment to using them
- 2 It is connected to community water issues.
- 3 It helps instill a sense of place and a responsibility for stewardship of that place.
- 4 It meets youth educational and personal needs including fun/recreation.
- 5 It involves youth as full and valuable partners and acknowledges their contributions.
- 6 It involves community partners (individuals, schools, agencies, and organizations) to avoid duplication and expand impacts.
- 7 It uses the support of an organization to provide continuity and stability and to ensure high quality.
- 8 It uses program design and activities to further program goals and address community needs.
- 9 It delivers information and skills effectively, including actually using water as part of teaching.
- 10 It is evaluated on several dimensions and incorporates resulting insights into new programs.

A sense of place, stewardship, and community action

It can be a challenge for either community-based or school activities to offer programs which incorporate all of these elements of success. As partners, schools and community-based programs can each contribute their strengths to create a successful program that meets student needs. For example, classroom education can provide the foundation of science or social-science information and skills, while natural resource professionals can contribute specific and detailed information about local water resources and issues. Youth clubs may carry out community investigations which they can bring into the classroom for analysis.

Western author Wallace Stegner, says "...at least to human perception, a place is not a place until people have been born in it, have grown up in it, lived in it, known it, died in it—have experienced and shaped it as individuals, families, neighborhoods, and communities, over more than one generation."



See inside front cover for information on introductory video: *Planning for Fun and Success!*



Developing a sense of place among youth and adults is a critical goal of water education. By identifying with the qualities of their community, people will be motivated to practice stewardship: caring for *their* natural resources. The Water Quality 2000 final report agrees: water educators must enable “people as individuals and collectively as members of the community to adopt a heightened sense of responsibility for protecting water resources.”²

Grounding water education programs in the local community allows young people to practice and apply the skills they have learned, to take actions that can make a difference to their community, and to produce results they can see themselves.

The future of the nation’s water quality and quantity will, for the most part, be determined locally. Since most communities draw their water resources from the local watershed, the decisions and actions people take related to water will affect them directly and immediately. Furthermore, actions which damage the resource, contaminate the supply, or use it up affect not just individuals but the community as a whole by changing its choices for the future.

Planning and evaluating for success

Many people involved with water education want to teach about water science, or to have fun with water, or to conduct an activity using a water resource. Our earlier publication, *Educating Young People About Water: A Guide to Goals and Resources*, may interest and help them.

This guide is for educators, community leaders, natural resource professionals, and others who want to go farther: to create a water education program which directly relates information and skills to community water issues and inspires personal action to address community needs. We offer here the best advice currently available about how to design and evaluate such programs.

To help you plan and evaluate a water education program in your community, this guide provides two detailed checklists: The Water Program Planning Checklist and The Water Program Evaluation Checklist. These offer step-by-step, expert advice to help ensure your program’s success.

Planning

Taking an organized and thorough approach to planning a program has many benefits. It helps ensure that you have thought about what you are trying to do and how you will get there. It also provides an opportunity to look at what resources your community already has available, what it needs, and what the youth want and need.

The planning process suggested here allows you to include in the decision-making other people who have an interest in the area. It can help empower and invigorate community leaders, resource managers, young people, and others who are concerned but do not know how to proceed. Planning also helps ensure that you use human and financial resources wisely and efficiently.

Evaluating

How will you know if your program is a success? Evaluating helps you know what you are doing and helps you make decisions that will improve your program. It tells whether program and financial resources are being used effectively. It also reassures your audience and cooperators that they have invested their time, enthusiasm and confidence wisely.



“If you don’t know where you are, you don’t know who you are.”

—Wendell Berry
Kentucky farmer and author

Planning Checklist
starts on page 11

Evaluation Checklist
starts on page 32



While the *Planning Checklist* helps you organize a program to include the elements of success, the *Evaluation Checklist* helps you determine whether your programs met those expectations and whether your program had an impact on the participants and the community. It also addresses performance of leaders and teachers.

Since we have defined success in a water education program so broadly (as “action which protects or improves water quantity or quality”), your evaluation may not immediately demonstrate the program’s success. However, the collective effect of community youth programs about water over several years may improve the resource enough to be measured.

Meanwhile, other parts of the evaluation process will tell you whether you have helped young people understand water and its ecology better, whether they can identify local water issues and related attitudes and values, and other elements of success.

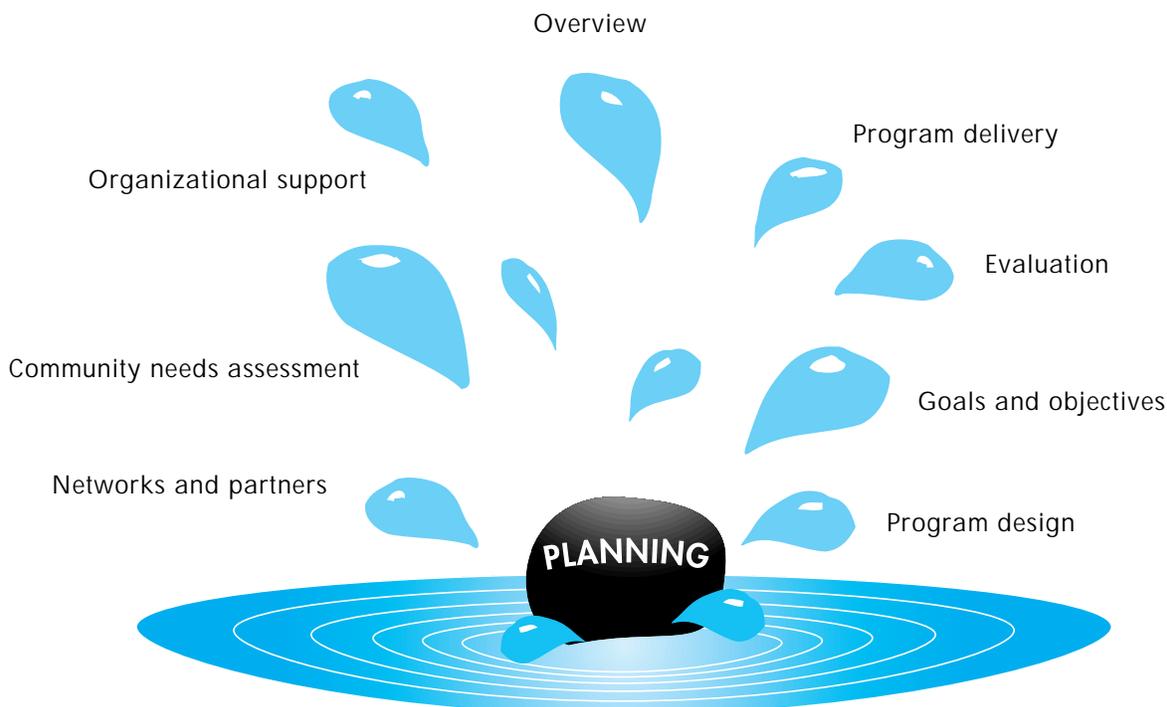
Using the checklists

While checklists are linear—step B follows step A, creating and developing a program is often multi-faceted and simultaneous. You may have any of a number of starting points when you begin a program, and sometimes several. The process probably looks more like a map than an outline.

You can make the checklists help you by jumping into whichever section fits your needs right now. Then turn to another section as it becomes useful. Make the questions work for you. Skip, expand, or combine them as you need to.

Using the resources

This book and others in this series are full of ideas, checklists, references, partner lists, and community action education materials. We invite you to take advantage of them.





To find and select water education activities —

See *Educating Young People About Water: A Guide to Goals and Resources*. This guide introduces over 100 youth water curricula. It also lists education topics and goals, and other unique resources useful in creating a water education opportunity or event.

To develop a program strategy appropriate to your situation —

See *Educating Young People About Water: A Guide To Unique Program Strategies*. This guide provides brief case studies of 30 unique water education programs taking place around the country in a variety of settings—after-school clubs, summer programs, museums, nature centers, festivals, and campaigns.

For a sample community action guide —

See *Give Water a Hand*. These books walk youth through the process of identifying local water resource needs and creating an action project in cooperation with local resource managers.

To link water education to community action —

See the list of organizations in the Resources section of this book. These government agencies and private groups actively support youth water education and helped develop *Give Water a Hand*.

To link school programs to community water concerns —

Find or become an “instigator” (see below) who forges links to community partners and identifies community or school-ground natural settings where students can practice and reinforce skills taught in the classroom. Natural resource professionals and youth club leaders can bring the results of community investigations to the class for analysis.

Managing for success: the role of the “instigator”

A great idea is not enough to ensure a great program. Enthusiasm and concern must be accompanied by leadership and legwork. Someone must be the “instigator”—the one who makes things happen. If that person is you, here are some key things you must do to get the program going and keep it going:

- Find out who is doing what and using which resources in educating about your topic. Make sure you don’t compete or repeat.
- Thoroughly evaluate and understand your community’s water education needs and concerns. Use experts. Don’t rely on just your personal understanding or local popular impressions.
- Collect information. Find experts, locate and enlist partners.
- Create or link with a network of partners who have the same community-based water education goals.
- Forge a connection to a stable organization active in the community.
- Organize planning sessions with partners and keep them going until you agree on goals and objectives.
- Provide educational materials. Make sure they fit the audience and the goals.
- Keep the network or partners on task so the project accomplishes its goals



See inside front cover for information on introductory video: *Planning for Fun and Success!*



- Set up systems to:
 - Evaluate the program
 - Celebrate its strengths
 - Fix its weaknesses
 - Continue it in the future

Here is an example of how one person became an instigator.

In Florida, where salt-free water may be in short supply, a County 4-H Extension agent made this issue part of her youth outreach program. As part of the University Cooperative Extension county system she has many years of experience in designing programs and has established credibility with other community groups.

She researched water conservation needs and potential solutions by contacting the local water utility and university experts. Then she contacted a summer youth day camp which was willing to incorporate her program as a theme program if she provided the instructors.

Choosing education activities based on the community goal of reducing water use through conservation, she hired and trained her summer staff using a small grant from the utility.

After the program ended, she and her staff contacted the families of selected youth participants. They found that a substantial number of youth had shared conservation tips with their families. Many families had installed a water conservation device (provided by the day camp) on the kitchen faucet and had tried other ideas for saving water while bathing, cleaning teeth, or using the toilet.

-
1. *Water: A National Priority, Americans' Attitudes Toward Water Quality and Availability*, conducted form the National Geographic Society by The Roper Organization, Inc., November 1993.
 2. *A National Water Agenda for the 21st Century*, final report, Water Quality 2000, 601 Wythe Street, Alexandria, Virginia, 22314. (See Resources at the end of this book for excerpts.)
 3. *Educating young people about water: a guide to goals and resources with an emphasis on nonformal and school enrichment settings*, Elaine Andrews and the Cooperative Extension National Review Team, USDA, Cooperative Extension, December 1992, University of Wisconsin-Madison, Environmental Resources Center, 216 Agriculture Hall, 1450 Linden Dr., Madison, WI 53706.
 4. *Children and the Environment*, a survey conducted for the Pew Charitable Trusts by Louis Harris and Associates, 1993.
 5. *Educating Young People About Water: A Guide to Unique Program Strategies*, Kelly Jo Warren, 1995, and *Educating Young People About Water, Thinking About Program Strategies That Work!* A Symposium Summary, Columbus, Ohio, December 1993. Both are available from the ERIC Clearinghouse for Sciences, Mathematics, and Environmental Education.
 6. Presented as part of a key note speech during the symposium, "Educating Young People About Water. Thinking About Program Strategies that Work! Emphasis on the nonformal setting." Columbus, Ohio, 1993.



Water Program PLANNING Checklist

This detailed checklist offers suggestions and questions to help you determine what your program goals are and how to meet them. It represents the best advice of over 40 outstanding youth water program managers from programs throughout the country. It has been reviewed at a national symposium of water education program managers⁷ and tested at specific program sites. Checklist sections include:

1. Program planning overview/review
2. Assessing community water education needs
3. Identifying networks and partners
4. Reviewing organizational support
5. Determining goals and objectives
6. Designing your program
7. Choosing a program delivery strategy
8. Evaluating your program



DONE PLAN TO NO PLAN

Who should use this checklist?

One of the first checklist users is likely to be a natural resource professional, community leader, education professional, or other person who wants to go beyond individual activities to develop a coherent, successful, continuing, community-based youth water education program.

It may be used again by a planning group. This group could include representatives of community groups and natural resource agencies, college or university specialists, public and private schools, people who will work directly with the youth, and the young people who will participate.

How to use the checklist

Use the checklist as a worksheet. Each checklist section begins by identifying the key success elements it addresses (see page 6). There is a brief explanation followed by one or two general questions, then the detailed planning questions. It concludes with a summary question.

Skip, emphasize, or combine questions as appropriate for your specific program. Information in the Resources section of this book and in other guidebooks in this series may also be helpful. You may use some sections more than once as you refine your ideas or involve partners.

Start with each section's general questions, then look at the more detailed planning questions which follow. Make notes as needed and indicate for yourself in the margin whether you have already DONE this part of the plan, whether you PLAN TO do it or whether you have NO PLAN to do it at this time. Then summarize what you learned in the summary question. You can use this information to enhance your responses to the questions in Program Planning, section 1.

7. See endnote 6 on page 10.



1 Program planning overview/review

Before you turn to the other sections in this checklist, take a moment to consider your program as a whole. Use the questions listed here. This will help you summarize your ideas before you begin. Make copies of this planning section. Jot down your preliminary thoughts on the copies and note which items (if any) you have already completed.

After you and your partners have worked through the other checklist sections, return to this page. Use it to help you summarize your work and reflect on each program planning component. Highlight any ideas that have changed.

1. What are your program goals? Keep in mind the primary community water education need, audience qualities, and other needs to be met through this program. Planning Checklist sections 2, 3, and 5 address this question.

2. What groups in your community are already meeting some or all of these goals? How will that affect your program planning? See Planning Checklist sections 3 and 4.

3. Where is this program going to “happen”? Can you plug into something that already exists? See Planning Checklist sections 3 and 4.

4. What will the youth actually do? Think about program content, design and specific daily activities. Planning Checklist sections 5, 6 and 7 deal with this.

5. *What resources do you need to conduct the program? Planning sections 2-7 will contribute helpful details.*

6. *How will the program be managed? Have you considered safety issues? How will you manage permissions and releases (insurance, health, emergency, parental permission)? Planning sections 4, 6 and 7 can help.*

7. *How will you market the program? See sections 6 and 7.*

8. *What are the evaluation plans and how will evaluations be used? See Planning section 8.*

9. *What will you do after the program is over for future marketing, recognition and reflection? Section 8 can help.*

10. *Visualize how the program will look, sound, and feel as it is occurring. How does your vision relate to your previous answers? Do you need to revise any previous thoughts?*



2 Assessing community water education needs

People experience and manage local water issues as part of their community. An effective water education program helps young people relate to and work on identified community or regional needs. It also helps them develop a sense of place and to feel responsible for stewardship of that place.

A needs assessment helps you understand your community well enough to organize your program around something that needs to be accomplished. It also helps you identify which young people might be interested in such a problem, what skills they need to work effectively on a project, and what will encourage them to join and stick with a program.

Success element
addressed (see p. 6)

2

Community
water issues

4

Youth needs

Why have you chosen to implement a community water education program at this time?

What knowledge and skills will youth in your community need to enable them to help improve water quantity or quality?

DONE PLAN TO NO PLAN

What community or regional water education need have you identified?

■ *How did you identify it?*

DONE PLAN TO NO PLAN

What gap in local youths' education about water have you identified?

■ *How do you know?*

DONE PLAN TO NO PLAN

Who are the youth in your target audience? Identify them clearly as to:

- Age
- Interests
- Educational needs/gaps
- Recreational/fun interests

DONE PLAN TO NO PLAN

Which of the following methods of involving a community in identifying needs could work in your community or have been accomplished already and could be involved in your planning process?

- Youth input (by survey, informal discussion, etc.)
- Citizen input (by survey, informal discussion, etc.)
- Public discussion of important local issues (reported by local news or brought to referendum)
- Advisory group input
- Grant or funding agency requirement(s)
- Educator or natural resource specialist(s) input
- School-identified water education needs

What did you learn from including community input into the needs assessment process?

Go on to any other section of the Planning Checklist. Sections 3 and 5 are related to this one and together 2, 3, and 5 can help you expand or modify question 1 in Planning section 1.



Success element
addressed (see p. 6)

6

Community
partners

3 Identifying networks and partners

Many citizens and teachers, agencies and organizations in every community are already involved in youth water education. Program success depends on working effectively with them.

Partnerships with schools and individual teachers help ensure that your program works educationally for the ages and abilities of your target youth. Schools teach the biology, ecology, chemistry, math, political science, and local history youth need to properly investigate local water concerns and interpret results. They also teach the investigative skills (choosing questions, creating and interpreting graphs, analyzing and explaining results) which are critical to effective programs.

Partnerships with natural resource professionals help ensure your program is based on and teaches accurate environmental and water resource information. These professionals also know about and have access to community or natural settings where youth can investigate water resources or issues and practice their skills.

Partnerships with existing, stable, community-based agencies (see Planning Checklist section 4) give the program a home base and help give your program continuity and longevity. This helps lead to measurable long-term impacts on community water resources.

Who currently conducts some type of youth water education program in your area? Identify each teacher, school, organization or agency and list what resources each has that could be useful to your project.

DONE PLAN TO NO PLAN

Have you explored or established partnerships and networks with these groups? Specifically, have you:

- *Explored how partnerships and networks will avoid duplication of program efforts?*
- *Identified possible mutual benefits, such as joint grant applications? (List them here.)*
- *Described partnership arrangements on paper to maintain identity and identify responsibilities, using a written agreement or contract to help avoid conflicts?*
- *Have you identified volunteer adults, such as parents, who can become partners? List here by name and note what each can offer.*

DONE PLAN TO NO PLAN

Have you checked further to identify additional agencies/networks you didn't list originally? (List them here.)

Summarize your thoughts about potential partnerships and networks for your project.



Go on to any other section of the Planning Checklist. Information from this section can help expand your responses to questions 1, 2, & 3 of Planning section 1.



4 Reviewing organizational support

Success element
addressed (see p. 6)

7

Organizational
support

Gaining acceptance for a program idea has long been associated with program stability. If you have any doubts, think about how it took 40 years, and the dedication of many groups, agencies and individuals, to gain acceptance for recycling.

People have many learning needs related to a new idea. They need to hear about it enough to know that the idea exists. They need to hear about it from a source they consider credible. The idea needs to be associated with their personal life concerns. And they need access to enough opportunities to learn that they can fit the learning into their busy lives. In other words, a one-time program or education activity is not enough. Opportunities to learn about water need to be incorporated into the culture of the community.

Having a sponsoring or host organization that provides continuing support for the program helps ensure its stability and consistency. Organizations which have community credibility in the eyes of their funders and of their clients are most able to provide this kind of long term stability.

Organizations with a mission that relates to the community water problem can: provide program management expertise, supply an “office” that funders or other community members can hook up to, help insure that program staff are properly trained, and be flexible when needs or resources change. These are also important ingredients of success. Try to link your program to an organization that can provide these qualities.

What is the sponsoring or host organization?

How has this organization committed ongoing support for such things as program ideas, resources, management, planning for the future, etc.?

DONE PLAN TO NO PLAN

Has the host organization gathered program ideas (or changes) from a variety of sources? Note person and idea for each source.

- *Specific person within a group or institution*
- *Network/partner participants*
- *Organization or staff*
- *Instructors or leaders*
- *Young people (participants or advisors)*
- *Program evaluations designed to contribute new program ideas*

DONE PLAN TO NO PLAN

Has the host organization determined how available resources could support or limit the scope of the program?

DONE PLAN TO NO PLAN

How has the host organization planned for good program management to ensure high quality programs? See also Planning section 7, Choosing a program delivery strategy.

- Selected consistent, professional program managers?
- Selected leaders and staff especially for this program—with skills, practical experience, and education appropriate to program goals?
- Trained the staff in program concepts and delivery?

DONE PLAN TO NO PLAN

How has the host organization provided for the program's future?

- Built a relationship with the funder which is dependable for ongoing program support?
- Involved one or more community partners to help provide program support?

DONE PLAN TO NO PLAN

Has the host organization provided for the program's future by planning for flexibility in the following areas?

- Audience
- Content/delivery methods
- Amount of grant money available
- Plans (resilient enough to meet changing conditions?)
- Time lines, personnel, or budgets flexible
- Potential to go beyond its initial scope

Summarize your thoughts about the host organization. Is it possible to provide support effectively? How will you compensate for any gaps?

Go on to any other section of the Planning Checklist. Information from this section can help expand your responses to questions 2, 3, 5 and 6 of Planning section 1.



Success elements addressed (see p. 6)

1
Goals

8
Design furthers goals

5 Determining goals and objectives

The ultimate goal of a successful water education program is to produce action which protects or improves water quantity or quality. Within this general goal, you need detailed goals and objectives which will help you design, deliver and evaluate a successful community water education program. This process may take special effort and require involving the community, professional staff, volunteers, and participants.

Goals should address water education, environmental education, and critical thinking skills and should focus on applying information to community water resources needs. They should also relate to broader water education themes and generate opportunities for teaching life skills.

Take advantage of proven instructional strategies that arise from science education and learning style research. Successful strategies from these disciplines will reveal many possibilities. It will also become obvious that people with expertise in applying these strategies should be part of your planning process. Consult the Resources section of this guide for more helpful details on this topic.

What do you consider to be potential goals of your program? How do these goals relate to community water education needs?

Is this program part of a broader youth education program(s)? What goals and objectives from the larger program relate to youth water education?

What other locally-available programs meet your youth water education goals? See also sections 3, Networks and partners and 4, Organizational support.

DONE PLAN TO NO PLAN

Which water education topics do you want to address through your program? See Resources for details.

- Science of water
- Water related ecosystems
- Drinking water supply: quantity and quality
- Water use
- Sources of water pollution and contamination
- Water quality: risk assessment and reduction

(continues next page)

- Management and protection strategies for specific uses
- Gov't./citizenship issues
- Water related careers

DONE PLAN TO NO PLAN

Which environmental education goals do you want to address through your program? (See Resources section.)

- Ecological foundations
- Conceptual awareness—issues and values
- Skills: investigation, evaluation, environmental action

DONE PLAN TO NO PLAN

Which life skills do you want to encourage with your program?

- Communicating with others
- Leading self and others
- Learning to learn
- Making decisions/solving problems
- Planning and organizing
- Planning one's life
- Relating to change and others
- Identifying/clarifying personal values

DONE PLAN TO NO PLAN

Do you have written goals and objectives? (Write them here.)

DONE PLAN TO NO PLAN

Do goals and objectives meet the following criteria?

- Clearly stated?
- Age-appropriate for audience? (see section 2, *Assessing community water education needs*)
- Activities support overall objectives?
- Objectives realistic and achievable from learner's perspective?

How would you restate your goals based on conclusions from this section?

Go on to any other section of the Planning Checklist. Information from this section can expand your responses to questions 1, 4, and 5 of Planning section 1.



6 Designing your program

Success elements addressed (see p. 6)

4

Youth needs

5

Youth as partners

Your program design helps answer the central water education question: How do we attract youth and keep them involved? Fortunately education about water offers an almost unique diversity of education opportunities. Water education can take place anywhere and never has to depend on talking or reading for transfer of information. If young people cannot be taken to water, water can be taken to them. These qualities make it easier to help youth feel connected to the program goals and activities.

Using design (and successful implementation), you can structure ways to meet your program goals. How you design the program will also help to ensure its quality and accessibility.

Specifically, this section helps you answer questions like: What will your program actually look like? How will water themes be included and who will decide? Should you organize a festival or start a water camp? Should you create a new program or incorporate your goals into an ongoing event? How will you connect to school programs? You can get ideas for design from the companion book *Educating Young People About Water: A Guide To Unique Program Strategies*.

You must also decide: How will the intended audience know about the program and how will they participate? How will you ensure program continuation in the future?

The answers to all these questions come from the results of your work on assessing community needs, working with partners, and connecting the program to a stable organization. They also come from the people who have been involved in helping set your program goals.

What do you want your program to look like? What information do you need to help you accomplish this?

DONE PLAN TO NO PLAN

Which delivery opportunity or strategy will work best for water education in your community? (See also section 2, Assessing community water education needs and section 3: Identifying networks and partners.)

- Campaign
- Day or residential camp
- Club, organization
- Community service learning
- Festival or fair
- Museum
- Nature or environmental education center
- School enrichment

DONE PLAN TO NO PLAN

What will you do to ensure a program of high quality?

■ *Are the people who conduct the program involved in its design?*

■ *Are the people who evaluate the program involved in the program design?*

■ *Are the participants involved in its design?*

DONE PLAN TO NO PLAN

If this program is derived from a pre-existing program, has it been successfully adapted to your particular audience or needs?

DONE PLAN TO NO PLAN

Does the program content and/or delivery target the learner and the learner's situation?

■ *Location (rural/urban)*

■ *Income level*

■ *Social conditions*

DONE PLAN TO NO PLAN

When youth do the planned activities, will they be able to meet activity objectives and overall program goals?

DONE PLAN TO NO PLAN

Before implementing the program, have you tried it with a subgroup or pilot group?



Section 6 –
Designing
your program

continued

DONE PLAN TO NO PLAN

How will you ensure the program is stable?

■ Is this water program consistent and predictable?

■ Will youth be able to participate more than one year/season?

■ Does program design or content change each year, as appropriate to conditions?

■ Are there opportunities to involve community partners in the program such as:

Volunteer teachers/leaders

Oversight committee members

Funders

Program evaluators/ reviewers

Planners or contributors

Providers of in-kind services/
special resources

DONE PLAN TO NO PLAN

Can your target audience get to the program? (Access)

■ Is the program location convenient for targeted learners?

■ If not, can the program be brought to the learner?

■ Is the setting accessible for people with disabilities?

■ Are fees a limiting factor to potential participants?

DONE PLAN TO NO PLAN

How will youth feel connected to program goals and activities?

■ What elements of local and of personal interest will be included?

■ Which activities offer opportunities for youth to have fun?

■ What will help youth feel they are learning something?

■ How will youth be involved as full and valuable partners?

■ How will you acknowledge youth contributions?

DONE PLAN TO NO PLAN

Which of the following general recommendations derived from successful water programs will you choose to emphasize? Note how you will incorporate them.

- *Water and its ecosystem are a central topic and feature*
- *A fun/recreation component*
- *Opportunities to physically interact with and/or manipulate water*
- *An interdisciplinary format around a water topic*
- *Relationship of water to many aspects of life and world*
- *Opportunities for youth to relate to water issues, develop a sense of place, and an attitude of stewardship*
- *Use of critical thinking skills to establish a personal connection to local environment and ecosystems*
- *A variety of options for youth involvement in program*
- *Activity choices that relate to youth interests (e.g. read a book, keep a field notebook, write a story, create a mural or videotape, etc.)*

DONE PLAN TO NO PLAN

Which of the following specific recommendations for teaching water programs will you use?

- *Incorporate water science*
- *Create a knowledge base for effective action directly or through partners (e.g. schools provide the background on stream ecology while the 4-H program provides an opportunity to monitor water quality)*
- *Address real water concerns in the community. (e.g. landfill leachate into groundwater, nitrate contamination in well water, PCB and toxic metals contamination in fish, or other water quality issues)*



Section 6,
Designing your program

continues on
next page



■ *Work on restoration/stewardship of local water resources within your watershed (stream-bank stabilization, beach clean-up, exotic plant removal, etc.)*

■ *Create opportunities for youth to use skills gained through the program in their homes and communities*

Section 6 –
Designing
your program

continued

DONE PLAN TO NO PLAN

How will the program be marketed to target participants?

■ *Direct mail*

■ *Announcements at schools and youth meetings*

■ *Local group newsletters*

■ *Posters at community centers*

■ *Public service announcements on TV and radio*

■ *Newspaper articles or announcements*

■ *Paid media advertising*

■ *Word of mouth through partner organizations*

List key components of your program design resulting from discussion of ideas in this section. Design components should address: quality, stability, access, connection, program considerations, and marketing.

Go on to any other section of the Planning Checklist. Information from this section can expand your responses to questions 4, 5, 6 and 7 of section 1.

7

Choosing a program delivery strategy



When you deliver your program, theory meets reality. What you do determines whether youth are attracted to, and stay involved with, water education. Often the people who are most effective at successfully delivering programs are teachers or other education professionals. Natural resource professionals should ask their education partners for help in planning how to deliver the program and in carrying out its delivery.

This section addresses such questions as: How will you manage the program? What will youth actually do? Have you taken advantage of the unique locations and qualities of water to make your program fun and memorable? Have you incorporated appropriate instructional strategies? How will instructors make sure that activities meet program goals? What mechanisms have you set up to recognize the contributions of participants, volunteers and staff?

According to directors of successful water education programs, youth are attracted to and remain interested in programs because:

- Activities use water (the real thing) and water has unique and fun properties. For example, it contracts when cold but expands just before freezing. In the right conditions it can form uniquely shaped crystals (snowflakes). Frozen it floats on water. Its surface is thick enough to support the weight of some living things like water insects. Things dissolve in it.
- Water education can be conducted anywhere that water is present including from a hose or in a bathtub or sink, but is especially enjoyable when conducted near or on a water resources such as a beach, stream, or lake.
- Water and its surrounding ecosystem lend themselves to investigation and solving a “mystery” or problem.
- Most youth already have a recreational interest in water (fishing, boating, swimming) that can be combined with an education theme.

You are encouraged to take their advice as you plan for program delivery.

What will be the key activities of your program?

What will be the unique strengths of your program?

Success elements addressed (see p. 6)

4

Youth needs

5

Youth as partners

9

Effective delivery

*Section 7,
Choosing a
program
delivery
strategy*

continues on
next page



DONE PLAN TO NO PLAN

Have you attended to basic management issues to ensure smooth program operation?

Section 7,
Choosing a
program
delivery
strategy

continued

■ *Is there a code of conduct for participants? staff?*

■ *Have instructors/leaders participated in a structured training program?*

■ *Do you have health insurance, emergency information and parental/guardian permissions on file?*

■ *Do you have an emergency plan on file in case someone is injured?*

■ *Are staff directly involved with youth trained in first aid and CPR?*

DONE PLAN TO NO PLAN

How will you use the following general instructional strategies that help lead to successful programs?

■ *Incorporate fun as a part of the education experience*

■ *Use appropriate science education strategies, e.g. the learning cycle approach (exploration, concept introduction or application) or inquiry method (asking questions and designing a method for answering questions)*

■ *Apply age-appropriate science processes (observing, communicating, comparing, organizing, relating, inferring, applying)*

■ *Encourage development of critical thinking skills which emphasize dialogue, reflection, and questioning*

■ *Use educational strategies that address the various learner abilities and learning styles, e.g. visual, auditory, manipulative and global learning styles*

■ *Share the learning responsibility between teacher and student*

DONE PLAN TO NO PLAN

*How will you ensure that the following strategies identified as **important to teaching about water** are part of your program delivery?*

- *Practice in learner objectives (hands-on or interactive)*
- *Close-up observation/handling of plants and animals in a water habitat or in a laboratory setting*
- *Observe changes in water quantity or quality over time*
- *Learn water conservation or protection ideas youth can use in the community or at home*
- *Encourage youth to express a desire or intention to use a water conservation or protection skill*
- *Allow youth to choose a project of interest within the water program*
- *Model appropriate behavior concerning the water topic, e.g. youth can practice conserving water in a program targeting water conservation*
- *Positively reinforce or recognize youth choosing an appropriate behavior*

DONE PLAN TO NO PLAN

Does the program provide appropriate recognition for each of the following?

Participants
Volunteers
Staff

As you deliver your water education program to your target audience, how will you incorporate sound management, appropriate education strategies, and a recognition scheme?



Go on to any other section of the Planning Checklist. Information from this section can expand your responses to questions 4, 6 and 7 of section 1.



8 Evaluating your program

Success element
addressed (see p. 6)

10

Evaluation

Evaluation helps you reflect on a program, make changes in it, and make decisions about it. While the most obvious time to evaluate is at the end, you must plan ahead for it. You can also include evaluation along the way to help check that the program and its activities are on track.

For detailed suggestions on how to evaluate the program, see the Evaluation Checklist starting on page 32.

How and when do you plan to evaluate your program?

DONE PLAN TO NO PLAN

In your program how will you plan to use the following evaluation strategies?

- *Measure expectations against outcomes*
- *Measure how program objectives, materials and activities relate to goals*
- *Measure participant perceptions of satisfaction including comfort, participation, opportunity, and information*
- *Take external impacts into consideration, such as unforeseen weather conditions, accident, or education materials being unavailable*
- *Evaluate at multiple levels of program delivery from planning and organizing to the actual event*
- *Formally review personnel*
- *Assess how well youth attained learning objectives and other impacts using pre/post tests, verbal valuations, youth presentation of results to demonstrate comprehension, etc.*



- *Provide opportunities for coordinators and instructors/leaders to evaluate each other's performance*
- *Verify that the program ties in with community or regional water issues or needs*
- *Ensure that evaluation is viewed as an important part of the program*
- *Design evaluations to be conducted regularly*
- *Summarize and use evaluation results*

Summarize the steps you will take during the program to ensure that you have enough information to evaluate the program when it is completed.

Go on to any other section of the Planning Checklist. Information from this section can expand your responses to questions 8 and 9 of section 1.



Water Program EVALUATION Checklist

Most educators are familiar with evaluating immediate or short term results: students read some information and we ask them a question to find out whether they retained the main idea. This Evaluation Checklist seeks to answer the broad program question: do the activities as a whole help participants **improve water quality or quantity in their community**, or is it simply a collection of science or recreation activities?

With youth programs, this particular objective may be difficult or impossible to evaluate. Most are so short (one day, one week, one semester) that they alone won't have an impact on the resource. However, taken together, community youth programs about water which are held over several years may show a measurable improvement to the resource. A critical element of success at this level, therefore, is making a continuing connection with the community.

This Evaluation Checklist will also help you to **examine specific elements of the program's structure and operation** and to carefully scrutinize its successes and its needs for improvement. It will help you determine if program resources are being used effectively and if you have met your own and others' expectations. It also addresses the performance of leaders and teachers. Other evaluation techniques and systems are available which can help you evaluate specific impacts on participants. See the Resource section for ideas and references.

Evaluation can help you twice: once during the program and again in planning for the new program. During the program you may want to emphasize evaluation of program processes and organization. After the program you may want to emphasize program impacts and analyze which program components contributed to those impacts.

This detailed checklist is based on information gathered from a review of environmental education literature and of program evaluation tools, and investigation of youth water education program strategies. It represents the best advice of over 40 outstanding youth water program managers and more than 30 published program descriptions. It has been reviewed at a national symposium of water education program managers and tested at specific program sites.⁸

8. See endnote 6 on page 10.



There are seven parts in this checklist which are generally comparable to the eight sections of the Water Program Planning Checklist.

1. Looking at your results—overview/summary
2. Organization mission
3. Why do this program?
4. Program support, partners and networks
5. Program goals, design and access
6. Program delivery
7. Evaluation

Who should use this checklist?

Initially, the program manager can use this checklist to help plan the evaluation process. Forming an evaluation committee is a good idea, however. It could include representatives of community groups, natural resource agencies, college or university specialists, schools, individuals who work directly with the youth, and the youth themselves. The committee will need to decide when to evaluate, how to evaluate, and how to use the evaluation results.

How to use this checklist

Use the checklist as a worksheet. If you are working with a committee or team, reflect individually on your answers to the evaluation sections then get together to summarize results.

Begin with section 1, Looking at your results—Overview/Summary. This helps you gather and summarize your impressions. Each of the other checklist sections begins with a brief explanation followed by general questions and then some detailed planning questions. It concludes with summary questions. Once you have completed the evaluation process, return to section 1 and note any new or revised answers to the questions there.

Skip, emphasize or combine questions as appropriate for your specific program. In addition to the information you developed using the Planning Checklist, the information in the Resources section of this book and in other guidebooks in this series may also be helpful.

People conducting a program evaluation sometimes face problems which may prevent them from gaining the benefits of evaluation. Don't let these problems scare you. Go ahead and do the best you can at evaluating the program, and take advantage of the results to plan for the next time. Some common barriers to evaluation include:

- not enough time to conduct an evaluation
- lack of participant knowledge about need for the program, causing participants to evaluate the program negatively
- difficulty in determining whether the water experience was educational
- lack of willingness to change, so evaluation results do not get used
- discovering that the program did not effectively relate activities to larger water resources or ecological concerns



NO	BETTER	WELL
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Start with each section's general questions.

Then look at the detailed planning evaluation questions which follow. Make notes and check

- NO, what you didn't do;
- BETTER, what you could have done better; and
- WELL, what you did well.

Then summarize what you learned in the summary question. You can use this information to enhance your responses to questions in Program Evaluation section 1 and to enrich the evaluation team's discussions.



1 Looking at your results—overview/summary

In working through the Evaluation Checklist, you will have to consider many aspects of your program. This section helps you put things together in one place. Begin by reviewing these summary questions to help provide perspective. Make copies of this section for you and your team. Jot down your thoughts on the copy.

Return to this page after you have completed the checklist sections relevant to your program. If you are working with a committee, reflect individually on your answers to each question here and to the questions in each evaluation checklist section, then bring the group together to summarize results.

1. *What makes your program successful?*

2. *What are your program's strengths in each of the following areas?*

■ *Program goals (What did you want your program to accomplish? Did it help youth relate to identified community water resource issues or needs?)*

■ *Program support by organization, networks and partners*

■ *Program design (What efforts did you make to design your program around program goals? Did your program strategy take advantage of water's special qualities and variety of locations?)*

■ *Access to the program (Who was your program designed to reach? Were there any barriers to their participation?)*

■ *Program delivery (What made your program successful? How did you define success?)*

■ *Program evaluation (What aspects of your program did you evaluate? How did you incorporate the results into your program?)*

3. Which areas have the potential for development or change?

4. Are there any unexpected outcomes? How will these figure into future plans?

5. What are the major areas of agreement among individual responses from evaluation committee participants?

6. What are the key differences in committee members' perceptions? Why are they different?

7. What can the evaluation team do to improve the program?

8. What are the barriers to change? What can the team do about them?

9. How does the support of your organization figure into your ability to respond to program feedback?

10. Review your program goals (section 1, Program planning overview/review, from the Planning Checklist). How do your conclusions mesh with your goals?



Success elements
addressed (see p. 6)

7

Organizational
support

2 Organization mission

Organizations have a mission which they seek to carry out. Often the organizational support that is helpful in providing water education program continuity and stability grows out of a good match between the organization's mission and the program's goals. Use this section to reflect on this issue.

Why is your organization(s) involved in youth water education?

How might your organization's mission and reputation enable you to respond to changes recommended through the evaluation process?

Have you determined how your organization is viewed by the community and by program participants? What were the results?

Go on to any other section of the Evaluation Checklist. Answers to these questions will help you expand on your answers to questions 1, 2, 9 and 10 of Evaluation Checklist section 1. Work with the evaluation team to recommend any needed program modifications.

3 Why do this program?



Communities experience and manage local water issues. An effective water education program helps youth relate to identified community or regional needs. What knowledge and skills do youth in your community need to enable them to help improve water quantity or quality? What did you want your program to do?

Describe briefly the needs your program met.

Success element addressed (see p. 6)

2

Community water issues

4

Youth needs

How did you identify those needs?

NO BETTER WELL

Specifically, what needs did the program meet?

■ *A water education need expressed in the youth's community*

■ *A gap in the youths' education about water*

■ *Community social concerns such as drug use prevention*

NO BETTER WELL

Who was the target audience? Was it clearly identified?

Section 3, Why do this program?

continues on next page



NO BETTER WELL

Why did you choose that audience?

Section 3,
Why do this
program?

continued

NO BETTER WELL

Who actually came to the program? Were they from the target audience?

NO BETTER WELL

Which of the following techniques for involving the community in identifying program needs did you use?

- Youth input (by survey, informal discussion, etc.)
- Citizen input (by survey, informal discussion, etc.)
- Public discussion of important local issue(s) (local news, referendum, etc.)
- Advisory group input
- Grant or funding agency requirement(s)
- Educator or natural resource specialist(s) input
- School-identified water education needs
- Program evaluation and feedback

Return to Evaluation section 1 and summarize your conclusions as an individual to questions 2-4 there. Work with the evaluation team to recommend any needed program modifications. Go on to any other section of the Evaluation Checklist.

Did your program relate to a community need? If yes, How do you know? If no, could your program be adapted to address a local need?

4

Program support, partners and networks



There are many organizations and programs that can help support each other or who could be in competition with each other. This section helps you evaluate the effectiveness of your program's networks and partners.

Success elements addressed (see p. 6)

How does your organization (or the one you work with) support this program?

6

Community partners

List any groups your program works with. Note whether the program's existence depends on the participation of a particular group.

NO BETTER WELL

Do the following characteristics of organizational and partner support describe your program?

- Consistent and predictable
- Avoids duplication
- Uses resources of several agencies
- Involves partners in program delivery (note how they were involved)
- Permits sharing/publicizing program results through newsletters, reports, computer networking, conferencing, etc.

NO BETTER WELL

Were you satisfied with the effectiveness of your program support? Why or why not?

Section 4, Program support, partners and networks

continues on next page



NO BETTER WELL

Were your partners satisfied with the effectiveness of the program support? Why or why not?

Section 4,
Program support,
partners and
networks

continued

Were partners or networks a factor in getting the most impact from your education program? How could they become part of increasing community impact?

Return to Evaluation section 1 and summarize your conclusions as an individual to questions 2-4 there. Work with the evaluation team to recommend any needed program modifications. Go on to any other section of the Evaluation Checklist.

5 Program goals, design and access

Your water program was designed to meet the educational goals you developed. These in turn were intended to address the community needs you identified such as concern about potential contamination or shortage of drinking water, for example.

There are many potential barriers to keep youth from participating in a program. A carefully designed program will consider its target audience before determining how to present the program.

List your program goals.

What knowledge, attitudes and skills were needed by the target audience to meet these goals?

How did you design your program to meet these goals?

List your "targeted" youth. Describe your understanding of their ability to get transportation, pay fees, and benefit from the program's presentation style.

NO BETTER WELL

Which, if any, of the following water education goals are addressed through your program? Goals are developed in Planning Checklist section 5. Also see Resources.

- Science of water
- Water-related ecosystems
- Drinking water supply: quantity and quality
- Water use
- Sources of water pollution and contamination

Success element addressed (see p. 6)

1

Goals

4

Youth needs

5

Youth as partners

8

Design furthers goals

*Section 5,
Program goals,
design and access*

continues on
next page



- *Water quality: risk assessment and reduction*
- *Management and protection strategies for specific uses*
- *Gov't and citizenship issues*
- *Water related careers*

Section 5,
Program goals,
design and access

NO BETTER WELL

Which of these general education practices did you use in program design?

continued

- *Clearly stated goals and objectives*
- *Achievable objectives*
- *Program content and/or delivery which targets the learner and learner's situation: urban/rural, income level, social conditions*
- *Youth who do the planned activities meet activity objectives and overall program goals*

NO BETTER WELL

Which education strategies important to programs about water did you use?

- *Water topics concern a large number of youth in the targeted group*
- *Water topic is related to many aspects of the youth's life and world*
- *Program incorporates water science and ecological connections*
- *Program gives participants an opportunity to relate to water issues in their community*
- *Helps youth use critical thinking skills to establish a connection to their environment (dialog, reflection, questioning)*
- *Youth actually experience/manipulate water*
- *Youth can choose how to be involved in the program*
- *Addresses real water concerns in the community; e.g., landfill leachate in groundwater, nitrate contamination in well water, PCB and toxic metals contamination in fish or other water quality issues*
- *Program provides an opportunity for restoration/ stewardship of local water resources and within their watershed (streambank stabilization, beach clean-up, exotic plant removal)*
- *Youth have opportunities to use skills gained in the program in their home communities*

NO BETTER WELL

Which, if any, of the following environmental education goals are addressed through your program?

- *Ecological foundations*
- *Conceptual awareness: issues and values*
- *Investigation skills*
- *Evaluation skills*
- *Environmental action skills*

NO BETTER WELL

Which life skills are encouraged through your program?

- *Communicating with others*
- *Leading self and others*
- *Learning to learn*
- *Making decisions/ solving problems*
- *Planning and organizing*
- *Planning one's life*
- *Relating to change and others*
- *Identifying/clarifying personal values*

NO BETTER WELL

Specifically consider issues of program access

- *Convenient location for targeted youth*
- *Fees (if any) based on participants' ability to pay (or covered by partners)*
- *Program meets differing participant needs (age, social/ cultural factors, abilities)*
- *Accessible setting for people with disabilities*

How will you know if your program met the need identified in section 3 of this Checklist?

What aspects of your program design contributed to meeting program needs?

Return to Evaluation section 1 and summarize your conclusions as an individual to questions 2-4 there. Work with the evaluation team to recommend any needed program modifications. Go on to any other section of the Evaluation Checklist.



6 Program delivery

Success element
addressed (see p. 6)

9

Effective delivery

A program can gain momentum when it's up and running. This will happen when the delivery builds on the program's strengths. What do youth actually do in the program? What strategies do instructors use? How do instructional strategies relate to goals?

What program strengths enhance program success? (proximity to water, supplement to an already popular program, great staff, etc.)

NO BETTER WELL

Specifically, which of the following program delivery strategies did you use?

- *The new approach or effort was tried with a subgroup (pilot group) before implementing the program*
- *Instructors/leaders completed a structured training program*
- *Fun/recreation were part of the education experience*
- *Used appropriate science education strategies such as the learning cycle approach (exploration, concept introduction/application) or inquiry method (asking questions and designing a method for answering)*
- *Applied age-appropriate science processes (observing, communicating, comparing, organizing, relating, inferring, applying)*
- *Developed critical thinking skills emphasizing dialogue, reflection and questioning*
- *Used educational strategies that address various learner abilities and learning styles (visual, auditory, manipulative and global)*
- *Provided shared learning responsibility between teacher and student*

NO BETTER WELL

Which of the following opportunities that are important for teaching about water did you use?

- *Opportunities to practice (hands-on or interactive) learner objectives*
- *Close-up observation/handling of plants and animals in a water habitat or in a laboratory setting*
- *Opportunity to observe changes in water quantity or quality over time*
- *Ideas of things youth can do in the community or when they get home*
- *Opportunities to express a desire or intention to take action*
- *Modeling appropriate behavior concerning the water topic, e.g. giving youth opportunities to practice effective water-conserving activities*
- *Supporting appropriate behavior, i.e., giving positive reinforcement or recognition*

Did your program take advantage of the many teaching strategies available to meet the “success” criteria described in the introduction?

Return to Evaluation section 1 and summarize your conclusions as an individual to questions 2-4 there. Work with the evaluation team to recommend any needed program modifications. Go on to any other section of the Evaluation Checklist.



7 Evaluation

Evaluation can be used to reflect on a program, to make minor or major changes in a program, or to make decisions about a program. For information on how to use this section, please see the Water Evaluation Checklist introduction. Ideas and resources to help you develop specific program impact measurements are in the Resources section.

Success element
addressed (see p. 6)

10

Evaluation

What is your overall evaluation of this program?

NO BETTER WELL

Who will be included in your evaluation?

NO BETTER WELL

What will you include in your evaluation? (knowledge change, changes in intentions, improved skills, etc.)

NO BETTER WELL

How and when will you evaluate your program?

NO BETTER WELL

Does your evaluation strategy provide the answers you need to meet intended uses of the evaluation?

- *Assess interest in the program*
- *Report to funders*
- *Reach new audiences*
- *Improve delivery strategies*
- *Modify design to better reach goals*

NO BETTER WELL

Did your program meet the needs you identified in section 3 of the Evaluation Checklist ?

■ *How do you know?*

NO BETTER WELL

In which of the following ways have you used evaluation?

■ *Determine if program accomplished what it was designed to do*

■ *Determine if participant expectations are met*

– *How did you determine that?*

■ *Relate program objectives, materials and activities to expectations*

– *Did they result in the knowledge or skill changes you expected?*

– *How do you know?*

■ *Assess youths' attainment of learning objectives for:*

Knowledge

Attitudes

Skills

Behaviors

– *How did you assess attainment of learning objectives?*

■ *Assess the performance of the leaders/teachers*

– *What criteria did you use?*

■ *Verify the relationship of the program to community needs*

– *What criteria did you use?*

Return to Evaluation section 1, Looking at your results, and summarize your conclusions as an individual to questions 2-4 there. Work with the evaluation team to recommend any needed program modifications. Go on to any other section of the Evaluation Checklist.

Table of Contents



RESOURCES for Youth Water Education Planning and Evaluation



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Water Quality 2000 Report — Challenges for the Future	49
National Geographic Society sample water quiz	49
Water topics and subtopics	50
Environmental education topics and subtopics	51
Questions adapted from Bennett's Hierarchy	52
Common evaluation strategies	53
Sample questions for evaluating participant impacts	54
Agencies with an interest in water issues	55
Private groups with an interest in water issues	55
Bibliography of sources for criteria to evaluate nonformal youth water education programs	56



Water topics and subtopics

In developing water education programs or reviewing materials for the likelihood that they will help meet water education goals, these topics should be considered.

1. Science of water

- Properties
- Importance to living things
- Hydrologic cycle
- Geology/hydrology dynamics
 - surface water
 - groundwater
 - regional supply

2. Water related ecosystems

- Types of ecosystems
 - lakes
 - wetlands
 - rivers
 - watersheds
 - ponds
 - streams
 - oceans
 - riparian
 - estuaries
 - ephemeral systems (intermittent)
- Major regional resource: _____

- Ecological concepts

3. Drinking water supply: quantity & quality

- Delivery
 - community/public
 - private
- Water quality control
 - well concerns
 - testing
 - public
 - private
- Treatment of drinking water
 - public drinking water
 - home treatment
- Lifestyle impacts/conservation

4. Water use

- Use of water by many groups
 - commercial
 - municipal
 - recreation
 - industry
 - domestic
 - agricultural
 - power production
- Conservation by user groups
- Issues/conflicts between user groups

5. Sources of water pollution/contamination

- Point source
 - agricultural sources
 - public &/or private wastewater
 - industrial & business hazardous wastes
 - energy production wastes
- Nonpoint source
 - agricultural
 - forestry
 - atmospheric deposition
 - urban
 - mining

6. Water quality: risk assessment & reduction

- Curriculum addresses the concept of how risk decisions are made
- Impact of water quality on health
- Impact of water quality on human food sources
- Impact of water quality on plant & animal communities

- Understanding & reducing risks for specific contaminants
 - bacteria
 - nitrates
 - pesticides
 - salinity
 - sediments
 - other chemicals

- Water quality indicators

7. Management & protection strategies for specific uses

- Agricultural management practices
- Chemical storage
- Chemical emergencies
- Development issues/pressures
- Natural disasters
- Recreational use
- Solid waste management decisions
- Wastewater treatment
- Wildlife habitat/land stewardship
- Management
- Zoning strategies
 - shorelands/floodplains
 - wetlands
 - wellhead/groundwater recharge areas

8. Government & citizenship issues

- Policy issues
 - water quality
 - water quantity
- Role of local government in developing protection strategies
- Citizen involvement & participation
- Legislation, regulation, incentives/disincentives

9. Water-related careers

- Technical
- _____
- Professional
- _____

Environmental education topics

In developing water education programs or reviewing materials for the likelihood that they will meet water education goals, the following environmental education goals should be considered.



1. Ecological foundations

(program focuses on:)

- Individuals & populations
- Interactions & interdependence
- Environmental influences & limiting factors
- Biogeochemical cycling
- Community & ecosystems concepts
- Homeostasis (balance of nature)
- Succession
- Humans as ecosystem components
- Ecological implications of human activity

2. Conceptual awareness: issues & values

(program encourages recognizing:)

- Ecological impact of human culture on environment
- Ecological impact of individuals on environment
- Ecological & cultural implications of environmental issues
- Alternative solutions
- Cultural implications of alternative solutions
- Investigation as prerequisite to decision-making
- Role of human values & need for personal values clarification in decision making
- Need for responsible citizen action in environmental issue remediation

3. Investigation skills

(program provides opportunities to:)

- Shape questions
- Formulate hypotheses
- Make observations and measurements
 - ___ Natural science settings
 - ___ Social science settings
- Perform tests

- Analyze results with respect to:
 - ___ ecological implications
 - ___ cultural implications

4. Evaluation skills

(program provides opportunities to:)

- Identify alternative solutions
- Identify values associated with alternative solutions
- Evaluate alternative solutions with respect to cultural & ecological implications
- Identify & clarify personal values & positions as they relate to issues & solutions
- Change personal values & positions with new information

5. Environmental action skills

(materials guide development of:)

- Skills to work towards ends consistent with personal values
 - ___ persuasion
 - ___ legal action
 - ___ community problem solving
 - ___ consumerism
 - ___ ecomanagement
 - ___ political action
 - ___ education
- Decision-making regarding environmental action strategies
- Opportunities to apply environmental action skills
- Evaluate influence of actions taken to effect balance between quality of life and quality of environment

Recent thinking by experienced environmental educators includes socio-political knowledge as a component to environmental education.¹¹ While socio-political themes have been woven into the previous listing, program planners/evaluators may wish to further emphasize the following education goals:

6. Socio-political knowledge

(program provides opportunities to:)

- Improve awareness of economic, social, political and ecological interdependence in urban and rural areas
- Study and communicate how human cultural activities influence the environment
- Study the relationship between beliefs, political structures, and environmental values of various cultures
- Study the basic components of societal systems
- Develop geographic understanding at the local, regional, and global levels
- Study patterns of change in society and culture
- Understand structure and scale in societies and culture

11. Summarized by the NAAEE Standards project. See reference below.

For more detail about environmental education goals, review the following references:

Tbilisi Intergovernmental Conference on Environmental Education. 1978. "Toward an Action Plan: A Report on the Tbilisi Conference on Environmental Education." A paper developed by the FICE Subcommittee on Environmental Education. Washington, D.C., U.S. Government Printing Office, Stock No. 017-080-01828-1.

Gardella, Ronald. 1986. "Environmental Education Curriculum Inventory Forms A and B." Northern Kentucky University, Highland Heights, Kentucky, 41076.

Hungerford, Harold, R. B. Peyton and R. J. Wilke. 1980. "Goals for Curriculum Development in Environmental Education," *Journal of Environmental Education*, 11(3):42-47.

NAAEE background papers on environmental education standards. 1995. North American Association of Environmental Education, Washington, D.C.

Roth, Charles. 1990. "Definition and Clarification of Environmental Literacy, a working paper," ASTM Environmental Literacy Project, 1916 Race St., Phila., PA, 19103-1187.

Resources



Questions adapted from Bennett's Hierarchy

One strategy¹² which has been used effectively to evaluate natural resource based programs uses Claude Bennett's hierarchy of program outcomes.

A wide variety of outreach programs use Bennett's program evaluation methodology to measure effectiveness.

Bennett's Hierarchy

-
- 1: Inputs: time expended, staff qualifications
-
- 2: Activities: educational methodology
-
- 3: People involvement: number and characteristics, continuity and intensity
-
- 4: Reactions: interest in activities, acceptance of leadership
-
- 5: Knowledge, attitude, skills, and aspirations change (KASA): direction and extent, duration
-
- 6: Practice change: individual innovation, structural change
-
- 7: End result: ultimate objectives, side effects

Because evaluation can be difficult, samples from the Bennett Hierarchy are regrouped here according to the sections of this publication's *Water Program Evaluation Checklist*. This should help by giving another set of words to consider. Questions listed after each of Bennett's topics were adapted from Bob Steelquist.¹² Most have also been integrated into the Evaluation Checklist in this guide. See the checklist for more details about these topics.

Evaluation Checklists 4 and 7: Program support, partners, and networks; Program evaluation

1: INPUTS

- what costs will be required to conduct this program including employees and materials?
- what is the source of the funds?
- how do you know if you have chosen the most cost effective approach to solving the water problem addressed in your program?

4: REACTIONS

- how do program participants view your organization and its leaders?
- how will you find out how program participants evaluate your instructors, organization, or water issue after involvement in the program?

Evaluation Checklist 3: Why do this program?

7: END RESULT

- what environmental condition will your program help correct?
- how will you know if the condition has been corrected?
- how will your program contribute to correcting the condition?

Evaluation Checklists 5, 6 and 7: Program goals, design, and access; Program delivery; Program evaluation

In Bennett's Hierarchy, goals, program design and delivery, and evaluation are integrated into the following themes.

2: ACTIVITIES

- what activities have you planned and what will you have to do to prepare?
- what factors will affect the success of these activities?

3: PEOPLE INVOLVEMENT

- what are the characteristics of your participants and how many participants are you planning for?
- how will you reach your participants?
- how will participants perspective be represented in program planning?

5: KASA

- does change in behavior require new knowledge or skills that can be learned? attitudes or awareness that must be developed? what information is required?
- how will information be transmitted to participants?
- how will you find out if participants received, understood, or used the knowledge, attitudes, skills or awareness that they are exposed to during the program?

6: PRACTICE CHANGE

- what current behavior (or lack of behavior) contributes to the condition?
- what changes in behavior do you hope will occur as a result of your project?
- how will you know if the behavior of participants has changed as a result of your program? short term? long term?

12. Materials developed by Bob Steelquist. Public Information Education grant program, Puget Sound, Washington, 1993.



Common evaluation strategies

How you evaluate your program depends on what you want to know about it. Here are seven program areas you might want to review along with a list of evidence you could collect and examine for each.¹²

Resources

Financial audit, tracking expenses, timesheets, letters of commitment of funding, in-kind contributions, donations

Activities

Project timelines, work plans, activity reports, status reports, final reports

Participants

Sign up sheets, participant lists, audience counts, product counts, contact lists, audience characterization

Participant reactions

Self-report evaluation form, instructor evaluation form, program audit, exit interview, instructor logs, correspondence files, news clipping files

Knowledge, attitudes, skills, awareness

Peer review of materials, pretest - posttest, certification exam, self-reflective writing, portfolio review, instructor logs, student journal, group self-assessment, polling, focus groups, informal consultation, skills demonstration, exit interview

Behavior change

Pledge, peer or participant rated exercise, incentive award, informal followup, polling, focus groups, direct observation, photo documentation, measuring indicators

Environment or resource condition

Ambient monitoring, hasty reconnaissance, population survey, mortality reports, creel census, incident reports, measuring indicators

For a more complete guide to identifying strategies for evaluating specific program outcomes, see *Program Evaluation Kit*, second edition, edited by Joan Herman. Available from SAGE Publications, the kit includes nine separate publications. You may want to begin with *Evaluator's Handbook*, the first in the series.

12. Adapted from presentation handouts developed by Bob Steelquist, Puget Sound, Washington, PIE program, 1993.



Sample questions for evaluating participant impacts

Questions to ask in a self report evaluation:

1. How did participants find out about the program?
2. What did participants hope to learn?
3. What was the most important idea or skill that participant gained from the program?
4. How will participant use the information he/she learned?
5. How would participants improve the program?

Other evaluation ideas:

1. Pre and post questions related to specific goals, i.e. can you identify the boundaries of your local watershed? Can you think of five ways to reduce your use of water at home? etc.
2. Pre and post skills observation, i.e. did participant identify information needed to understand a particular water issue and successfully interview a public official to acquire that information? Do parents report that participant remembers to turn off the water while brushing teeth? etc.
3. Problem solving ability, i.e. participant must plan a way to find the answer to a relevant problem. Try the same or similar problem before and after the activity or program. For example, the participant is asked to develop a plan to find out how to insure that home water is good quality? Can the participant figure out what to do first, second; who to call for help in designing the plan, etc.?
4. Pre and post environmental conditions observation, i.e. participant decided that the stream needed to have trash removed to improve fish and wildlife habitat. Was the habitat improved as a result of this activity according to accepted criteria?
5. Informal group discussion about topics such as: what do you remember the most about what we did? How do you know you learned something new? what would you do different now that you experienced this activity? What would make this activity more fun? why did we do (activity A) before we did (activity B)?



Agencies with an interest in water issues

Government agencies

National Oceanic and Atmospheric Administration (NOAA)

No contact available at present

US Cooperative Extension Service

Check your local phone book under County Government for the Cooperative Extension office in your county.

US Environmental Protection Agency

EPA Resource Center
202/260-7786

EPA Public Information Office
202/260-7751

EPA Region 5
Education Computer Programs
312/353-6353

US Fish And Wildlife Service

Office of Training and Education
Publications Unit
4401 North Fairfax Dr.
Mailstop webb 304
Arlington, VA 22203
703/358-1711

US Forest Service

Natural Resource Conservation
Education Program (NRCEP)
14th and Independence Ave., SW
Washington, DC 20090-6090
202/205-1545

US Geological Survey

Check your local telephone book under US Government, Department of the Interior for the office nearest you.

US Natural Resources Conservation Service

Check your local telephone book under US Government, Department of Agriculture for the office nearest you.

Private groups

American Forests

1516 P St., NW
Washington, DC 20005
800/8-RELEAF

American Water Works Association

Public Affairs Department
6666 W. Quincy Ave.
Denver, CO 80235
303/794-7711, EXT. 4114

The Blue Thumb Program A consortium of public and private groups

National Drinking Water Week
Headquarters
6666 W. Quincy Ave.
Denver, CO 80235
303/794-7711

Earth Force

1501 Wilson Blvd., 12th floor
Arlington VA 22209

Global Rivers Environmental Education Network (Green)

721 East Huron St.
Ann Arbor, MI 48104
313/761-8142

The Groundwater Foundation

PO Box 22558
Lincoln, NE 68542-2558
402/434-2740

Izaak Walton League of America

707 Conservation Lane
Gaithersburg, MD 20878-2983
301/548-0150
1/800/BUG-IWLA

National Association of Conservation Districts

408 E. Main, PO box 855
League City, TX 77574
713/332-3402

National 4-H Council

Environmental Stewardship
Program
301/961-2866 or 2833

National Marine Education Association

Dauphin Island Marine Lab
PO Box 369-370
Dauphin Island, AL 36528
205/861-7558

Project Wet (Water Education For Teachers)

National Project WET
201 Culbertson Hall
Montana State University
Bozeman, MT 59717-0057
406/994-5392

River Network

PO Box 8787
Portland, OR 97207-8787
503/241-3506

Trout Unlimited

1500 Wilson Blvd., #310
Arlington, VA 22209-2310
703/284-9409

Water Environment Federation

601 Wythe Street
Alexandria, VA 22314-1994
703/684-2487

Western Regional Environmental Education Council (WREEC)

4014 Chatham Lane
Houston, TX 77027
713/520-1936



Bibliography of sources for criteria to evaluate youth nonformal water education programs

Bibliography

Strategies for evaluating programs

Strategies for evaluating programs

USDA Cooperative Extension. 1976.
Analyzing Impacts of Extension Programs.

This paper describes a program evaluation methodology developed by Claude F. Bennett which is used by a wide variety of outreach programs to measure effectiveness. The hierarchy of evidence for program evaluation includes the following steps:

1. Inputs: time expended, staff qualifications
2. Activities: educational methodology
3. People involvement: number and characteristics, continuity and intensity
4. Reactions: interest in activities, acceptance of leadership
5. Knowledge, Attitude, Skills, and Aspirations change: direction and extent, duration
6. Practice change: individual innovation, structural change
7. End result: ultimate objectives, side effects

Remaining discussion focuses on: selection of evidence for evaluation, evaluation criteria, and study types.

The Extension evaluation model was recently applied to an evaluation of project WILD by Margaret Tudor of the Washington Department of Wildlife in 1992. Her study combined Washington State data with a 1990 survey by Standage Accureach to provide information for each category suggested by the Bennett model. Tudor was not able to demonstrate any direct linkages between use of Project WILD and behavior changes that would meet Department of Wildlife goals. However, the materials were widely used with a high level of teacher satisfaction. Tudor recommends the development of measurable action outcomes to enhance the use of these materials.

Bennett, Dean B. 1988-89. *Four Steps to Evaluating Environmental Education Learning Experiences.* **Journal of Environmental Education, 20(2):14-2.**

Bennett urges the need to evaluate environmental education (EE) programs in order to convince the educational community that EE can be an integral aspect of the curriculum and actually improve the learning experience. He states some reasons why educators avoid evaluating their programs, e.g., time, expense, complexity, fear of being evaluated, and criticism of being too subjective. Bennett then suggests a simplified four-step evaluation method to assist environmental educators to become better evaluators. Bennett describes the variety of evaluation measures which could be used including: performance tests, questionnaires, interviews, observations, artifact examination, and unobtrusive measures.

McCrea, Edward J., and Glenn D. Weaver. 1984. *Nonformal Environmental Education : An Overview and Methodology for Evaluation.* **In Monographs in Environmental Education and Environmental Studies, Vol I, edited by Arthur B. Sachs, ERIC, Ohio State University College of Education, School of Natural Resources, 1200 Chambers Rd., 3rd Floor, Columbus, OH 43212.**

Authors summarize the nonformal EE history, i.e., early educational materials, agency involvement, and historical events that led to strengthening the EE movement. Since the 1980s, many nonformal educators have focused on issue-oriented programs hoping to directly affect positive social behavior and problem-solving. Traditional practitioners question the effectiveness of this narrow focus as truly beneficial in increasing public awareness. Authors then address the key points of the learning theory as the first step in predicting the potential effectiveness of nonformal programs. Nonformal education programs should possess the following attributes in order to maximize learning potential: (1) learning is

based on past learning; (2) learning occurs best when it is multisensory; (3) learning should build on the reality principle and use concrete examples; (4) learning should be non-threatening and reinforcing; (5) educational activities should be as enjoyable as possible and be structured to provide challenges; (6) educational activities should be structured to facilitate concepts building; (7) learning should be demonstrated by a change in behavior; (8) specific attempts should be made to teach for transfer (from knowledge to action).

Nonformal EE evaluation procedures differ from the cognitive testing process of conventional education. Authors discuss setting standards by creating a hypothetical average or an optimum program against which to compare EE programs. However, this process also creates difficulty due to the subjectivity of setting standards and measuring adherence to those standards. Finally, the authors point to an evaluation tool designed by themselves for the U.S. Fish and Wildlife Service programs. Program attributes are identified, then used as the basis for developing standards. Standards are specific, concrete statements intended to identify presence or absence of program elements.

Murphy, Nancy. 1993 draft. *Innovative Student Assessment in Environmental Education*. Presented at the 1993 annual conference of the North American Association of Environmental Education. Paper available from Nancy Murphy at Antioch University, Seattle.

This paper summarizes authentic assessment resources available to evaluate environmental education. The author focuses on assessment relevant to instructional decision making only. To that end, she recommends that instructors evaluate: preconceptions, conceptual change, ability to apply concepts in new contexts, participation in group construction of shared meanings, personal behavior changes, and attitude change. An assessment model is provided for use of the learning cycle model which includes: engagement, exploration, discovery, experimentation, and extension. Examples of generic assessment tools as applied to environmental education are also provided. Generic tools include: concept mapping; prior

knowledge charts; rubrics such as checklists, Likert scales, and scoring scales, analytical trait tools, and holistic scales. Further information and example tools using generic evaluation strategies are provided on how to assess preconceptions, how to assess conceptual change, how to assess group skills, how to assess behavior change, and how to assess attitude change.

Thomas, Ian G. 1990. *Evaluating Environmental Education Programs Using Case Studies*. *Journal of Environmental Education* 21(1): 3-8.

Addresses the difficulty of evaluating programs which involve students in citizen action. Proposes a case study approach which would answer "how" and "why" questions and would lead to "understanding" rather than "knowledge." References other evaluation experts who verify that case descriptions can be useful when no theoretical data model exists. Reminds users that validity and reliability concepts must be considered in developing the case study model. One example described questionnaires and interviews which sought to gain information about program features, especially those perceived to be of interest and/or worthwhile.

Evaluation criteria that could be adapted for youth nonformal water education programs

Bennett, Dean B. 1989. *Four Steps to Evaluating Environmental Education Learning Experiences*. *Journal of Environmental Education* 20(2):14-21.

Bennett suggests a simplified four-step evaluation method to assist environmental educators to become better evaluators: set expectations; plan the evaluation; determine results; use the results. Expectations include: knowledge and understanding objectives, thinking skills objectives, values and attitudes objectives, action skill objectives; and allowing for unanticipated outcomes.

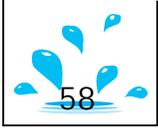
Resources



Bibliography

Strategies for
evaluating
programs

Adaptable
evaluation
criteria



Bibliography

Adaptable
evaluation
criteria

Important
skills for
success

Dwyer, William O., Frank C. Lemming, et al. 1993. *Critical Review of Behavioral Interventions to Preserve the Environment: Research Since 1980.* **Environment and Behavior, 25(3): 275-321.**

Authors note that from 1970-1990, behavioral intervention studies that focus on environmentally relevant behavior peaked in 1977 and then steadily declined into 1990. The research was restricted to behavior-change interventions and obtained 54 intervention studies with antecedent and consequence strategies. They concluded that over the past decade, much of the research did not allow for meaningful comparisons among other interventions while few studies included critical follow-up procedures. Without follow-up, techniques that produce long-term behavior change may be overlooked. Authors note some accomplishments from the 1980s research.

The techniques that have resulted in consistent behavior change are antecedent conditions, commitment, modeling, and goal-setting strategies. The authors then offer several specific suggestions to address the methodological problems and general research.

Gardella, Ronald. 1986. *Environmental Education Curriculum Inventory Forms A and B.* Northern Kentucky University, Highland Heights, Kentucky 41076.

Translation of 1978 Tbilisi definition of environmental education and 1980 Hungerford, Peyton and Wilke goals for environmental education into a checklist useful for reviewing curriculum materials for their environmental education components.

Hungerford, Harold R., and Trudi L. Volk. 1990. *Changing Learner Behavior Through Environmental Education.* **Journal of Environmental Education 21(3): 8-21.**

Research into environmental behavior has not been able to show that increased knowledge will change human behavior. To achieve responsible citizenship behavior, individuals must be given the opportunity to develop the sense of "ownership" and "empowerment." Individuals who act have "expressed an intention to take action" and "possess a desire to act". Authors also found that to change learner behavior, strategies should be imple-

mented across all grade levels. The cooperation of nonformal education agencies as well as local and regional educational resources would maximize this opportunity for success.

Lisowski, Marilyn, and John F. Disinger. 1991. *The Effect of Field-Based Instruction on Student Understandings of Ecological Concepts.* **Journal of Environmental Education, 23(1): 19-23.**

Authors assess comprehension and retention of selected ecological concepts when using field study instruction techniques. Results showed that students learned effectively through field-based instruction in conceptual development. Used the Student Ecology Assessment (SEA) for evaluating concept development.

Niedermeyer, Fred C. 1992. *A Checklist for Reviewing Environmental Education Programs.* **Journal of Environmental Education, 23(2):46-50.**

Increasingly, various forms of environmental education materials are reaching schools. The author provides educators a checklist to identify the technical characteristics when reviewing or developing EE programs. These characteristics are those which instructional developers determine as highly desirable, e.g., clearly stated objectives, student opportunities to practice objectives, and field-tested programs.

Skills important to success in youth nonformal water education programs

Berger, Ida, E. and Ruth M. Corbin. 1992. *Perceived Consumer Effectiveness and Faith in Others as Moderators of Environmentally Responsible Behaviors.* **Journal of Public Policy and Marketing, 11(2), 79-89.**

The authors use a 1989 environmental opinion poll of the Canadian population to examine the influence of perceived consumer effectiveness and faith in the efficacy of others on the relationship between environmental attitudes and consumer behaviors. Results support the concept that "Consumers need to be empowered to rely on their own capabilities to achieve valued environmental outcomes."



Berman, Shelley. 1991. *Thinking in Context: Teaching for Open-mindedness and Critical Understanding in Developing Minds: A Resource Book for Teaching Thinking*, ed. Arthur Costa. **Educators for Social Responsibility, Alexandria, VA.**

Educators for Social Responsibility claim that students lack the necessary thinking skills to understand complex social issues. Under the whole-language approach, thinking is a integrative process that is enhanced when placed in the context of real, meaningful situations. Berman lists nine strategies that enrich students' thinking abilities through empowerment and confidence including: creating a safe environment, collaborative thinking, teaching interconnectedness, multiple perspectives, and providing opportunities to act on their thinking. If youth are to become active participants in society, they must feel confident that others value their thinking and that their thinking makes a difference by improving their own lives or influencing others.

De Young, Raymond. 1989. *Exploring the Difference Between Recyclers and Non-Recyclers: the Role of Information.* **Journal of Environmental Systems, Vol. 18(4), 341-351.**

This study found no difference between the attitudes of recyclers and non-recyclers. Those who did not value recycling (as demonstrated in attitude studies six months prior to the initiation of community recycling) participated in recycling activities as often as those who did value recycling. As a result, the author recommends that environmental education focus on how to turn intentions into actions, rather than on changing attitudes.

De Young, Raymond. 1993. *Changing Behavior and Making It Stick: The Conceptualization and Management of Conservation Behavior.* **Environment and Behavior, 25(4): 485-505.**

Due to the complexity and ubiquity of environmental issues, the need to find strategies to change conservation behavior while minimizing the need for repeated intervention continues to challenge EE program developers. Environmental education professionals have used the following techniques of intervention: informational techniques, positive motivational techniques and coercive techniques. Five

evaluation techniques should be used to measure the impact of the intervention technique on behavior change: reliability, speed of change, universality, generality, and durability. Under these criteria, positive motivation techniques produce the best results, especially if they focus on intrinsic motivation. Commitment strategies provide this opportunity reliably producing both quick and durable behavior change.

Disinger, John F. 1990. *Teaching Creative Thinking Through Environmental Education.* **In ERIC/SMEAC Environmental Education Digest, Columbus, OH 43212 (614) 292-6717. EDO-SE-90-33.**

Creative thinking has been defined as one aspect of higher-order thinking necessary for problem-solving, invention and achievement. If teachers are to teach creative thinking in students, they must first develop their own creative talents. Authors point to several techniques to foster creative thinking, such as storytelling, brainstorming, guided imagery, and reflective writing. Environmental education can act as a mode for learning how to think creatively by identifying alternatives, using multiple resources, and identifying real and potential impacts of existing problems and potential solutions.

4-H National Program. National 4-H Criteria for Curricula Development. National 4-H Program Leader, USDA Room 3860 S. Building, Washington, DC 20250-0900.

A resource developed specifically for those creating curriculum materials to be used by 4-H clubs.

Gigliotti, Larry M. 1990. *Environmental Education: What Went Wrong? What Can Be Done?* **Journal of Environmental Education, 22(1):9-12.**

The author argues that although environmental education has been successful at producing ecologically concerned citizens, people are generally unwilling to change their personal lifestyles in ways which are necessary to solve some environmental problems. Citizens who have learned misconceptions or myths about the environment have criticized the behavior of others, but lack the knowledge and conviction to change their own behaviors. Gigliotti states that every citizen needs a basic understanding

Bibliography

Important
skills for
success



Bibliography

Important
skills for
success

of ecological principles, information on the alternatives and consequences of actions, and information on possible individual action. To help change the myth that people are separate from the environment, environmental education messages must make the connection between environmental information and individual actions and solutions to environmental problems.

Howe, Robert W., and John Disinger. 1988. *Environmental Education That Makes A Difference —Knowledge To Behavior Changes.* In **ERIC/SMEAC Environmental Education Digest, Columbus, OH 43212 (614) 292-6717. EDO-SE-90-12.**

Students who are given the opportunity to engage in long-term, realistic environmental issues tend to demonstrate responsible environmental behavior. Authors describe several variables involved in developing this accountability. Such individuals exhibit: (1) knowledge of relevant environmental concepts, (2) knowledge of environmental problems and issues, (3) concern for the quality of the environment, (4) knowledge of action strategies that may be used for resolving an issue, (5) belief that their action can make a difference, (6) commitment to take action, and (7) experience in action-based activities. Authors then list three sets of materials shown to have a significant effect on student learning and behavior: (1) *Conservation and Children* (National Diffusion Network, 1988); (2) *Investigating and Evaluating Environmental Issues and Actions: Skills and Development Modules* (Hungerford, 1988); and (3) *Decisions for Today and Tomorrow: Issues in Science-Technology-Society* (Iozzi, 1987).

Howe, Robert W., and Charles R. Warren. 1989. *Teaching Critical Thinking Through Environmental Education.* In **ERIC/SMEAC Environmental Education Digest, Columbus, OH 43212 (614) 292-6717. EDO-SE-89-22.**

Critical thinking skills are an intricate part of daily life. Students are asked and expected to make complex choices, judgements and evaluations everyday. Authors list several critical thinking skills definitions, including Ennis' (1987) definition: the process and skills involved in rationally deciding what to do or

what to believe. Business and industry continue to report that many employees are not able to think critically in job situations. Authors argue that schools need to re-evaluate how and what they are teaching and how to better prepare students for various societal situations. EE is thought to be a good mechanism in teaching critical thinking skills due to the scope, breadth and reality of environmental issues.

Jones, Jo, and R. Dale Safrit. 1992. *Critical Thinking: Enhancing Adolescent Decision-Making.* **Journal of Home Economics, 84(3): 4-7.**

Critical thinking skills involve problem-solving, decision-making, and evaluating one's position on issues. Key elements in the critical thinking process are dialogue, reflection, and questioning. These elements underlie the authors' 13 "effective strategies" to foster critical thinking in teens. Such strategies include debate teams, dramatizations, journal writing, listening teams, and considering alternatives. Each strategy presents teens with realistic situations in which they are asked to consider the points of view of those involved in the conflict.

Katzev, Richard D., and Anton U. Pardini. 1987. *The Comparative Effectiveness of Reward and Commitment Approaches in Motivating Community Recycling.* **Journal of Environmental Systems, 17(2): 93-113.**

This study investigated the value of commitment to an environmental action. Various study components compared commitments vs. monetary incentives, single request vs. multiple requests for commitment, and verbal commitments vs. written commitment. Another study by Theodore Wang and Richard Katzev explored the individual vs. group commitment option. (1990. Group Commitment and Resource Conservation: *Two Field Experiments on Promoting Recycling.* *Journal of applied Social Psychology, 20(4): 265-275.*) Results showed that commitments work better than monetary incentives for their ability to produce short term involvement and enduring behavior change. Commitments must be explicit for a specific action. They are enhanced if they are individual, public, written, and voluntary. Commitments to a specific act may lead to a more generalized commitment.

Monroe, Martha C., and Stephen Kaplan. 1988. *When Words Speak Louder Than Actions: Environmental Problem-Solving in the Classroom.* **Journal of Environmental Education, 19(4): 38-41.**

Authors promote using case studies to teach environmental problem-solving skills in place of action-oriented projects. Encouraging discussion of actual problems and presenting examples of successful solutions increases students' familiarity with optional solutions. Authors argue that action-oriented environmental projects may actually discourage students from future environmental action. They support this claim stating that projects are challenging to carry out and do not guarantee a positive experience for all students. Action projects also impose classroom constraints and require a very special commitment from the teacher. Authors further state that future studies should directly test the students' knowledge rather than rely on the teachers' impressions.

Neilson, Allan R. 1989. *Critical Thinking and Reading: Empowering Learners To Think and Act.* **ERIC Clearinghouse on Reading and Communication Skills, Smith Research Center, Indiana University, Bloomington, IN.**

Neilson argues that students' lack of critical thinking skills reflects our current educational system and the assumptions it holds about the nature of knowledge, teaching and learning. Educators place an overwhelming emphasis on teaching and considerable faith in direct instruction (lectures, readings, drill exercises) as the primary means of transferring facts and skills. When students have little active involvement in their education, compliance, rather than independence, in students' thoughts and actions tend to be valued. Neilson addresses the question "How to better prepare our children for the world beyond the classroom?" by suggesting application of an alternative framework that encourages personal independence.

Newhouse, Nancy. 1990. *Implications of Attitude and Behavior Research for Environmental Conservation.* **Journal of Environmental Education, 22(1):26-32.**

Most environmental attitudes are formed as a result of life experiences vs. a specific program designed to change attitudes. One explanation

for the discrepancy is the possibility that attitudes being taught do not correspond well to behaviors which are being measured. Attitudes have been found to be changed through certain types of experiences. A sense of loss, repeated exposure to a stimulus, hands-on contact, information, and modeling by a respected or liked person are perceived as having the potential to promote attitudinal change. Yet, in order for persons to take action, they must believe in their ability to bring about change through personal behavior. Additionally, change is accompanied by individual sense of responsibility, a clear understanding of the issues, and a supportive atmosphere.

Renner, John W., and Edmund A. Marek. 1986. *The Learning Cycle and Elementary School Science Teaching, chapters 4-7 and 9-10.* **Heinemann, Portsmouth, NH.**

These chapters summarize key components and philosophy of the learning cycle as developed by Robert Karplus based on education principles described by Jean Piaget. The learning cycle focuses on development of the ability to think rather than memorization of knowledge. The learning cycle approach includes three stages: exploration, conceptual invention, and concept implementation. Programs designed around the learning cycle strategy have been demonstrated to produce students as knowledgeable about content as students in a traditional course of study, but more able to apply what they have learned in a new situation.

Spinner, Nancy R. 1992. *Using Learning Styles to Empower Youth and Families.* **Journal of Home Economics, 84(3): 8-11.**

Learning reflects our response to environmental, social, emotional, physical, and psychological stimuli. Spinner describes studies comparing American and Asian student family situations. These studies suggested that American mothers tend to believe that school success results from an innate ability, whereas Japanese and Chinese mothers believe more in the relationship between hard work and success. Spinner also notes various learning styles: visual, auditory, manipulative (kinesthetic), and global learning. The style that suits a child's interest can best be determined by the parents. Determining a child's learning style

Resources



Bibliography

Important
skills for
success



Bibliography

Programs and recommendations

and encouraging parental involvement in the child's education may lead to higher achievement. Through greater parental expectations, a child may express him/herself through positive learning attitudes, self-confidence, curiosity, initiative, and persistence.

Wals, Arjen E., Almut Beringer, and William B. Stapp. 1989-90. *Education in Action: A Community Problem-Solving Program for Schools*. *Journal of Environmental Education*, 21(1):13-19.

The Action Research and Community Problem-Solving (ARCPS) model is adapted from a social science model (1940s) used to resolve disputes with a group. Under this model students isolate and thoroughly explore one environmental problem for study. ARCPS applies a systematic approach to learning that aims to equip students with the self-esteem and skills necessary for them to become confident and capable participants of society.

Water education programs and recommendations

Brody, Michael J. 1993. *A Comparison of Maine and Oregon Students' Science Knowledge Related to Marine Science and Natural Resources*. Presented at the annual meeting of the American Educational Research Association, Atlanta, Georgia.

Approximately 160 4th, 8th, and 11th grade students were interviewed in each state to determine knowledge about marine environments. The study demonstrated that while most students had some understanding of marine environment principles, most learning took place in the elementary grades. Overall, understanding of the concepts and principles related to marine ecosystem dynamics, resource utilization, management, and decision-making processes was low.

Brody, Michael J. 1993. *Student Understanding of Water and Water Resources: a Review of the Literature*. Presented at the annual meeting of the American Educational Research Association, Atlanta, Georgia.

The author investigated education literature about water topics in the areas of physics and chemistry education, biology education, earth

systems education, and water resource education. In general, studies showed that student understanding of science terms related to water and water resources is superficial. Students are not able to apply concepts which should underlay a particular term to other situations. Students showed particular difficulty explaining evaporation, diffusion, osmosis, etc. even when they had been introduced to appropriate molecular concepts. Students prefer explanations of common phenomena that they have acquired through personal experience. Models of water-related phenomena are too abstract and do not seem to relate to the everyday experiences of children. Although individual subject areas such as physics, chemistry, and biology address water topics, little effort is made to connect concepts taught in one subject with those in another. Research about student understanding of historical and cultural contexts of water does not exist.

A resource of note identified by this literature review is the Water Resource Knowledge Assessment (WRKA) described in *Water Resource Knowledge Assessment of College Bound High School Graduates*, by T. Mills, in *Proceedings of the Oklahoma Academy of Science*, 63: 78-82.

Fortner, Rosanne W., and Thomas G. Teates. 1980. *Baseline Studies for Marine Education: Experiences Related to Marine Knowledge and Attitudes*. *Journal of Environmental Education*, 11(4), 11-19.

This study summarizes the results of a marine awareness measure, The Survey of Oceanic Attitudes and Knowledge (SOAK). Results for Virginia's 10th grade students were compared with marine related experiences by the same students. Statewide average on the knowledge section was 49%. Those who scored higher also had more positive and less variable attitudes toward marine issues. Since ocean preservation does not make personal demands, positive attitudes were not interpreted as a measure of depth of commitment to improvement of ocean resources. A comparison of ocean awareness activities such as watching National Geographic TV specials, class activities, recreation activities, aquarium visits, indicated that students with the greatest access to these opportunities had the most knowledge and most positive attitudes. This suggested to the

authors that socio-economic status was a factor, leading them to recommend improved access for all youth to a variety of marine learning experiences.

Symposium on Water Resources Education: A Lifetime of Learning and Changing Roles in Water Resources Management and Policy. June 1993. Proceedings of the American Water Resources Association annual conference.

This conference included eight papers about water education. They are summarized below.

—*Symposium on Water Resources Education. Bixby, R. O. 1993. Environmental Education Initiative.*

Describes a watershed tutorial module using a graphical user interface (Arc View, a GIS program). Target audiences for the program were: decision makers, junior and senior high school students, and undergraduate college students. The project was initiated by the South Two River Watershed District which has an aggressive policy of public education. The environmental education initiative includes partnerships with a variety of local resource agencies, a state university, and two school districts. The effort is part of a comprehensive local water plan. One of the plan steps included working with two local school districts to provide curriculum materials on local geology and the impact of human habitation on water concerns. The resulting interactive computer module uses an existing data base on surface and ground water quality and quantity.

—*Symposium on Water Resources Education. Brown-Babcock, M., and J. Zilligen. 1993. Marine Debris Curriculum: Awareness to Action.*

Describes “Save Our Seas,” a comprehensive marine debris education program for grades K-12. The program includes curriculum materials, a teacher training network, and local events. The curriculum seeks to develop a sense of stewardship and instill a commitment to take personal responsibility to protect natural resources. It provides practical approaches to restoring the environment. Each unit includes a “cleanup” activity. At the secondary school level students design a model for cataloging and measuring the amounts of debris found during their cleanup. Data is analyzed, then students brainstorm solutions. If possible, they implement one of the solutions.

—*Symposium on Water Resources Education. Dyckman, Claire, N. Hansen, A. Murphy, K. O’Laughlin, and W. Scherrer. 1993. Watershed Education: Lessons from the Northwest.*

Watershed education efforts in the Pacific Northwest have led to a number of conclusions about what it takes to provide successful programs. Programs focus on adult audiences, including adults who work with children. Programs include stream teams, adopt-a-stream, wild Olympic salmon (a 25 ft. fiber-glass walk-in salmon), field based environmental education for schools with an interdisciplinary focus. All programs:

- focus on understanding the entire watershed
- provide information specific to a particular basin
- conduct most instruction in the field
- limit programs to small groups
- promote long-term action and environmental problem-solving
- cooperate with different interest groups and agencies
- integrate school and community activities
- address scientific, technical, political, and individual aspects of watershed management
- employ a variety of interactive teaching methods
- furnish models for participants to teach to others

Program planners have been challenged by the need to educate so that individuals develop a long-term commitment and so that individual commitments are supported by local institutions. They recommend long-term funding for the best results. They also suggest proceeding slowly, including as many groups as possible, and addressing controversy. To make complex watershed topics manageable to audiences, they recommend keeping education as simple and concrete as possible.

—*Symposium on Water Resources Education. Handley, S. M. 1993. Streamwalk: A Dynamic and Successful Education and Public Involvement Project.*

Developers of the Streamwalk program attribute its success to the fact that it provides the lay person with an opportunity to become involved in environmental protection.





Bibliography

Programs and recommendations

Participants answered 11 stream description questions and several questions about land use and stream bank condition. Explanations of significance of each question are described in the materials. Results are entered into an EPA Region 10 data base. In each major geographic area, a lead agency or consortium of agencies has assumed responsibility for local Streamwalk programs. Local groups, students, and individuals can be involved in the program. Other support materials include a Streamwalk game for young children and a campaign to involve state workers into the program. The Streamwalk activities were also successfully integrated into the Boise River Festival.

— *Symposium on Water Resources Education*.
Higgins, Susan H. 1993. *Trends in Water Education: Results of the Western Watercourse Adult Education Needs Survey.*

The Western Watercourse conducted a study in 1992 to determine the water education needs of citizens in 17 western states. Survey participants (300 out of 900 water-related professionals responded) identified nine water topics as fundamental water education components. Topics include: (1) water conservation, (2) how to become personally involved in water quality protection, (3) where does water come from? how we harness and allocate water? (4) the basics of water science and the public process, (5) groundwater: take the mystery out and tell us what it really is and how to protect it, (6) water rights, (7) science and protection of wetlands and riparian areas, (8) integrated resource management: how planning and land uses in a watershed impact water quality and quantity, and (9) water and economics: what is the value of water? In order to increase public participation and commitment in water science and water use issues, it was determined that these nine topics should be addressed in a public water education program. Respondents stated they believe the general public receives most of their information about water resources from television programming, newspapers and magazines, or newsletters. In response, survey respondents view the challenge as lying in developing new communication media about water resources and management.

— *Symposium on Water Resources Education*.
Hoening, E. 1993. *Public Involvement and Education: A Framework for Local Government in Urbanizing Communities.*

Describes Public Involvement and Education (PIE) strategies for Olympia, Washington.

Olympia has integrated the conventional functions of public information, involvement, and education into its staff team for the Water Resources Program. This allows staff to be involved in all elements of public involvement and education. The Olympia program is based on the Puget Sound Water Quality Authority planning process. Key policies emphasize public involvement and education. A watershed, or basin, approach is an important element in all water resource programs. Major projects were: Stream Teams — short and long term projects for citizens; Operation Water Works — for businesses; and Project GREEN — for schools.

Recommendations were that a municipal unit begin its education program by identifying a geographic unit of planning. Second, a needs assessment should be completed. Goals should be developed based on this need. Program elements should include: community grants, education and training for a variety of audiences, public information and outreach, coordination and evaluation, technical assistance, data management.

— *Symposium on Water Resources Education*.
Koenings, J., and J. Mountjoy-Venning. 1993. *Comprehensive Water Resources Education Techniques in Thurston County, Washington.*

Outreach methods for public education include: springs tours by bus, restaurant table talkers, low tide beach tours, septic system homeowner workshops, beach booths, volunteer monitoring.

— *Symposium on Water Resources Education*.
Mercer, M. 1993. *Forging School Partnerships in an Era of Change.*

Seattle's water utility has chosen to develop school partnerships as a means of connecting with the community. Steps for a successful relationship include: determining whether a partnership is compatible with agency needs and goals, gaining administrative support, developing a familiarity with the school environment, selecting a school, developing mutual goals and levels of involvement, developing a final budget, setting a time line, recruiting and training volunteers, tracking activity levels, and communicating results.

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